

2024 ISP Consumer Panel

To: AEMO

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Submission: DRAFT 2023 Inputs, Assumptions and Scenarios Report (IASR)

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Contents

1. Bigger Picture Themes and Key Messages.....	5
Bigger Picture Themes	5
Process Themes	5
Topic Specific Priorities	5
1. Cost Matters – and who pays that cost matters.....	5
2. Net Zero Matters - and behavioral responses will vary	6
3. Orchestration	7
4A: Uncertainty of how consumers will behave / respond, (consumer side)	
4B: Supply chain pressures	8
5. Transparency.....	9
6A. Policy - Australia	9
6B. Policy – International	10
7. Social Licence	11
Process Themes	11
8. Role of DNSP’s.....	11
9. Sensitivity testing	12
10. Consumer Engagement Separate process	12
Topic specific priorities	12
11. Discount rate.....	12
12. Hydrogen assumptions	13
13. Consumer risk preferences	14
14. Transmission cost database	14
2. About the ISP, IASR and Consumer Panel	15
2.1 Background	15
2.2 ISP Overview	15
2.3 The IASR	17
2.4 The ISP Consumer Panel	19
2.5 Regulatory Framework.....	20
2.6 Funding Transparency Statement.....	20
3. Changes since ISP22 and challenges for 2024	21
3.1 What is changed or changing?	21
1. Prices matter even more as cost of living pressures are growing	21
2. Government Policy: New and changing energy policies, e.g., Rewiring the Nation and Jurisdictional plans.....	24
3. Other policies and expectations related to energy services and policies.....	24

4. The requirement of better consumer engagement.....	25
5. What are the energy based services that various groups of consumers want now and into the future?.....	25
6. Consumer Risk preferences: how much are various customers willing to pay for future outcomes, and what is their appetite for price volatility?.....	26
7. Social Licence: what does it mean in the ISP context, how is it earned?	26
8. Costs of implementation.....	26
9. New and emerging technologies: it is difficult for consumers to differentiate between the genuine technology innovation, hype or wishful thinking and thinly veiled grabs for Government subsidies or funding	26
10. Uncertainty (the 2022 ISP could not predict the Ukraine war)	26
3.2 Challenges for the 2024 ISP	27
Integration	27
Modelling	27
4. Overall Comments on the IASR Engagement Process so far	29
4.1 Introduction	29
4.2 The ISP Framework and Stakeholder Engagement.....	29
4.3 2022 Panel Comments	30
4.4 2023 IASR Engagement Process.....	31
4.5 Consumer Risk Preferences	32
4.6 Engagement considerations.....	33
4.6.1 Key timings.....	33
4.6.2 The FRG	34
4.6.3 Consumers	34
4.7 Summary	35
5. Scenarios	36
6. Sensitivities	39
7. Inputs and Assumptions.....	43
7.1 Policy and emissions reduction settings	43
7.1.1 Public policy settings.....	43
7.2 Consumption and demand historical and forecasting components.....	45
7.2.1 Distributed Energy Resources (DER) uptake and generation/charging/discharging patterns	45
7.2.2 Electric and fuel-cell vehicles	50
7.2.3 Electrification	53
7.2.4 Hydrogen.....	53
7.2.5 Electricity Price Indices	56

7.2.6 Demand side participation.....	56
7.3 New entrant generator assumptions.....	57
7.3.1 Technology build costs.....	57
7.3.2 Locational cost factors	62
7.3.3 Storage modelling	63
7.4 Social Licence	64
7.5 Distribution aspects (DNSP's)	67
7.6 Fuel assumptions	69
7.6.1 Gas price forecasts	69
7.7 Financial parameters.....	76
7.7.1 Discount Rate	76
7.8 Hydrogen assumptions and infrastructure needs	80
7.9 Employment factors.....	81
Appendix A - Abbreviations	83
Appendix B – Summary of some ISP related policies.....	84

1. Bigger Picture Themes and Key Messages

This section provides the 2024 Integrated System Plan (ISP) Consumer Panel's (2024 Panel) thoughts about the key themes that we have identified from the Draft 2023 Inputs, Assumptions and Scenarios Report (IASR) as well as our main messages for AEMO. As such, this section is not an Executive Summary of the rest of the submission but brings together recurring themes, in contrast to the more specific responses to aspects of the Draft 2023 IASR in subsequent sections.

The themes have been grouped under three headings: bigger picture themes, process themes and topic specific considerations and priorities.

Bigger Picture Themes

1. Cost Matters - and who pays that cost matters.
2. Net Zero matters – and behavioral responses will vary.
3. Orchestration
4. Uncertainty
 - a. Uncertainty of how consumers will behave / respond, (consumer side)
 - b. Supply side
5. Transparency
6. Policy
 - a. Australia
 - b. International
7. Social Licence

Process Themes

8. Role of DNSPs
9. Sensitivity analysis
10. Consumer engagement

Topic Specific Priorities

11. Discount rates
 12. 'Hydrogen Scenario'
 13. Consumer Risk Preferences
 14. Transmission Cost Database
- } Important and subject to separate processes,
} along with ISP methodology

1. Cost Matters – and who pays that cost matters

In the context of rising costs and declining real incomes (for many), the thought of higher electricity costs causes despair for many households and businesses.

The value of the combined Regulatory Asset Base (RAB) for electricity networks in Australia is about \$105 billion (transmission \$23 b, distribution \$82 b).¹ The 2022 ISP foreshadowed the need for \$170 billion in new investment by 2050, this being the total weighted spend to develop, maintain and operate generator storage and future network investments. ISP specific projects, actionable and

¹ AER (2022a) State of the Energy Market Report at <https://www.aer.gov.au/news-release/aer-releases-its-state-of-the-energy-market-2022-report> p.61.

future projects, being about \$7b. This means that a substantial cost will need to be met by energy consumers or taxpayers.

At the same time, the median persons income of Australians in 2019 (reported in November 2022) was \$52,338,² many with decline real incomes with CPI higher than wage/ income growth.

This reflects the tension between energy market costs and capacity to pay for many people. While AEMO may argue as it did in its Consultation Summary Report on the 2021 IASR that:

“AEMO acknowledges feedback in relation to who should fund network upgrades, but notes that the ISP is a whole-of-system optimisation process that does not allocate costs to specific parties. Feedback relating to funding of transmission projects should be directed to the ESB’s Post-2025 Electricity Market Design initiative or the AEMC’s Coordination of Generation and Transmission Investment (CoGaTI) review.”³

The costs of implementing the ISP are increasing substantially due to a range of factors discussed throughout this report. While AEMO may say that the ISP does not consider who pays, we believe it cannot avoid that discussion. The transition was initially presented to consumers as an opportunity for much lower electricity costs from renewables. That is not going to happen soon. Then it was presented as costs being lower than what they would otherwise have been without the network and generation investment. Now it is something like there will be increased costs in the short term, but prices will fall in the long term.

AEMO cannot ignore the reality that the significant costs of the ISP mean that what we refer to as ‘consumer social licence’ i.e., consumer support for the ISP is directly dependent on the level of cost borne by consumers. How is that cost going to be shared between Governments (taxpayers), generators and consumers? Too much cost for consumers facing affordability issues will result in a loss of consumer support for the ISP.

Panel Proposals for 2023 IASR

- **Key Message: there are higher costs for consumers in all scenarios, so consumers need to be brought along with maximum transparency about likely costs.**
- **Key Message: the 2024 ISP cannot ‘ignore’ the who pays question.**
- **Key Message: modelling needs to consider the heterogeneity of consumers, i.e., different groups of consumers have different priorities and differing ability to pay. Analysis needs to consider distribution of results as much as measures of ‘central tendency’ (i.e., averages).**

2. Net Zero Matters - and behavioral responses will vary

There is strong public and business support for moving to net zero and for the transition to renewable electricity generation - the rate of businesses signing corporate PPAs and installation of rooftop PV is evidence. Governments at all levels have a strong role to play in supporting the transition to net zero in the energy sector, including financial support for energy consumers particularly vulnerable consumers, education about the need for orchestration and community engagement to create the conditions for social licence. The Draft 2023 IASR has many core assumptions that revolve around forecasts of how consumers will behave (e.g., social licence, fast transition in an environment of high prices, DER orchestration) but there is considerable uncertainty

² Personal Income in Australia, 2015-16 to 2019-20 | Australian Bureau of Statistics at www.abs.gov.au

³ AEMO (2021) 2021 IASR Consultation Summary Report at <https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-iasr-consultation-summary-report.pdf?la=en> see p.88.

about how consumers will actually behave and which behavioral prompts, policies and ‘nudges’ will be effective.

Comments made during the AEMO Draft 2023 IASR Webinar on 2 February 2023 reinforce this commitment to net zero and the energy sectors playing a major role, including through the ISP.

Panel Proposals for 2023 IASR

- **Key Message: the 2024 ISP and Final 2023 IASR cannot downplay the deep community concern about the importance of achieving Net Zero and ISP playing a role.**
- **Key Message: the Draft 2023 IASR illustrates that governments at all levels will need to do more to support energy consumers through the transition.**

3. Orchestration

To be fully effective, the ISP needs to optimise network and non-network responses. At its core, the ISP is predominantly a transmission plan. More needs to be done to create the conditions for maximising the growth of non-network solutions (outside of the RIT-T process). The transmission infrastructure building part of the ISP needs to be matched with related factors including generation, consumer energy resources (CER) and demand management, so that all aspects come together – this is the required ‘orchestration.’

The Panel considers orchestration to be the processes to implement responses to the pace, scale and utilisation of consumer energy resources (CER), which comprise small-scale embedded generation, storage technologies and ‘smart systems’, such as residential and commercial PV systems, battery storage, electric vehicles (EVs) and Virtual Power Plants (VPPs). CER also refers to other resources that enable greater demand flexibility, including energy efficiency for housing and appliances.

AEMO has also presented a definition in discussions with the Panel, being “orchestration is the use of digital technologies to partially or fully control distributed and/or consumer energy resources, so as to achieve outcomes of both the orchestrator and the energy resource owner.”

The ISP needs a graph on the level of Demand Response, DER, EE, etc. that is also needed to achieve the (optimal) development path. This would be a companion to the changing generation mix over time, etc. There needs to be some focus on reform rather than actionable projects.

AEMO should also include in the final ISP proposed ‘nudges’/orchestration action that is also required to achieve the ISP.

Panel Proposals for 2023 IASR

- **Key Message: focus also needs to be given to the non-network factors which enable the Optimal Development Path (Energy Efficiency (EE), Distributed Energy Resources (DER), Demand Management, VPPs).**
- **Key Message: the ISP needs to be integrated with other relevant policies and practice, i.e., town planning, energy efficiency, etc.**

4. Uncertainty

4A: Uncertainty of how consumers will behave / respond, (consumer side)

Current cost of living pressures means that consumer response to various messaging about electricity costs will not necessarily follow 'rational expectations' behavioral notions, and will change over time.

The Final 2023 IASR needs to highlight relative uncertainty for all scenarios while the costs to achieve scenario outcomes vary considerably. Consumer social licence has not yet been gained for this. Many consumers think that renewable generation will give cheaper energy but do not realise that the costs to get there are high.

There is no accepted single 'trusted voice' for consumers to access regarding energy costs, trajectories and requirements. This means that there is room for falsehoods to be regarded as truths, stakeholders to lay false claim to being 'the' voice of consumers, conspiracy theories to grow, and consumers to be exploited by the unscrupulous. This in turn fuels mistrust and deepens uncertainty.

Presenting truth to uncertainty is crucial for successful implementation of the ISP. For AEMO, this means continuing to give high priority to processes considering social licence and for sensitivity analysis on social licence should be applied. Social licence considerations should be extended to the methodology for developing the ISP (a separate process to the IASR). Also important in responding to uncertainty arising from the lack of a trusted voice for consumers is for AEMO to develop a communication strategy associated with all major aspects of the ISP and with end users as a major audience.

There is also a risk that the true costs to consumers of the components which will make up the total ISP costs will not be revealed due to a variety of factors (e.g., inaccurate estimation of social licence costs, etc.).

Panel Proposals for 2023 IASR

- **Key Message: cost pressures on consumers are paramount.**
- **Key Message: uncertainty limits standard modelling and forecasting, so more focus needed on sensitivity analysis.**
- AEMO's Consumer Risk Preferences work is vital for the Final 2023 IASR and 2024 ISP.
- A table should be included in the Final 2023 IASR to show the relative certainty/uncertainty for various scenario inputs with an indicator of cost required to achieve scenarios outcomes.
- Consumer side analysis to include behavioral economics analysis along with demand elasticities by personal income and time.
- ISP modelling should include distribution impacts, where modelling is possible, to enhance distribution network efficiency and reduce peaks through the transmission network.
- Sensitivity analysis should include consideration of impact on lower and higher income people, e.g., 20th and 80th percentile on wealth/income distribution.

4B: Supply chain pressures

The world is wanting to rapidly decarbonise and there is competition for the resources available to enable that to occur. That competition is very hot since the US passed the *Inflation Reduction Act* in 2022. This provides enormous subsidies for the development of networks, renewable generation and storage in the US as it seeks to build domestic capacity and reduce reliance on imports,

especially from China, to meet its emission targets. This means the US is drawing resources (funding, skills, manufacturing capacity) from the rest of the world. This is contributing to a world ‘subsidy race’ as other countries see the impact on their decarbonisation targets.⁴

This will have a significant impact on Australia with its small domestic manufacturing and skills base and heavy reliance on imports. It is occurring at a time when Governments are spending significant funds on other civil construction activity and where there is an immense and growing pipeline of construction projects apart from those associated with the energy transition. While States are making efforts to increase the ability of local supply and skilled labour, we will remain heavily dependent on imports for major parts of the capital and labour to implement the ISP. Australia is unable to compete with the US in the ‘subsidy war’.

Panel Proposals for IASR

- **Key Message: the 2024 Panel is not confident that the cost estimates in the GenCost database sufficiently reflect these supply chain constraints; we look forward to seeing how the Transmission Cost Database reflects these pressures.**
- **Key Message: supply chain pressures will delay implementation of the ODP timetable, so the analysis needs to undertake sensitivity testing on the project (transmission and generation) schedule.**

5. Transparency

The 2024 Panel recognises that there has been increased transparency in each successive ISP but there are a number of areas where more is still required e.g., aspects of costs, level of engagement with DNSPs.

Panel Proposals for 2023 IASR

- **Key Message: consideration of ‘who pays?’ questions for the ISP now need to be considered as consumer risk preferences and social licence are incorporated into the ISP, and these are partially cost dependent.**
- **Key Message: consumers need to have confidence the projected cost of the ODP is accurate and reflects their interests, and for this they need full transparency.**
- Sensitivity analysis and better evidence will be required, in modelling, regarding project costs: locational, timing and technical. (Refer Section 6).
- Some more detail in the narrative for the Final 2023 IASR will be required, making for a longer document, or more appendices. We consider this to be acceptable and desirable.

6A. Policy - Australia

There have been significant national and jurisdictional policy developments since the 2022 ISP. How AEMO considers policy, including government owned energy projects, is also critical across many aspects of the ISP.

For one example, it could be considered odd there are any scenarios above 2.0 degrees temperature rise despite clear policy, while some of the hydrogen in gas networks aspirations applied on the basis of policy are not accurately reflective of actual policies, let alone plausibility as noted later in this submission. AEMO’s approach to policy should include policies that have been legislated, funded, have demonstrated commitment and are plausible. AEMO applies the ‘public policy criteria’ as set

⁴ For a recent review of the impact of the Inflation Reduction Act see David Skaysbrook ‘Decarbonising Clean Energy Supply Chains’ Paper presented at the Queensland Energy Conference 22 February 2023.

out in NER 5.22.3(b). The distinctions between which policies are included in the ISP scenarios and which are not has become more difficult to discern.

As another example, recent updates about Snowy 2.0, a centrepiece of government policy and driver of material ISP transmission costs, confirm the unrealistic nature of the proponent Snowy Hydro's projected timelines. It is clearly unlikely Snowy 2 will be operating this decade, and to assume otherwise does not meet AEMO's own core principle of plausibility.

Frequent and significant recent announcements also add a timing question to which policies are included in 2024 ISP scenarios.

The politics of energy markets and policy means that there are many factors that can impact policies, some which lead to poor outcomes. For the ISP, evidence must continue to trump policy, noting that evidence can be both quantitative as well as qualitative.

Panel Proposals for 2023 IASR

- **Key Message: the Final IASR should include a table/description of the policies included in scenario considerations checked against AEMO policy inclusion criteria and 'cutoff date' for policy considerations.**
- **Key message: AEMO should require a strong evidence base before adopting assumptions or inputs based on policy alone (including government owned energy projects), as it would for any projects initiated by the private sector. To do otherwise introduces unacceptable risk that is inconsistent with the long term interests of consumers.**
- See transparency comment on 'who pays?'

6B. Policy – International

Policies from overseas will also impact on Australia. The key issue here is the impact of the *US Inflation Reduction Act* passed in August 2022. It provides for nearly \$US400 b in subsidies for energy security and climate change.⁵ This will have the effect of drawing capital and skilled labour to the US and away from other countries and potentially significantly delay the ability of other countries, including Australia, to meet their renewable energy and climate targets. While the Act does encourage significant new investment in the US (particularly to reduce its reliance on Chinese manufacturing capacity) to reduce their domestic supply chain pressures, it will, at least in the short and medium term, exacerbate the existing world supply chain pressures on both network and generation build. Now we are beginning to see other countries – particularly the EU – considering how they can avoid losing out and their proposed response is to increase their own subsidies. This will only lead to an escalating 'subsidy war' that is costly, very unproductive and only increasing supply chain pressures.

We are already seeing domestic hydrogen developers wanting Australia to significantly increase subsidies to support their business cases, already reliant on significant government assistance. Australia should not compete in this 'subsidy war' and expect electricity consumers (or taxpayers) to subsidise rent seeking from hydrogen developers. We would expect many other options are available on a much lower \$/t abatement available for Australia.

At their meeting on 24 February 2023, Australian Energy Ministers agreed to 'revise and refresh' the 2019 Hydrogen Strategy given overseas developments like the US legislation. While there is a reduced role for hydrogen exports in the 1.5C Green Energy Exports scenario (vs the 2022 Hydrogen

⁵ https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf

superpower scenario), they are still relatively significant. Given the Ministers' decision, the 2024 Panel believes the CSIRO/Climate works modelling used to underpin the hydrogen assumptions in the 1.5C Green Energy Exports scenario should be revisited with a detailed analysis of the potential impact of the US and other countries increased subsidies.

Panel Proposals for 2023 IASR

- **Key Message: the current multi-sector modelling should be updated to seek to assess the impact of the US legislation impact in particular, and any other overseas policy development likely to impact on the ISP.**

7. Social Licence

A major question for the ISP is how to quantify the impact of Social Licence on Transmission. It is important to note that we consider social licence in two contexts:

- Community Social Licence which relates to measures including engagement of impacted communities and payments to landowners for hosting electricity infrastructure
- Consumer Social Licence which relates to acceptance of the costs to all consumers of generation and transmission infrastructure.

It is crucial that broader acceptance of TNSP projects is not lost in compensation to landowner considerations.

The 2024 Panel proposes sensitivities around social licence covering project delay and capex costs.

Panel Proposals for 2023 IASR

- **Key Message: social Licence is a crucial IASR consideration, and better engagement is needed before the Final 2023 IASR.**
- **Key Message: expand the Draft 2023 IASR definition to include 'consumer social licence'.**
- **Key Message: expand the model sensitivities to cover schedule delay and increased capex resulting from the need to obtain social licence.**
- **Key Message: work to rapidly improve the knowledge base of the Advisory Council on Social Licence to support them to make a meaningful contribution to the 2024 ISP.**

Process Themes

8. Role of DNSP's

There is limited certainty about DER forecasts due to AEMO's apparently limited engagement with DNSPs. Many distribution business are currently engaging actively with consumers on CER, tariffs and related topics. Many DNSPs have very up to date forecasts and data and insights into consumer attitudes and expectations.

The 2024 Panel acknowledges that AEMO does engage with DNSPs, though it appears to focus on engagement on technical issues. The message the 2024 Panel is getting from DNSPs is that this should increase and expand to include other disciplines e.g., to those in consumer engagement, regulatory, pricing and Government relations.

Panel Proposals for 2023 IASR

- **Key Message: ensure that IASR forecasts are aligned with DNSP forecasts.**

- **Key Message: widen the scope of engagement with DNSPs outside a purely technical focus.**
- **Key Message: set out in detail the level of engagement with DNSPs in the Final IASR.**
- AEMO should consider making recommendations for improving policies, tariffs and messaging to consumers to use load, where possible, to improve DNSP network multifactor productivity and reduce future peak loads to reduce TNSP build.

9. Sensitivity testing

The high level of uncertainty around costs, schedule and policy means there is increased focus on the range of sensitivity testing. The use of sensitivities can help consumers understand how robust the Candidate Development Paths (CDP) are to changes in key variables. Showing a high-ranking CDP based on central case assumptions is still high ranking after significant sensitivity testing on multiple variables given confidence to consumers that the recommended optimal development path is robust and in their long term interests.

Panel Proposals for 2023 IASR

- **Key Message: allow for increased levels of sensitivity testing, to provide transparency for matters with high levels of uncertainty with a focus on cost and schedule.**

10. Consumer Engagement Separate process

“Boards need to lead and engagement needs to go through the organisation – like a golden thread.”
– Sharon Darcy (Sustainability First UK) delivering Gill Owen Lecture 2017.

The ISP Consumer Panel strongly supports AEMO’s commitment to engaging well, and acknowledges the time and resource pressures for AEMO to deliver on this commitment. Consumer engagement needs to be an active and ongoing process for AEMO and relevant consultants too, to both boost social licence and manage uncertainty.

Panel Proposals for 2023 IASR

- **Key message: consumer engagement needs to become the ‘golden thread’ that weaves through all decision making, including through IASR components.**
- The consumer engagement strategy and associated actionable plan that is currently a ‘living document’ for AEMO and the 2024 Panel, should be published, when practical.
- Consumer engagement strategy needs to be the first 2026 ISP document produced and consulted upon.

Topic specific priorities

11. Discount rate

Sensitivity testing in the 2022 ISP showed that changes in the discount rate had the largest impact on net market benefits of any sensitivity. The 2022 Panel was very critical of the consultant’s use of the ‘on the day’ approach to calculation of the central discount rate when the private sector operates on ‘hurdle rates’ that generally do not change with interest rates. ISP discount rates are also applied outside of the ISP process, to both ISP and non-ISP projects, and the merit and accuracy of their settings have been called into question in those contexts.

The updated report from the same consultant for the Draft 2023 IASR has the same flaws highlighted by the 2022 Panel.

Panel Proposals for 2023 IASR

- **Key Message: the 2024 Panel recommends that AEMO commission a different consultant to provide data on what is the expected return on private sector investments and how that has changed over recent years.**
- **Key Message: the above study should be completed in time to allow stakeholder engagement prior to publication of the Final 2023 IASR.**

12. Hydrogen assumptions

Hydrogen is likely to play an important niche role in emissions reduction, at a global level, in sectors and regions that are otherwise difficult to decarbonise.

Beneficiaries and/or governments - not consumers - should carry the costs of infrastructure to support hydrogen production

Producing, storing, transporting and using hydrogen at scale for most potential applications remains far from economic after more than 50 years, and a recent burst of activity, of research and development. Despite the high hopes of proponents and governments, plans for hydrogen are highly speculative, and rely on major technology and other breakthroughs to become feasible.

Hydrogen production and export projects should not be cross-subsidised by other energy users. This entails the beneficiaries (future hydrogen projects) or government carrying the full cost of electricity transmission required for the purposes of hydrogen production, storage and transport.

Current cost recovery arrangements for shared transmission do not support a beneficiary-pays approach to funding the transmission required for future large hydrogen projects.

The above observations cast doubt over whether the ISP should countenance the inclusion of transmission for hydrogen facilities at all, or at least in the absence of reforms (or committed government funding) that avoid imposing the high costs of transmission for future speculative hydrogen on consumers.

Panel Proposals for 2023 IASR

Either:

- Government funding, committed funding by proponents and/or reforms to cost recovery should prevent other consumers funding the portion of shared network infrastructure attributable to hydrogen projects in the ISP, or
- AEMO should minimise the inclusion of hydrogen projects in the ISP to a level where there is no material cost or risk, including the risk of underutilisation of transmission assets, for other consumers.

It is not realistic, or in the interest of consumers or emissions reduction, to assume non-trivial volumes of hydrogen will be used in gas distribution networks

At the same time as hydrogen is being explored for export, the natural gas distribution and transmission sectors are facing the existential threat of underutilisation and asset stranding as homes and businesses shift traditional gas loads to electricity.

The prevailing view of independent energy experts is that gas of any type has a diminishing future as a fuel in homes. The question of new gas connections ceasing altogether is one of 'when', not 'if', and it is plausible large portions of gas distribution networks will be decommissioned by 2050.

To inject more than a trivial blend of hydrogen blend (averaged across the gas network) does not reflect:

- consumer interests or preferences
- economic feasibility, now or into the future
- technical feasibility, now or into the future
- decarbonisation needs over any time scale
- AEMO's core principles for the IASR.

Panel Proposals for 2023 IASR

For the reasons outlined above, the Draft 2023 IASR's assumptions about hydrogen blending in gas networks do not satisfy AEMO's core principle that the scenario be plausible.

Given the asymmetry of risk (the Draft 2023 IASR only examines overoptimistic levels of hydrogen), these assumptions arguably do not satisfy AEMO's core principle that scenarios be usefulⁱ.

Noting there are technology trials which will result in some injection of hydrogen into gas networks for the foreseeable future, AEMO's IASR should assume the following levels of hydrogen in reticulated gas networks:

- a default value of 2% in all scenarios (rather than unlimited as per the Green Exports scenario and <10% as per the other scenarios)
- a sensitivity of 10% in the Green Exports scenario (rather than a default value of unlimited as proposed in the Draft 2023 IASR).

13. Consumer risk preferences

A key issue for the 2022 ISP Consumer Panel was the risks of over (too much, too early) or under (too little, too late) investment in network and generation in the face of uncertainty around the timing of coal plant closure. The 2022 Panel recommended that AEMO undertake engagement to better understand consumer risk preferences.

AEMO has appointed Deloitte to see how measurement of this willingness to pay might be done, what results are available from consumer engagement and how this might be incorporated into the ISP modelling. The 2024 Panel is deeply involved with this Deloitte and AEMO project as they seek to answer these questions.

14. Transmission cost database

The Transmission Cost Database (TCD) contains a significant amount of information on actual and forecast costs of various components of network build. After a cursory analysis in the 2020 ISP, AEMO made considerable advances in the sophistication of its TCD in the 2022 ISP and is seeking to expand that sophistication in the 2024 version. The 2024 Panel considers this is a core part of the ISP assumptions given the scale of the recommended build and the extreme supply chain and social licence pressures driving substantial increases in forecast costs.

AEMO has appointed Mott MacDonald (MM) to update the 2022 TCD. The 2024 Panel has had the benefit of a number of meetings with AEMO and MM as they have developed their Draft report. The 2024 Panel has provided extensive feedback to AEMO on suggestions to improve the Draft. That feedback included a recommendation that the revised report be published for stakeholder comment as part of the Transmission Expansion Report in April.

2. About the ISP, IASR and Consumer Panel

2.1 Background

South Australia (SA) experienced a “system black” (state-wide blackout) on the afternoon of 28 September 2016. According to the AER, the system black was triggered by severe weather that damaged both transmission and distribution assets, followed by reduced wind farm output and a loss of synchronism that caused the loss of the Heywood Interconnector. Widespread blackouts lasted for a period of 8 hours for the majority of areas across the state, while some areas remained without power for days. There was a period of market suspension for a further 13 days.⁶

The SA system black triggered a tsunami of state and national energy regulatory reviews, rule changes and enforcement action. A focus of this action was to ensure that such an event never occurs again. The Coalition of Australian Governments (COAG) energy ministers agreed to an independent review of the national electricity market at an extraordinary meeting on 7 October 2016. Dr Alan Finkel AO, Australia’s Chief Scientist, was Chair of the Expert Panel that conducted the review.

The *Blueprint for the Future of the National Electricity Market* was issued on 9 June 2017 as the final report of the independent review chaired by Dr Alan Finkel. The *Blueprint* contained 50 recommendations, including 5 related to system planning. Recommendation 5.1 effectively introduced the Integrated System Plan (ISP):

“By mid-2018, the Australian Energy Market Operator, supported by transmission network service providers and relevant stakeholders, should develop an integrated grid plan to facilitate efficient development and construction of renewable energy zones across the National Electricity Market.”⁷⁸

2.2 ISP Overview

The Integrated System Plan (ISP) is a whole-of-system plan for the development of the National Electricity Market (NEM) for the next 20 years and beyond. It is focused on the long-term interests of electricity consumers to ensure the efficient development of the power system for all users and the delivery of reliable, affordable energy for everyone.

AEMO’s next ISP is due to be published in July 2024. Under the National Electricity Rules (NER), the ISP is to be published every two years. An ISP Methodology is to be published at least every four years.

The first ISP was issued in July 2018, with the statement that it was a:

⁶ AER (2018) Investigation report into South Australia’s 2016 state-wide blackout at <https://www.aer.gov.au/wholesale-markets/compliance-reporting/investigation-report-into-south-australias-2016-state-wide-blackout>

⁷ Finkel, A (2017) Independent Review into the Future Security of the National Electricity Market at <https://www.energy.gov.au/publications/independent-review-future-security-national-electricity-market-blueprint-future>

⁸ Finkel, A (2017) *ibid* p.24.

“cost-based engineering optimisation plan by the Australian Energy Market Operator (AEMO) that forecasts the overall transmission system requirements for the National Electricity Market (NEM) over the next 20 years.”⁹

The transmission investment recommended for immediate action in the 2018 ISP was estimated to be between \$450 million and \$650 million. These projects were to become regulated network assets and therefore be funded by consumers through electricity bills.

The 2020 ISP was released on 30 July 2020. Here, the ISP was described as a:

“whole-of-system plan to maximise net market benefits and deliver low-cost, secure and reliable energy through a complex and comprehensive range of plausible energy futures. It identifies the optimal development path for the National Electricity Market (NEM), consisting of ISP projects and development opportunities, as well as necessary regulatory and market reforms.”¹⁰

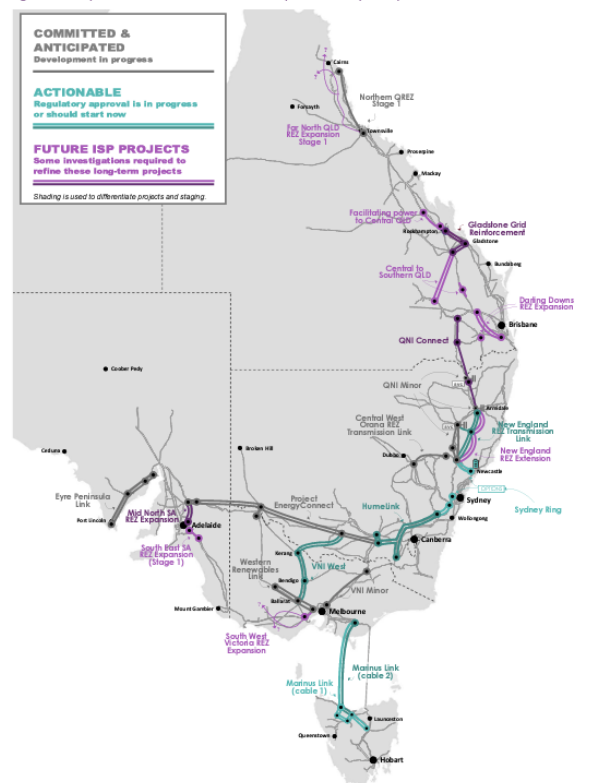
The optimal development path includes actionable ISP projects and future ISP projects, which can be progressed through the Regulatory Investment Test for Transmission (RIT-T) process. The actionable ISP projects in the 2020 ISP were forecast to cost between \$6.8 billion and \$12.7 billion over the period 2022-32, financial years.

The 2022 ISP was released in June 2022 with the statement that it:

“...sets out an optimal development path (ODP) which identifies investments that meet the future needs of the NEM, including actionable and future ISP projects (transmission projects or non-network options), and development opportunities in “distribution assets, generation, storage projects or demand-side developments that are consistent with the efficient development of the power system”.¹¹ It guides investors and other decision-makers on the optimal timing and placement of those resources.”

The figure shows the 2022 ISP ODP.¹² The 2022 ISP was the first ISP to be subject to the full set of consultation and transparency arrangements under the National Electricity Rules (NER). The actionable ISP projects in the 2022 ISP were forecast to cost \$15.1 billion

Figure 27 Map of the network investments in the optimal development path



[†] Additional projects to expand REZs and upgrade flow paths after 2040 are highly uncertain, vary significantly between scenarios, and are not shown on this map. See Appendix 5 for more information.

⁹ AEMO (2018) Integrated System Plan 2018 at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2018-integrated-system-plan-isp> p.3.

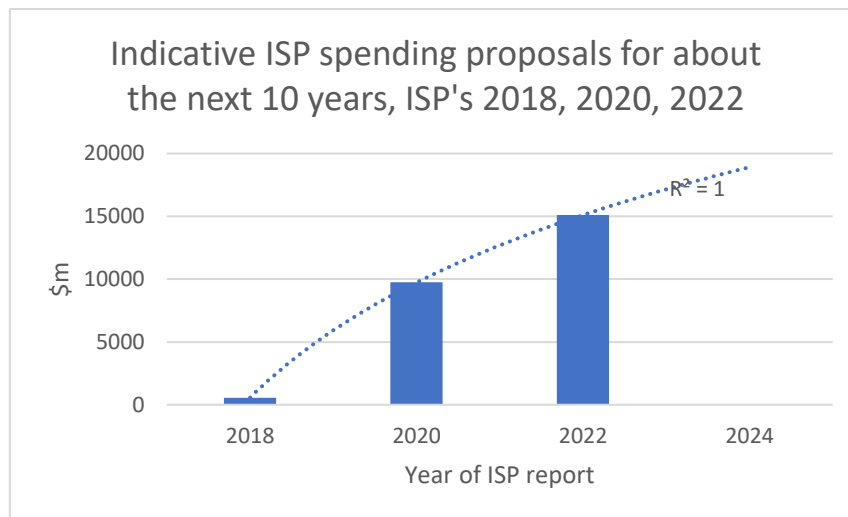
¹⁰ AEMO (2020) Integrated System Plan 2020 at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp> p.9.

¹¹ NER 5.10.2.

¹² AEMO (2022b) 2022 ISP at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp> p.62.

over the period 2026-31, this being the sum of the cost estimates for actionable network investments in the optimal development path in the 2022 ISP (note that some of the estimates are presented in the ISP with accuracy ranges).

Taking the mid points of the indicative ranges of priority spending for about the next decade for from the first three ISPs, and using a logarithmic trend as best option for this limited data set, yields the below projection for the fourth:



Data Sources: AEMO: 2018, 2020, 2022 ISP's

We recognize the hypothetical nature of this data, but believe that the figure provides a useful picture, and indicates a 2024 ISP cost of about \$19 billion is plausible. The 2024 Panel is concerned about a further increase in projected ISP spending from the 2024 ISP, at a time when energy bills, and other costs of living, are already harming a large number of households and businesses. The 2024 Panel does not think that the community social licence for this magnitude of expenditure has been obtained.

In addition to cost, consumers are also concerned about a range of optimisation issues pertinent to the ISP, including:

- retirement of coal
- emissions reduction
- the future of distributed energy resources
- reliability
- social licence.

2.3 The IASR

AEMO reports in its Draft 2023 IASR that:

“The National Electricity Rules (NER)¹³ require AEMO to develop, consult and publish the IASR in accordance with the Australian Energy Regulator’s (AER) Forecasting Best Practice

¹³ NER cl.5.22.8(a).

Guidelines¹⁴. Consistent with these Guidelines, AEMO is following a “single stage process”, publishing this Draft 2023 IASR for stakeholder feedback.”¹⁵

AEMO published the Draft 2023 IASR on 16 December 2022. AEMO made a call for submissions and stated that it would accept submissions until 5pm AEDT on 16 February 2023.

The publication of the Draft 2023 IASR marked the commencement of AEMO’s formal consultation on its key forecasting and planning inputs, assumptions and scenarios for the 2024 ISP. Scenario planning is a key aspect of the Draft 2023 IASR. AEMO describes scenario planning as follows:

“The use of scenario planning is an effective practice when planning in highly uncertain environments, particularly through disruptive transitions. Scenarios are a critical aspect of forecasting, enabling the assessment of future risks, opportunities, and development needs in the energy industry. Scenarios therefore purposefully cover the breadth of potential and plausible futures impacting the energy sector and capture the key uncertainties and material drivers of these possible futures in an internally consistent way. AEMO uses a scenario planning approach coupled with cost-benefit analysis to determine economically efficient ways to provide reliable and secure energy to consumers through the energy transition.

While some scenarios may be more likely than others, no single scenario is expected to be the definitive version of the future that will occur and understanding the potential benefits or regrets of developments across the scenario collection is valuable when investing in the face of uncertainty. In reliability assessments a central scenario is selected from this scenario collection (typically being that which is considered most likely), enabling critical evaluation of that particular scenario’s future needs to maintain reliability, while other scenarios provide insights regarding the spread of reliability risks in the energy transition, and opportunities for addressing them.”¹⁶

The 2022 Panel noted that AEMO generates the Draft ISP by taking the parameters of the IASR, analysing potential development paths under each scenario using a suite of energy market models, and comparing the results with a Cost-Benefit Analysis process.¹⁷

The scenarios are developed based on a wide range of inputs and assumptions, both explicit and implicit. These include:

- policy and emissions reduction settings
- consumption and demand historical and forecasting components
- existing generator and storage assumptions
- new entrant generator assumptions
- fuel assumptions
- financial parameters
- renewable energy zones (REZs)
- transmission
- power system security

¹⁴ At <https://www.aer.gov.au/system/files/AER%20-%20Forecasting%20best%20practice%20guidelines%20-%202025%20August%202020.pdf>

¹⁵ AEMO (2022a) Draft 2023 IASR op.cit.

¹⁶ AEMO (2022a) *ibid.* p.17.

¹⁷ 2022 Panel (2021b) ISP Consumer Panel Report on AEMO’s Inputs Assumptions and Scenarios Report at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/get-involved/consumer-panel>

- gas system assumptions
- hydrogen assumptions
- employment factors.

2.4 The ISP Consumer Panel

The ISP Consumer Panel is an advisory body set up under changes to the National Electricity Rules (NER) put in place since the 2020 ISP. The role of the ISP Consumer Panel is to bring a consumer-focused perspective to the ISP development process, in particular having regard to the long-term interests of consumers.

AEMO appointed four members to the 2024 ISP Consumer Panel (the 2024 Panel) in September 2022:

- Craig Memery, advocate with the Public Interest Advocacy Centre’s Energy and Water Consumer Advocacy Program
- Jo De Silva, senior leader at the Australian Energy Regulator (Consumer Reference Group) and Energy & Water Ombudsman SA
- Mark Grenning, Director of Policy and Regulation at the Energy Users’ Association of Australia
- Mark Henley, advocate for vulnerable people and communities.

The 2022 ISP Consumer Panel (the 2022 Panel) described their approach to the long term interests of consumers:

“...to ensure the ISP adequately accounts for the risks of over- or under-investment when the future, inevitably, doesn’t turn out the way it was modelled today. If there is over-investment, consumers will pay more than they need to for electricity, and we know the affordability of electricity is already a major issue for many consumers. If there is under-investment, there will be an increased risk of power outages due to reduced reliability or security of supply, or failure to meet emissions reductions targets due to an inability to connect new renewable generation.”¹⁸

The 2024 Panel endorses this approach.

Under the NER, the Panel is required to publish two main reports:

- A report on the IASR by 28 September 2023
- A report on the Draft ISP by 15 February 2024.

AEMO must publish these reports on its website and have regard to them but is not obliged to give effect to any recommendations in these reports.¹⁹

In addition to these two required reports, the Panel considers it has a role in the ongoing ISP development process and is supported by AEMO in this regard. The Panel engages closely with AEMO through formal and informal submissions and other activities.

The Panel can be contacted via ISPconsumerpanel@aemo.com.au.

¹⁸ 2022 Panel (2021b) ibid p.14.

¹⁹ NER (clause 5.22.7).

2.5 Regulatory Framework

Under the NER, the following Guidelines are relevant to the ISP:

- Cost Benefit Analysis Guidelines
- Forecasting Best Practice Guidelines²⁰.

The AER can specify which parts of the Guidelines are binding on AEMO and has a compliance and enforcement role to ensure AEMO complies with the provisions set out in the NER and the binding elements of the Guidelines.

2.6 Funding Transparency Statement

The 2024 Panel members are paid by AEMO from the funding it receives for the role of National Transmission Planner (NTP). This funding comes from the transmission businesses of each state, who collect their revenue from their customers in the form of regulated charges. AEMO determines how much of the NTP budget is allocated to the ISP Consumer Panel and the rate of remuneration of Panel members.

²⁰ <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable/final-decision>

3. Changes since ISP22 and challenges for 2024

As the second ISP Consumer Panel, we have built on the solid base for consumer perspectives provided and envisaged by the 2022 ISP Panel and the 2022 ISP.

From this base, the 2024 Panel recognises that in a sector as dynamic as electricity, there are a number of changes and contextual circumstance that will impact the development of the 2024 ISP. These will need to be considered in developing the inputs and assumptions used for the modelling to further develop the four ISP scenarios. This section identifies the changes that we expect to have the greatest impact on consumers, or at least some consumer cohorts.

3.1 What is changed or changing?

1. Prices matter even more as cost of living pressures are growing
2. Government Policy: New and changing energy policies, e.g., Rewiring the Nation and Jurisdictional plans
3. Other policies and expectations related to energy services and policies
4. The requirement of better consumer engagement
5. What are the energy based services that various groups of consumers want now and into the future?
6. Consumer Risk preferences: are customers willing to pay more than they are currently paying for different future outcomes e.g., lower price volatility?
7. Social Licence: what does it mean in the ISP context, how is it earned?
8. Costs of implementation
9. New and emerging technologies: it is difficult for consumers to differentiate between the genuine technology innovation, hype or wishful thinking and thinly veiled grabs for Government subsidies or funding
10. Uncertainty (the 2022 ISP could not predict the Ukraine war).

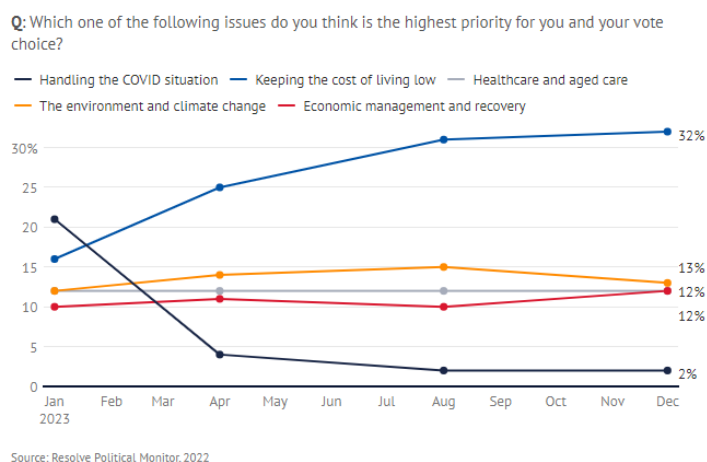
1. Prices matter even more as cost of living pressures are growing

Cost of living pressures are increasingly being raised as the most pressing issue that households are confronting.

On 31 December 2022, the Sydney Morning Herald published monthly survey responses asking about the relative priority of a set of issues for Australian households.²¹ The 2024 Panel suggests that this is but one of many surveys telling the same story - many Australians are increasingly concerned about their living costs.

²¹ Wade, M. (2022) “The year of living costs’: Financial pressures top Australia’s worry list in 2022” at <https://www.smh.com.au/business/the-economy/the-year-of-living-costs-financial-pressures-top-australia-s-worry-list-in-2022-20221228-p5c942.html>

Top 5 Policy Priorities, 2022



Source: Wade, M. (2022) op.cit.

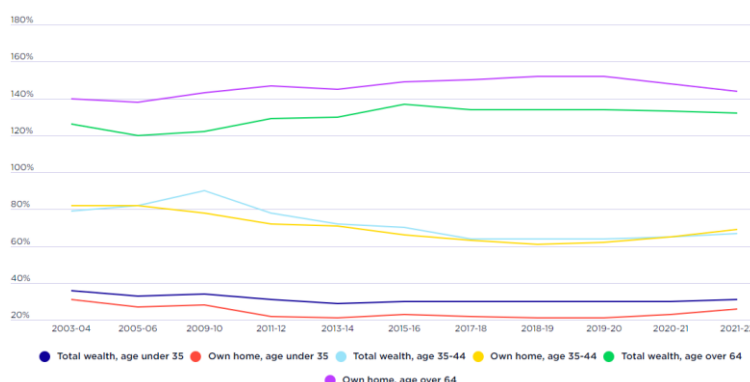
The survey shows that during 2022, the percentage of people listing cost of living as their highest priority doubled to 32% of the population, overtaking COVID concerns by February 2022.

Concern about the environment and climate change was the second highest priority for most of the year.

Over the twelve months to the December 2022 quarter, the CPI rose 7.8%. ABS reported that “the most significant price rises were Domestic holiday travel and accommodation (+13.3%), Electricity (+8.6%), International holiday travel and accommodation (+7.6%) and New dwelling purchase by owner occupiers (+1.7%).”²² This suggests that for expenditure over which households have minimal control, electricity costs had the highest increase during 2022 and contributed to inflationary pressures.

More deep-seated is the slowly growing wealth divide with share of total wealth declining since 2003-4 for all households with head under 44 years, whether homeowners or not.

Average wealth of households by age, as a percentage of the average wealth of all (%)



Source: ACOSS (nd) Wealth inequality at <https://povertyandinequality.acoss.org.au/category/inequality/wealth-inequality/>

²² ABS (2023) Consumer Price Index, Australia at [https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/consumer-price-index-australia/latest-release#:~:text=Key%20statistics,-The%20Consumer%20Price&text=Over%20the%20twelve%20months%20to,owner%20occupiers%20\(%2B1.7%25\)](https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/consumer-price-index-australia/latest-release#:~:text=Key%20statistics,-The%20Consumer%20Price&text=Over%20the%20twelve%20months%20to,owner%20occupiers%20(%2B1.7%25))

About a third of Australian households are now renters and rental is the fastest growing form of housing tenure. Some renters chose to do so, but a vast majority have no choice.

News website InDaily published an article on 16 January 2023 saying:

“The nation’s richest one per cent have accumulated 10 times more wealth than the bottom 50 per cent over the past decade, according to a report by Oxfam.

The *Survival of the Richest* report released on Monday shows the richest one per cent, who make up nearly 200,000 people with a combined wealth of more than \$3 trillion dollars, have accumulated more than \$2500 a second or \$150,000 per minute for 10 years straight.

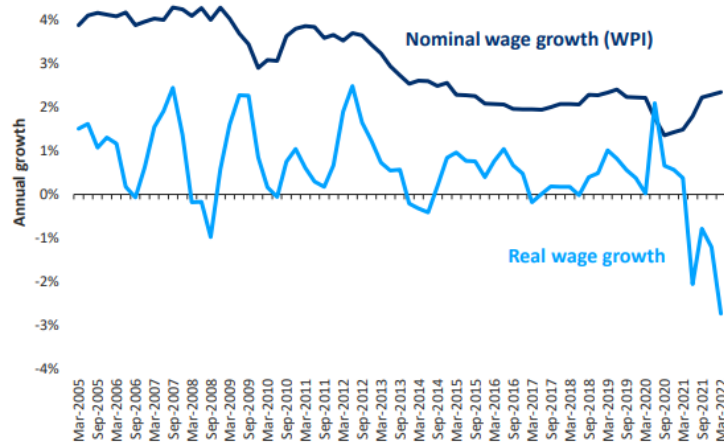
Additionally, billionaire wealth is now 61 per cent higher than it was before the pandemic and there are 11 more billionaires today than there were in 2020.”²³

Ever higher concentration of wealth will also likely limit economic growth and the demand for electricity, while also exacerbating difficulties that many energy customers will have in paying their bills.

At the same time, real wages, on average, have been falling recently.

The following graph is taken from the Australia Institute discussion paper *Are wages or profits driving Australia’s inflation?*, which is described as “an analysis of the National Accounts Labour costs have played an insignificant role in the recent increase in inflation, accounting for just 15 percent of economy wide price increases while profits have played an overwhelming role, accounting for about 60 percent of recent inflation.”²⁴

Falling nominal and real wage growth, March 2005 to March 2022



Source: Australian Bureau of Statistics Wage Price Index and Consumer Price Index

Source: *The Australia Institute (2022) p.2*

The growing concern about cost of living, coupled with high electricity prices and falling real wages, introduces a higher level of anxiety about future electricity costs for many households, than was the case for the 2022 ISP. This has potential impact on concerns about rising costs, including energy for

²³ Mibenge Nsenduluka (2023) “Australia’s rich continue to get richer” at [Australia's rich continue to get richer \(indaily.com.au\)](https://indaily.com.au)

²⁴ Richardson, D., Saunders, M. and Denniss, R. (2022) *Are wages or profits driving Australia’s inflation?* at <https://australiainstitute.org.au/wp-content/uploads/2022/07/Are-wages-or-profits-driving-Australias-inflation-WEB.pdf>

individual households leading to adverse ‘social licence’ and affordability impacts, while in aggregate, the rising costs and lower incomes impacts can be recessionary which, for the ISP 2024 could translate into declining energy demand and consequently slower implementation.

2. Government Policy: New and changing energy policies, e.g., Rewiring the Nation and Jurisdictional plans

The Draft 2023 IASR document provides thorough documentation of changing government energy policy. The 2024 Panel considers that this a particularly pertinent topic for the 2024 ISP process and also provide some focus on changing government policy.

Since the development of the 2022 ISP, there has been a change of Government nationally and in South Australia. Nationally and at state level there have been a number of policy announcements that have likely impact on aspects of the ISP2024, including questions about ‘who pays?’ (refer to Appendix B for a summary of some of these policies).

In summary: all jurisdictional governments in the NEM now have net zero targets and substantial policies to respond to energy supply and climate change adaptation. Most of these strategies also involve objectives of economic development and job creation.

Most jurisdictions also have related policies dealing with Renewable Energy Zones and some have (green) Hydrogen action plans.

Most of these policies have been announced or revised over the past 12-24 months and there will likely be more announcements and commitments in the near future. The dynamics of policy and program development since the development of the 2022 ISP has been substantial.

The 2024 Panel has not tallied up the combined spending pledges from national and jurisdictional governments but estimate it to be of the order of \$40 billion to \$60 billion over the next 5 or so years. People are already required to pay for significant jurisdictional energy infrastructure and transition strategies, both through taxes and energy bills.

Appendix B is not a comprehensive list of policy announcements by National and jurisdictional governments but highlights the extremely dynamic aspect of energy policy and associated strategies and projects. The ISP program will need to be ever more dynamic in adjusting models (the next AEMO modelling paper to be released in March 2023), inputs and assumptions. Keeping consumer voices informed and involved will be increasingly important in appropriately responding to the dynamics and uncertainty of energy markets.

We also note that the recent US *Inflation Reduction Act* (passed on 16 August 2022) is providing large subsidies for US renewable energy programs that are having the effect of drawing immense resources to the US and away from other countries, including Australia.

3. Other policies and expectations related to energy services and policies.

The Australian Government’s energy website²⁵ lists the following “energy strategies and frameworks” that are a part of energy policy beyond the net zero target and Rewiring the Nation.

- [Powering Australia](#)
- [National Energy Performance Strategy](#)

²⁵ [Australia's energy strategies and frameworks | energy.gov.au](#)

- [Bilateral energy agreements](#)
- [Energy security and emergency management](#)
- [Fuel security](#)
- [Future Fuels Strategy](#)
- [Australia's National Hydrogen Strategy](#)
- [Establishing offshore renewable energy infrastructure](#)
- [Trajectory for Low Energy Buildings](#)
- [Energy Budget information](#)

Some of these strategies have potential to significantly impact on the ISP, particularly by changing future electricity demand. The Trajectory for Low Energy Buildings for example, if enthusiastically implemented and extended, would dramatically reduce household energy needs for heating and cooling by 2050, or sooner.

Other initiatives and factors that also impact on energy supply and demand include:

- Town planning
- Energy efficient housing
- Energy efficient appliances
- Public transport

The 2024 Panel recommends that ISP plans rigorously factor in relationships and impacts from the range of policies and strategies that will impact on future energy demand, particularly considering that demand side reductions reduce the need for transmission projects.

4. The requirement of better consumer engagement

Strong leadership in consumer engagement in the energy sectors, particularly by network service providers over the last 2-3 years, is supporting the expectation of consumers and consumer representative groups that the calibre of consumer engagement continues to improve.

5. What are the energy based services that various groups of consumers want now and into the future?

Not too long ago, households wanted heating/cooling, lighting, refrigeration, cooking, hot water and entertainment as the main services provided by electricity. The range of household and business services provided by electricity is growing rapidly with transport increasingly becoming an electricity service along with security, communications, home office, enhanced entertainment and a growing array of 'smart' services.

This growing range of services required from electricity exacerbates divergence in energy service expectations for different customer groups and requires that electricity access is affordable and reliable.

6. Consumer Risk preferences: how much are various customers willing to pay for future outcomes, and what is their appetite for price volatility?

The matter of consumer risk preferences was strongly developed by the 2022 Panel and draws on the above observations about the growing range and diversity of expectations about continuity of services from electricity. We discuss this work further in Section 4.5.

7. Social Licence: what does it mean in the ISP context, how is it earned?

This is a topic identified by the 2022 Panel and one that is being explored by some jurisdictional governments. On 25 October 2022, the NSW Government announced that it was establishing a:

“...new Strategic Benefit Payments Scheme....to support the rollout of a modern electricity grid.

Under the scheme, private landowners in NSW will receive \$200,000 per kilometre of new transmission infrastructure hosted on their land, paid out in annual instalments over 20 years, indexed to CPI.”²⁶

Victoria recently announced a similar scheme.²⁷ This is one response to the aspect of social licence for transmission lines on land owned privately. Social licence for major energy infrastructure is more than this.

AEMO has appointed a Social Licence Advisory Board that the 2024 Panel expects will provide advice on aspects of social licence. The 2024 Panel considers aspects of social licence in Section 7.4.

8. Costs of implementation

The cost of implementation for ISP projects is impacted substantially by domestic and global supply chain constraints, contractor availability and competition from other infrastructure projects, including other energy projects. These are pushing up ISP costs and are unlikely to abate fully in the foreseeable future. We consider aspects of implementation costs in Section 7.3.

9. New and emerging technologies: it is difficult for consumers to differentiate between the genuine technology innovation, hype or wishful thinking and thinly veiled grabs for Government subsidies or funding

There are many proven, probable and possible new technologies that could be ‘game changers’ for electricity supply. It is difficult for consumers to differentiate between the genuine technology innovation, hype or wishful thinking and thinly veiled grabs for Government subsidies or funding.

Another important role for the ISP is to be able to sensibly include the take up of proven new technologies and to identify likely innovations with constructive impact, without ‘picking winners’ or moving away from a sound evidence base.

10. Uncertainty (the 2022 ISP could not predict the Ukraine war)

Against the backdrop of all of these substantial and recent changes there is the remaining potential for high impact, exogenous shocks impacting the Australian electricity grid. The 2022 ISP did not predict the Ukraine war.

²⁶ Deputy Premier and Minister for Regional NSW Paul Toole (2022) [Australia’s first benefit sharing scheme for landowners hosting new transmission lines | NSW Government](#)

²⁷ See <https://www.premier.vic.gov.au/landholder-payments-fairer-renewables-transition>

Uncertainty impacts both demand and supply sides and challenges system planners more than ever before. The 2024 Panel suggests that the most appropriate responses to uncertainty is for the ISP to accept that uncertainty is 'the new normal,' improve data and modelling to be ever more dynamic and most importantly to keep engaging with consumers and other stakeholders, without paying too much attention to any vested interest.

3.2 Challenges for the 2024 ISP

In responding to the new and continuing issues, the Integrated System Plan confronts challenges at each of its components:

Integration

It is difficult to produce an integrated, national system plan for electricity in a dis-integrated policy setting.

Return of the States

The 2024 ISP needs to consider how best to integrate the recent policy announcements regarding climate change and energy policies from the Commonwealth as well as jurisdictional governments.

Other impacted sectors

Similarly, the 2024 version of the ISP would do well to further explore integration of energy policies and programs with other impacted sectors, including:

- transport, where car-pooling schemes may well become more popular
- public transport, including the electrification of public transport
- urban planning and greener cities with the potential for reduced energy demand, depending on government leadership to speed up the greening of cities. The alternative is that poor energy efficiency planning in emerging cities, Western Sydney in particular, can lead to substantial future energy needs for households with energy inefficient housing in ever hotter summers. The ACT's urban design for newer developments, e.g., Ginninderry / Western Belconnen provide an example of more energy responsive urban planning
- housing and appliance energy efficiency design criteria. Over recent years many appliances have become much more energy efficient, the same cannot be said for housing stock, particularly rental housing.

Modelling

The modelling used for the ISP will also need to better account for both the range of related inputs that would be included in a comprehensive model and better reflect the dynamics of electricity markets and policy.

System

The ISP is a driver of policy decisions and will impact on people's lives and businesses for decade, so it needs to take a systemic approach that is beyond the Generation and Transmission system of the National Electricity Market. The 'system' includes energy market entities including distribution businesses, rural and remote communities (including SAPS) as well as people, the communities they live in and the organisations for which they work.

Plan

The plan aspect of ISP needs to be cognisant of the social economic, political and environmental aspects of the plan as well as the technical.

As such it needs to include planning relevant to:

- technology and expectations about new tech capability keeps changing.
- changing national and jurisdictional politics and frameworks
- social Licence (in its various meanings)
- cost of living and the growing wealth divide
- relationships with the rest of the world, including climate action and supply chains.

The ISP is important, but it cannot be 'everything'. This is part of the challenge for the 2024 ISP.

Pathways to the future are non-linear, there will be great leaps forward and stubborn falling back. This reality of implementation is also part of the unpredictable context for the Plan.

4. Overall Comments on the IASR Engagement Process so far

4.1 Introduction

The regulatory framework for the development of the ISP requires AEMO to achieve high levels of engagement in the forecasting and decision-making process. AEMO's own corporate commitments also require high-level engagement. This Section sets out the key elements of the regulatory framework as well as AEMO's commitments relating to engagement, to consider how effectively AEMO has engaged in the development of the 2023 Draft IASR. The Section also highlights areas for AEMO improvement in the ISP development process.

4.2 The ISP Framework and Stakeholder Engagement

The development of the ISP is framed by the National Electricity Rules and the AER's Guidelines to make the ISP actionable²⁸ (the Guidelines). In its response to the 2021 Draft IASR, the 2022 Panel referred to these Guidelines to illustrate how they are intended to drive AEMO's engagement processes, with particular focus on transparency and stakeholder engagement.²⁹

In its Final Decision on the Guidelines, the AER stated that transparency is important because it allows stakeholders to understand and test AEMO's conclusions and effective consultation is said to improve the forecasting and decision-making process.³⁰

Effective consultation in the Forecasting Best Practice Guideline includes detailed discussion at workshops, public forums and to individual stakeholders and a wide range of engagement strategies to receive appropriate feedback from stakeholders with unique perspectives.³¹

This Framework is complimented by AEMO's own commitments, including in its Strategic Priorities identified in FY2022 and its FY2023 Corporate Plan.³²

Of four high priority areas identified by the AEMO Board and Executive in FY2022, "Engaging our Stakeholders" is listed as priority 3. In this priority, AEMO is actively seeking to become a "trusted partner" working with its members and stakeholders and states that it wants to "meet and exceed stakeholder expectations" through active engagement, listening and response to feedback.³³

In its FY2023 Corporate Plan, AEMO sets out to "clearly and consistently consider stakeholder feedback" and "co-design the ISP Engagement Strategy", "motivated by a strong energy consumer focus" and to "continually improve the stakeholder experience." Collaboration is a key theme.³⁴

²⁸ AER (2020a) Guidelines to make the ISP actionable at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable>

²⁹ 2022 Panel (2021a) Draft 2021 Inputs, Assumptions and Scenarios Report at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/get-involved/consumer-panel>

³⁰ AER (2020b) Guidelines to make the ISP actionable Final Decision at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable>

³¹ AER (2020c) Forecasting best practice guidelines at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable>

³² <https://aemo.com.au/about/strategic-priorities-and-projects>

³³ AEMO (nda) Strategic Priorities and Projects at <https://aemo.com.au/about/strategic-priorities-and-projects>

³⁴ AEMO (ndb) Corporate Plan FY2023 at <https://aemo.com.au/about/corporate-governance/corporate-plan>

4.3 2022 Panel Comments

The 2022 Panel noted that their establishment was unfortunately late in the process of the development of the scenarios. They also noted that the 2022 ISP Consumer Engagement Plan was late in its development.³⁵

According to the 2022 Panel, AEMO used two main forms of engagement in preparing the Draft 2021 IASR:

- The Forecasting Reference Group (FRG) and
- Focused engagement activities on particular issues.³⁶

The Panel noted that the FRG discussion was directed at subject matter experts and a very small proportion of regular attendees were consumer advocates. Reportedly, FRG meetings were targeted to registered attendees only, limiting the reach and experience of participants. Little time was left for discussion at FRG meetings and there were questions around provision of written responses to questions and comprehensiveness of the minutes. The Panel commented that the FRG is not a forum for capacity building.³⁷

The challenges for consumer engagement listed by the 2022 Panel included:

- Lack of familiarity or interest in the ISP framework and development
- Limited time and resources leading to conflicting priorities
- Timing of consultations.³⁸

The 2022 Panel stated that consumers are a subset of stakeholders that warrant a bespoke approach to engagement.³⁹

The 2022 Panel “is of the view that it has been difficult for consumers and other stakeholders to engage in the development of each ISP, and this has impacted confidence in the findings of previous ISPs.”⁴⁰ They noted that they were provided a first draft of a Stakeholder Engagement Plan was provided to them two months after publication of the Draft 2021 IASR.

The Panel made the following recommendations to embed engagement within AEMO’s corporate culture:

1. Allocate adequate resources to build AEMO’s capacity for engagement
2. Establish KPIs for engagement and accountability within AEMO
3. Establish an evaluation framework for engagement
4. Develop a more comprehensive and tailored stakeholder engagement plan for the 2024 ISP
5. Develop and maintain a stakeholder management system to regularly assess stakeholder needs and interests and identify gaps in stakeholder representation and participation
6. Formalise internal and external inter-relationships to share knowledge across consultations
7. Adopt a collaborative and co-design approach to engagement.

³⁵ 2022 Panel (2021a) op. cit.

³⁶ 2022 Panel (2021a) op. cit.

³⁷ 2022 Panel (2021b) op. cit.

³⁸ 2022 Panel (2021a) op. cit.

³⁹ 2022 Panel (2021a) op. cit.

⁴⁰ 2022 Panel (2021b) op.cit. p.19.

8. Implement a program of social research to better understand consumer and community attitudes and perceptions about the future energy market⁴¹

4.4 2023 IASR Engagement Process

The 2024 Panel which began its work in mid-September 2022. Engagement on the IASR, particularly on the scenarios, had already commenced at this point. According to the AEMO website, AEMO has undertaken the following engagements in the lead up to submissions closing on the Draft 2023 IASR:

Date	Activity
13 July 2022	Scenarios webinar
31 August 2022	Scenarios webinar 2
31 August 2022	FRG meeting – Involve stakeholders with Economics and Multi-sector modelling
21 September 2022	FRG meeting – Multi-sector modelling
28 September 2022	FRG meeting – Involve stakeholders on DER, Electric Vehicle and Gas Price forecasts
21 October 2022	Transmission Cost Database webinar
25 November 2022	Transmission Cost Database Update webinar 2
16 December 2022	Publication of Draft 2023 IASR
24 January 2023	Joint ISP and Consumer Panel ISP introductory session
2 February 2023	Draft 2023 IASR public webinar
9 February 2023	Consumer advocate verbal consultation submission session

In addition to the above activities, AEMO also holds a regular Consumer Forum and these meetings have included discussion on the ISP. The Forum considerations of 2024 ISP issues in 2022 are listed below (the Forum had a presentation on the 2022 ISP in July). Discussion was mostly ‘inform’ on the IAP2 spectrum.

Date	Topic	Agenda time
September	Scenarios	40 mins
December	Consumer Risk Preferences	30 mins

In 2023, AEMO are proposing a Consumer Forum meeting every two months – the first is scheduled for late February.

AEMO has held regular meetings with the 2024 Panel on specific topics of interest to the Panel. Meetings are held at least fortnightly, with frequency of meetings and the detail covered reflecting commitment to engagement from both AEMO and the 2024 Panel. The 2024 Panel has welcomed this extensive engagement with AEMO.

AEMO presented the 2024 Panel with a Draft ISP Engagement Strategy on 10 October 2022. The Strategy was not released for public comment and to the Panel’s knowledge, was never finalised. AEMO presented the 2024 Panel with a Draft ISP Engagement Plan Overview spreadsheet on 10 January 2023. The Panel provided comments to AEMO on this spreadsheet via email and at a meeting on 16 January 2023, 18 January 2023 and 6 February 2023. While there is not a published

⁴¹ 2022 Panel (2021b) op. cit. pp.30-32.

Plan, there is “a living Plan” and AEMO has been responsive to the 2024 Panel's feedback regarding particular focus areas. The Plan is regularly discussed at meetings.

4.5 Consumer Risk Preferences

AEMO presented the 2024 Panel with a briefing on a Consumer Risk Project on 19 September 2022. The 2024 Panel has engaged intensively with AEMO since that date to codesign and collaborate on the Project with AEMO.

What are the issues and considerations?

A key issue for the 2022 Panel was the risks of over (too much, too early) or under (too little, too late) investment in network and generation. The 2022 Panel recommended that:

“AEMO should undertake targeted engagement with consumer stakeholders on their risk preferences in relation to ISP investments. This engagement should focus on specific tangible issues where AEMO needs to exercise judgement in how the risks to consumers of under or overinvestment are managed, particularly where different CDPs have similar net market benefits but different impacts on the risks to consumers arising from uncertainty.”

And that

“AEMO’s decisions on the ODP and the ISP’s risk management toolkit (e.g., option value, early works, preparatory activities, REZ Design reports) should be informed by the outcomes of AEMO’s engagement with consumers on risk preferences. AEMO should transparently explain how it has taken these risk preferences into account.”⁴²

Are consumers willing to pay more to reduce future price and service volatility or are consumers happy to have a reduction in service for a lower bill? How might these values be incorporated into the ISP? The usual narrative is around how timing of ISP projects can serve to mitigate the impact of early coal closure e.g. by building a network investment earlier. Yet this assumes that AEMO has control over the timing of that investment when it only has a role in recommending the optimal timing for that project to be commissioned. When it is actually commissioned there is a range of factors outside of AEMO’s control – social licence, supply chain etc.

AEMO’s Approach

AEMO has commissioned Deloitte to develop a methodology for measuring these consumer risk preferences with the results feeding into the Draft ISP in December.

Consumer Panel Comments

The 2024 Panel is collaborating with AEMO and Deloitte in developing the methodology. In the 2024 Panel’s view, key aspects are:

- Before asking consumers about willingness to pay or willingness to accept a lower level of service for a lower bill, consumers need to have a clear understanding of the level of risk they are currently bearing as an electricity consumer, asset owner and taxpayer

⁴² 2022 Panel (2021) <https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en> p.10.

For example, consider a Queensland consumer. A central plank of the State Government's Queensland Energy and Job's Plan⁴³ is the ability of the Government to use its State-owned generators as a 'flex' i.e., close earlier or keep open longer as new network and renewable generation is built. That means the Government is saying 'we are taking away the volatility risk of early coal closure or delay in building new network and renewable generation that will occur in other States that do not own their own generation'. On that basis why would a Queensland consumer be willing to pay additional \$ for something the State Government has promised to fully mitigate using assets that the electricity consumer has a share of ownership in?

- Deliberative forums are considered to be the default tool for gathering consumer preference information for this project given the complexity of the topic.

The 2024 Panel looks forward to continuing our involvement as the methodology is developed and implemented.

4.6 Engagement considerations

4.6.1 Key timings

Both the 2022 Panel and the 2024 Panel found that their establishment was late in the process of the development of the scenarios. Both Panels also found that the Engagement Plan was late in its development. The 2024 Panel also experienced delays in publication of an ISP newsletter for stakeholders, having first emailed AEMO notice of a proposed ISP newsletter on 21 November 2022 and continuing to follow up with AEMO until the final newsletter was published on 12 January 2023.

As AEMO is seeking to become a trusted partner, the 2024 Panel recommends that AEMO considers how it will prioritise engagement in the future to avoid delays in engagement. Delays such as the above may be for legitimate reasons but they are not conducive to building trust among partners.

The 2024 Panel also recommends that AEMO establish the 2026 Panel in early 2024. This would allow the new Panel to:

- work with the 2024 Panel to better understand the role of the Panel
- work with the 2024 Panel and AEMO to codesign the 2026 ISP Stakeholder Engagement Plan that is finalised prior to publication of the 2024 ISP in June 2024; this Plan should include publication of a regular ISP newsletter for stakeholders, and the first issue of this newsletter should be distributed in April 2024
- participate in AEMO engagement activities on the Draft 2024 Plan.

Given limited resources, AEMO may wish to establish this 2026 Panel with two periods:

- a limited role up to publication of the Final ISP in June 2024
- the substantive period from July 2024 where it can be involved in all Draft IASR engagement from the start of the process, including contributing to early considerations of the 2026 scenarios.

Both the 2022 Panel and the 2024 Panel noted the difficulty for consumer advocates of having to respond to the Draft IASR over the Christmas period, which invariably also includes the call on some consumer advocates to be responding to revised regulatory proposals for some network businesses.

⁴³ <https://www.epw.qld.gov.au/energyandjobsplan>

4.6.2 The FRG

Both the 2022 Panel and the 2024 Panel found concerns with overreliance on the FRG as a means of engagement. As noted in the section on the regulatory framework, effective consultation in the *Forecasting Best Practice Guideline* includes **detailed discussion** at workshops, public forums and to individual stakeholders and a **wide range of engagement strategies** to receive appropriate feedback from stakeholders with unique perspectives [emphasis added].⁴⁴

While the 2024 Panel notes that AEMO appears to have made significant improvements related to FRG meetings, concern remains with the need for more detailed discussions. The 2024 Panel recommends that in addition to hosting FRG meetings, AEMO also conduct a series of “deep dive” workshops, where the format enables more time for extended discussion and utilises different tools such as Miro and breakout rooms to enable the “deep dive” element to be fully maximised for priority topics. The 2024 Panel also recommends that AEMO consider the use of external facilitation for these deep dives, to maximise participatory facilitation skills within the forums. The 2024 Panel also recommends that some of these deep dives be advertised to a broader number of participants than just the FRG membership. It is also important the participants receive feedback after the event from AEMO to show how their contributions were heard and responded to.

4.6.3 Consumers

As outlined above, AEMO has stated in its FY2023 Corporate Plan, that it is “motivated by a strong energy consumer focus” and wants to “continually improve the stakeholder experience.” Collaboration is a key theme.⁴⁵ The 2022 Panel recommendation that a bespoke approach to engaging with consumers on the ISP is relevant in this context.

The technical nature of the ISP makes it difficult for consumers and consumer advocates to engage in its development. The FRG is not an effective engagement forum for consumers. The 2024 Panel recommends that AEMO considers experience from engagement in other technical areas to further develop its consumer engagement program. Members of the 2024 Panel have successfully engaged both consumers and consumer advocates on Rate of Return issues, which are highly technical subjects, as members of the Australian Energy Regulator’s (AER) Consumer Reference Group (CRG). Key elements of the success of this engagement include:

- codesign of workshop materials between the AER and the CRG
- the CRG leading one on one interviews with consumer advocates (with the potential to codesign interview questions)
- conducting Masterclasses for consumer advocates to familiarise them with technical concepts
- the CRG partnering with the AER to communicate with advocates about events and engagement opportunities
- CRG members utilising their personal networks to expand consumer participation
- development of trust between the CRG and consumer advocates
- the CRG acting as a conduit for AER staff to develop relationships with consumer advocates
- CRG facilitation of selected engagement events.

⁴⁴ AER (2020c) Forecasting best practice guidelines at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/guidelines-to-make-the-integrated-system-plan-actionable>

⁴⁵ AEMO (ndb) Corporate Plan FY2023 at <https://aemo.com.au/about/corporate-governance/corporate-plan>

The 2024 Panel supports the development of a bespoke consumer engagement strategy for the ISP. The Panel recommends that this strategy be a medium-term strategy that extends beyond one ISP period – the Panel recommends that AEMO and the 2024 Panel codesign an ISP consumer engagement strategy for 2023-2026.

4.7 Summary

The 2024 Panel acknowledges that AEMO is making significant steps towards better practice engagement and in this context, notes AEMO’s work on consumer risk preferences, development of the FRG, the joint AEMO/Panel ISP introductory session and hosting the verbal consultation session with consumer advocates. The Panel notes that these developments are a strong indication of AEMO’s intention to become a trusted partner.

The 2024 Panel notes that it does take time to develop the sort of trust AEMO is seeking and that delays in engagements can be a barrier. The Panel is optimistic that AEMO can take further steps on the road to trusted relationships and offers the recommendations in this Section in the spirit of collaboration and partnership.

5. Scenarios

Due to our delayed appointment, the 2024 Panel was unable to engage with AEMO for the July and August webinars on Scenarios. However, we have had some engagement since our appointment.

Naming of scenarios

The 2024 Panel understands AEMO seeks to maintain some consistency between successive ISPs in minimising changes in scenarios. Our view is this consistency should not come at the expense of accurately reflecting changes between ISPs that may influence selection and description.

The 2024 Panel supports renaming the 2022 Hydrogen scenario to Green Energy Exports and removing the 2022 Slow Change scenario.

Noting the 2.6C Progressive Change scenario is now the least progressive in any pertinent sense, the 2024 Panel recommends renaming that to have an accurately descriptive name, perhaps name it the “2.6C slow change scenario?”

Core principles, definition of plausible and use of sensitivities

AEMO identifies 5 core principles: internally consistent, plausible, distinctive, broad and useful.

‘Plausible’ described as: “the potential future described by a scenario narrative could come to pass.”⁴⁶

In the 2024 Panel’s view, this descriptor is too broad, as it could include futures that are improbable or highly unlikely, based on current technologies and trajectories. While scenario-based approaches are intended to consider a range of outcomes, it is not in the interest of energy users to build an energy system to cater to futures that are built on what are currently very optimistic assumptions on the expected future commerciality of particular technologies. This does not preclude these technologies being the basis of scenarios in a future ISP when there is more certainty around commerciality. Inclusion now runs the risk that consumers are asked to bear large costs to subsidise technologies that may not ever be commercial.

Where AEMO wishes to test the possible outcomes of any highly unlikely future – such as one with more than 2% hydrogen in existing gas networks, one where social licence issues do not cause delays and cost changes for transmission, or one where Snowy 2 is operative and fully connected by 2030 – these should be tested through sensitivity analysis, rather than core assumptions in scenarios.

The 2024 Panel recommends.

- Improving the definition of plausible to exclude futures that are highly improbable or highly unlikely. One appropriate measure, consistent with energy market forecasting approaches, would be to apply a 90% or 10% probability of exceedance as the boundaries to ‘plausible; assumptions.
- Using sensitivity tests, not base assumptions, to test unlikely futures that have higher impacts.

Scenarios describe a future state evolving over the next 30 years. The question remains of how they should seek to reflect what might happen in the current decade – which is likely to be a non-linear transition to the long-term state defined by scenarios.

⁴⁶ AEMO (2022a) Draft IASR p.17.

For example, the description of the 1.5C Green Energy Exports scenario relies on:

“The availability of low-cost, low emissions energy support domestic energy consumers as well as international customers.”⁴⁷

This may be the case sometime in the 2030’s, but it is very unlikely to be the case in the 2020’s unless a number of changes are made to current arrangements, such as Governments fully funding the cost of new networks (rather than just providing concessional finance).

While the Draft 2023 IASR does acknowledge uncertainty in relation to:

“The health and evolution of the Australian economy, and the impact to the transformation of the energy sector and energy consumers, including the scale and pace of electrification of Australia’s industrial, manufacturing, mining and transportation sectors (and others), and the supply chains that support it.”⁴⁸

it does still appear to assume:

- economic growth drives the energy transition;
- continuing falls in energy costs accrue to all consumers; and
- there are few or no supply side constraints – such as for labour, materials, critical minerals - in the longer term.

These assumptions are arguably bold, given medium to long term outlooks for both the domestic and global economies, energy and commodity prices, the domestic jobs market and global supply chains, and should be tested through scenario development.

All the scenarios, particularly the Green Energy Exports, assume continued strong consumer support for a (generally) fast transition. The description of the 1.5C Green Energy Exports says:

“The energy transition in Australia is embraced quickly by consumers, supported by commensurate actions globally, with consumer investments in distributed energy resources (including electrified vehicles), and energy efficient homes.”⁴⁹

The 1.8C Diverse Step Change says that, like the 1.8°C Orchestrated Step Change scenario:

“..., this scenario likewise includes a global step change in response to climate change, supported by technology advancements and strong consumer support of the transition,”⁵⁰

with the pace driven by the rate of economic growth both allowing and supporting a faster transition. The 1.8C Orchestrated Step Change scenario is described as one where:

“Moderate growth in the global and domestic economy underlies the appetite to address climate change and provides a supporting environment for the development and uptake of relevant technologies.”⁵¹

While opinion polls show strong support for a fast transition, there is a real risk of the support for energy consumers carrying the cost of decarbonising the wider economy falling over the next 2-5 years in the face of large energy price increases at a time of wider affordability pressures. This risk exists independently of the level of economic growth and is likely to persist unless Governments

⁴⁷ AEMO (2022a) *ibid* p.19.

⁴⁸ AEMO (2022a) *op.cit.* p.4.

⁴⁹ AEMO (2022a) *op.cit.* p.19.

⁵⁰ AEMO (2022a) *op.cit.* p.21.

⁵¹ AEMO (2022a) *op.cit.* p.20.

show a willingness to provide significant subsidies/compensation, reflecting that the wider economy, not just energy users, are the beneficiaries of decarbonisation.

The 1.8C Diverse Step Change scenario differs from the Orchestrated Step Change scenario in its greater use of green gases, resulting from a concerted push by the gas networks. This assumption is inconsistent with AEMO's own principles (it is neither plausible nor, arguably, useful), and inclusion will be strongly objected to by some stakeholders. We discuss the issue of hydrogen in gas networks further in Section 7.2.4 below.

Sensitivity Testing

Three sensitivities are proposed – discount rate, offshore wind under the Victorian policy announced last year and 'smoothed infrastructure sensitivity'. The discount rate sensitivity was applied to the 2022 ISP, where the CDPs were quite sensitive to the upper bound discount rate of 10%. The Draft 2023 IASR says: "Higher and lower discount rate sensitivities, given the volatility of financial markets in the last year, with the timing and magnitude of a return to 'equilibrium' financial parameters remaining uncertain."⁵²

Considering the long-term decline in interest rates for many years that has now reversed, as has happened a number of times previously, and the 17% mortgage rates around 30 years ago, the 2024 Panel questions what AEMO considers 'equilibrium'. The sentence implies that an increase in rates is moving away from an 'equilibrium'.

Please refer to section 7.2.4 in this report for the 2024 Panel's observations and recommendations on sensitivities in relation to hydrogen in gas networks.

Supply chain constraints

The 'smoothed infrastructure sensitivity' appears to be a proxy for supply chain constraints, though it only applies to the availability of skilled labour. All the scenarios have strong global moves to decarbonise and the 2024 Panel expects that this will place constraints on materials and equipment supply chains throughout the world.

The 2022 ISP mentioned the need to secure essential materials, especially steel and concrete, and referred to further work with Infrastructure Australia to examine the issue in more detail.⁵³ The 2024 Panel asks what the outcome of this further work has been.

Scenario Mix

For the ISP to be of most value, scenarios need to reflect both the range of potential future outcomes and mix of public policy settings. In workshops conducted by AEMO during February 2023, some respondents challenged the inclusion of the 2.6C scenario as being outside existing Government targets and policy, ie to keep under 2.0C. We also recognise that all scenarios reach net zero by 2050 - just some get there quicker.

We have sympathy for this view but also recognise the merit of a potential 2050 outcome where global warming is over the 2.0C target. While there is nothing that the Panel considers desirable about this scenario, we think that it is a valid scenario and worth retention as one of the 4 scenario options, it also serves as something of the counterfactual to 1.5C and 1.8C scenarios.

⁵² AEMO (2022a) op.cit. p.6.

⁵³ AEMO (2022b) 2022 ISP op.cit. p.98.

6. Sensitivities

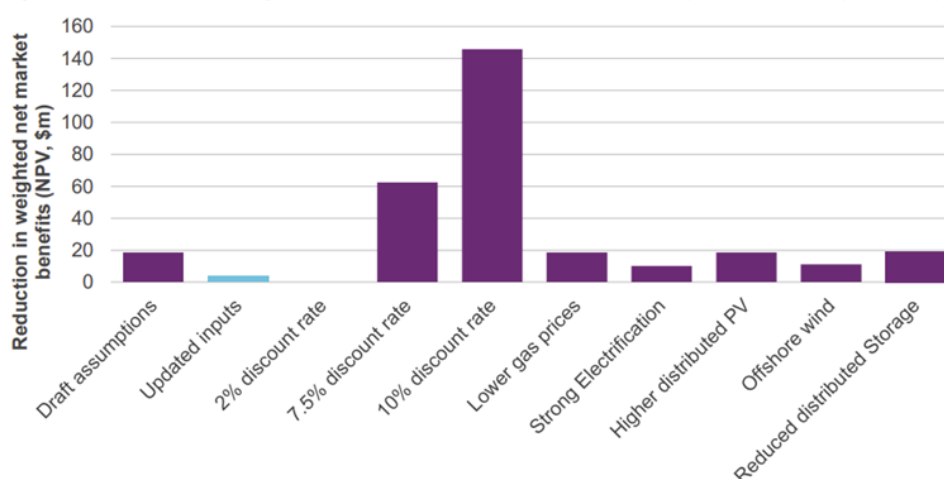
What are the issues and considerations?

There are many uncertainties around the assumptions that underpin the scenario modelling. The use of sensitivities can help consumers understand how robust the candidate development paths (CDPs) are to changes in key variables. Showing that a high-ranking CDP based on the central case assumptions is still a high-ranking CDP after significant sensitivity testing on multiple variables gives confidence that the recommended optimal development path is robust and in the long term interests of consumers.

AEMO's Approach

In the 2022 ISP, AEMO undertook sensitivity testing on a wide range of variables⁵⁴ – discount rate, lower gas prices, stronger electrification, higher installed capacity of distributed PV systems, additional deep storage in Queensland, initial storage deployments within the Sydney, Newcastle and Wollongong area and removing the influence of TRET on Marinus. Further sensitivities were applied to the Step Change scenario – offshore wind targets in Victoria, reducing uptake and coordination of distributed storage and a lower discount rate. The major sensitivity impact was with higher discount rates.

Figure 32 Reduction in weighted net market benefits in ODP relative to top-ranked CDP, by sensitivity



Source: AEMO (2022b) op.cit. p.91

AEMO proposes to do at least three sensitivities in the 2024 ISP – higher and lower discount rates, offshore wind in Victoria and ‘smoothed infrastructure sensitivity’ – to explore the costs and benefits of reducing the volatility of employment demand. It also seeking feedback on undertaking sensitivity testing of social licence.

Consumer Panel comments

[The proposed sensitivities](#)

The 2024 Panel agrees with the proposed sensitivity on discount rate. The 2024 Panel is unsure of how the employment factor sensitivity would be calculated other than through capex cost. Central to the effectiveness of sensitivity testing is whether the central case values are properly justified. The 2024 Panel is concerned that the proposed central cases for both these sensitivities are indeed

⁵⁴ AEMO (2022b) see the discussion on pp. 89-92.

defensible central cases – capex cost is discussed in Section 7.3 and discount rate is discussed in Section 7.7.

In Section 7.1, the 2024 Panel proposes that the Victorian Government’s offshore wind policy should be included as a public policy under the NER rules and hence is not a sensitivity. However, given there are significant risks around the ability to actually implement this policy, we think it should remain a sensitivity.

Expand the number of sensitivities

The 2024 Panel proposes the following additional sensitivities:

- Social licence – network commissioning delay and increased capex due to both supply chain and commissioning delay
- Increased capex – there are two related factors here
 - The range in the capex estimates – network costs estimates are generally Class 5 which the 2022 ISP had a $\pm 30\%$ with (in the view of the 2022 Panel) insufficient justification of why it was much narrower than the ACCC boundary variation of -20% to $+100\%$.
 - Supply chain pressures increasing capex
- Delay in generation projects commissioning timetable focussing on Snowy 2.0 and the Kurri gas/hydrogen generation which may be due to a range of factors e.g., supply chain and engineering issues.

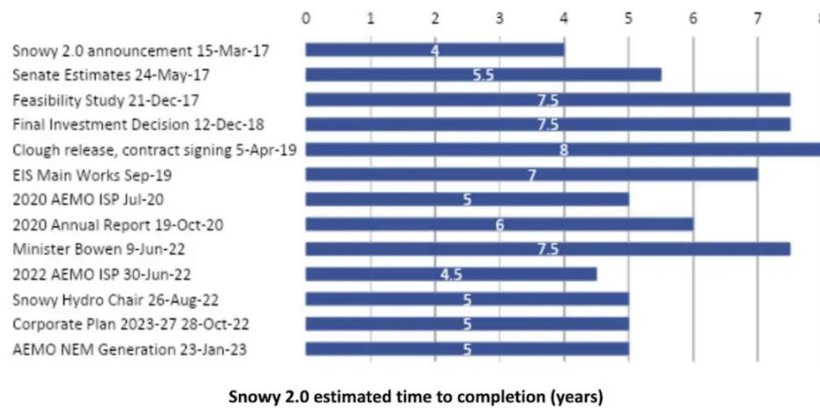
In Section 7.4.1, we define ‘social licence’ to include both ‘Community’ (local community acceptance of new infrastructure development) and ‘Consumer’ (acceptance of the costs to all consumers of the generation and network infrastructure). The two interrelated risks around social licence are project delay and cost increase due to that project delay. Supply chain risk also manifests in increased capex. Project delay may result in a change in generation mix e.g., if WRL and VNI West are delayed, does that increase the need to build offshore wind despite its much higher cost? If the large pumped hydro projects in the Queensland Energy and Jobs Plan (Pioneer-Burdekin and Borumba) are delayed, then the Queensland Government has indicated that it will keep its coal fired stations open longer.

There has been considerable public discussion in recent times on the timetable for the commissioning of Snowy 2.0. The original announcement in March 2017 proposed completion by 2021. At the end of the feasibility study in December 2017 (which said the project was technically and financially ‘feasible’), the Prime Minister said operations would start ‘from 2024’.⁵⁵ Successive announcements since then have gradually pushed out the commissioning date. The table below shows how the time to completion has changed over time.⁵⁶ The most recent update to the Generation Information Page has Snowy 2.0 being ‘fully commissioned’ by December 2027.⁵⁷

⁵⁵ Prime Minister Malcolm Turnbull (2017) at <https://pmtranscripts.pmc.gov.au/release/transcript-41391>

⁵⁶ Renew Economy (2023) at <https://reneweconomy.com.au/snowy-hydro-finally-fesses-up-on-delays-to-snowy-2-0-and-for-kurri-kurri-too/>

⁵⁷ AEMO (nd) at <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information>



Source: *Renew Economy* (2023) at <https://reneweconomy.com.au/snowy-hydro-finally-fesses-up-on-delays-to-snowy-2-0-and-for-kurri-kurri-too/>

It is interesting to note that the dates provided by Snowy Hydro and used by AEMO are consistently shorter than the dates provided by Clough (the head EPC contractor) and the Federal Minister. Further, since construction started, the time to completion seems to be unchanged even as work progresses. For example, the 2020 ISP has a 5 years to completion assumption, the same period in the January 2023 Generation Information page update. Both dates were supplied by Snowy Hydro.

Clough went into receivership in 2022 and there are major disputes between it and contractor and Snowy Hydro about cost overruns. There have been recent reports about one of the three tunnel boring machines being stuck at a point considerably shorter than where it was supposed to be.⁵⁸ Snowy Hydro has released only limited news.⁵⁹

For the December 2027 fully commissioned date to occur, Humelink and Sydney Ring have to be fully commissioned to be able to transport the full generation capacity of Snowy 2.0 to Sydney. The 2022 ISP has a Humelink 'target implementation date' of July 2026 and Sydney Ring by July 2027.⁶⁰ Transgrid's latest update says 'construction finishing in 'late 2026'⁶¹ for Humelink but it is not stated whether this means the line will be fully commissioned and available by that time.

The broad parameters of the four sensitivities are:

- on ISP actionable projects – date of full commissioning and operation
- delay in full commissioning of the two large pumped hydro storages in the Queensland Energy and Jobs Plan – Pioneer-Burdekin and Borumba
- on capital costs of ISP actionable projects and the Pioneer-Burdekin and Borumba projects
- the full commissioning date for Snowy 2.0 and Kurri gas/hydrogen generation units

The Panel looks forward to discussing the detail around how that sensitivities might be modelled in detail.

Model 'combined' sensitivities

Given the interconnection between these sensitivities, it is important that they are modelled in combination. It is of limited use to consumers to be told that 'individual sensitivity testing on

⁵⁸ ABC (2023) at <https://www.abc.net.au/news/2023-02-12/snowy-2-0-this-hole-is-above-a-stuck-tunnel-boring-machine/101957418>

⁵⁹ Snowy hydro (2022) at <https://www.snowyhydro.com.au/news/snowy-2-0-headrace-tunnel-update/>

⁶⁰ AEMO (2022b) p. 20.

⁶¹ Transgrid (nd) at <https://www.transgrid.com.au/projects-innovation/humelink>

variable A or variable B' does not change CDP net benefits enough to change the ODP when the relevant question is 'what impact does sensitivity testing on variable A and B combined have on the ODP? Changes in variable do not occur in isolation. There are risks and uncertainties everywhere. 'Combined' sensitivity analysis will increase consumers' confidence in the results.

The ISP Methodology sets out AEMO's approach to sensitivity analysis.⁶² The 2024 Panel understands the need for AEMO to trade-off complexity and breadth in the level of analysis it undertakes. Given the crucial importance of social licence in the ODP, the 2024 Panel recommends that a small number of 'combined' sensitivities be completed e.g., the sensitivity of a CDP to both date of full commissioning and capex cost.

When the 2022 Panel discussed the issue of 'combined' sensitivities with AEMO, they were told that the modelling was too complex and not possible. The 2024 Panel understands that combined sensitivity analysis will be possible for the 2024 ISP. The 2024 Panel looks forward to more discussion on this issue in the context of the Draft Methodology due to be published on 31 March 2023.

⁶² AEMO (2021) *ISP Methodology* at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/isp-methodology> pp 88-90

7. Inputs and Assumptions

7.1 Policy and emissions reduction settings

7.1.1 Public policy settings

What are the issues and considerations?

The decision on what to include as a ‘public policy’ can have an important impact on the ISP.

AEMO’s Approach

AEMO applies the ‘public policy criteria’ set out in NER 5.22.3(b) to determine whether a policy is included in all scenarios. The policy must meet at least one of five criteria:

- a commitment has been made in an international agreement to implement that policy,
- the policy has been enacted in legislation,
- there is a regulatory obligation in relation to that policy,
- there is material funding allocated to that policy in a budget of the relevant participating jurisdiction, and
- The Ministerial Council of Energy (MCE) has advised AEMO to incorporate the policy.

Consumer Panel Comments

The 2024 Panel agrees with the Draft that given new policy is being announced all the time by Federal and State Governments, the public policy assumptions need continual updating. The 2024 Panel makes the following comments on some particular policies:

There are significant risks that the Victorian offshore wind policy timetable is not achievable

The Draft has this as a sensitivity rather than a public policy included in all scenarios, noting that further developments could result in its inclusion. The 2024 Panel submits that two recent announcements support the case for it to be included as a public policy:

- the mid-December announcement where the Federal Government formally declared⁶³ the first offshore development zone⁶⁴ covering 15,000 sq kms from Lakes Entrance in the east to south of Wilsons Promontory in the west.
- the likely first project to be developed in the zone – the proposed 2.2GW Star of the South project - has been given Major Project Status by the Federal Government.⁶⁵

However, we see considerable risks around the Government’s ability to actually implement the policy. This is driven by the international demand for materials and skilled labour for offshore wind is expected to far exceed the available supply. A range of recent international reports have highlighted significant constraints on Governments’ ambitious offshore wind targets - the lack of skilled labour

⁶³ See <https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-unlocking-power-offshore-wind-gippsland>

⁶⁴ See <https://www.dcceew.gov.au/energy/renewable/establishing-offshore-infrastructure#:~:text=Declaration%20of%20an%20area%20%2D%20Gippsland,energy%20on%2019%20December%202022>

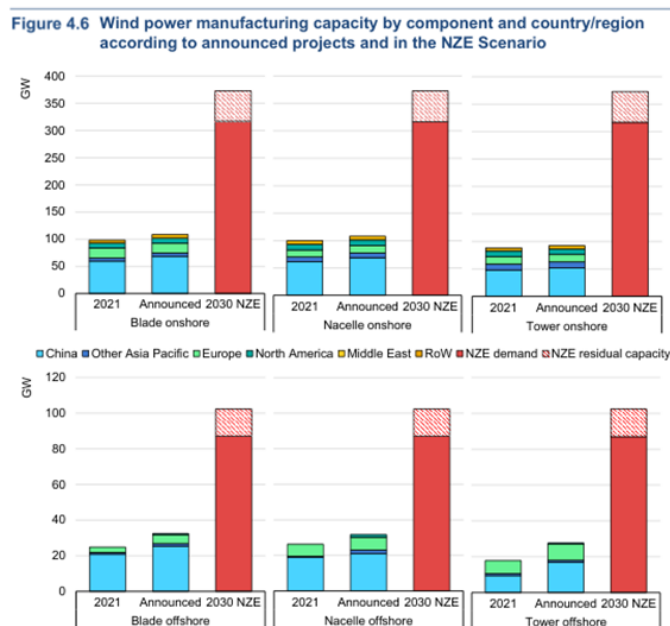
⁶⁵ See <https://www.industry.gov.au/news/offshore-windfarm-development-awarded-major-project-status#:~:text=The%20Australian%20Government%20has%20awarded%20Major%20Project%20Status%20to%20the,to%20the%20National%20Electricity%20Market>

(much more skilled than for onshore wind) across the supply chain, the shortage of manufacturing capacity and the shortage of specialised ships to transport blades to the installing country.

The latest edition of the regular IEA Energy Technology Perspectives published in January 2023 covers all three. On labour it states:

“Offshore wind projects require better trained workers and more labour input per megawatt than onshore projects over their lifetime. There are growing concerns that shortages of trained personnel in the offshore wind sector could delay installations in the coming years”.⁶⁶

On manufacturing capacity, the IEA states that the current wind manufacturing capacity is significantly below what is required to meet the IEA wind target under the NZE (equivalent to the ISP 1.5C Green Energy Exports) scenario:⁶⁷



Source: IEA (2023) op.cit. p.224

A June 2022 report of the US Department of Energy’s National Renewable Energy Laboratory (NREL) on supply chain issues in offshore wind pointed to all three issues as potentially serious constraints on the US’s ability to meet the US offshore wind targets.⁶⁸ A recent Bloomberg report pointed to impact of the lack of vessels in Asia.⁶⁹

“The shortage of ships is significant for Asia as the GWEC predicts the continent will top Europe as the region with the most new offshore wind installations through 2026. A lack of vessels could set back countries’ efforts to diversify away from fossil fuels. “The potential crunch is likely to occur in the mid-to-late 2020s as more countries begin constructing their wind farms to meet

⁶⁶ IEA (2023) at <https://iea.blob.core.windows.net/assets/a86b480e-2b03-4e25-bae1-da1395e0b620/EnergyTechnologyPerspectives2023.pdf> p.72.

⁶⁷ IEA (2023) ibid. p.224.

⁶⁸ NREL (2022) at <https://www.nrel.gov/docs/fy22osti/81602.pdf>

⁶⁹ Bloomberg (2023) at https://www.bloomberg.com/news/articles/2023-02-01/asia-faces-shortage-of-ships-to-install-offshore-mega-wind-farms?cmpid=BBD020223_GREENDAILY&utm_medium=email&utm_source=newsletter&utm_term=230202&utm_campaign=greendaily

2030 national targets,” said Bahzad Ayoub, a senior analyst at consultant Westwood Global Energy Group.

“Many of the existing ships have been deployed to Europe, said Marco Polo’s Lee. To fill the gap in Asia, tugs and support vessels that were serving oil rigs in Southeast Asia have been diverted to wind farms, he said. But using oil and gas ships can’t be a long-term solution, and the current fleet of installation vessels may soon become obsolete as turbine sizes grow to be almost as long as the Eiffel Tower.”

Queensland Energy and Jobs Plan

While significant high level major announcements have been made by the Queensland Government, many of the details remain to be published. Some will be available in April/May with the publication of the draft legislation and supporting documentation. The 2024 Panel awaits this information to further understand the likely commissioning dates of major generation and network components. The 2024 Panel supports the QJEP being in all scenarios. It remains to be seen whether the various components survive the cost benefit analysis to enable them to be on the optimal development path.

Jurisdictional policies regarding hydrogen development

The 2024 Panel supports the non-inclusion of these policies. There have been numerous announcements and some limited Government funding provided. The 2024 Panel understands AEMO’s close observation of South Australia’s developments with \$593 million over the period 2022-23 to 2025-26 to the Office of Hydrogen Power South Australia to deliver the Hydrogen Jobs Plan. This plan which intends to establish hydrogen production for exports, including ‘green steel’ and power generation.

Rewiring the Nation

The 2024 Panel is unclear about why there is a discussion of *Rewiring the Nation* (RtN) when the ISP is not concerned with ‘who pays’ (the 2024 Panel argues in Section 1 that it should). Commonwealth Government decisions on RtN funding results from considering the ODP from the ISP and the availability of such funding would not influence the selection of the ODP. It would be good to understand how inclusion or exclusion of RtN might impact the ISP modelling.

7.2 Consumption and demand historical and forecasting components

7.2.1 Distributed Energy Resources (DER) uptake and generation/charging/discharging patterns⁷⁰

What are the issues and considerations?

The Energy Security Board (ESB) notes that:

“Australians have embraced distributed small-scale energy resources, such as rooftop solar and home batteries, and three million, or one in four, homes now have solar. These resources have drastically changed the dynamic of how the market works...”⁷¹

⁷⁰ This topic includes potential aggregation and coordinated charging/discharging opportunities for Consumer Energy Resources (CER) (such as through Virtual Power Plants (VPPs)) and focusses on:

- Distributed PV
- Battery storage.

⁷¹ ESB (nd) Integration of consumer energy resources (CER) and flexible demand at <https://esb-post2025-market-design.aemc.gov.au/integration-of-distributed-energy-resources-der-and-flexible-demand>

As the 2022 Panel noted, significant investment in DER is a core feature of the energy transition. This investment is on the side of both consumers (investing their own money and resources) and governments (providing subsidies to enable the achievement of policy objectives).⁷²

Stakeholder feedback to AEMO during a Scenarios webinar on 13 July 2022 indicated that 79% of respondents thought DER uptake and orchestration should be a key differentiator between scenarios. Comments from stakeholders included:

“Highest degree of uncertainty in future energy mix...the level of DER is highly uncertain and will dictate the level of investment in T&D and utility scale capacity additions.”

“DER and particularly orchestration is a significant uncertainty.”

“YES – there seems to be a misunderstanding [of] the interrelationship between transmission and CER/DER.”⁷³

These behind the meter investments will influence the required utility scale investments, but AEMO acknowledges that the extent to which they will do this “is unknown”.⁷⁴ According to AEMO, these sensitivities were explored in the 2022 ISP. As noted by the 2022 Panel, AEMO must consider a range of potential future scenarios for DER as there is a risk that consumers could either overinvest or underinvest in the ISP if these developments are not adequately taken into account.⁷⁵

The risk of overinvestment or underinvestment is present because the extent of DER investment can impact on the extent of transmission investment required. Utility scale Variable Renewable Energy (VRE) will also require more transmission investment than DER. Consumers need to be confident about how the DER and VRE projections impact projected transmission builds. The 2024 Panel commends AEMO in recognising this important theme in the Draft 2023 IASR, as illustrated in its matters for consultation discussed below.

AEMO’s Approach

The Draft 2023 IASR has a section on CER based on two consultant forecasts: CSIRO and Green Energy Markets. There are subsections dedicated to Distributed PV and Battery storage uptake (including aggregated energy storage – virtual power plants and hosting capacity of distribution-connected CER).

AEMO notes the inputs and assumptions were updated through the consultancies (capacity for Distributed PV) and presentations to FRG on draft/preliminary forecasts took place in September 2022.

Consumer Panel Comments

The 2022 Panel commented on the very significant future network and other benefits of DER, referring to an Energy Networks Australia report that if DER is used to provide network services, that would obviate the need for \$16.2 billion in network investment by 2050.⁷⁶

⁷² 2022 Panel (2021a) op. cit.

⁷³ Stakeholder feedback (2022) Scenarios webinar 13 July 2022 at <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/opportunities-for-engagement> pp.27-28.

⁷⁴ AEMO (2022c) Draft FRG Minutes 28 September 2022 at <https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/forecasting-reference-group-frg> p.3

⁷⁵ 2022 Panel (2021a) op. cit.

⁷⁶ 2022 Panel (2021a) op. cit.

The 2022 Panel considered that there was a risk that the inputs, assumptions and scenarios for 2021 underestimated the future uptake and nature of DER and the impact this would have on the overall development of the Integrated System Plan. They said that in addition to significant increases in rooftop solar PV, additional and more advanced DER infrastructure (digital metering, smart inverters, energy storage, energy management systems, household appliance with smart controls, electric vehicles etc) are now entering the customer market. The 2022 Panel stated that the ISP is the ideal planning instrument to consider the role of DER in a ‘whole of system’ way.⁷⁷

In line with this whole of system approach, the 2022 Panel wanted AEMO to recognise that distribution networks are shifting investments to enable the network to increasingly host DER and recommended that AEMO cross reference the distribution companies’ strategies and developments within the various scenarios and in the IASR.⁷⁸

The 2022 Panel expected to see the rise of coordinated and orchestrated distributed energy resources in the energy system, stating:

“This significant change will reshape how electricity and other services are dispatched across than NEM through new technology and approaches such as dynamic operating envelopes and virtual power plants, potentially resulting in reduced need for transmission investments.”⁷⁹

The 2022 Panel said that these technological advancements need to be carefully considered in the ISP development and that consideration needs to be given to how these investments by consumers and other parties interact with and support the transmission investments proposed within the IASR and the ISP. They recommended that:

“... it would be prudent of AEMO to have direct conversations with the various distribution networks and new service providers to get a greater understanding of the current and future investments in this area and the projected changes in network utilisation and energy flows and how these impacts both the IASR and ultimately the ISP.”⁸⁰

The 2024 Panel acknowledges that AEMO has gone further in the Draft 2023 IASR in assessing the potential future update and nature of DER by obtaining the two consultant forecasts from CSIRO and Green Energy Markets. The 2024 Panel makes the following comments:

Issue	Description	Panel comments
Supply chain constraints	In August and September, FRG members raised the issue of supply chain constraints and how they may impact future uptake of DER. In the September FRG meeting, CSIRO acknowledged that AEMO’s scenarios include a spread for supply chain constraint longevity and an extra dispersion is added in the short-term regression in the DER model. CSIRO said this could be	The 2024 Panel welcomes the move by CSIRO to reduce their Progressive Change scenario assumptions on DER from 5% below trend to 10% below trend, to account for the worst case of short-term supply constraints.

⁷⁷ 2022 Panel (2021a) op. cit.

⁷⁸ 2022 Panel (2021a) op. cit.

⁷⁹ 2022 Panel (2021a) op. cit. p.76.

⁸⁰ 2022 Panel (2021a) op. cit. p.77.

	considered further to better reflect uncertainties.	
Impacts on the distribution system	Stakeholders have pointed to the increased need to understand DER impacts on the distribution system, such as costs and constraints. This issue includes export limits.	The 2024 Panel understands that AEMO liaises with DNSPs in various forums to understand differences in forecasts and consolidate new information on DER hosting.
Consumer willingness to invest as well as capacity	Research by Energy Consumers Australia (ECA) and the Australian Energy Regulator Consumer Reference Group (CRG) ⁸¹ considers consumers' willingness to reduce demand and the propensity to invest in solar and/or battery technology, as well as their capacity to invest.	The 2024 Panel supports the 2022 Panel view that further insights into changing consumer preferences could be gathered through existing consumer research. The CRG research shows the impact that diminishing affordability has on consumers ability to invest in more energy efficient appliances or instal more solar. The ECA research shows the proportions of consumers who are willing to invest in DER. This information can be mapped against forecast DER uptake, to clarify how the forecasts sit against consumers revealed preferences.
VPP economic benefits	In September, an FRG member asked what drives the residential choice to join a VPP if the economic benefit is not better than a standalone battery? CSIRO responded that once the batteries exist, it will be beneficial to both parties to use them in VPPs.	Research by Energy & Water Ombudsman SA indicates that consumers are increasingly concerned about the choice of joining a VPP or having a standalone battery. It is not clear from this research that consumers will necessarily draw the conclusion that it will be in their benefit to use them in a VPP. The 2024 Panel recommend that AEMO consider the VPP complaints data from energy ombudsman schemes and calibrate this against VPP uptake forecasts.
Use scenarios and sensitivities to explore different DER levels	During the scenarios webinars, stakeholders provided feedback that AEMO should use scenarios and sensitivities to explore different DER levels.	The 2024 Panel welcomes the central role of DER in the 2023 scenarios and notes the offshore wind sensitivity.
VPP customer complaints	Research by the Energy & Water Ombudsman SA tracks VPP complaints data.	The VPP complaints data indicates that VPP complaints are levelling while the number of VPPs grows.

⁸¹ ECA (2021) Energy Consumer Behaviour Survey at <https://energyconsumersaustralia.com.au/publications/energy-consumer-behaviour-survey-findings-october-2021>

ECA (2017-2021) Energy Consumer Sentiment Survey at <https://energyconsumersaustralia.com.au/?s=Energy+Consumer+Sentiment+Survey>

CRG (2022) CRG Consumer Survey 3 at <https://www.aer.gov.au/publications/guidelines-schemes-models/rate-of-return-instrument-2022/draft-decision#step-83972>

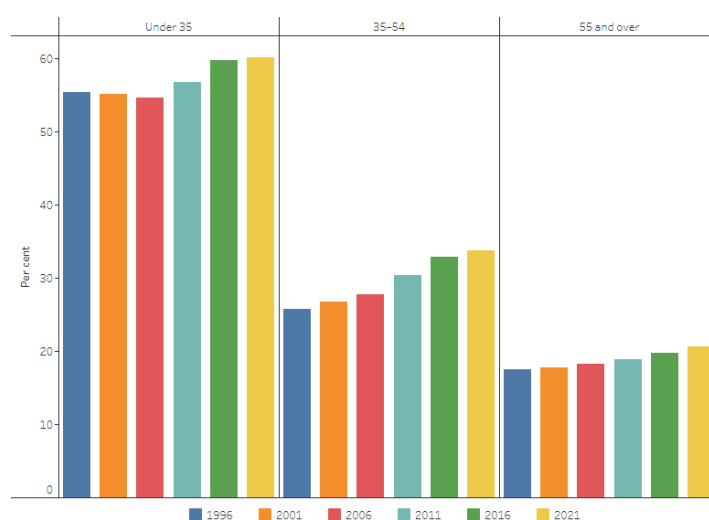
Consumer Panel Response to Matters for Consultation

AEMO Matter for Consultation 1: Are the assumptions which are proposed to apply affecting CER (including PV non-scheduled generation, or PVNSG) investments providing a reasonable spread of futures to evaluate the transmission-scale investments needed for the energy transition?

The 2024 Panel considers that the assumptions which are proposed to apply affecting CER provide a reasonable spread of futures to evaluate the transmission scale investments needed for the energy transition and notes that given affordability issues, further government subsidies may be needed to deliver the carbon policy ambition – the ISP should make the cost of moving to net zero visible to governments so they can make the necessary policy decisions and back these up with subsidies if needed.

The 2024 Panel notes that another potential limit to the rate of growth of small-scale PV installation is the combination of private rental being the fastest growing form of housing tenure while PV uptake for rental properties is stubbornly low.

Proportion of Households who rent, by age of reference person, Australian Census 1996 - 2021⁸²



Source: Australian Institute of Health and Welfare, *Home ownership and housing tenure*, August 2022

On the evening of census night 2021, 31% of households were renters.

The above graph shows that renting is increasing as the form of housing tenure for all age groups, including older person households (over 55 years) who have traditionally been homeowners.

By the time the 2024 ISP is published, it is likely that a third of households will be renters.

“Rooftop solar uptake for rental properties currently sits at just 4 per cent, while uptake for owner-occupied homes is approaching 30 per cent – seeing almost one-third of Australian homes facing substantial barriers to getting solar installed.”⁸³

⁸² Australian Institute of Health and Welfare (2022) at <https://www.aihw.gov.au/reports/australias-welfare/home-ownership-and-housing-tenure#ownership>

⁸³ Renew Economy (2021) quoting the Australia Institute on 19 January 2021 at <https://reneweconomy.com.au/state-governments-key-to-unlocking-rooftop-solar-for-renters-says-thinktank/>

Social service organisations report that landlords show little interest in installing PV on rental properties while jurisdictional Governments balk at subsidies for landlords to encourage the uptake of PV for renters.

Unless there are changes in approach from landlords or jurisdictional Governments, it is unlikely that PV uptake will increase for rental properties, suggesting that the growing rate of rental housing tenure may limit the potential growth of PV installation for residential housing.

AEMO Matter for Consultation 2: Should other considerations affecting the operation and orchestration of consumer resources be considered, particularly regarding the variation between the 1.8°C Diverse Step Change and 1.8°C Orchestrated Step Change scenarios? Will these assumptions effectively distinguish the investment needs of transmission-scale infrastructure with greater or lesser consumer resources?

The 2024 Panel considers that government support of orchestration will be a key to its adoption.

Consumers are going to take up orchestration for more reasons than just financial e.g., climate change objectives, reliability. Therefore, increasing extreme weather events and the possibility of outages need to also be considered.

AEMO Matter for Consultation 3: AEMO has adopted the average of each consultant's projections regarding battery and VPP orchestration levels from GEM and CSIRO for the 1.8°C Diverse Step Change scenario, which results in a higher update forecast than an alternative of adopting the lower forecast from CSIRO in isolation. Do stakeholders have any comments on the adoption of this level?

The 2024 Panel supports the higher update forecast given overinvestment risk considerations.

7.2.2 Electric and fuel-cell vehicles

What are the issues and considerations?

The electrification of transport, for both personal and commercial applications has been pending for some time but is now becoming more of a reality in Australia – noting that rate of adoption in Australia has been slower than in other locations, particularly Europe and Asia.

The Evguide, a part of “Cars Guide”, reports:

“As of April 2022, there are 30 electric vehicle models available in Australia, including 65 variants, comprising of 28 plug-in hybrid electric vehicles (PHEVs), and 37 battery electric vehicles (BEVs, or EVs).

Since 2011, there have been more than 40,000 electric vehicle sales in Australia. There are 30 electrified vehicles for sale in Australia in 2022, and a total of 65 variants, with more models planned to hit the market in 2022 and beyond.⁸⁴”

The Evguide reports that:

“The percentage of electric cars in Australia accounts for 2 per cent of the overall market in 2021 ... compared to 17 per cent in Europe, and 13.3 per cent in China.

Although EVs only accounted for 9 per cent of global car sales in 2021, there's a definite trend toward growth of EV sales.

⁸⁴ Evguide (2022) at <https://www.carsguide.com.au/ev/advice/how-many-electric-cars-are-there-in-australia-83262>

Around 130,000 EVs were sold globally in 2012, but now, that many EVs are sold in a week.”⁸⁵

The 2024 Panel agrees that while the pace of purchase of electric vehicles is accelerating in Australia, projections of future sales and EV use remain notoriously difficult.

The electrification of transport, personal and commercial, is underway, and accelerating from a relatively small base.

Was there a 2022 recommendation?

The 2022 Panel stated:

“...a recent research study by McKinsey and Morgan Stanley suggests a significant step change in people’s willingness to embrace new technology and mobility trends.

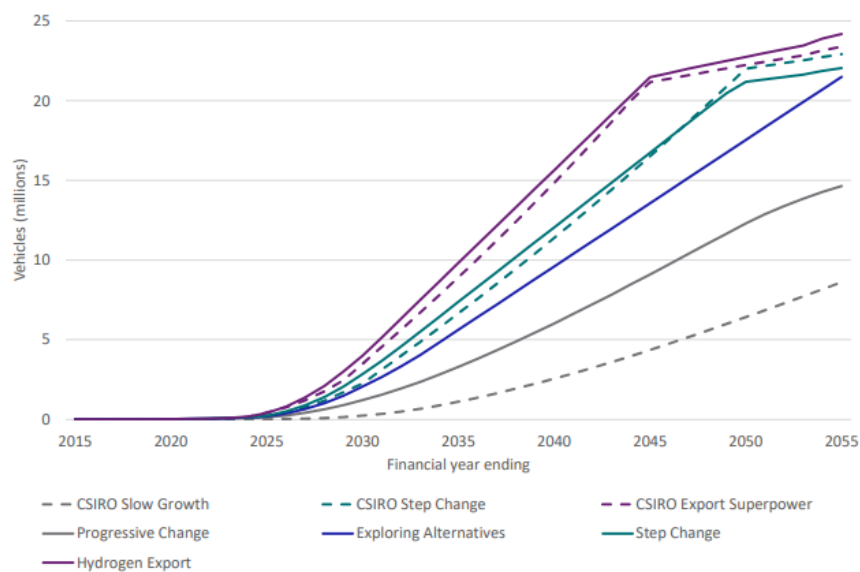
We recommend AEMO to consider these as inputs into the scenarios and IASR modelling to reflect the significant trends towards Electric vehicles.

To assist in the development of these scenarios we also recommend AEMO directly engage with the Electric Vehicle Council of Australia, its members and associated businesses and other stakeholders and consider State Government commitments to EV uptake.”⁸⁶

AEMO’s Approach

The Draft 2023 IASR utilises a report, *Electric vehicle projections 2022*, prepared by CSIRO that considers electric vehicle demand and includes the following.⁸⁷

Projected number of EVs in the NEM compared to 2021 scenarios (dashed lines)



Source: CSIRO (2022) p.52

The report says that the key changes from 2021 projections are:

⁸⁵ Evguide (2022) *ibid*.

⁸⁶ 2022 Panel (2021a) *op.cit.* pp.78-79.

⁸⁷ CSIRO (2022) at <https://aemo.com.au/consultations/current-and-closed-consultations/2023-inputs-assumptions-and-scenarios-consultation>

- “1. Stronger uptake before 2030
2. The assumed demand at peak for household charging has decreased
3. Charging is higher on weekends
4. Time of use charging behaviour has been updated
5. Public or fast charging behaviour has also been updated.

Since the 2021 projections the most significant market development has been a proliferation of stronger state and commonwealth electric vehicle policies – in particular, 2030 targets of around 50% sales and state subsidies of \$3000-\$3500 and Commonwealth subsidies of \$8000-\$12000 in the form of fringe benefit tax exemptions for electric vehicles”⁸⁸

The headline finding that EV uptake is occurring at a faster rate now than projected in 2022, for every scenario is consistent with changing community attitudes.

Consumer Panel Comments

The November 2022 report projects a greater EV presence than was projected for ISP 2022. The report also states that economic growth is a determinant of EV sales, the stronger the economy and the better pay rates grow, the more EV’s will be purchased.

Over the next decade, the 2024 Panel expects EV sales to be concentrated with fleet purchases and higher income individuals. Once there is a competitive used car market for EV’s and a demonstrated effectiveness of them, the use of EV’s will grow strongly. The CSIRO data adequately reflects this trajectory.

The 2024 Panel is less certain about the extent to which EV’s will be picked up for commercial activity, for example couriers, local freight and taxis.

The 2024 Panel does not identify any concerning flaws in the CSIRO analysis but notes that EV costs, recharging options and government policy will all heavily influence the rate of uptake.

The 2024 Panel suggests that the EV issue which will have significant network impact is the approaches to recharging that emerge over the next 3-5 years. Tariff structures for EVs are crucial if EVs are to play a role in improving network productivity rather than creating further peak load and requisite, expensive grid expansion. These tariffs must provide strong incentives for EV charging at times that utilise existing network capacity at transmission level and particularly in the distribution networks.

CSIRO observes in their report that currently “off-peak” occurs at night, but the future may see “off peak” in the middle of the day to incentivise charging directly from rooftop PV.

The Final 2023 IASR needs to present a better understanding of the pricing for EV charging assumed in the demand profiles. Have the demand forecasts assumed cost reflective pricing?

Consideration of policies and tariffs that actively encourage efficient use of existing network is a crucial aspect of ‘orchestration’ (see Section 1). Any practices that allow EV charging at times that could increase maximum demand need to be actively discouraged.

⁸⁸ CSIRO (2022) *ibid.* p.v.

7.2.3 Electrification

What are the issues and considerations?

The rate of electrification is a key variable driving the transition. The 2024 Panel is particularly interested in the assumptions relating to the 'hard to abate' sectors. The 2024 Panel has found many forecasts make overly optimistic forecasts about the relative ease of commercially electrify major industrial processes.

AEMO's Approach

Industrial electrification is based on the multi-sectoral modelling by CSIRO and Climate works.⁸⁹ In the Draft 2023 IASR, AEMO comments on the industrial sector:

"The industrial sector comprises a range of subsectors, each with their own fuel use characteristics. While most oil and gas demand can be electrified (or switched to alternative gases), high-heat processes are challenging to electrify without further technological advances. Examples of such processes are the direct reduction process for iron and steel, and high temperature blast furnaces. Scenarios requiring faster emissions reduction assume greater investment appetite for technological advances to achieve the emissions reduction goals."⁹⁰

Consumer Panel Comments

AEMO has advised that the multi-sectoral modelling does not have visibility of the investment cycle of industrial companies. It considers the economic viability of fuel switching to meet economy wide cost minimisation objectives rather than other actions to decarbonise and is not a site-specific or asset specific decision optimisation. As the report notes (p. 32):

"In industry, the maximum annual uptake rate of electrification technologies is based on the assumed rate at which technology could be replaced at equipment end-of-life, effectively a maximum annual technology build rate. This rate can be varied by scenario. Each subsector is also subject to a maximum total share of technically feasible electrification over time."

The above suggests it has little relevance to the decisions that industrial users make in real life. For example, while there may be excitement about the production of a small quantity of green steel using hydrogen in an experimental site in Sweden, it is a long way from being economic at scale. The commerciality of electrification of gas use can be very process specific – what is the temperature required? how recently did the company install its current technology? what level of Government support is available for electrification? It is difficult to have confidence in high-level modelling results given these uncertainties cover a large part of manufacturing industry.

Overall, the multi-sectoral modelling seems overly simplistic approach to a veery complex issue.

7.2.4 Hydrogen

Hydrogen is likely to play an important niche role in emissions reduction, at a global level, in sectors and regions that are otherwise difficult to decarbonise.

⁸⁹ See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/csiro-climateworks-centre-2022-multisector-modelling-report.pdf?la=en

⁹⁰ AEMO (2022a) op.cit. p.49.

The potential for Australia to capitalise on its renewable resources to produce hydrogen for export purposes - as a pure or blended gas, in ammonia or as an input to exported materials such as metals - has given rise to an appetite for developing infrastructure to support the production, storage and transport of hydrogen here.

The 2024 Panel notes enthusiastic discussion about the potential for hydrogen, both in the 2022 ISP with a “hydrogen superpower” scenario and as reflected by recent jurisdiction government announcements and flagged budget spending of \$845 million for hydrogen projects.

Consumer Panel Comments

1. Beneficiaries and/or governments - not consumers - should carry the costs of infrastructure to support hydrogen production

Producing, storing, transporting and using hydrogen at scale for most potential applications remains far from economic after more than 50 years, and a recent burst of activity, of research and development. Despite the high hopes of proponents and governments, plans for hydrogen are highly speculative, and rely on major technology and other breakthroughs to become feasible.

Given this, and the significant first mover disadvantage for self-funding these projects, hydrogen proponents rely heavily on subsidies. Considering the expansion of the shared electricity transmission networks required to support the hypothetical Green Energy export scenario, this raises the question: how can the long term interest of energy users be promoted while building that infrastructure?

The answer: hydrogen production and export projects should not be cross-subsidised by other energy users. This entails the beneficiaries (future hydrogen projects) or government carrying the full cost of electricity transmission required for the purposes of hydrogen production, storage and transport.

Current cost recovery arrangements for shared transmission do not support a beneficiary-pays approach to funding the transmission required for future large hydrogen projects.

The above observations cast doubt over whether the ISP should countenance the inclusion of transmission for hydrogen facilities at all, or at least in the absence of reforms (or committed government funding) that avoid imposing the high costs of transmission for future speculative hydrogen on consumers.

Panel Proposals for 2023 IASR

Either:

- Government funding, committed funding by proponents and/or reforms to cost recovery should prevent other consumers funding the portion of shared network infrastructure attributable to hydrogen projects in the ISP, or
- AEMO should minimise the inclusion of hydrogen projects in the ISP to a level where there is no material cost or risk, including the risk of underutilisation of transmission assets, for other consumers.

2. It is not realistic, or in the interest of consumers or emissions reduction, to assume non-trivial volumes of hydrogen will be used in gas distribution networks

At the same time as hydrogen is being explored for export, the natural gas distribution and transmission sectors are facing the existential threat of underutilisation and asset stranding as homes and businesses shift traditional gas loads to electricity.

Electrification of gas loads is driven by a number of factors. Cost and affordability are the key drivers, with applications for gas in most homes⁹¹ now being materially more expensive over the life of the appliance compared to the efficient electric⁹² alternatives. Other factors include the high and unavoidable emissions associated with natural gas, and the risks of gas in the home to health and safety.

All these factors are reflected in changing consumer preferences. Fewer homes are being built with gas connections, more existing gas users are reducing gas demand or eliminating gas connections altogether, and government policies, at a state, territory and local level, are beginning to reflect a future where natural gas has little or no role in homes and other buildings.

The prevailing view of independent energy experts is that gas of any type has a diminishing future as a fuel in homes. The question of new gas connections ceasing altogether is one of 'when', not 'if', and it is plausible large portions of gas distribution networks will be decommissioned by 2050.

Gas network owners and operators, in the absence of a viable long-term solution to the threat this poses to their businesses, are promoting the injection of hydrogen in gas distribution networks in the hope this will sustain their businesses. But the idea that hydrogen can be cost effectively accommodated into gas networks or compete with alternatives, is at best, far-fetched, unless there are substantial technological and cost reducing breakthroughs in the short term future

Most gas transmission networks, and many of the industrial gas users who collectively consume a large portion of stationary natural gas, cannot tolerate any amount of hydrogen in their systems today. Appliances in homes and other buildings may accommodate up to 10%, but this remains unproven, and in reality, will be limited by the 'weakest link' in the supply and consumption chain, which is likely to be significantly lower than 10% and could be as low as 2%. Distribution network capacity for hydrogen is limited by many factors, including legacy materials that do not tolerate or properly contain hydrogen, operation and maintenance procedures that cannot yet be done safely with hydrogen, limits to the upstream capacity of transmission and, foremost, limits to the downstream capacity of consumer appliances and installation.

Even in the event of future breakthroughs and heavy subsidies, to inject a trivial amount of hydrogen (say around 2% across a given gas distribution network) would incur prohibitive costs for both the demand and supply side, mostly in systems and appliances that are already increasingly uncompetitive with lower cost, lower emissions electrical alternatives. In other words, putting hydrogen in gas networks will only drive faster electrification of gas load.

Due to the energy lower density of hydrogen, injecting 2% hydrogen results in less than a 1% reduction in associated emissions. A 10% hydrogen blend will reduce emissions by about 3%. Rather than assisting decarbonisation, diverting emissions reduction funds to blend gas in hydrogen networks will substantially delay emissions reduction.

In summary, to inject more than a trivial blend of hydrogen blend (averaged across the gas network) does not reflect:

- consumer interests or preferences

⁹¹ The main exception to this being high density homes that currently use gas and are unsuited to either the external compressors required for heat pump hot water and reverse cycle air conditioning or electrical wiring upgrades needed for induction cooking.

⁹² Efficient electric options include heat pump water heaters, reverse cycle air conditioners and induction cooktops. Electric resistance type equivalents to these appliances are generally markedly less efficient and/or less favoured by consumers.

- economic feasibility, now or into the future
- technical feasibility, now or into the future
- decarbonisation needs over any time scale
- AEMO's core principles for the IASR.

Panel Proposals for 2023 IASR

For the reasons outlined above, the Draft 2023 IASR's assumptions about hydrogen blending in gas networks do not satisfy AEMO's core principle that the scenario be plausible.

Given the asymmetry of risk (the Draft 2023 IASR only examines overoptimistic levels of hydrogen), these assumptions arguably do not satisfy AEMO's core principle that scenarios be usefulⁱⁱ.

Noting there are technology trials which will result in some injection of hydrogen into gas networks for the foreseeable future, AEMO's IASR should assume the following levels of hydrogen in reticulated gas networks:

- a default value of 2% in all scenarios (rather than unlimited as per the Green Exports scenario and <10% as per the other scenarios)
- a sensitivity of 10% in the Green Exports scenario (rather than a default value of unlimited as proposed in the Draft 2023 IASR).

7.2.5 Electricity Price Indices

What are the issues and considerations?

To better understand how the price forecasts have been made and what impact they have on ISP modelling.

Consumer Panel Comments

The discussion of this topic in the Draft is relatively short and raises several questions:

- What is the forecast methodology for the period beyond the availability of ASX futures?
- Table 27 shows retail price forecasts – are they delivered? In which case how have other costs – network, retail margin etc been determined?
- How were C&I delivered prices determined?
- How have these price forecasts been used to forecast demand?
- What is the methodology used to determine the elasticities in Table 15?

The Panel looks forward to further discussions with AEMO on these matters.

7.2.6 Demand side participation

What are the issues and considerations?

The 2024 Panel is seeking more clarity around the use of US and European data for forecasting long term DER.

AEMO's Approach

AEMO's approach in the Draft 2023 IASR draws on overseas data to forecast what might be the maximum possible by 2052, set as an upper limit that can vary below this depending on the scenario and then linearly interpolate between now and 2052 for each scenario.

A review of US and European evidence suggested a reasonable upper estimate target for DSP in 2052 would be 8.5% of operational maximum demand everywhere in the NEM except NSW and Tasmania. In NSW, the Peak Demand Reduction Scheme is forecast to reach 10% by 2029-30 and then stay flat. In Tasmania, the forecast rate varies from 4.25% to 0% depending on the scenario.

The US evidence was a 2009 study on the potential for DSR over the next 5-10 years which considered four scenarios where the level of DSP by 2019 ranged from 4-20% of 'peak' demand.⁹³ AEMO validated this forecast against actual that is published annually by the Federal Energy Regulatory Commission (FERC).⁹⁴ The European study was completed in 2014 and looked at the potential for demand response in 2020.⁹⁵ It suggests a potential 9.4% of 'peak load'. There was no validation of the European target with more recent actual data.

Consumer Panel Comments

We are in very early days for demand response in Australia. In 2020, the AEMC made a rule change to facilitate demand response for large customers.⁹⁶ The AEMC rejected an application to include residential and small business customers. While it is useful to look at other jurisdictions to see what is happening, the 2024 Panel believes there should have been more analysis around how the 8.5% was selected. The wholesale market arrangements in the US and the EU generally differ greatly from the NEM. The December 2021 FERC report showed that in the US:

- a total smart meter penetration rate of 60.3% in 2019 vs ~10% in 2009 but a large variation among regions – from 23% to 74%
- great variation in wholesale demand response resource participation across RTOs/ ISOs in 2020 – 0.1% (in the South West Power Pool) to 7.1% (in the mid-west MISO).⁹⁷

The 2024 Panel is of the view that 8.5% may be plausible with more analysis, but it will require continuous improvement of the Wholesale Demand Response Mechanism by AEMO and reforms to allow aggregators to undertake wholesale demand response on behalf of residential and small business customers independently of energy retailers. The 2024 Panel recommends AEMO commits to the former and recommends the latter as a necessary reform.

7.3 New entrant generator assumptions

7.3.1 Technology build costs

What are the issues and considerations?

The forecasts costs of new generation and storage is a key input to the ISP modelling. There are rising uncertainties around these costs given materials and labour cost pressures at every part of the supply chain - availability of raw materials, component manufacturing and site assembly. This is not just a COVID related matter but a consequence of the global push to decarbonise that will demand significant resources over the next 20-30 years. The large subsidies available under the US Inflation

⁹³ AEMO do not explain how their definition of 'operational maximum demand' compares with FERC's 'peak demand'.

⁹⁴ FERC at <https://www.ferc.gov/power-sales-and-markets/demand-response/reports-demand-response-and-advanced-metering>

⁹⁵ Sia Partners (2014) at https://www.sia-partners.com/system/files/document_download/file/2020-06/20141218_Article_DR-potential-in-Europe-1.pdf

⁹⁶ AEMC (2020) at <https://www.aemc.gov.au/rule-changes/wholesale-demand-response-mechanism>

⁹⁷ FERC (2022) at <https://www.ferc.gov/media/2022-assessment-demand-response-and-advanced-metering>. This report was published after the Draft IASR was published.

Reduction Act are having the effect of drawing immense resources to the US and away from other countries. Some e.g., the EU are considering increasing their subsidies, but it is not a game that Australia can afford to play in. We are a price taker to a large extent, at least for the next 5-10 years.

Australia has a limited domestic capacity and will be very reliant on imports of materials and skilled labour to achieve the ISP ODP timetable given not just the ISP network and generation projects, but all other large construction activity expected in the next decade.

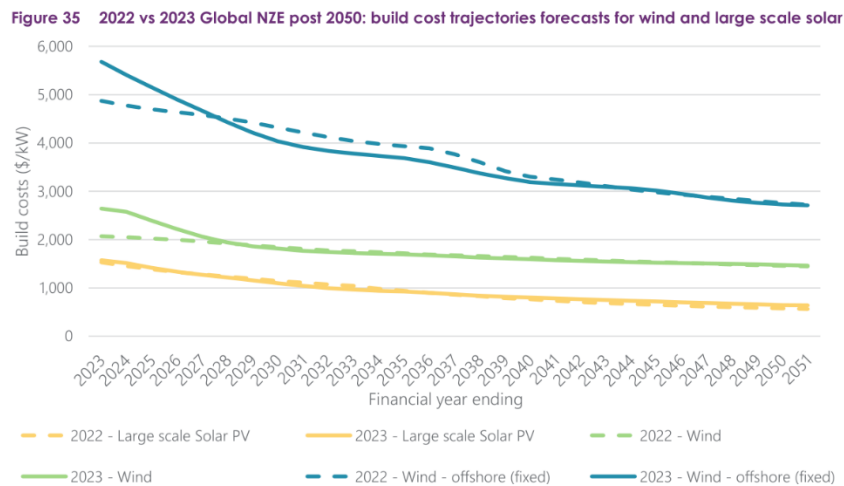
The crucial role of the two large pumped hydro projects in the QEJP means there is renewed focus on the pumped hydro cost modelling. We look at that in the next section.

AEMO's Approach

AEMO's approach is based on the annual CSIRO Gen Cost publication. The latest was published in December 2022 forecasts the capex for a range of generation and storage technologies out to 2051.⁹⁸ CSIRO has a three-stage process to construct the costs in the Figure:

- building on aurecon's estimated 2021 costs⁹⁹, detailed modelling on a 'basket of costs' approach to get the 2023-24 costs
- reliance on CSIRO's GALLM model that provides build cost estimates that are a function of global and local technology deployment to forecast from 2027-28
- interpolation of costs between 2023-24 and 2027-28.

With build costs developed for three scenarios that are then aligned with the proposed ISP scenarios. The results shown in the following figure for large scale solar, and onshore and offshore wind under the 'Global NZE post 2050' scenario that aligns with AEMO's Diverse Step Change and Orchestrated Step Change scenarios.



Source: AEMO (2022a) p.94

Aurecon's current cost estimates were often a significant increase on last years' estimates, particularly for onshore and offshore wind, driven by supply chain issues. CSIRO's forecasts sought to include these inflationary pressures through a change in its modelling approach.

⁹⁸ CSIRO (2022) at <https://publications.csiro.au/publications/publication/Plcsirop:EP2022-5511>

⁹⁹ aurecon (2021) at https://aemo.com.au/-/media/files/major-publications/isp/2022-forecasting-assumptions-update/2021-cost-and-technical-parameters-review_rev3-21-march-2022.pdf?la=en

Consumer Panel Comments

A major theme of this submission is that the cost estimates have not adequately considered supply chain and social licence cost pressures leading to cost estimates that are likely to be considerable underestimates. The 2024 Panel recommends that consideration of these issues will lead to higher ‘central case’ estimates and greater application of cost ranges and risk sensitivities.

1. Supply chain pressures seem to be underestimated

The Draft 2023 IASR discusses the NEM locational cost factors in Table 25 and says:

“...exclude cost premiums that may arise if multiple projects are simultaneously competing for scarce resources across the construction supply chain.”¹⁰⁰

This is exactly the situation Australia is facing in the next decade – not just multiple simultaneous generation and network projects in the electricity sector, but significant construction activity all through the economy. Various Infrastructure Australia reports¹⁰¹ highlight the massive expansion in projects and the severe constraints from having multiple projects proceeding simultaneously. The Market Infrastructure Capacity Report published in December 2022 found that:

“...Australia’s public infrastructure pipeline has increased by \$15 billion in value over the last 12 months.”¹⁰²

2. Is there a consistent approach with the proposed employment factors?

The UTS report AEMO uses to estimate employment factors for generation technologies highlights considerable risks in the availability of the required labour for both local component manufacturing and generation construction. There should be transparency around the consistency of the CSIRO forecasts and the employment factors. Has the CSIRO analysis effectively assumed that whatever labour is required will be available and at the same cost base as the Aurecon 2021 estimates?

3. Related to (1), there should be more explanation around the reversion to ‘normal’ date of 2027

The 2024 Panel understands the conventional and generally accepted technique in long term modelling, that at some stage in the future, ‘things are assumed to return to normal’. CSIRO comment:

“The inflationary cycle is assumed to be at its peak in 2022 and 2023 and to take until 2027 to return to normal costs. Forecasts of the input price indices are used to shape the profile of cost reductions to 2027 as global inflationary pressures unwind. After 2027, our standard projection methodologies are resumed.”¹⁰³

The justification for selecting 2027 is based on RBA inflation forecasts presented to the October 2022 FRG – inflation is expected to return to the RBA target range of 2-3% by then.

The 2024 Panel also accepts the methodology used in the GALLM model where the rate of technology deployment is the key driver for the rate of reduction in technology costs for all non-mature technologies. There is a strong historical basis for the ‘learning by doing’ approach.

¹⁰⁰ AEMO (2022a) op.cit. pp.97-98.

¹⁰¹ Infrastructure Australia (multiple dates) at <https://www.infrastructureaustralia.gov.au/infrastructure-market-capacity-program>

¹⁰² Infrastructure Australia (2022) at <https://www.infrastructureaustralia.gov.au/publications/2022-market-capacity-report> p.25.

¹⁰³ CSIRO (2022) op.cit. p.ix.

The 2024 Panel response is twofold:

- While the economy wide inflation rate may return to normal because of local and international factors, that does not preclude strong inflationary supply chain (labour and materials) pressures continuing in capex and opex associated with building and operating the network, generation and storage required to implement the ISP well beyond 2027.
- Continued cost pressures may offset the learning rates.

CSIRO has not made a case for the conventional modelling approach to be used in a world with large supply chain pressures exacerbated by massive subsidies in countries with . ambitious 2030 and beyond emission reduction targets. It is difficult to believe that even if the economy wide CPI is back to 'normal' by 2027, that inflation in generation and network construction will be back to its pre-COVID rate.

It would be helpful to understand how the GALLM modelling takes account of supply chain constraints.

4. What is the impact of local procurement and Government favoured employer/contractor policies? State Governments have a range of local procurement policies designed to increase the level of local sourcing of materials in their State. For example:

- NSW Roadmap – tender guidelines for REZs require a baseline of 40% of the value up to commissioning for wind and 49% for solar, with a stretch target of between 72% and 81% and specific targets for steel components¹⁰⁴; the Government has established a Renewable Energy Sector Board to maximise the use of locally produced and supplied goods and services, employment of suitable qualified local workers and opportunities for apprentices and trainees¹⁰⁵; following the announcement in 2022 of the closure of Eraring in 2025, the Government announced the establishment of a Renewable Manufacturing Fund to make strategic co-investments with the private sector to establish and expand local supply chains for renewable energy content¹⁰⁶, and
- Queensland Energy & Jobs Plan - one of its three focus areas is "Secure jobs and communities' with actions to 'grow the renewable energy supply chain in Queensland' and 'partner with industries and communities to maximise benefits from the energy transformation and drive regional economic opportunities':

"The clean energy infrastructure outlined in this Plan to build the SuperGrid will create a pipeline of investment to help expand Queensland's share of the renewable energy supply chain and increase the use of local content on projects...

To maximise opportunities for more local manufacturing and jobs from renewable investment, the Queensland Government is committed to 'Buy Local' to provide local businesses with access to the government market and stimulate regional economies."¹⁰⁷

¹⁰⁴ NSW Government (2022a) at <https://www.energy.nsw.gov.au/sites/default/files/2022-09/nsw-renewable-energy-sector-board-plan.pdf>

¹⁰⁵ The Hon. Matt Kean MP (nd) at <https://mattkean.com.au/news/media-release/renewable-energy-sector-board-boost-local-manufacturing-and-jobs>

¹⁰⁶ NSW Government (2022b) at <https://www.energy.nsw.gov.au/news/nsw-response-closure-eraring-power-station#:~:text=To%20capture%20these%20job%20opportunities,up%20to%20500%20new%20jobs>

¹⁰⁷ Queensland Government (2022) at https://www.epw.qld.gov.au/_data/assets/pdf_file/0029/32987/queensland-energy-and-jobs-plan.pdf p.19

With a range of funding commitments to support these initiatives.

All major Government contracts in Queensland – including Government owned generators and networks – are required to follow a range of Government policies around preferred contractors, union membership, pay and conditions and local procurement. In particular, the Best Practice Industry Conditions (BPICs) that mandate pay and conditions for workers employed on Government projects which is a type of pattern bargaining that will apply to all contractors wishing to bid for these projects.¹⁰⁸ The local construction industry argues that this will result in a significant increase in the costs of construction in Queensland.

Local procurement policies and union coverage requirements are expected to have a significant impact on costs. It is unclear how the CSIRO modelling has accounted for these policies.

5. Is there a consistent approach to the cost of land and biodiversity costs for generation and storage (CSIRO) and network (Transmission Cost Data Base)?

The Draft 2023 IASR states (p.96):

“When comparing GenCost’s capital costs in \$/kW with Aurecon, note that Aurecon does not include the cost of land in its presentation of \$/kW capital costs, whereas this is included by GenCost, and therefore by AEMO.”¹⁰⁹

Table 24 p.97 has technology cost breakdown ratios showing the % of total costs that land is. Given the location cost factor in Table 25 p.98 for land is 1.0 for all locations, land costs are assumed to be the same everywhere. The Draft 2023 IASR states:

“The cost groupings (low, medium, and high) consider access to ports, roads and rail, and regional labour costs, but ignore localised environmental, geological, and social drivers which require site-by-site assessments and are difficult to predict pre-feasibility.”

This approach seems inconsistent with the approach to land costs in the draft Mott MacDonald Transmission Cost database report which does show regional variation.

The 2024 Panel understands that it is difficult to estimate these costs, but this does not support a position of not including any cost component for them. Perhaps the exclusion of land/social licence costs is because it is considered an annual operating cost e.g., with the NSW Government’s Strategic Benefit payment and Victorian Government’s landholder payments?¹¹⁰ If so, where else in the analysis are these costs included?

6. This suggests the benefits of considering costs as a range with risk factors applied

Aurecon’s estimate of current (2021) build costs provides the following description of its methodology:

“This cost data has been normalised or adjusted to account for differences in battery limits, scope, location factors, technical factors (where relevant), etc.

¹⁰⁸ Standard BPIC’s (2022) at https://www.epw.qld.gov.au/_data/assets/pdf_file/0014/20435/best-practice-industry-conditions.pdf

¹⁰⁹ AEMO (2022a) op.cit. p.96.

¹¹⁰ NSW Government (nd) at [https://www.energyco.nsw.gov.au/community/strategic-benefit-payments-scheme#:~:text=Under%20the%20SBP%20Scheme%2C%20private,a%20period%20of%2020%20years;Victorian%20Government%20\(February%202023\),https://www.premier.vic.gov.au/landholder-payments-fairer-renewables-transition](https://www.energyco.nsw.gov.au/community/strategic-benefit-payments-scheme#:~:text=Under%20the%20SBP%20Scheme%2C%20private,a%20period%20of%2020%20years;Victorian%20Government%20(February%202023),https://www.premier.vic.gov.au/landholder-payments-fairer-renewables-transition)

A representative cost has been selected for the hypothetical project from the data available, and cost certainty qualified based on the spread and quality of data available. Recent trends for each technology have been reviewed and discussed throughout the report.

These have been considered when selecting the hypothetical project, nominating technical parameters, and developing the cost estimates on a 2021 basis.”¹¹¹

A range of technical and financial assumptions are made e.g., no taxes, import duties or contingency. There is no engagement with EPC contractors or issuance of tenders and the risk and cost components of EPC contracts can vary considerably from project to project. Given these factors, Aurecon concluded:

“The accuracy / certainty of the cost estimates is targeted at +/- 30% based on the spread and quality of data available and our experience with the impact of the above factors.”¹¹²

The 2024 Panel thinks this is a reasonable approach, though it is not clear how the specific level of symmetrical costs variation was arrived at, and this should be better explained.

The 2024 Panel is concerned about how these ‘base year’ numbers are then represented in the CSIRO forecasts. The CSIRO forecasts, whether for 2023-24 or the longer term GALLM model results, make no mention of an accuracy range and seem to be a point estimate. Perhaps we are to assume they are meant to be a mid-point symmetrical estimate with an equal probability of an increase or decrease? If so, that should be stated and explained e.g., how are the supply chain pressures discussed above, reflected in the modelling? There is a hint of this in the modelling discussion in Appendix A.1.2 (p.63) of the CSIRO report but the 2024 Panel considers this should be more fully explained.

The 2024 Panel expects that the further out the forecasts, the larger the possible cost range and the less certainty that a point is indeed a symmetrical mid-point. This is particularly the case where a technology like hydrogen is still in its ‘early learning rate 1’ stage.¹¹³ This suggests the need to put some risk factors around the estimates when used in ISP modelling – using the AACE approach¹¹⁴ used in network cost estimates.

7.3.2 Locational cost factors

What are the issues and considerations?

Locational cost factors are important in assessing capex which the Panel has identified as a major engagement issue for the 2024 ISP.

AEMO’s Approach

The Draft IASR proposes a range of locational cost factors (low, medium and high) for different categories of capex e.g., equipment, fuel connection, cost of land and development and O&M. They are the same factors as in the 2022 ISP and are based on a GHD 2018-19 review. As noted in the 2022 IASR:

“These locational scalars take into account access to ports, roads and rail, and regional labour costs, but ignore localised environmental/geological/social drivers which require site-by-site

¹¹¹ aurecon (2021) op.cit. p.5.

¹¹² aurecon (2021) op.cit. p.11.

¹¹³ CSIRO (2022) <https://publications.csiro.au/publications/publication/Plcsi:EP2022-5511> p.63.

¹¹⁴ See https://web.aacei.org/docs/default-source/toc/toc_96r-18.pdf

assessments and are difficult to predict pre-feasibility. They also exclude cost premiums that may arise if multiple projects are simultaneously competing for scarce resources across the construction supply chain.”¹¹⁵

Consumer Panel comments

Given our discussion of supply chain constraints in many parts of this submission, we have no confidence in these location factors being anywhere near what is currently the case, or expected to be the case, over the next 10-20 years.

The period since 2018-19 has been a time of massive increase in proposed construction activity both in and outside the energy sector. Numerous reports referenced in this submission have pointed to the difficulties in sourcing the required resources close to a capital city let alone in a regional or rural area when much of the ISP network and generation will be made.

We recommend that AEMO commission GHD to do an update of their 2018-19 report that also includes consideration of supply chain constraints.

7.3.3 Storage modelling

What are the issues and considerations?

The announcement of the two major pumped hydro energy storage (PHES) projects in the QEJP has brought the issue of PHES costs back to centre stage. Given capex costs are very site dependent, forecasts are very difficult to make.

AEMO's Approach

AEMO includes PHES options for 8, 24 and 48 hours of energy storage. Capex costs are based on a 2018 study by Entura (part of Hydro Tasmania)¹¹⁶ plus updated costs provided by Hydro Tasmania in 2021 on the costs of the 20 hour Cethana project in Tasmania.¹¹⁷ Then, locational cost factors are applied based on the Entura advice.

Consumer Panel comments

The 2024 Panel does not profess to have any special expertise in these costs and makes the following general observations.

Social licence issues around landowner support can loom large for PHES projects; it is unclear how those risks have been incorporated into PHES capex.

¹¹⁵ See pp90-91 <https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en>

¹¹⁶ Entura (2018) Pumped hydro modelling at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2019/Report-Pumped-Hydro-Cost-Modelling.pdf

¹¹⁷ Hydro Tasmania (2021) at https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2021/iasr/submissions/%E2%80%8Chydro-tasmania.pdf; the 2021 IASR Consultation Report published in July 2021 p.29 <https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-iasr-consultation-summary-report.pdf?la=en> says that “AEMO has also engaged with Hydro Tasmania to source improved cost estimates for the Cethana Pumped Hydro project.” but the reference provided in the 2023 Draft IASR is from a Hydro Tasmania submission in February 2021.

While Hydro Tasmania can provide capex on the Centura project:

“Hydro Tasmania is at an advanced stage in our feasibility study into the development of Tasmanian PHES, and in December 2020 announced Cethana as our preferred site. We have undertaken extensive work into understanding the geology of this site, and can indicate with a high degree of confidence that Tasmanian PHES will cost in the order of \$1.6 million to \$2 million per MW (includes an amount for contingency).”¹¹⁸

It does not provide any indication of its AACE cost class¹¹⁹, and even that level of detail is not available for other PHES projects. As we have seen with Snowy 2.0, costs can increase significantly even for a project where considerable engineering work was completed prior to the letting of major construction contract.

This same Hydro Tasmania advice notes in reference to the 2021 IASR:

“Furthermore, the Draft IASR (Table 27) implies that long duration storage (greater than 12 hours) is an option across all Australian states by considering scaling factors. The potential for cost effective long duration storage is entirely dependent on appropriate project-specific physical site conditions that are conducive to long duration PHES.”¹²⁰

AEMO seems to have adopted the same position in the 2023 Draft IASR as it did in the 2021 Draft IASR.

We make the same comment we made above on GenCost regional cost factors – these PHES factors seem to also exclude the premiums that may arise when there are multiple projects simultaneously competing for scarce resources. There is no reasoning provided as to why regional cost factors in a 2018 Entura report should apply in 2023 and beyond. The experience of Snowy 2.0 costs seems to have been ignored in this analysis.¹²¹

7.4 Social Licence

What are the issues and considerations?

The importance of social licence has exploded in recent years. The 2022 ISP highlighted its importance and the ‘on the ground’ experience in actionable projects like WRL, VNI West and Humelink have shown that a failure to properly consider it can lead to major project delays and cost increases.

What does the 2024 Panel mean by ‘social licence’?

The 2024 Panel discusses social licence in two contexts:

[Community social licence](#)

The 2024 Panel adopts a slightly different definition than the Draft 2023 IASR:

¹¹⁸Hydro Tasmania (2021) *ibid* p.6.

¹¹⁹ See <https://library.aacei.org/pgd01/pgd01.shtml>

¹²⁰ AEMO (2021c) 2021 IASR at <https://aemo.com.au/consultations/current-and-closed-consultations/2021-planning-and-forecasting-consultation-on-inputs-assumptions-and-scenarios>

¹²¹ See the recent press release from Snowy Hydro highlighting significant cost pressures they are facing. <https://www.snowyhydro.com.au/news/snowy-hydro-responds-to-abcs-7-30-report/>

“‘Social licence’ is a term commonly used to refer to local community acceptance of new infrastructure development.”¹²²

The 2024 Panel definition is:

Community Social Licence – relates to measures including engagement of impacted communities and payments to landowners for hosting electricity infrastructure.

Consumer social licence

By this, the 2024 Panel means acceptance of the costs to all consumers of the generation and network infrastructure.

The absence of the first adds to cost and schedule delay. The absence of the second reduces consumer support for the ISP. After all, the political narrative has been ‘the transition will result in lower electricity costs’. Consumers faced with large affordability pressures are beginning to wonder if they believe the political narrative.

This section focusses on the former. Section 1 focusses on the latter.

How does the ISP consider landowner social licence?

There are two ways in the Draft 2023 IASR:

1. In the transmission cost database and its estimates of land purchase and biodiversity costs
2. In the IASR through Section 3.9.2 - REZ social licence and resource limits

This section focusses on the latter. The 2024 Panel is engaging deeply with AEMO on the former as they prepare the draft Transmission Expansion Report for publication in early May.

REZ social licence and resource limits

AEMO’s Approach

AEMO’s approach is to develop REZ renewable resource limits based on technical factors e.g., size of wind turbines and quality of wind resource (see Draft 2023 IASR, figure 45, p. 119) and assume this level of generation can be built. Social licence costs associated with that resource limit are assumed to be incorporated in the network and generation capex estimates. AEMO seeks to measure the social licence costs of expanding beyond that resource limit (i.e., 1% of land area for solar and 5% for wind). This is done through the use of a ‘land use penalty factor’ that measures the increased land costs or difficulties in obtaining land for that expansion e.g., planning approvals and engagement with the community and traditional landowners. In the 2022 ISP, this factor was estimated at \$0.25m/MW. The 2024 Panel understands that AEMO used a CPI factor to get the proposed \$0.27m/MW.

The factor was not informed by detailed land cost studies or surveys, but rather carefully set to a level during initial modelling that allowed for appropriate REZ generation planting (i.e., not forcing generation into low-quality REZs, and allowing for VRE to distribute between higher-quality REZs more evenly).

¹²² AEMO (2022a) op.cit. p.121.

Consumer Panel Comments

The 2024 Panel can understand the logic behind incorporating the factor. These comments are designed to help stakeholders get a better understanding of the concept and hopefully improve its relevance and acceptance.

The value was set in a way that may bias the modelling results

By setting the value to sit between lower cost activities like connection costs, system strength mitigation costs and higher costs like large network augmentations to increase capacity, this may avoid bringing forward the proposed development dates of more remote REZs. A modelling assumption should be driven by the best estimate of costs for that assumption, not by a value that could be seen as unduly influencing the results. If a more realistic social cost means remote REZs are developed earlier at higher cost, then that is simply a valid model output.

The setting of the factor through a modelling construct may miss some of the practical impact of the measure

The modelling approach to calculation of the factor seems to assume it is common across all REZs. Is this a reasonable assumption?

This approach assumes obtaining social licence for the additional generation will not impact the timetable or costs of building the additional generation (or any required network augmentation) AEMO's logic is that social costs are built into the transmission cost database estimates that are informed by historical evidence. Our concern is that historical evidence seems to be a poor predictor of future costs. We examine this issue in more detail in our comments on the Mott MacDonald draft report on an update to the Transmission Cost Database (TCD), in particular its forecasts of land costs. This factor was not meant to account for project delay.

Is the CPI adjustment factor appropriate?

The 2024 Panel wonders whether a simple CPI factor will fully reflect the costs involved. The explosion in importance of social licence in recent years is driving cost increases at much greater rate than CPI e.g., the NSW Government's Strategic Benefits Payment. Engagement is now much more complicated than it was even a couple of years ago as local communities seek to have a much greater say in the development process.

An additional way to incorporate social licence into the analysis

The Draft 2023 IASR states:

“Social licence, therefore, could be a theme of the scenario collection and/or be applied as sensitivity analyses to the scenarios. AEMO considers that the relationship between the scenario narratives and social licence settings is unclear, and is proposing to apply social licence considerations in sensitivity analysis. AEMO is seeking stakeholder views on this proposed approach, and the appropriate settings and impacts that should apply in any such analyses.”¹²³

As discussed above in Section 6, the 2024 Panel proposes adding sensitivities to reflect social licence – capex and project delay.

Panel engagement with the Advisory Council on Social Licence (ACSL)

The 2024 Panel welcomed the appointment of the ACSL, given the importance of wide-ranging engagement on social licence. The 2024 Panel was informed by AEMO that the Panel would engage closely with the ACSL in the course of our ISP role. The ISP Timetable document, published in

¹²³ AEMO (2022a) op.cit. p.6.

September 2024, discussed the importance of getting a better understanding of social licence issues that could create significant project delays and noted that:

“The CAC (now the ACSL) will work closely with the ISP Consumer Panel, among others.”¹²⁴

The Council’s Terms of Reference refer to three core parts of the Advisory Council’s role, one being:

“ISP development – To provide input on community sentiment, social licence, and the issues/risks and opportunities/pathways forward on the ISP. The Council may be required to collaborate with the ISP Consumer Panel (which is established by AEMO under the (NER) as required.”¹²⁵

AEMO’s commentary of the first meeting of the ACSL in December 2022 noted:

“The Advisory Council will meet again early in the new year, when it will consider inputs, assumptions and scenarios for the 2024 Integrated System Plan.”¹²⁶

The 2024 Panel appreciated the opportunity provided by AEMO for a special social licence briefing on 17 February 2023. This included initial thinking on matters that will be further consulted on with the ACSL at its next meeting on 13 March. The 2024 Panel looks forward to further advice on how the ACSL will be involved in the next stages of the ISP and what engagement AEMO plans between the ACSL and the Panel.

7.5 Distribution aspects (DNSP’s)

What are the issues and considerations?

The distribution sector made up 78% of the total network RAB for the NEM in 2022 (AER data)¹²⁷ and so demands consideration in a future network strategy.

Was there a 2022 recommendation?

The 2022 Panel said that it would be prudent of AEMO to have direct conversations with the various distribution networks and new service providers to get a greater understanding of the current and future investments in DER and new technologies more broadly and the projected changes in network utilisation and energy flows and how these impacts both the IASR and ultimately the ISP. Has AEMO engaged in these direct conversations and if so, how are they reflected in the Draft IASR?

In line with a proposed whole of system approach, the 2022 Panel wanted AEMO to recognise that distribution networks are shifting investments to enable the network to increasingly host DER and recommended that AEMO cross reference the distribution companies’ strategies and developments within the various scenarios and in the IASR. How has AEMO responded to this recommendation in the Draft IASR? Specifically, how are distribution aspects of ISP considered, including opportunities for increased productivity of existing networks?

¹²⁴ AEMO (2022d) 2024 Integrated System Plan Timetable September 2024 <https://aemo.com.au/-/media/files/major-publications/isp/2022/2024-isp-timetable.pdf?la=en> p.11.

¹²⁵ AEMO (2022e) at https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/5ms-meetings/community-advisory-council/terms-of-reference-aemo-community-advisory-council.pdf?la=en

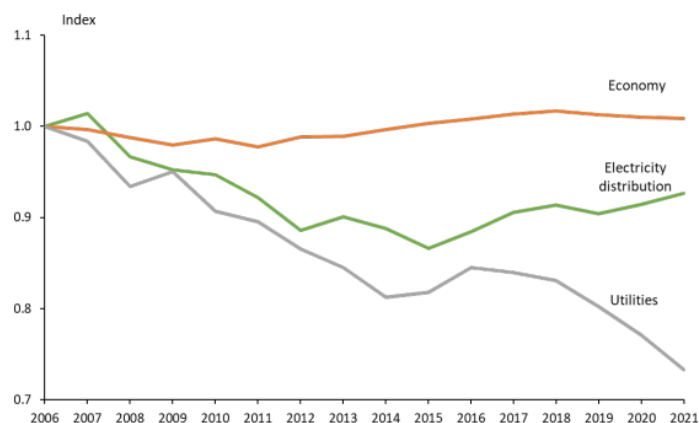
¹²⁶ AEMO (2022f) at <https://aemo.com.au/newsroom/news-updates/community-voice-speaks-volumes-at-inaugural-advisory-council-meeting>

¹²⁷ AER (2022) *State of the Energy Market Report 2022* at <https://www.aer.gov.au/publications/state-of-the-energy-market-reports> p.61.

Consumer Panel Comments

The economic productivity for both electricity distribution and transmission are worse now than in 2006 and below industry wide averages.

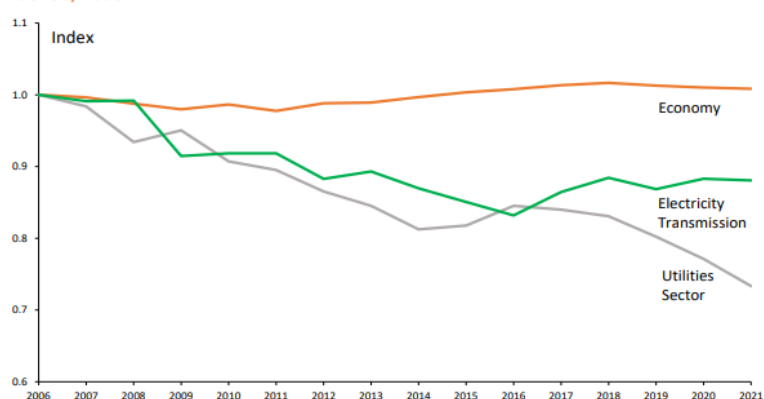
Figure 6 Electricity distribution, utility sector, and economy productivity, 2006–2021



Source: Quantonomics; Australian Bureau of Statistics.

Note: The productivity of the Australian economy and the EGWWS industry is from the ABS indices within 5260.0.55.002 Estimates of Industry Multifactor Productivity, Australia, Table 1: Gross value added based multifactor productivity indexes (a). We have rebased the ABS indices to 1.0 in 2006.

Figure 7 Electricity transmission industry, utilities sector, and economy productivity indexes, 2006–21



Source: AER annual benchmarking report 2022 at <https://www.aer.gov.au/networks-pipelines/performance-reporting/annual-benchmarking-report-distribution-and-transmission-2022> p.16 and p.15

Consider the electricity demand associated with the take up of Electric Vehicles. If many EV's are recharged between say 6.00 and 9.00pm, peak demand time for the network, then the peak will be exacerbated and more transmission infrastructure required to meet a much higher peak demand, albeit for only a couple of hours a day. However, if EV's are mainly recharged at periods of low network demand (daytime solar peak and later at night) then a major new load would simply serve to improve network productivity, utilising existing capacity. To achieve this outcome, policy and tariff arrangements for EV charging will be necessary with maybe modest DNSP investment to achieve the desired outcome.

In this situation sound policy and active engagement with DNSP's would offset the further transmission expenditure that would result if an increase in peak demand resulting from EV charging during high demand periods.

The 2024 Panel suggests that there may be potential tradeoffs in improved efficiency for network spending in the distribution sector compared to transmission.

How are opportunities to increase the total factor productivity of distribution networks considered with regard to potential reductions in investment in Transmission e.g., EV charging policy and practice can both increase or decrease network (MTFP) productivity – how are these policy and practice options considered in IASR?

The 2024 Panel also asks about the extent to which (edge of grid) SAPS (Stand Alone Power Systems) been considered in developing the ISP with their potential for reducing the spread of the future transmission network to the extremities of the network?

7.6 Fuel assumptions

7.6.1 Gas price forecasts

What are the issues and considerations?

Forecast gas prices are one of the most significant assumptions in the ISP. Benefits measurement of different options under the Regulatory Investment Test for Transmission (RiT-T) are often dominated by savings in lower gas fired generation. The 2022 ISP concluded that the closure of coal fired generation will require 10 GW of gas-fired generation for peak loads and firming:

“Gas-fired generation will play a crucial role as coal-fired generation retires. It will complement battery and pumped hydro generation in periods of peak demand, particularly during long ‘dark and still’ weather periods. It will help cover for planned maintenance of existing generation and transmission. And it will provide essential power system services to maintain grid security and stability, particularly following unexpected outages or earlier than expected generation withdrawal.

This critical need for peaking gas-fired generation will remain through the ISP time horizon to 2050, and older and less efficient peaking plants may need to be replaced. Additional and earlier peaking gas-fired generation would add resilience against potential shortfalls in VRE, storage, DER or transmission.”¹²⁸

A substantial proportion of the market benefits of the 2022 ISP ODP are fuel cost savings.

¹²⁸ AEMO (2022b) op.cit. p.10.

Table 4 Market benefits of the ODP (\$M, NPV)

Class of market benefit	Slow Change	Progressive Change	Step Change	Hydrogen Superpower	Scenario weighted
Scenario weighting	4%	29%	50%	17%	
Generator and storage capital deferral	6,058	8,825	17,740	55,381	21,087
FOM cost savings	926	662	2,455	15,081	4,020
Fuel cost savings	3,673	13,710	14,979	7,481	12,884
VOM cost savings	-13	283	334	22	252
USE+DSP reductions	8	7	-385	3,862	467
Gross market benefits	10,651	23,488	35,122	81,827	38,709
Network projects (Flow paths ⁵⁴)	-7,067	-7,127	-8,540	-10,503	-8,405
Network projects (REZ expansion)	-55	-1,263	-2,105	-17,095	-4,327
Total network cost ⁵⁵	-7,122	-8,390	-10,644	-27,599	-12,732
Network cost (counterfactual)	-	-	-	10,357 ⁵⁶	1,761
Additional network cost (relative to counterfactual)	-7,122	-8,390	-10,644	-17,242	-10,971
Total net market benefits	3,529	15,097	24,478	64,586	27,738
Return on investment (ratio):					
• all network investments	0.5	1.8	2.3	2.3	2.2
• additional to counterfactual	0.5	1.8	2.3	3.7	2.5

FOM: fixed operating and maintenance. VOM: variable operating and maintenance.

Source: AEMO (2022b) p.64

Consumer Panel Comments

The 2024 Panel begins by reviewing the 2022 ISP Panel’s advice that expressed considerable reservations about the methodology used by the consultant Lewis Grey Advisory (LGA). In particular, the 2022 Panel had no confidence in the methodology because a lot of it was not transparent (it was essentially a ‘black box’) and consultation on the forecasts may have met the letter, but not the spirit, of the Forecasting Best Practice Guideline (FBPG). The Panel made a number of recommendations for gas price forecasting in the 2024 ISP.

LGA was engaged to prepare the forecasts in the Draft 2023 IASR. While there have been some improvements in transparency, they have been insufficient to convince the 2024 Panel that it can have any confidence in the forecasts. Our efforts to get a fuller explanation of the model from the consultant failed.

The 2024 Panel provided comments to AEMO on the forecasts and the gaps the 2024 Panel saw in the LGA analysis last November. Then, in December 2022, the Federal Government announced¹²⁹ the gas price cap for 2023 and the implementation of a Mandatory Code for the gas industry using the ‘reasonable price’ concept to be developed by the ACCC. This approach explicitly delinks domestic gas prices from international prices e.g., LNG netback which was the basis for the LGA forecasts. Instead, the ‘reasonable price’ will be:

“...defined as efficient long run marginal costs of domestic supply, allowing for a commercial return on capital reflective of the industry’s risk profile. This would be assessed with reference to the cost of the most likely new domestic gas production to meet forecast domestic demand, including:

1. operating expenditure reflecting efficient new development(s);
2. depreciation based on the economic life of the new development(s);

¹²⁹ Prime Minister Anthony Albanese (2022) at <https://www.pm.gov.au/media/energy-price-relief-plan#:~:text=Tackling%20high%20gas%20prices%20by,inclides%20a%20reasonable%20pricing%20provision%2C>

3. return on capital (set as a benchmark return reflecting the financing costs of an efficient business facing similar risks); and
4. an allowance for taxation and royalties.”¹³⁰

The Mandatory Code is expected to be in place by mid-2023 to enable contractual negotiations for gas supply from 2024. The Government has given no time limit for the Code’s term:

“The Mandatory Code will be an ongoing addition to Australia’s east coast gas market regulation, with key elements subject to review on the basis of changes to the market’s structure and conduct.”¹³¹

The development of the Mandatory Code requires AEMO to undertake a fundamental review of their approach to gas price forecasts to be used in the ISP. This should be the subject of consultation leading up to the publication of the Final IASR – the Government’s timetable would mean the ACCC would publish its first calculation of the reasonable price prior to publication of the Final IASR.

1. What did the 2022 ISP Consumer Panel say about gas price forecasts in the Draft 2021 IASR?

The 2022 Panel commented extensively on the forecasts prepared by LGA (the consultant).¹³² After an extensive review of the consultant’s report and discussions with the consultant, the 2022 Panel remained very critical of the consultant’s forecasts:

- the lack of transparency around model assumptions and methodology (it was basically a ‘black box’), and
- stakeholder engagement undertaken by AEMO was poor and well below expectations from the single stage process required under the Forecasting Best Practice Guidelines (FBPG).¹³³

The 2022 Panel’s submission on the final IASR made a number of suggestions for improvement of the gas forecasting process in the future:

- allowing the Panel to comment on the draft consultant scope of work and participate in discussions with the consultant on report drafts
- AEMO to provide the selected forecaster with standard assumptions that are used elsewhere in the ISP modelling that would be relevant to gas price forecasting e.g., oil price forecasts
- the forecast report to provide greater transparency on the modelling methodology to avoid the ‘black box’ concerns more commentary on why forecasts have changed over recent years
- more comprehensive stakeholder engagement on the consultant’s ‘full length’ Draft Report to meet the FBPG requirement for ‘single stage’ consultation
- AEMO to consider developing inhouse expertise in gas price forecasting if the 2022 ISP indicated that it is likely to continue being a material input.

There was some further consultation through the Draft Forecasting Assumptions Update issued on 20 December 2021 (and reissued with minor revisions on 21 December 2021)¹³⁴ to comment on the

¹³⁰ The Treasury (2022) https://treasury.gov.au/sites/default/files/2022-12/c2022-343998-cp_2.pdf p.10

¹³¹ The Treasury (2022) *ibid* p.4.

¹³² The 2022 Panel (2021a) pp 40-53 and the 2022 Panel (2021b) pp.59-67.

¹³³ AER (2020c) *op.cit.* see Appendix B.

¹³⁴ AEMO (2021d) December Draft 2022 Forecasting Assumptions Update at <https://aemo.com.au/consultations/current-and-closed-consultations/2022-consultation-on-forecasting-assumptions-update>

latest forecasts by LGA and published as part of the Draft ISP¹³⁵ and progress against the 2022 Panel's recommendations above. The 2022 Panel concluded that while:

- the latest report provides useful additional transparency, it still had major concerns about the methodology used, and
- the approach of seeking comments in the context of the Draft Forecasting Assumptions Update may meet the letter of the FBPG does not meet the spirit of that Guideline. This was because the timing risks limiting the ability of stakeholders to fully consider the report and facilitation of a more rigorous discussion and debate with stakeholders.

The 2022 Panel made the following recommendations for gas price forecasting in the 2024 ISP:

- Allow the Panel to comment on the drafts of the consultant's report and engage directly with the consultant at the same time as AEMO prior to publication of a draft report
- Require the report to provide even greater transparency on the methodology and more detail on why forecasts have changed from the previous iteration
- Enable stakeholder consultation on a full draft report, rather than simply a high-level slide summary as an FRG meeting agenda item, to allow more comprehensive debate on the methodology and meet the FBPG requirement for 'single stage' consultation.

2. The 2024 Panel Comments on the Draft 2024 IASR gas price forecasts

AEMO took up a number of the 2022 Panel's recommendations:

- The 2024 Panel had the opportunity to comment on the scope of work sent to potential consultants – our comments emphasised the need for improved transparency and greater stakeholder engagement on the draft forecasts, and
- There has been greater engagement, including a 90-minute Panel only session as well as the FRG session.

Nevertheless, the overall conclusion of the 2024 Panel from these two sessions, plus drawing on the experience of the continuing Panel member from the 2022 ISP, was that we did not have confidence that the modelling methodology provides robust forecasts that can be used in the 2024 ISP or 2023 GSOO.

The 2024 Panel's concerns with the LGA Model and Forecasts

These comments were made to AEMO prior to the Federal Government's announcement in December 2022 to implement a gas price cap for 2023 and a Mandatory Gas Code from mid-2023. So, they were in the context of the application of the LGA modelling approach and outputs in the absence of that Government policy.

LGA provides forecasts of "delivered average contract prices (including transmission costs) applicable to Large Industrial Consumers, with high load factors".¹³⁶ Based on our experience in the east coast gas market, the 2024 Panel has no confidence that the consultant has the requisite knowledge to be able to build a model that robustly reflects current and expected market dynamics for large industrial customers:

¹³⁵ LGA (2021) Gas Price Projections for Eastern Australian Gas Market 2022 at <https://aemo.com.au/-/media/files/major-publications/isp/2022/iasr/lewis-grey-advisory-gas-price-projections-report.pdf?la=en>

¹³⁶ LGA (2022) op.cit. p.8.

- there is little reference to the impact of how the then political debate around the Heads of Agreement¹³⁷ between the Government and the LNG exporters and a possible price cap might impact price forecasts at least over the next 3-5 years
- the consultant said (FRG meeting 26 October 2022, slide 20) that the short-term outlook is for “New Contract prices look like LNG Netback” which would mean \$45/GJ in 2023 based on the ACCC netback calculation; but then goes on to say it will be influenced by elasticities of export vs domestic without giving details (see below).
- when the consultant was told by a Panel member in the 18 October 2022 session that C&I customers were being offered gas at \$30/GJ, the consultant did not acknowledge that it was a fact being reported.

In the webinar with the 2024 Panel on 18 October 2022, the consultant argued that they had done all the explaining that they can about the methodology. However, the 2024 Panel believes there are still important elements of the modelling that are not transparent. For example, the consultant claims that they have ‘validated’ the model in 2021 using ACCC data on actual contract prices; apart from this simple statement in the consultant’s December 2020 report copied below¹³⁸, the 2024 Panel has not seen evidence that supports the statement about the 2021 model being validated. The 2024 Panel is also querying model validation against the step change in prices that has occurred in 2022.

2.3.2 Model Validation

The RMMEAU model used in this study was benchmarked against new contract prices reported by the Australian Competition and Consumer Commission (ACCC).

Source: LGA (2021)

Further, during the 18 October 2022 webinar, the consultant was unable to clarify whether the International Energy Agency July 2022 forward curve was an input or an output.

The consultant states that “Gas market prices are largely determined by contract negotiation between producers and buyers”¹³⁹ but it is unclear how the model takes account of the relative bargaining leverage held by producers vs buyers where supply is limited, and pricing was effectively set by LNG producer opportunity costs as moderated by what producers think they can get away with without direct Government intervention. This is the very behaviour that led the Federal Government to introduce the 2023 price cap and Mandatory Code.

The consultant states that “Prices are set by a Demand-Supply balance” and that the price is an “outcome(s) equivalent to Least-Cost supply plus a margin due to market power”.¹⁴⁰ The consultant states that the Nash Cournot framework used in their model has the ability to take account of market power, but the consultant has been unable to provide any detail to the 2024 Panel on what it is, how it is measured, whether it differs by geographic location and if so why and how it might change over time.

¹³⁷ https://www.industry.gov.au/sites/default/files/2022-09/heads_of_agreement_the_australian_east_coast_domestic_gas_supply_commitment.pdf

¹³⁸ LGA (2021) Gas Price Projections for the 2021 GSOO Public Version at <https://aemo.com.au/energy-systems/gas/gas-forecasting-and-planning/gas-statement-of-opportunities-gsoo/2021-gas-statement-of-opportunities> p.8.

¹³⁹ LGA (2022) op.cit p.8.

¹⁴⁰ LGA (2022) op.cit. p.10.

The 2024 Panel argued in our discussions with the consultant that gas prices over the next 3-5 years may be largely set by political decisions on how Governments wish to intervene to fix a dysfunctional market. And that is exactly how it has subsequently turned out. The consultant failed to explain to us how a Nash Cournot model can handle the Government intervention.

The consultant lists the model inputs including price elasticities. Apart from stating (FRG meeting 26 October 2022, slide 20) that “Modelling assumes that Domestic market is more elastic than LNG”, no data on the elasticities used in the model was provided. There were two answers provided at the FRG – one indicating they are in the model, the other indicating that they are difficult to measure. The consultant was unable to state whether they are linear or subject to step changes e.g., does the model have any different elasticities for large industrial customers looking at say prices going from \$10/GJ to \$15/GJ vs prices going from \$10/GJ to \$30/GJ?

The consultant lists the model outputs as “Price Adjusted Demand (Total Demand = Total Supply)” (FRG meeting 26 October slide 8) but it is unclear whether the model can account for the possibility of demand destruction as large industrial companies close.

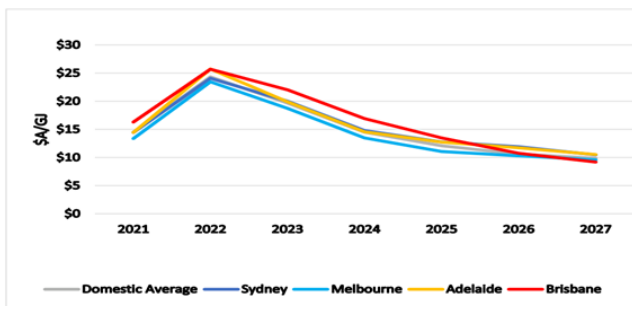
The consultant uses the Rystad costs of production data that are used in the GSOO, but the level of detail available on how those numbers were derived is scant. In the FRG meeting 26 October 2022, the consultant said there are different costs of production across the different ISP scenarios but in response to an FRG question about the basis for this difference implied it was exchange rate driven. The LBA report varies the \$A/\$US exchange rates in each scenario but we do not know whether they are consistent with the exchange rate assumption in other parts of the Draft IASR e.g., the CSIRO Gen Cost results or the Mott MacDonald work on the transmission cost data base.

Scenario Specific Assumptions			
Scenario	Resource Development	Production Costs	LGA's Oil Price Projections
Progressive Change	Only Gas Resources in Fields Already Developed + Approved for Development	High	High
Step Change	All Resources in Developed Basins	Medium	Medium
Hydrogen Exports	All Resources in Developed Basins	Medium	Low
Exploring Alternatives	All Resources in Developed Basins + Gunnedah (2026)	Low	Medium

Source: FRG Meeting 26 October 2022, slide 15

The consultant produces different price forecasts depending on location. There is no explanation as to why the Brisbane price (close to major production fields) would be higher than Melbourne (with declining Victorian production) over the next few years.

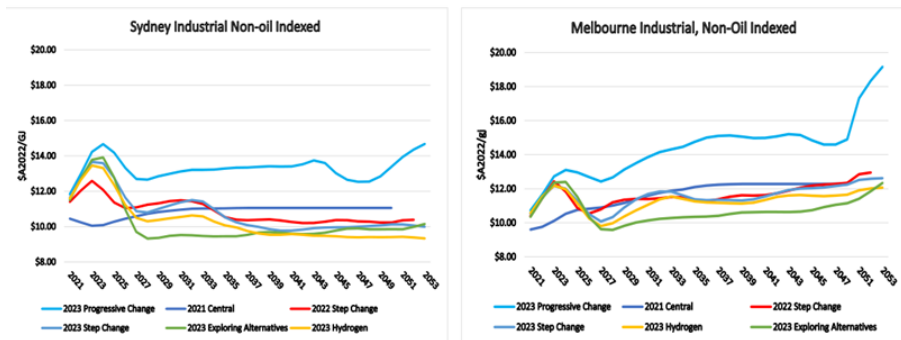
Short-Term Outlook
 Domestic New Contract Prices Track LNG
 New Contract Prices



Source: FRG meeting 26 October 2022, slide 19

The consultant argues that prices vary by scenario (see for example, FRG meeting 26 October 2022). This seems to be driven by the assumption referred to above – that costs are lower in different scenarios and market power has no impact. There is no explanation for this logic.

Sydney prices are lower in scenarios with declining demand (lower LNG prices).
 Melbourne Prices are lower in scenarios with lower resource costs



Source: FRG meeting 26 October 2022, slide 26

The consultant has provided no evidence that even if resource costs are lower that these lower costs will be passed on in lower prices given the market power producers have. Our experience is that prices are driven by market power, not resource cost.

The consultant has provided no evidence that producers will exercise a different level of market power according to ISP scenario. Victorian reserves/deliverability are expected to go into steep decline over the next few years increasing Victoria’s reliance on Queensland gas – and with it, higher transport costs. So Victorian industrial users will be increasingly negotiating with Queensland suppliers and potential constraints in pipeline capacity into Victoria.

The consultant has provided oil indexed and non-oil indexed price forecasts without any information on the proportion that are in each category.¹⁴¹ The July 2022 ACCC Gas Report, available to the consultant in preparing the forecasts has this data on oil linked prices in 2022 contracts:¹⁴²

Table 2.1: GSAs by pricing mechanism

	Fixed Price	Brent Crude	Total
2022 % Count	91%	9%	100%
2022 % Quantity	57%	43%	100%

Source: ACCC analysis of information provided by suppliers

Source: ACCC (2022)

The consultant states that the Port Kembla import terminal is a committed project¹⁴³ but the AEMO 2022 GS00 has revised its 2021 position from ‘committed’ to ‘anticipated’ from winter 2024.¹⁴⁴

The consultant’s discussion of Adelaide prices in the FRG meeting (October 26, 2022, slide 27) referred to the potential for an LNG import terminal at Adelaide but the consultant did not give a clear statement about what the model assumes other than saying something like they ‘have not determined if it is economic’.

The consultant’s approach to the trend in transmission tariffs over the forecast period is unclear. When asked during the FRG webinar about how stranded asset risk was treated in the model, the initial response from the consultant was that it was not considered. This was surprising given the forecasts project out to 2052, when natural gas is assumed to be a relatively minor energy source and, given the modelling excludes hydrogen and ‘renewable/biogas’, gas network pipes are only transporting natural gas. However, later the consultant said that the model adjusted transmission tariffs to volumes carried, so in effect that is a proxy for stranded asset risk where hydrogen/renewable gas does not substitute for natural gas in transmission pipelines (and so issues like embrittlement in high-pressure transmission pipelines do not arise).

7.7 Financial parameters

7.7.1 Discount Rate

What are the issues and considerations?

The 2022 ISP Panel was very critical of the approach taken by Synergies, AEMO’s consultant on the discount rates, to be used and the engagement process used to debate their report.¹⁴⁵

Sensitivity testing on discount rates in the 2022 ISP showed they had the largest impact on reducing net market benefits of the scenario weighted ODP.

¹⁴¹ LGA (2022) op.cit.

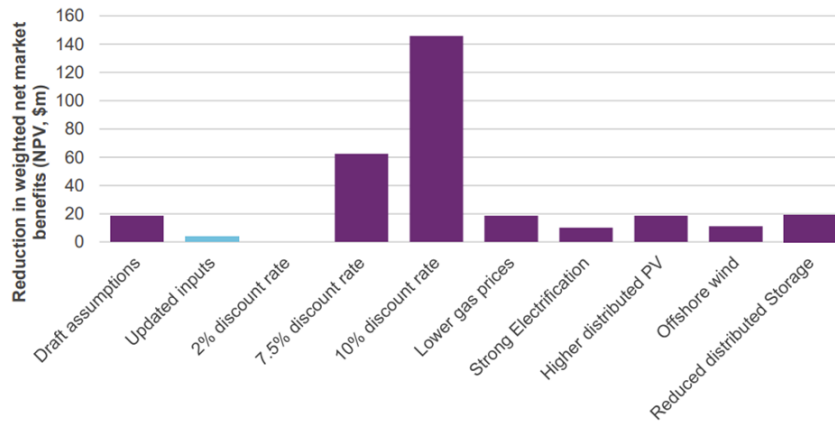
¹⁴² ACCC (2022) Gas Inquiry <https://www.accc.gov.au/system/files/ACCC%20Gas%20Inquiry%20-%20July%202022%20interim%20report%20-%20FINAL.pdf> pp.45-6.

¹⁴³ LGA (2022) op.cit.

¹⁴⁴ AEMO (2022g) Gas Statement of Opportunities 2022 at <https://aemo.com.au/en/energy-systems/gas/gas-forecasting-and-planning/gas-statement-of-opportunities-gsoo> p.4.

¹⁴⁵ For example, see the 2022 Panel Submission on the Final IASR at <https://aemo.com.au/-/media/files/major-publications/isp/2021/isp-consumer-panel-report-on-2021-iasr.pdf?la=en>

Figure 32 Reduction in weighted net market benefits in ODP relative to top-ranked CDP, by sensitivity



Source: AEMO (2022b) p.91

AEMO's Approach

The AER Cost Benefit analysis Guideline 'requires' i.e., it is binding, that the discount rate:

"...is required to be appropriate for the analysis of private enterprise investment in the electricity sector across the National Electricity Market (NEM) and is required to be consistent with the cash flows that the ISP is discounting.

...To meet the above requirement, AEMO should select a discount rate(s) that reflects the systematic risk associated with the expected cost and market benefit cash flow streams over the life of the projects in a development path. The lower boundary should be the regulated cost of capital, based on the AER's most recent regulatory determination at the time of the final ISP.

...Since the discount rate is an important parameter for estimating the present value of long-term projects, AEMO's choice of discount rate should be informed by expert guidance."¹⁴⁶

AEMO initially proposed to commission a new study of the appropriate discount rate for the 2024 ISP but ran out of time and asked Synergies to complete an update of their 2021 report for the 2022 ISP.

The consultant's approach in the updated report is to discuss the limitations of their 'on the day' (frequent adjustment as parameters change daily) approach used in their 2021 report vs the alternative 'stability' (stay relatively unchanged for long periods of time) approach proposed by the 2022 ISP Consumer Panel. The initial pages of their latest report seems to effectively endorse, without acknowledgment, the 2022 Panel's view. The 2022 Panel stated:

"Whilst it can be reasonably be expected that contemporary market conditions, particularly the risk free rate and debt risk premium, will influence capital budgets and investment decisions by businesses, contemporary market conditions do not directly inform hurdle rates used by businesses."¹⁴⁷

"...there is a benefit in maintaining stability in discount rates such that longer term decision making is unaffected by market perturbations. This clearly reflects the decision making of

¹⁴⁶ AER (2020d) Cost Benefit Guideline at <https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%202025%20August%202020.pdf> p.10.

¹⁴⁷ Synergies (2021) Synergies Discount Rate Report at <https://aemo.com.au/consultations/current-and-closed-consultations/2023-inputs-assumptions-and-scenarios-consultation> p.9.

businesses assessing opportunity cost for their business (which is a different issue to the social opportunity cost, the key parameter for the ISP). The benefit of stability stems from applying a broadly similar discount rates to projects that are effectively competing for the same finite pool of resources in the economy with associated opportunity costs arising from project selection.”¹⁴⁸

The consultant’s report discusses at length how the two approaches are applied in Australia – the ‘on the day’ approach by economic regulators e.g., AER, the ‘stability’ approach by the Federal and State Governments. They then propose what can be seen as a variation on the ‘on the day’ approach - the discount rate should be updated using a two stage process every two-year ISP cycle:

- “First, assess whether changes in market conditions justify a change in the discount rate based on a material change in relevant parameters (principally the risk free rate)
- Then, only if the review finds a material change in the risk free rate, update all relevant parameters influenced by it in the discount rate assessment (risk free rate, debt risk premium, market risk premium and inflation).”¹⁴⁹

Changes in inflation and the risk free rate are considered the most important parameters for the discount rate calculation. While there is no clear definition of ‘material’, the consultant argues that, given the changes in these parameters since 2021, they then proceed to recalculate the discount rate effectively using an on the day approach. This resulted in an increase in the proposed discount rate driven by the recent increase in the risk free rate.

Table 28 Pre-tax real discount rates

	Central estimate	Lower bound	Upper bound
2022 ISP	5.5%	2.0%	7.5%
Draft 2023 IASR	7.0%	4.0%	9.0%

Source: AEMO (2022a) p.110

Consumer Panel Comments

The 2024 Panel does not think the engagement on this fundamental matter has met the AER’s Best Practice Forecasting Guidelines

The 2022 Panel emphasised the need for wider engagement on such an important issue¹⁵⁰. That Panel did not consider the engagement met the requirements of the AER Best Practice Forecasting Guideline and recommended:¹⁵¹

B6	Discount Rates	This parameter did not receive the attention it deserved in this ISP cycle. Consult earlier and wider for the 2024 ISP	4.4.5
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Source: The 2022 Panel (2021b) p.9

This increased stakeholder engagement has not occurred in the 2024 process which the 2024 Panel, again, considers has not met the AER’s Guideline. There should have been a commissioned consultant’s report by a different consulting firm in order to test this important methodological issue. While this report should have been subject to a webinar prior to publication of the Draft IASR, we propose that separate consideration of the discount rate proceed as quickly as possible from now, but with enough time for both a different approach to be applied through a consultancy and for appropriate, focussed engagement to occur, at least in time of the draft ISP 2024

¹⁴⁸ Synergies (2021) *ibid.* p.13.

¹⁴⁹ Synergies (2021) *op.cit.* p.15.

¹⁵⁰ The 2022 Panel (2021b) *op.cit.* Appendix C.

¹⁵¹ The 2022 Panel (2021b) *op.cit.* p.9.

The proposed variation to the ‘on the day’ approach still has fundamental flaws even when it is converted to ‘every two years’

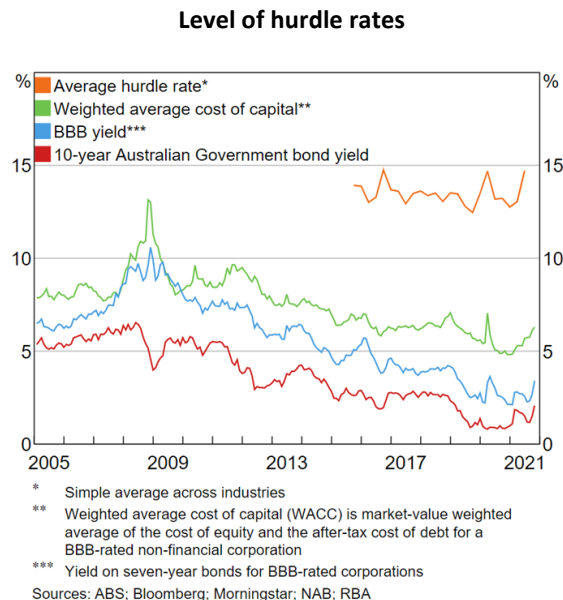
The major criticism of the Synergies 2021 report by the 2022 Panel was its use of the ‘on the day’ approach to calculating the central estimate. The 2022 Panel’s (unpublished) advice to AEMO in June 2021 argued:

“Our experience in the private sector is that this (‘on the day’ approach) is not how discount rates (more commonly referred to as hurdle rates) are derived in the private sector for long term energy investments. Rather rates are determined in a way that results them being applicable over long periods of time and not influenced, for example, by daily movements in risk free rates. Their purpose is to reflect the expected WACC over the life of the asset when interest rates could go through a number of cycles.”

The Reserve Bank of Australia (RBA) recently issued a research paper on ‘Why are hurdle rates so sticky’ that proposed several reasons why hurdle rate for private sector businesses do not change much as interest rates change. Importantly the practice is not new.

“Firms commonly evaluate potential capital expenditure projects by comparing expected project returns to a hurdle rate, which is determined by each firm and reflects the minimum acceptable rate of return for a project. Firms typically use hurdle rates that are well above the weighted average cost of capital (WACC) and are sticky (i.e., do not move much) over time. This result has been observed through several central banks' liaison programs in recent years, including in Australia, Canada, Sweden and the United Kingdom. Similar observations can be traced back in the literature to at least the 1930s.”¹⁵²

Since 2015, the National Australia Bank has included a question on the level of hurdle rates to its quarterly business survey in 2015. The following graph from the RBA article shows the large difference between those hurdle rates and interest rates and the relative stability of the hurdle rates in the face of significant falls in interest rates.



Source: RBA (2021)

¹⁵² RBA (2021) at <https://www.rba.gov.au/publications/bulletin/2021/dec/why-are-investment-hurdle-rates-so-sticky.html>

Despite the binding AER Guideline requirement there is no evidence provided of what discount rate private sector investors require for a long-term investment in the NEM

This was the case in their 2021 report (which had private sector data on components of the ‘on the day calculation methodology but not private sector discount rates) and there is no data in their updated 2022 report.

There needs to be more empirical evidence on the justification on the upper bound estimate. The upper bound seems to be based on a higher beta, though no explanation is provided.

The 2024 Panel recommends that AEMO commission a different consultant to provide data on what is the expected return on private sector investments in the NEM and how that has changed over recent years

The January 2023 estimates of the after-tax discount rate for ‘Green and renewable energy’ investment in the US was 8.93% based on a 55/45 debt/equity ratio.¹⁵³ No doubt this is influenced by the large subsidies paid to US firms that will increase significantly under the recently passed Inflation Reduction Act. Capital for Australian projects will be in a world competitive market for investment funds and in the absence of significantly increased Governments subsidies¹⁵⁴, will mean the discount rate will need to be higher in Australia to attract the required funds. The consultant scope of work should include provision of advice on how competition for capital around the world is impacting on required discount rates in Australia.

7.8 Hydrogen assumptions and infrastructure needs

Please also refer to section 7.2.4.

What are the issues and considerations?

The 2024 Panel has concerns about the robustness of the analysis underpinning the costs of hydrogen.

AEMO’s Approach

The Draft 2023 IASR states:

“There are two main potential large scale hydrogen supply pathways, both of which require bulk transport of energy from the source to the consumer. The main difference is the location of the conversion; that is, whether the bulk transport occurs using electrons (with electrolyzers and water located at the consumer) or molecules (with electrolyzers and water located at the VRE source).

AEMO has reviewed external studies on the optimal choice of pathway, and notes a lack of consensus, due to the dependence on many project parameters. The ISP model is currently configured to transport electrons via electricity transmission, with electrolyzers located at export ports or close to domestic electrical load centres. At this stage AEMO is not proposing to increase the complexity of the model’s derivation to incorporate the alternative configuration.”¹⁵⁵

¹⁵³ See https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wacc.html

¹⁵⁴ We note that the Clean Energy Council is calling for these, see for example <https://www.cleanenergycouncil.org.au/news/bidens-clean-energy-arms-race-puts-australian-economy-on-the-back-foot>

¹⁵⁵ AEMO (2022a) op.cit. p.150.

So AEMO proposes to continue the approach in the 2022 ISP of 10 ports for export hydrogen – Newcastle, Port Kembla, Townsville, Mackay, Gladstone, Bell Bay, Geelong, Portland, Port Bonython and Cape Hardy/Port Spencer. The Draft 2023 IASR states:

“For the 2024 ISP, water availability is not considered to be a limiting factor to affect electrolyser operations, since all sites are assumed to be coastal. Water is not a costed component of electrolyser operation within the ISP modelling, although some export ports may require desalination. AEMO recognises that further analysis may be needed in future to validate the availability of water resources.”¹⁵⁶

Consumer Panel Comments

The assumptions AEMO has made emphasise the much high level of inaccuracy around hydrogen costs and the 1.5C Green Energy Exports scenario. This needs to be explicitly highlighted and analysed e.g., what costs would be added were desalination be required?

7.9 Employment factors

What are the issues and considerations?

This data indicates the level of local labour required to build generation and transmission. It is an important input to the capex and opex estimates for generation and transmission. There are a number of reports and a lot of anecdotal information on the difficulty many businesses in all parts of manufacturing and construction are having in recruiting their required skilled labour. Employment factors drive the demand for labour and this in turn drives costs and project timetable.

AEMO’s Approach

The proposed factors are drawn from the joint study AEMO and other sponsors undertook with the Institute for Sustainable Futures at UTS which in turn substantially relies on earlier work by the same authors in 2020 for the Clean Energy Council. It was based on the scenarios in the 2022 ISP. Key conclusions include:

- a rapid scale up of the energy workforce is needed to implement the ODP under all scenarios except the Slow Change (which is not a scenario in the 2024 ISP); there is a particularly rapid build-up in the next 2-3 years to facilitate the constriction phase over the next decade
- construction employment in large scale technologies is subject to major upswings and downswings; this ‘boom-bust’ pattern creates significant risks for labour supply, exacerbated by competing demands for infrastructure build in other parts of the economy and the fact that much of the energy infrastructure is in rural areas
- the rapid increase in requirements for in-demand occupations brings a high risk of skill shortages which could impact on the achievement of the ISP’s optimal development path. Skill shortages create the risks of delays, increased project costs (wage inflation, recruitment costs and liquidated damages), and increased cost of capital to reflect increased risk
- the forecasts exclude WA and NT, other parts of the energy sector e.g., for operations not NEM connected, hydrogen production or other electrification or energy efficiency initiatives Government and the private sector may undertake, let alone all other major infrastructure commitments by Governments.¹⁵⁷

¹⁵⁶ AEMO (2022a) op.cit. p.152.

¹⁵⁷ Rutovitz, J., Langdon, R, Mey, F., Briggs, C. (2022) The Australian Electricity Workforce for the 2022 Integrated System Plan: Projections to 2050. Prepared by the Institute for Sustainable Futures for RACE for

The Draft 2023 IASR highlights the demand for skilled labour and the challenges in meeting that demand.

Consumer Panel Comments

The UTS report is, understandably, full of caveats around the calculations and the results. There are so many unknowns. The results assume projects are built on the ISP timetable. Social licence issues suggest this may not be the case given the experience of the Western Renewables Link in Victoria and so the ‘construction time’ may be too conservative. We commented above on the timetable for Snowy 2.0 that will be considerably longer than AEMO’s assumed four years. The timetable for the Kurri gas peaker may be considerably longer than the AEMO’s assumed two years.¹⁵⁸

While an individual State may seek to ‘smooth’ the development pathway to limit skill shortages (e.g., NSW with its Roadmap pathway), this is very difficult to do in practice. All States have their own political commitments and they do not want to see their State losing skilled labour to help another State meet its timetable. We would expect that the Queensland Government would argue that a major objective of the Best Practice Industry Conditions discussed in Section 7.3.1 that require contractors bidding for major Queensland Government contracts to employ union members at what private sector employers regard as very generous conditions is to enable Queensland contractors to retain their labour force in the face of competing demands.

The report assumes that the current level of onshore manufacturing for the included technologies will persist for the study period. As commented above, there are State based policies to increase the level of local content. The study does do a sensitivity on increased local content in several renewable technologies especially utility solar PV (base case 2% increasing to 30% for 2030-50, utility scale batteries (base case 15% increasing to 30% for 2030-50). Onshore manufacturing adds significantly to the job numbers. Given the political importance of these local procurement policies, the 2024 Panel thinks there is a case to be made for the ‘base’ case to reflect the implementation of these policies.

Finally, as noted above, there needs to be consistency between these factors and forecast capex costs for generation and transmission. That should be clearly stated in the IASR.

2030 at <https://aemo.com.au/-/media/files/major-publications/isp/2022/supporting-materials/the-australian-electricity-workforce-for-the-2022-isp.pdf>

¹⁵⁸ Renew Economy (2023) at <https://reneweconomy.com.au/snowy-hydro-finally-fesses-up-on-delays-to-snowy-2-0-and-for-kurri-kurri-too/>

Appendix A - Abbreviations

ACOSS	Australian Council of Social Service
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CDP	Candidate Development Path
CER	Consumer Energy Resources (similar to DER)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DER	Distributed Energy Resources
DNSP	Distribution Network Service Provider
Draft 2023 IASR	Draft 2023 Inputs, Assumptions and Scenarios Report
EV	Electric Vehicle
IASR	Inputs, Assumptions and Scenarios Report
ISP	Integrated System Plan
NEM	National Electricity Market
OPD	Optimal Development Path
RAB	Regulated Asset Base
SAPS	Stand Alone Power System
SME	Small and Medium Enterprises
The 2022 Panel	The 2022 ISP Consumer Panel
The 2024 Panel	The 2024 ISP Consumer Panel
TNSP	Transmission Network Service Provider
VPPs	Virtual Power Plants

Appendix B – Summary of some ISP related Government policies

The Australian Government has legislated emissions reductions targets of 43% by 2030 (on 2005 levels) and net zero by 2050 and announced its “Rewiring the Nation” program on 19 October 2022 stating in its media release:

“Rewiring the Nation will provide \$20 billion of low cost finance for transmission investment to modernise the grid and implement the ISP. The Australian Government will work closely with state and territory governments to deliver this investment and facilitate timely delivery of the ISP’s major transmission projects.”¹⁵⁹

This announcement was followed by a joint statement with the Victorian Premier:

“The agreement between Victoria and the Commonwealth sets out:

- \$1.5 billion of concessional financing from Rewiring the Nation available for REZ projects in Victoria, including offshore wind projects;
- A commitment to coordinate Victorian and Commonwealth regulatory processes to support the rapid development of the Victorian offshore wind industry;
- Rewiring the Nation, through the Clean Energy Finance Corporation, will provide a concessional loan of \$750 million for VNI West to ensure it is completed by 2028;
- Victoria will contribute equally with the Tasmanian and Commonwealth Governments to a total 20 per cent of project equity to deliver Marinus Link.”¹⁶⁰

On 22 December 2022 announcements were made about joint projects with NSW:

“The joint \$7.8 billion deal will back 8 critical transmission and REZ projects. Rewiring the Nation will enable \$4.7 billion from the Commonwealth to join with \$3.1 billion from the NSW Transmission Acceleration Facility, to help NSW realise its Electricity Infrastructure Roadmap.

This agreement will establish these critical transmission and REZ projects:

- Sydney Ring – Hunter Transmission Project (HTP)
- Central-West Orana Renewable Energy Zones (REZ)
- New England REZ
- Humelink
- VNI West
- Hunter-Central Coast REZ
- Sydney Ring – Southern Sydney Ring
- South-West REZ.”¹⁶¹

The Victorian Government has announced the following energy related policies since September 2022:

- [Offshore wind energy](#)

¹⁵⁹ [Delivering priority transmission projects | energy.gov.au](#)

¹⁶⁰ [Rewiring The Nation To Supercharge Victorian Renewables | Prime Minister of Australia \(pm.gov.au\)](#)

¹⁶¹ <https://www.energy.gov.au/news-media/news/rewiring-nation-deal-fast-track-clean-energy-jobs-and-security-nsw#:~:text=The%20joint%20%247.8%20billion%20deal,realise%20its%20Electricity%20Infrastructure%20Roadmap.>

- [About energy](#)
- [Energy regulators and market operators](#)
- [Victorian Energy Upgrades for industry](#)
- [Victorian Energy Upgrades for businesses](#)
- [Gas heater safety](#)
- [Victorian Energy Upgrades for households](#)
- [Traditional Owner Renewable Energy Program](#)
- [A clean energy future](#)
- [About the electricity sector](#) (NB Embedded networks)
- [Zero emissions vehicles](#)
- [Electricity Distribution Network Resilience Review](#)
- [Renewable energy zones](#)

NSW has an Electricity Roadmap that is established in the Electricity Infrastructure Investment Act 2020 No. 44. The Act lists the following objects:

“3 Objects of Act

(1) The objects of this Act are—

- (a) to improve the affordability, reliability, security and sustainability of electricity supply, and
- (b) to co-ordinate investment in new generation, storage, network and related infrastructure, and
- (c) to encourage investment in new generation, storage, network and related infrastructure by reducing risk for investors, and
- (d) to foster local community support for investment in new generation, storage, network and related infrastructure, and
- (e) to support economic development and manufacturing, and
- (f) to create employment, including employment for Aboriginal and Torres Strait Islander people, and
- (g) to invest in education and training, and
- (h) to promote local industry, manufacturing and jobs, and
- (i) to promote export opportunities for generation, storage and network technology.”¹⁶²

Regular updates to this Act are published by the NSW Government.

Introducing the Queensland “Energy and Jobs” plan in September 2022¹⁶³, Premier Palaszczuk said:

¹⁶² [Electricity Infrastructure Investment Act 2020 No 44 - NSW Legislation](#)

¹⁶³ [queensland-energy-and-jobs-plan-overview.pdf \(epw.qld.gov.au\)](#)

“My Government has a long standing commitment of 50 per cent renewable energy by 2030, and now we are accelerating our progress. We are committing an extra \$4 billion to our energy transformation and setting two new renewable energy targets of 70 per cent renewable energy by 2032 and 80 per cent by 2035. We will showcase our clean energy credentials to the world as we prepare to deliver a climate positive Olympic and Paralympic Games in 2032.”

Queensland has committed to an electricity system that is 70% renewable energy by 2032 80% by 2035.

Projects to achieve this include:

- “At least 25 GW new and existing renewable energy
- Gladstone grid reinforcement to support heavy industry to switch to renewable energy and decarbonise their operations
- All publicly owned coal-fired power stations operating as clean energy hubs by 2035, supported by a legislated Job Security Guarantee for energy workers
- Two new world-class pumped hydro projects that together could deliver up to 7 GW of long duration storage
- Around 1500km of new high voltage backbone transmission to move more power around the state
- Up to 3 GW of low to zero emissions gas generation for periods of peak demand and backup security
- A smarter grid to support over 11 GW of rooftop solar and around 6 GW of batteries in homes and businesses.”

In late 2021, South Australia announced that the:

“Government has already committed to achieve net zero emissions by 2050 and has today gone one step further with a goal to reduce greenhouse gas emissions by at least 50 per cent by 2030. The ambitious goals are beyond the targets mentioned in the current Climate Change and Greenhouse Emissions Reduction Act 2007 for emissions reduction and renewable energy production.

The Government has provided hundreds of millions of dollars of investment across our environment and energy portfolios as well as developing our [Climate Change Action Plan 2021–25](#), which is the most powerful vision for climate action of any South Australian Government in history.”¹⁶⁴

The Tasmanian Government also has clear policy objectives about climate change and renewable energy, beyond the idea of “Tasmania as the battery of the nation. In November 2020, they announced the Tasmanian Renewable Energy Action Plan:¹⁶⁵

“The Tasmanian Government has identified renewable energy as a key economic driver for the future. The Tasmanian Renewable Energy Action Plan (TREAP) will be key to the Government’s vision of utilising renewable energy to benefit all Tasmanians through job creation, helping our environment and driving investment and economic growth. Our TREAP will deliver for Tasmanians in three key priority areas:

- Transforming Tasmania into a global renewable energy powerhouse

¹⁶⁴ [South Australian climate change initiatives | Energy & Mining \(energymining.sa.gov.au\)](#)

¹⁶⁵ [Tasmanian Renewable Energy Action Plan December 2020.pdf \(stategrowth.tas.gov.au\)](#)

- Making energy work for the Tasmanian community
- Growing the economy and providing jobs.”

The ACT has also been proactive in responding to climate change and has been at the forefront of developing climate change response policies and programs. The ACT Government says:

“The ACT Climate Change Strategy is helping our city reduce greenhouse gas emissions and prepare for climate change. The strategy will help us:

- build resilience to climate change impacts
- make sure we don’t ‘lock in’ future emissions
- lay the foundations for our commitment to net zero emissions by 2045.

Targets

The ACT is committed to achieving net zero emissions by 2045 (based on 1990 levels). We’ll get there progressively. We aim to reduce emissions by:

- 50 to 60% by 2025
 - 65 to 75% by 2030
 - 90 to 95% by 2040.”¹⁶⁶
-

¹⁶⁶ <https://www.climatechoices.act.gov.au/policy-programs/act-climate-change-strategy>