2024 ISP Consumer Panel

To: **AEMO**

Attn: ISP@aemo.com.au

Report: **ISP Consumer Panel Report on Draft 2024 Integrated System Plan**

- As required by Clause 5.22.7 of the National Electricity Rules

February 2024

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Recognition of Traditional Owners

The Consumer Panel acknowledges the Traditional Owners of Country throughout Australia. We pay our respects to Elders past, present and emerging.

Chapter 1. Executive Summary and Recommendations

Background and scope

The ISP Consumer Panel (the Panel) was established under the National Electricity Rules in November 2020 as part of the oversight framework that accompanied the introduction of the Integrated System Plan (ISP). We are four energy professionals with long histories in consumer issues and the National Electricity Market (NEM).

This report is in response to requirements under the National Electricity Rules for us to report on AEMO's Draft 2024 ISP and has been informed by our ongoing engagement with AEMO and stakeholders.

Our Approach

At the outset, the Panel would like to acknowledge the complexity of the ISP process and the dedication of those involved in its development.

The 2024 Panel, as with the 2022 Panel, strongly agrees that meeting the National Electricity Objective (NEO) of the long-term interests of consumers during such a period of transition requires a 'whole of system plan' that looks ahead 20+ years. We also recognise that the NEO has recently been revised to include reference to "reducing Australia's greenhouse gas emissions."

Decarbonisation and decentralisation are quickening, and we want consumers to be confident the ISP's "optimal development path" (ODP) appropriately balances the risks of under-investment or over-investment in the power system as we make the transition. The ISP also need to achieve 'social licence,' a matter than has gained increasing attention since the 2022 ISP.

In relation to the ISP, we have interpreted the National Electricity Objective (the pursuit of the long term interests of electricity consumers) as occurring when the ISP process plans and initiates prudent and efficient investments in the capacity of the electricity system to best meet the future needs of consumers at an efficient cost. We are conscious that these projects have long lead times and the 'optimal' need for them depends on a large range of influences, each with significant uncertainties.

The Panel members wish to sincerely thank the many AEMO staff who have genuinely, enthusiastically and patiently engaged with us over our time on the Panel. Collectively, Panel members have considerable experience across the NEM in consumer engagement and AEMO's engagement with the Panel is up there with the best that we have experienced. Preparation of the ISP places an enormous workload on AEMO staff as they seek to engage with as wide a spectrum of stakeholders as possible at the same time as meeting its rules requirements and actually completing all the modelling in a very tight timetable. The Panel very much appreciates the manner in which AEMO has enabled us to not only develop a very good understanding of the ISP but also to make a contribution the development of the 2024 ISP that, we believe, will increase understanding by, and benefits for, consumers.

Overall Themes

As the Panel has considered development of the 2024 ISP we have identified six major recurring themes. While connected, we think that identifying these themes is helpful, particularly in presenting consumer perspectives. The themes are:

1. *'Transmission' Plan vs 'whole of system' plan*
   Daniel Westerman says in his preface:

   > "The plan outlines the lowest-cost pathway of essential generation, storage and transmission infrastructure to meet consumers' energy needs for secure, reliable and affordable energy, and to achieve net zero emissions targets,"

   We do not believe that this is the case because the ISP is a transmission plan and not a whole of system plan.

   The ISP proposes in many places that to achieve this plan:

   > "Renewable energy connected by transmission, firmed with storage and backed up by gas-fired generation is the lowest cost way to supply electricity to homes and businesses throughout Australia's transition to a net zero economy."

   For reasons outlined in Chapter 4, we believe a more accurate statement about how to achieve this plan would be something like:

   > "A combination of supply side measures - including grid connected renewables, energy storage and thermal generation - and demand side measures - including energy efficiency, demand response and consumer energy resources - is the lowest cost way to meet the energy needs of the homes and businesses throughout Australia."

2. *Constrained ODP*
   Apart from being constrained in achieving its aim from being a transmission plan rather than a whole of system plan, the recent large expansion in State and Federal energy and climate policies which are included as input assumptions in the modelling, future constrains the transparency of the results for consumers. The more that policy expansion continues, the less the result will be an Optimal Development Plan from a consumer perspective.

3. *Hard choices will be required*
   To achieve the optimal development path (ODP) and, by implication, the range of Government policies, will require a number of hard choices to be made that have political, social and economic consequences. These hard choices can be mitigated through a 'whole of system' approach.

4. *The issue of 'affordability'*
   The approach of measuring consumer 'affordability' with reference to 'net market benefits' is flawed. Many consumers will not be able to 'afford' the costs described in the Draft ISP, particularly while energy costs continue to rise at a faster rate than CPI and incomes. . Given AEMO does not address the 'who pays' question and in any case does not forecast electricity prices, the ISP cannot make any judgements about affordability.

5. *The role of gas*
   The significantly increased role for gas generation in this ISP compared to the 2022 ISP requires public debate on how this is going to be achieved. This is a debate that cannot be put off simply because the expanded gas generation requirement does not occur for at least 10-15 years.

6. *The 'how?'*
   The ISP sets out the 'what' but says little about the 'how' to efficiently implement the ODP. We think it should but understand its reluctance. Questions of 'how the ISP will be implemented?' are pertinent to a range of parties other than AEMO, including governments and industry.

The Following discussion provides more detail of the Panel's reasoning in identifying these themes.

1. *'Transmission' Plan vs 'whole of system' plan*

While AEMO may claim that the ISP "…considers the whole NEM power system" (p.35) we do not agree. Our view is that the ISP narrative is based on a belief that large scale supply side transmission centred options are the primary tool for meeting Government decarbonisation targets. While the 2024 ISP has expanded its consideration of non-transmission options, there is a long way to go on considering solutions involving the role of the distribution system – connecting renewables and storage, orchestration and consumer energy resources; the role of energy efficiency and demand response. This should be a focus of the 2026 ISP to reduce the risk of stranded transmission assets as technological development reduces the cost of these alternatives.

2. *Constrained ODP*

This is not a criticism of AEMO's approach. AEMO follows the rules and the relevant AER Guidelines to develop the ISP and this includes incorporating Government policy as inputs and assumptions. In the 2021 IASR for the 2022 ISP) there were 6 pages of policy inputs and assumptions. In the 2023 IASR (for the 2024 ISP)there are 15 pages, reflecting the significant expansion in explicit Government energy and climate policy in the last two years. Any further increase in the policy assumptions in the 2026 ISP will mean the resultant ODP will most likely be even more constrained and potentially even less relevant to consumers focussed on affordability and system efficiency.

We would suggest that the more governments (National and Jurisdictions) realise the difficulties of achieving their 2030 objectives, the greater the policy intervention and the less consumers are able to transparently see that the ISP is indeed an optimal development path from a consumer perspective with particular respect to the NEO. With the expected establishment of a South Australian planning function 2024, all NEM states will have State based regulatory frameworks and project preferences that result from jurisdictional policies, this is not the result for a national planning framework.

We take two examples. The first relates to the Victorian Government's offshore wind policy. We contend that offshore wind is only in the ODP because of that policy. It occurs nowhere else, despite all of the action at Federal and NSW Government levels, simply because it is too expensive – there are lower cost alternatives. But the nature of ISP modelling means that Victorian consumers will never know if it is cheaper to import solar and wind from South Australia or NSW than building offshore wind in Victoria. It is no different in other States policies which seek to maximise state benefits rather than NEM benefits.

The second is the measurement of ODP net benefits. This is calculated against a counterfactual that includes five 'committed and anticipated' projects that Governments or the regulatory framework has approved. Only one is on track to be completed on time (Far North Queensland REZ in April 2024). One is under construction with uncertainty on whether it will meet the Draft ISP timetable (Project Energy Connect)[1]. Three have yet to start construction (Western Renewables Link, Central West Orana REZ and CopperString 2032). Consumers have no idea whether the projects have net benefits and the final costs are uncertain. AEMO's approach is based on a view that the ISP is about 'actionable' and 'future' projects, not 'past' projects. Yet consumers have to pay for both.

The themes of "Transmission plan" vs "whole of system" plan and "Constrained ODP" are linked, impacting each other. We also note that this policy expansion has been happening in the past, it is not just a current development, though significant at the moment. There is likely to be a continued expansion in these Commonwealth and jurisdictional polices in the future, particularly if it is getting harder to meet Government emission targets. The questions for consumers is the extent to which policies compete, the rate of change of policy settings and whether they add costs.

3. *Hard choices will be required*

These include:

- Who pays – the electricity consumer or the taxpayer? This is important as it influences ongoing 'customer social licence' to continue supporting the transition during an 'affordability crisis.'
- Intergenerational equity – how much should be paid by the current generation of electricity consumers and how much should be effectively borrowed to be paid for by future generations who will receive the climate benefit?
- Social licence – how to (re)gain landowner and community trust and support for siting network and generation in rural and regional Australia?
- How to balance carbon reduction and specific environmental concerns? The recent Commonwealth decision to reject the Port of Hastings as an assembly point for Victorian offshore wind construction is a clear example. The Victorian Government has said carbon reduction should prevail; conservationists said the environment should prevail.
- An expanded role of gas for firming – will that be accepted by stakeholders?

The ODP sets out a very comprehensive plan that will require an immense effort by all stakeholders to achieve. The hard choices will only expand as Governments realise the difficulty of meeting their emission targets.

4. *The issue of 'affordability'*

For over two decades Australian energy consumers have been promised 'cheaper energy' through a series of 'reforms', 'policy announcements' and 'big' projects. The reality is that over the last 10-15 years the trend in retail prices in every jurisdiction is an increase greater than the trend increase in CPI and personal incomes. Current cost of living concerns are widely reported.

[1] The Draft ISP (Table 1, p.12) has 'in service timing' advised by Transgrid of Stage 1 by April 2024 and Stage 2 by December 2024. The Transgrid website has 'Project commissioning - Proposed in 2024' https://www.transgrid.com.au/projects-innovation/energyconnect#Timeline

Any assessment of 'affordability' starts with determining the highest net benefit ODP but it certainly does not end there. It then has to go the next step of discussing 'who pays' and what the ODP means for electricity prices over the ISP forecast period. Forecast prices depend on a lot of factors, not the least of which is how much of the ODP costs will Governments pay.

Consumers will not be able to 'afford' to pay all of the costs associated with the ODP and Governments have realised this with a range of policies eg

While recognising that the 'who pays' question is outside AEMO's remit, we do not believe that consumers will be able to afford the costs to implement the ODP. This 'lack of affordability' will need to be considered in a number of contexts:

- How are the costs to be divided in the short to medium term between Governments (taxpayers) and electricity consumers?
- How are the costs apportioned to electricity consumers going to be apportioned between:
    - different consumer classes today, and
    - today's consumers and future generations of consumers ,

  we think that the 'beneficiary pays' principle should guide these apportionments.

The short to medium term share is being addressed through measures such as:

- more cost reflective network prices eg solar export charges, but there is a long way to go to achieve fully cost reflective network pricing
- Expanded explicit Government subsidies on electricity costs

The longer term intergenerational equity issues are subject to often contradictory policy responses eg

- Recent AEMC decisions on financeability are providing for accelerated depreciation of long life assets. A desire to allow networks to finance ISP projects results in current consumers bearing a larger cost burden compared with what they would bear with the standard straight line depreciation.
- The Federal Government's recent decision to significantly expand the Capacity Investment scheme (paid for by taxpayers) rather than expand the RET (paid for by electricity consumers) and how the Federal Government allocated Rewiring the Nation concessional funding.

In summary, given the question of 'who pays' is outside of AEMO's remit, we believe the ISP cannot make any conclusion about consumer affordability. It can only draw conclusions about highest net benefits. This presents AEMO with a dilemma – its remit means it cannot make any conclusion about affordability. It can only make a conclusion about highest net benefits which is not affordability. However, the need to convince consumers that the transition is 'affordable' is key to getting 'consumer social licence' to support for the ISP. This means consumer support for the ODP is dependent on the level of Government financial support to ensure consumer affordability.

5. The role of gas

If an expanded role of gas for firming is accepted, who will pay for the investment required in the gas supply chain to deliver a large volume of gas over short periods of time each year? This includes pipeline assets that may be required for only a fraction of their technical 30-60 year asset lives. Who is going to take the stranded asset risk and how will the provision of peaking only services be priced?

6. The 'how?'

The ISP sets out the 'what' is required – the ODP but has little on the 'how' of achieving this. We would prefer AEMO to be more active in its advocacy for the 'how' but understand its reticence in doing so.

A crucial aspect of the 'how' is also considering the policies and practices that are separate from the ISP specifically but are crucial to achieving the ODP. Policies and practices about energy efficient housing and products is an example along with effective orchestration of consumer energy resources
.
What the ISP does provide is an immense amount of data and analysis to assist those seeking to understand and implement the 'how'. This will be essential in the necessary policy discussions on the 'how' that we hope will result in more transparency around the cost of Government policies for consumers.

Responses to consultation questions

With this background we offer the following summary answers to the five questions AEMO asks as part of the Draft ISP 2024, with further detail provided in Part 4 of this submission.

1. *Does the proposed optimal development path help to deliver reliable, secure and affordable electricity through the NEM? If yes, what gives you that confidence? If not, what should be considered further, and why?*

   We have confidence that the implementation ODP produces reliable and secure electricity in the NEM within the constraints AEMO has eg Government policy inputs, social acceptance of the future role of gas generation for firming and our view that it is a 'transmission' plan rather than a 'whole of system' plan. We cannot answer whether it will be affordable because the ISP does not address the 'who pays' question and does not provide forecasts of electricity bills over the forecast period. All we can say is that the greater the level of future costs are born by taxpayers, a more 'progressive' source of revenue, the more likely the ODP will be affordable for all electricity consumers, both in the near and longer term future.

2. *Do you think that the proposed timing and treatment of actionable projects support a reliable, secure and affordable NEM? If yes, what gives you that confidence? If not, what should be considered further, and why?*

   Assuming timing refers to 'optimal' timing rather than 'proponent' timing[2], yes it does. But there is no chance that the optimal timing will occur for all actionable projects (nor for that matter 'committed and anticipated' projects either). The Draft ISP has a forecast coal retirement profile[3] that is an outcome of the carbon constraint in the modelling. This is very unlikely to happen in practice given the actual timing of ISP project completion.

   We cannot draw any conclusion on affordability for the same reasons we gave in our answer to Question 1.

3. *Does the Draft 2024 ISP accurately reflect consumers' risk preferences? If yes, how so? If not, how else could consumers' risk preferences be included and what risks do you think are important to consider?*

[2] Table 1 p.12
[3] Figure 1 p.9

The Panel undertook extensive engagement to develop a measure of consumer risk preferences for residential and small business. However, this remains to be completed as part of the 2026 ISP with expansion to include C&I and to build on the learnings from the considerable efforts that were made to reflect consumer risk preferences in developing 2024 ISP.

4. *Do you have advice about how social licence can be further considered in the ISP, or advice on how to quantify the potential impact of social licence through social licence sensitivity analysis?*

   We support the use of social licence sensitivities and discuss a range of suggestions in Part 4 below to expand the usefulness of this sensitivity testing.

5. *Do you have any feedback on the Addendum to the 2023 Inputs Assumptions and Scenarios Report?*

   We make comments throughout our submission on some of the issues raised – social licence, consumer risk preferences, power system security and unknown risk factors for estimated transmission costs.

Outline of this submission

Following a list of the recommendations, the remaining sections of this submission in turn:

- discuss the role of the Consumer Panel
- examine the NEM market context from a consumer's perspective, particularly the myriad of promises Governments and market bodies have made to them over many years. It is fair to say few if any have been met in recent years. Why should consumers believe current promises?
- comments on particular sections of the Draft ISP (including the Appendices) and sets out our recommendations for each section. Some recommendations apply to developing the Final 2024 ISP and some to the 2026 ISP, and
- discuss other topics for further consideration as part of the 2026 ISP and again makes some recommendations.

Recommendations (consolidated)

Recommendations from the Panel are summarised below and are presented in three categories:

1. Those that are relevant to preparing the Final 2024 ISP
2. Those that are relevant to preparing the 2026 ISP
3. Those that are relevant to the effectiveness of the ISP but are outside of AEMO's remit and fall into the responsibility of Energy Ministers and other marker bodies;

All are aimed at improving the effectiveness and understanding of the ISP for consumers.

A recurring theme was the need for greater clarity and transparency around the reasons for particular assumptions and conclusions. While the Draft 2024 ISP has considerably improved transparency and detail compared to the 2022 ISP, we consider there are areas to continually improve. We agree with the AER in its Transparency Review[4]:

> "AEMO has been transparent in setting out its approach… however, we consider there are some aspects of the draft ISP where AEMO should better explain how key inputs and assumptions contribute to the draft ISP outcomes."

Note that the heading for each recommendation is the same as is used in the Draft 2024 ISP and relates to that aspect of the Draft. Page numbers also relate to the pages from the Draft 2024 ISP.

1. Recommendations relevant to finalising the 2024 ISP

General: Changing Context (with reference to Media release 15/12/23: "Updated energy plan …")

That the messaging at the launch of the final 2024 ISP should provide clear and unambiguous information to customers about the cost challenges, as well as 'common good' benefits of the ISP and related transition costs.

Executive Summary – A plan for investment in the energy transition (Draft ISP pp 6-19)

Daniel Westerman says in his preface:

> "The plan outlines the lowest-cost pathway of essential generation, storage and transmission infrastructure to meet consumers' energy needs for secure, reliable and affordable energy, and to achieve net zero emissions targets,"

We do not believe that this is the case because the ISP is a transmission plan and not a whole of system plan.

The ISP proposes in many places that to achieve this plan:

> "Renewable energy connected by transmission, firmed with storage and backed up by gas-fired generation is the lowest cost way to supply electricity to homes and businesses throughout Australia's transition to a net zero economy."

For reasons outlined in Part 4, we believe a more accurate statement about how to achieve this plan would be something like:

> <u>"A combination of supply side measures - including grid connected renewables, energy storage and thermal generation - and demand side measures - including energy efficiency, demand response and consumer energy resources - is the lowest cost way to meet the energy needs of the homes and businesses throughout Australia."</u>

Executive Summary – Benefits of the Optimal Development Path (Draft ISP p 14)

Given that both Government policy inputs and AER Guidelines mean that many of our concerns discussed above are outside of AEMO's control to change, we would recommend that AEMO provide greater clarity on how it applies this methodology and its limitations. This

[4] https://www.aer.gov.au/news/articles/communications/transparency-review-aemo-draft-2024-integrated-system-plan-complete

should be outlined in a consumer summary and not require readers delving into the complex Methodology appendix.

Executive Summary – Risks to the development of the ISP and the energy transition and Appendix 6.7

AEMO should acknowledge and describe the risk of forecast errors in the relevant parts of the executive Summary and in Appendix 6

Part A, Section 1.1 – The two Part energy transition and its benefits (page 22)

Simplify the statement of consumer needs – and similar statements elsewhere in the ISP - to "All must have reliable and affordable supply".

Explain more fully the three types of consumers and their different needs, as opposed to different connection points shown in Figure 4.

Executive Summary and Section 4.1 - How the ISP results are represented – Coal is retiring faster than announced (Draft ISP Figure 1 and pp. 46-8)

That AEMO make the role of input policy assumptions on the ODP clearer in representing the ISP results regarding coal plant closure.

A more transparent description for consumers of what the Draft ISP is something like:

> "About 90% of the NEM's coal fleet is required to retire before 2035 to meet the Commonwealth and State carbon objectives."

Part A Section 1.3 – Significant and diverse benefits (p. 28)

AEMO to note the downside impact of connection to international material and equipment markets more explicitly.

Section 3.2 – The reliability, security, affordability and emissions reductions needs – balancing reliability and affordability.

AEMO further explain, in the final 2024 ISP, how they have applied their judgement in balancing reliability and affordability, particularly recognising that reliability standards are set exogenously, in the context that:

- reliability settings for the ISP are determined by various prescribed elements, including the Reliability Standard and Value of Customer Reliability.
- AEMO assesses affordability according to the highest net benefits ODP to meet reliability and emissions requirements and within the relevant government policy constraints.

Section 3.2 – The reliability, security, affordability and emissions reductions - affordability as 'long term interests and net market benefits' (pp. 37-8)

AEMO should provide more clarity around how it sees its approach to measuring consumer affordability is valid.

AEMO should seek to develop measures of the distributional impact of the ISP.

Section 3.3 Preparing the ISP – Three potential scenarios for the future (p.40)

For the 2024 ISP:

- AEMO more transparently set out its position on Marinus 2, and whether the Marinus Stage 2 component of the Marinus Project should be classified as an actionable project in the 2024 ISP.
- If AEMO chooses to proceed with the inclusion of Marinus Stage 2 as actionable project in the 2024 ISP, then AEMO should explain why it has included the second stage as an actionable project and with delivery due in early 2030s.
- AEMO should demonstrate how this decision is consistent with the AER's CBA Guideline which requires AEMO to balance the risks to consumers of 'premature' investment in the transmission network[5].

Section 4.2 – Four times today's consumer energy resources (pp. 47-8)

AEMO and the Consumer Panel to consider implications of the ESB report on CER and the transformation of the NEM in finalising the 2024 ISP.

Section 8.2 – Risks that market and policy settings are not yet ready for coal's retirement (pp. 75-6) 1. Planning and environmental approvals

The Final ISP has a discussion of the risks around Government planning approvals and the conflicts between carbon reduction and environmental quality that pose potentially considerable risks to whether replacement generation is available when coal plants close.

Modelling to include a sensitivity on project timing relating to a delay in planning and environmental approvals.

Section 8.2 Risks that market and policy settings are not yet ready for coal's retirement (pp 75-6) 2. The 'How' aspect of risk mitigation to achieve the ODP.

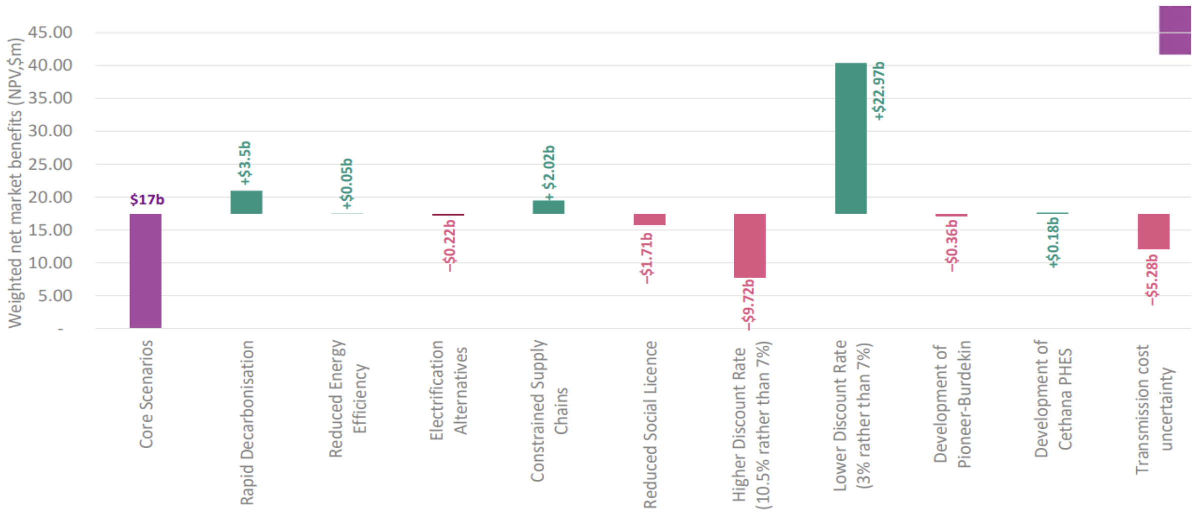
AEMO consider more commentary on policy responses to mitigate the risks discussed in Chapter 8 regarding policy and market settings.

Appendix 6 – Cost Benefit Analysis – A 6.7 Testing the resilience of the candidate development paths (pp. 71-85)

AEMO should have a more explicit summary discussion of sensitivity results in the Final 2024 ISP.

The figure below on the impact of the ten sensitivity tests was presented in AEMO's December 2023 webinar and should be also be included in the Final 2024 ISP report and in Appendix 6 to that report.

[5] For example, see p.17 https://www.aer.gov.au/industry/registers/resources/reviews/review-cost-benefit-analysis-and-regulatory-investment-test-guidelines. The requirement to balance the risks of over-or premature investment in the AER's CBA Guideline follows the requirements in NER Clause 5.22.5(e)(1).



Appendix 7 - System Security

AEMO provide greater clarity in their approach to:

- how all categories of system security costs are calculated and why they are included/not included
- the large cost accuracy range for synchronous condensers costs.

Appendix 8 – Social Licence

AEMO provide much greater transparency on how it selected the social licence sensitivity parameters.

Aurecon Costs and Technical Parameter Review and CSIRO GenCost Report

The final Aurecon and CSIRO Gen Cost reports should provide greater clarity on their approach to the issues discussed in this section of the Panel's submission.

The Panel supports AEMO to seriously consider using the draft CSIRO 2023-24 GenCost results in the Final ISP modelling. We await other submissions' views on this matter.

2. Recommendations relevant to preparing the 2026 ISP

Section 3.2 – The reliability, security, affordability and emissions reductions – affordability as 'long term interests and net market benefits' (pp. 37-8)

AEMO should seek to develop measures of the distributional impact of the ISP from ISP 2026.

Section 3.3 Preparing the ISP – Three potential scenarios for the future (p.40)

For the 2026 ISP:

- AEMO revisit the three scenarios for the 2026 ISP bearing in mind the issues raised by the Panel in the selection and use of the scenarios, including application of its own principles of scenarios demonstrating 'diversity' and 'broad' reach (in respect of comparing the Step Change and Progressive scenarios), and the principles of 'plausibility' and 'usefulness' in the inclusion of the GEE scenario.

- the core principles to be used in the selection of scenarios should be revisited with the 2026 Panel.
- AEMO commence a process of a wide-ranging consultation on the scenarios earlier in the 2026 ISP process including industry and consumer stakeholders, as well as the 2026 ISP Panel.

Section 3.3 Preparing the ISP – Three potential scenarios for the future Delphi Panel selection of scenario weights (p. 41)

Continue active engagement with the 2026 ISP Consumer Panel to explore further improvements that may be made to the Delphi process.

Section 4.2 – Four times today's consumer energy resources (pp. 47-8)

As CER becomes evermore significant in Australian energy systems, a much better knowledge of the extent of engagement with and by third party operators is important. The Panel encourages AEMO to enhance its recording and reporting of third party involvement on the electricity market.

Section 4.3 – Seven times today's utility-scale wind and solar (pp. 48-9)

That in developing the 2026 ISP, AEMO explore the options for reporting on potential levels of future curtailment and spilling to maximise use of generation.

Section 4.4 REZ and network design to optimise capacities

Recognising the importance of engagement with First Nations communities, we encourage AEMO to develop a strategy that would enable documentation of engagement with First Nations communities to be included in future ISP documentation to identify effective and less effective recognition of the interests and concerns of First Nations communities.

Appendix 6 – Cost Benefit Analysis – A 6.7 Testing the resilience of the candidate development paths (pp. 71-85)

For AEMO's decision on discount rates:

- AEMO investigate the option of using different discount rates for regulated and unregulated assets in assessing the net market benefits for each of the CDPs for the 2026 ISP, given evidence that investors differ in their cost of capital for these assets.
- If AEMO is concerned that this approach would be inconsistent with the AER's 2020 CBA Guidelines, and the 2023 update to the Guideline (and we believe it is not), AEMO propose to the AER further amendments to the CBA Guideline for 2026.
- AEMO undertake a more extensive consultancy on the market participants' perceptions of discount rates for different asset classes.
- AEMO seek expert advice on how it should consider consumer discount rates in the context of the growing importance of consumers' decisions on behind the meter investments and/or agreement to engage in orchestration and demand management.

Establish an increased cost as well as schedule delay for the supply chain sensitivity.

Undertake combined sensitivity testing when there are more than one 'sensitivity factor' identified for a particular sensitivity.

Section 6.4 – Storage and Gas to Firm Renewables – Flexible gas for renewable droughts and peaking (pp. 65-6)

The GSOO should identify the gas supply and pipeline augmentation requirements to meet long term GPG gas requirements.

AEMO to develop a Gas Costs Database (akin to the Transmission Cost Database) as part of a wider IASR complementing the GSOO to better inform the 2026 ISP modelling.

Appendix 7 – System Security

System Security issues should be examined more closely as part of the Methodology review in the 2026 ISP.

Appendix 8 – Social Licence

AEMO continue to maintain an active focus on improving social license as part of its work program.

2023 IASR Addendum – 13 Unknown risk factor for estimated transmission costs

The development of the 2026 ISP Transmission Cost Database (TCD) involves a thorough review of the 'unknown risk' factor based on more up to date data.

Supporting Documents – Consumer Risk Preferences

AEMO work closely with the 2026 ISP Consumer Panel to co-design the further development of consumer risk preferences for application to future ISP's.

Hydrogen scenario

The development of scenarios in the 2026 ISP should take a more comprehensive approach to analysing the hydrogen cost assumptions and how they may influence the scenario variables.

ISP Modelling

AEMO continues to remain abreast of modelling developments and engages with stakeholders making submissions on modelling approaches.

3. Recommendations relevant to the effectiveness of the ISP that are outside of AEMO's remit.

Section 4.2 – Four times today's consumer energy resources (pp. 47-8)

The development of a national CER orchestration strategy should be implemented by energy Ministers as part of the development of the 2026 ISP while AEMO should seek to better quantify impacts of effective orchestration and measures, and the risks if this is not successful, to enable improvements in policy and forecasting.

Section 6.4 – Storage and Gas to Firm Renewables – Flexible gas for renewable droughts and peaking (pp. 65-6)

> Energy Ministers develop a work programme on the changes that might be required in the NEM and pipeline regulatory frameworks to support the required investment in GPG and gas supply shown in the 2024 ISP.

Chapter 2. Consumer input to the ISP.

The role of the ISP Consumer Panel is to bring a consumer-focused perspective to the ISP development process, with particular regard to the long-term interests of consumers.

The four members of the 2024 ISP Consumer Panel (the Panel) are:

- Bev Hughson, Advocate with a focus on promoting consumers' interests, based on 30+ years working in the gas and electricity industries.
- Craig Memery, advocate with the Public Interest Advocacy Centre's Energy and Water Consumer Advocacy Program.
- Mark Grenning, Director of Policy and Regulation at the Energy Users' Association of Australia.
- Mark Henley, long term advocate for vulnerable people and communities, recently retired from Uniting Communities as Manager Policy and Advocacy and inaugural and continuing member of the Energy Consumers Roundtable.

In combination, Panel members have extensive experience in advocating across many aspects of Australia's energy markets from consumer perspectives. Panel members are not accountable to any particular consumer organisation while seeking to reflect the diversity of consumer views, concerns and preferences in the development of the ISP.

The 2022 ISP Consumer Panel (the 2022 Panel) described their approach to the long term interests of consumers as[6]:

> "…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."

The 2024 ISP Panel endorses this approach.

Under the Clause 5.22.7 of the NER, the Panel is required to publish two main reports:

- A report on the IASR by 28 September 2023[7]
- 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.

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

[6]See p.14 https://wa.aemo.com.au/-/media/files/major-publications/isp/2021/isp-consumer-panel-report-on-2021-iasr.pdf?la=en

[7] https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-report-on-2023-iasr.pdf?la=en

AEMO through formal and informal submissions and other activities. These submissions are listed on our AEMO webpage[8].

The members of the 2024 ISP Consumer Panel have drawn heavily on the work and recommendations from the 2022 ISP Panel, the first ISP consumer panel.

The Panel has considered views presented by consumer groups and other stakeholders during the 2024 ISP process, as well as matters raised by the AER in the two transparency reviews.[9],

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

[8] https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/isp-consumer-panel

[9] See: https://www.aer.gov.au/documents/aer-transparency-review-aemo-2023-inputs-assumptions-and-scenarios-report-28-august-2023; https://www.aer.gov.au/publications/reports/performance/transparency-review-aemo-draft-2024-integrated-system-plan

Chapter 3. Changing Context

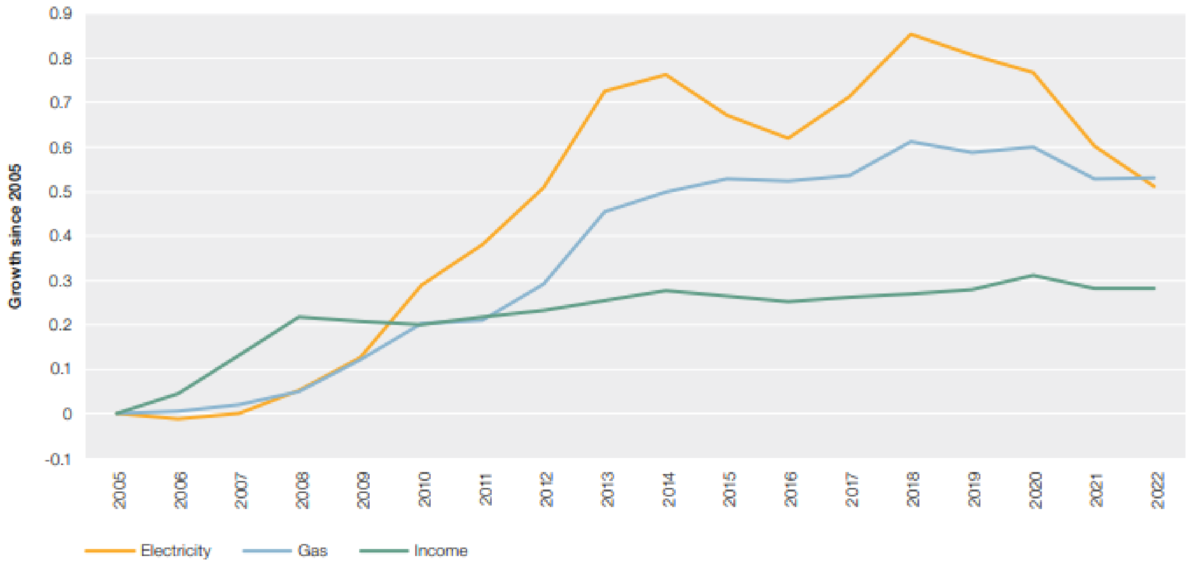
Introduction

Before considering topics from the draft ISP 2024 in further detail, the Panel considers that some discussion about the context in which the 2024 ISP has been developed is important, particularly reflecting consumer perspectives.

Since the formation of national energy markets in Australia including the associated national market bodies (AEMO, AER, AEMC), the promise to consumers has been changing:

- First promise: Introducing competition into Australian energy markets will lead to cheaper energy bills.
- Then: the expansion of cheap renewable generation will lead to cheaper bills,
- Then: after some short term pain, energy will be cheaper in the longer run,
- Then: the transition to a renewable future (including the ISP) is cheaper for customers than the alternative
- Now – it will be cheaper than the alternative after an (unspecified) period of time.

For all of the promises to consumers for cheaper energy bills, the outcome for well over 20 years has been different. The following chart from the AER State of the Energy Market report[10] shows that indexed gas and electricity bills have continued to rise as a percentage of income for residential customers.



Note: Inflation adjusted.
Source: Electricity and gas index – ABS, Consumer Price Index, various years; income index – ABS, Household Income and Wealth, Australia, various years.

This chart ends with 2022 so it does not include the impact of the 20-24% rise in the Default Market Offer in 2023-24. The AER's most recent Retail Markets Report for 2022-23 showed energy

[10] See p. 235 https://www.aer.gov.au/system/files/2023-10/State%20of%20the%20energy%20market%202023%20-%20Full%20report_1.pdf

affordability for retail customers continues to worsen[11]. C&I customers have also had to bear significant rises in both electricity and gas costs in recent years.

There are a wide range of issues that have contributed to the transition going slower than is required to meet Government 2030 emission targets eg social licence, supply chain and past 'climate wars'. It remains to be seen if Government measures to speed up the transition will get it back on track. These measures tend to increase costs which places more pressure on Government to shoulder more of that cost burden.

While support for the transition is falling by some measures, it is still a majority[12], the December 2023 ECA Energy Consumer Sentiment Survey[13]. found that just 12% of respondents believed that their electricity bill will decrease in the short term due to the transition, only 22% believe it will make electricity supply more reliable consumer have falling support for 2030 targets but rising support for 2040. Affordability is 'front of mind' for them. n the implication from these results is consumers are looking to Governments to improve energy affordability as a condition for a faster transition. Without that there is a risk that the 'consumer social licence' will diminish and the transition slow down. The tax base is also a more progressive as a payment source, in aggregate than energy bills, which are proportionately more expensive for lower income customers.

Rising costs of energy have been staple headlines for Australian media outlets for well over two decades, resulting in a loss of trust in energy markets and associated bodies, by consumers. For consumers, waiting for the much promised cheaper energy bills has become akin to "Waiting for Godot[14]".

The introduction of the ISP and its evolution

It was this problem that in October 2016 that led the Council of Australian Governments (COAG) energy ministers to establish the Independent Review into the Future Security of the National Electricity Market, chaired by Dr Alan Finkel AO, Australia's Chief Scientist. The Finkel Review provided a Blueprint for the Future Security of the NEM, with recommendations to deliver a smooth transition for the changing power system, and for energy consumers across the NEM. The Blueprint highlighted the need for better system planning as one of the three pillars required to achieve the following[15]:

> "Enhanced system planning will ensure that security is preserved, and costs managed, in each region as the generation mix evolves. Network planning will ensure that new renewable energy resource regions can be economically accessed."

The first Integrated System Plan (ISP) was released in 2018 included the following[16]:

> This Integrated System Plan (ISP) is a cost-based engineering optimisation plan by the Australian Energy Market Operator (AEMO) that forecasts the overall transmission system

[11] https://www.aer.gov.au/system/files/2023-11/Annual%20Retail%20Market%20Report%202022-23%20-%2030%20November%202023_1.pdf
[12] https://secnewgate.com.au/sec-newgate-mood-of-the-nation-october-2023/
[13] https://energyconsumersaustralia.com.au/news/what-consumers-want-from-the-energy-transition
[14] This is reference to the play "Waiting for Godot" 1955 (English version) by Samel Beckett
[15] See p. 9 https://www.dcceew.gov.au/sites/default/files/documents/independent-review-future-nem-blueprint-for-the-future-2017.pdf
[16] https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=en&hash=40A09040B912C8DE0298FDF4D2C02C6C

requirements for the National Electricity Market (NEM) over the next 20 years. (Opening paragraph, Executive Summary)

"The overall plan delivers economic benefits under all scenarios, although the timing of some elements varies under different assumptions, particularly relating to the rate of change and the progress of proposed major energy storage initiatives." (Page 7)

We observe that in the 5 years since the first ISP was released there have been significant changes in the context in which the ISP is located and an understanding of these changes is crucial in looking to the future of Integrated System Plans. Key developments include:

1. In the absence of a coherent national energy policy, the ISP very quickly became the default national energy policy.

2. Jurisdictional Governments have become much more active in promoting projects and legislating policies and projects that impact the ISP. The wide extent of these is shown in Table 2 of the IASR. This has the effect that the ISP is effectively a 'constrained optimisation' of what is in the long term interests of consumers. Some jurisdictional policies are antithetical to a national system plan that takes cost effectiveness into account. States use their own policies to maximise renewable development in their State even if it might be cheaper for electricity consumers to import power from another State. For example, the Draft ISP ODP has offshore wind in Victoria because it is a jurisdictional policy – we will be surprised if the 2030 offshore wind target will be achieved, because of its cost. Job creation and regional development are amongst objectives for jurisdictional governments that apply to energy markets but are not necessarily optimal from a total energy market focus.

   It is difficult to envisage a national 'supercharged' ISP (an objective of the 2023 review of the ISP)[17] when it is hostage to expanding State policy.

3. The ISP has, in practice, been more of a 'Transmission Plan' than a 'Whole of System Plan.'; as we have said in our submission on the Final IASR[18]:

   > "While AEMO describe the ISP as a 'whole of system' plan, it is in practice, a 'whole of transmission' plan with limited involvement of distribution networks, even those with substantial sub-transmission assets."

   In the first ISP, its primary transmission focus was clearly stated.

4. The failures in engaging effectively with some communities and the impact this can have on the 'social licence' to progress the ISP in these areas have become more evident, particularly over the past couple of years. AEMO has recognised the growing importance of social licence including through establishing an Advisory Council on Social License and through including Social License related 'sensitivities' in ISP 2024 modelling.

[17] https://www.energy.gov.au/energy-and-climate-change-ministerial-council/energy-ministers-publications/terms-reference-review-integrated-system-plan#:~:text=The%20ISP%20review%20will%20determine,maintain%20affordable%20and%20reliable%20energy.

[18] See p. 5 https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-report-on-2023-iasr.pdf?la=en

5. The rules do not require AEMO to consider 'who pays'. Yet the massive cost increases in ISP projects means the cost burden cannot be ignored. The early ISP approach of some stakeholders of a 'build it at any cost to the consumer' attitude has had to be tempered by the realisation that consumers are not prepared to pay 'any cost'. The who pays and who carries the financial risks questions: energy customers, investors or tax payers is now central to the transition. The impact for customers is linked to how Governments and others respond, e.g. greater attention to concessional financing or grants/concessions to ease direct costs to consumers. Failure to consider the 'who pays' question risks losing 'consumer social licence' and support for the transition.

Communication of the ISP to consumers

The Panel noted with considerable interest what we regarded as overwhelmingly constructive media responses on publication of the Draft ISP.

The key themes emphasised in AEMO's communications with release of draft ISP were[19]:

- Its urgent: "While progress is being made, the transition is urgent and faces significant risks if market and policy settings, social licence and supply chain issues are not addressed," Mr Westerman said.[20]
- Coal generation exiting and faster than previously forecast, future is renewables.
- Strong emphasis on 'firming': "batteries and pumped hydro, and backed up by gas-powered generation."

These are clear and important messages. As with the changing promise to consumers, there are many changes in the messaging of these key themes over recent years. For example, the coal story told to electricity consumers has morphed:

- 20 years ago, high demand was still anticipated, resulting in the capacity of coal and other generators being expanded
- Then, with ample coal generation capacity and mounting concerns about climate, the question became: 'How much do we need to pay coal generators to close?' It was considered payment to close would come from government revenue
- Forecast peak demand failed to eventuate as DER/CER expanded, but it took a number of years before the changed trend was acknowledged as more than an anomaly and incorporated into future forecasts; in the meantime, coal generators were compensated by tax payers for an anticipated carbon price liability (and did not return these funds when that liability ceased with the early removal of the carbon price)
- Then, because of over investment in supply, coal generators were exiting the market, leading to the requirement for a notice of retirement to require a minimum notice period before generators could exit
- Then the Victorian Government reached confidential deals with Yallourn and Loy Yang to keep them open to an agreed date with taxpayers picking up the bill

[19] https://aemo.com.au/newsroom/media-release/updated-energy-plan-reiterates-the-need-for-urgent-delivery

[20] https://aemo.com.au/newsroom/media-release/updated-energy-plan-reiterates-the-need-for-urgent-delivery

- Now Energy Ministers are considering the Orderly Exit Management Framework[21] designed to force coal generation to stay online with the cost paid by electricity consumers through their transmission chargers. .

This transition of messaging reflects the uncertainty of contemporary energy markets and the apparent desire at political and industry level to apply a disproportionate share of the associated risks at the feet of energy consumers.

The final 2024 ISP needs to deliver a promise to consumers that they can believe and accept. This requires the best available data, maximum transparency and brutal honesty. AEMO has a significant role to play in this clear and honest messaging, but it cannot be the only voice.

Recommendation

That the messaging at the launch of the final 2024 ISP provide clear and unambiguous information to customers about the cost challenges, as well as 'common good' benefits of the ISP and related transition costs.

[21] https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/system-planning-working-group/orderly-exit-management-framework-consultation-paper-december-2023

Chapter 4. Comments on specific topics in the Draft ISP, Appendices and Supporting Documents

This part of our submission provides specific comments on topics discussed across the Draft Plan and associated appendices. We use the same headings as in the Draft Plan or relevant appendix and reference the relevant pages from the Draft ISP 2024 and appendices. This approach has enabled our submission to more clearly focus on key topics / themes, particularly those that are relevant to more than one of the section headings from the Draft 2024 ISP.

Executive Summary – A plan for investment in the energy transition (Draft ISP pp 6-19)

Why is this an issue?

We ask whether AEMO's central conclusion on the least cost pathway is valid? This is a substantial concern for consumers. Also framing of the ISP's findings is important, particularly for wider audiences, including AEMO's ISP communications strategy.

What does the Draft ISP say?

Daniel Westerman says in his preface:

> "The plan outlines the lowest-cost pathway of essential generation, storage and transmission infrastructure to meet consumers' energy needs for secure, reliable and affordable energy, and to achieve net zero emissions targets."

The ISP proposes in many places that to achieve this plan:

> "Renewable energy connected by transmission, firmed with storage and backed up by gas-fired generation is the lowest cost way to supply electricity to homes and businesses throughout Australia's transition to a net zero economy."

Panel comments

This statement may have been true in the past when the political will to decarbonise was lacking at a Federal level and States were yet to introduce their own energy transition policies or the true cost and timetable of this form of transition were not known. However, given neither is the case today, and acknowledging the data provided in the ISP, we question its accuracy, relevance now and apparent basis that large scale transmission and supply-side options are the only tool for decarbonisation.

We agree that wind and solar energy are the cheapest generation sources on a $/MWh basis and that new transmission, storage, and gas generation will all play a key role in the future energy system. However, the most cost effective, reliable decarbonised future energy system will include more than just these things and not limit their use to the applications described.

Further, the ISP does not include a 'whole of system' model within which to consider how other elements might be co-optimised to play a different, potentially more significant role that results in lower costs to consumers.

- While more transmission is clearly needed, it is not the only option for connecting renewable generation. In fact, it's increasingly obvious that the cost of and timeliness to deliver this option is higher than previously hoped, such that relying on transmission risks delaying and adding material cost to the energy transition. At the same time, the lowest cost and fastest options to connect a limited amount of new generation are underutilised capacity in existing sub-transmission and distribution networks and behind the meter generation for C& I, business and household energy users. As the Draft ISP notes (p.7):

> "Rooftop solar alone contributed more electricity to the first quarter of 2023 (12.1%) than grid-scale solar, wind, hydro or gas."

- The potential role of storage extends well beyond firming, to include back-up (as defined for the ISP) and an alternative to building more networks; indeed, storage may be faster, more cost effective, more flexible and lower-risk tool for alleviating curtailment and maximising decarbonisation than some new proposed transmission projects.
- It would be remiss not to acknowledge the potential value of investments in energy efficiency, especially in the context of the significant load growth that AEMO foresees out until 2050. Energy efficiency reduces costs throughout the supply chain – in the wholesale energy market, ancillary services markets, transmission and distribution. Due to avoided thermal losses, each megawatt hour saved through energy efficiency saves about 1.1 MW hours of energy generated and transmitted. And in the future energy system where storage is prevalent, this figure may be even higher due to the roundtrip efficiency energy stored for the kinship and had a different time than it is generated.
- Demand response - including demand response that is currently available but untapped due to the lack of development of demand response markets, and future demand response opportunities such as electric vehicle charging and electrification of household gas loads – presents opportunities that will be able to compete with gas for back-up and storage for firming. This appears to be implicitly acknowledged on p.10, which notes Consumer Energy Resources such as VPPs as a potential firming source, however in most of the document it is not noted.
- The distinction made between firming and back-up is an overly binary one, particularly considering the draft ISP's own definitions of storage by depth and duration. Further, while the draft ISP addresses the need for backup of renewables during protracted periods of low wind and solar generation, there is little mention of the need to back up increasingly old and unreliable coal generation; despite the increased risk posed by an unplanned outage of one or more coal units.
- While the draft ISP addresses the need for backup of renewables during protracted periods of low wind and solar generation and to meet peak demand (see P24 for example), there is little mention of the need to back up increasingly old and unreliable coal generation; despite the increased risk posed by an unplanned outage of one or more coal units.
- A small, but not insignificant, number of existing energy users in regional and remote locations will be more cost-effectively supplied by predominantly renewable-powered stand-alone power supplies and microgrids that are independent of the distribution and transmission network.

Recommendations

Daniel Westerman says in his preface:

> "The plan outlines the lowest-cost pathway of essential generation, storage and transmission infrastructure to meet consumers' energy needs for secure, reliable and affordable energy, and to achieve net zero emissions targets,"

We do not believe that this is the case because the ISP is a transmission plan and not a whole of system plan.

The ISP proposes in many places that to achieve this plan:

> "Renewable energy connected by transmission, firmed with storage and backed up by gas-fired generation is the lowest cost way to supply electricity to homes and businesses throughout Australia's transition to a net zero economy."

For reasons outlined in Part 4, we believe a more accurate statement about how to achieve this plan would be something like:

> <u>"A combination of supply side measures - including grid connected renewables, energy storage and thermal generation - and demand side measures - including energy efficiency, demand response and consumer energy resources - is the lowest cost way to meet the energy needs of the homes and businesses throughout Australia."</u>

Executive Summary – Benefits of the Optimal Development Path (Draft Plan p.14)

Why is this an issue?

The Draft ISP quotes weighted net benefits of some $17.4b compared to $27b in the 2022 ISP – a significant drop. The way net benefits is defined and measured is not clearly presented in the Draft ISP. It is important that consumers and other readers of the ISP documents have clarity around its meaning and what they are being asked to support in the ISP results.

What does the Draft ISP say?

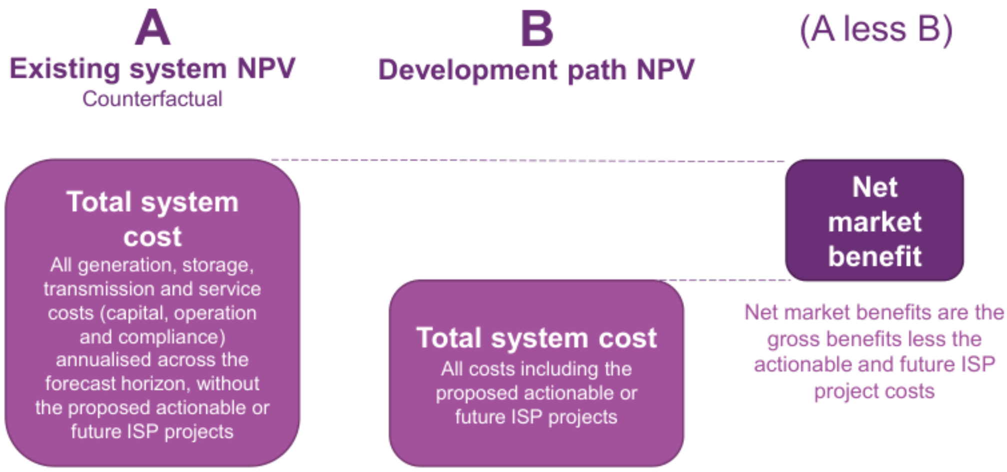
AEMO follows the AER's Cost Benefit Analysis Guideline[22] and describes its approach in the ISP Methodology as[23]:

> "The CBA assesses the benefits of ISP projects against a status quo where no ISP projects are built. This requires the development of a CFDP [counterfactual development path] to be modelled for each scenario. This counterfactual case considers the development of the system without any actionable or future ISP projects (although ISP development opportunities may be included) and is used to identify the market benefits of the set of ISP projects included in each DP. These benefits are the differences between the discounted total system cost of the CFDP and the discounted total system cost of each DP. (see Figure 20)."

[22] https://www.aer.gov.au/industry/registers/resources/reviews/review-cost-benefit-analysis-and-regulatory-investment-test-guidelines/final-decision

[23] See p.91 https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/isp-methodology-2023/isp-methodology_june-2023.pdf?la=en

Figure 20 Cost-benefit analysis calculation of net market benefits of development paths



The CFDP is the baseline from which benefits of the optimal development path are measured. It[24]:

> "…represents a development path (DP) with no future network augmentation other than committed and anticipated projects, or small intra-regional augmentations and replacement expenditure projects. It forms the basis on which all other DPs are compared within each scenario."

The committed and anticipated ISP projects[25] are Far North Queensland REZ, Project Energy Connect, Western Renewables Link, Central West Orana REZ and CopperString 2032 and are all included in the counterfactual. Committed projects meet all five of the commitment criteria (planning, construction, land, contracts, finance). Anticipated projects meet three of those five criteria[26]. Getting to those categories is driven by their inclusion in an earlier ISP ODP (all except CopperString) or due to Government action (CopperString). So, the measure of net benefits is the additional benefits that the 'already actionable', 'newly actionable' and 'future' ODP projects provide over the counterfactual projects. In the Draft 2024 ISP[27]:

> "Net market benefits of transmission investment have reduced by 37 percent, from $27.7 billion in the 2022 ISP to $17.45 billion. Factors include increased transmission costs, generator and storage costs, updated energy policies, commitment to transmission projects whose benefits are now assumed and not included in the total, and lower gas prices."

Panel comments

The Panel has only become aware of the details of this methodology as we have discussed the reasons for the lower net benefits with AEMO. It is important and not straightforward.

A project becomes 'committed and anticipated' and hence part of the counterfactual, either through a Government policy assumption (CopperString and CWO) or through it being part of a previous ODP and meeting the category criteria (Project Energy Connect (PEC) and Western Renewables Link (WRL)). Even though the capex estimate for CopperString has not been categorised to any level of accuracy, CopperString is included because of the Queensland Government policy. That policy took a

[24] Ibid p. 81
[25] Draft ISP Plan Table 1, p.12
[26] See Glossary p. 84 Draft ISP 2024
[27] Draft ISP Plan p. 19

$2.5b project in the Queensland Energy and Jobs Plan (QEJP)[28] in late 2022 and it became a $5b project in March 2023[29]. Even though the latest capex estimates for PEC and WRL are significantly above the capex estimates that were used to include them into the 'committed and anticipated' category (and hence the counterfactual), that is irrelevant to AEMO's assessment of net benefits for a CDP or ODP. The implicit assumption is that these projects will proceed, irrespective of whether they have net benefits.

AEMO's reasons for this net benefits measurement approach are twofold:

- They are modelling consistent with the ISP Methodology and the AER Cost Benefit Analysis Guideline, and
- The ISP is a plan for future decisions, not past decisions – it cannot keep re-evaluating past network decisions and AEMO does not debate the merits of projects which are well underway and/or which have Government commitment to proceed.

These are reasonable comments but are not obvious to consumers when reading the Draft ISP. A common theme in this submission is that AEMO should be clearer not only about what the ISP is, but particularly what it is not. This requires a much more transparent presentation of the role of the counterfactual and acknowledgment that the ISP makes no conclusion about whether the counterfactual projects have net benefits and are consistent with the NEO.

Looking more closely at a couple of these counterfactual projects, PEC was an actionable project in the 2020 ISP based on capex of $1.53b[30] (nominal). The AER's 5.16.6 review concluded in January 2020 that it was a marginal project and any significant change in costs could mean there are no net benefits[31].

By September 2020 Transgrid and ElectraNet had made a CPA application to the AER for total capex of $2.363b. The AER eventually approved $2.275b[32](nominal). At this cost it would have failed the 5.16.6 review and would not have been part of the 2020 ISP ODP. It would then have been re-assessed in the 2022 ISP at that higher cost. However, the fact that it did get into the ODP as a 'committed and anticipated project' meant it's net benefits were never re-assessed[33].

Western Renewables Link was a 'committed' project in the 2020 ISP on the basis of a PACR completed in July 2019 with a capex of $370m[34]. Given it is now a 'committed and anticipated project; the capital costs are irrelevant.

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[28] https://www.epw.qld.gov.au/energy/energy-jobs-plan?gad_source=1&gclid=CjwKCAiArLyuBhA7EiwA-qo80KTZ-lHnhzOwiy9FmNt4_w0pDGqjFdqDSoMSiVxodMaspSdxClnK4BoCpBMQAvD_BwE

[29] The conversion of part of the line to 500kV would only account for a portion of the increase. https://statements.qld.gov.au/statements/97314#:~:text=The%20Palaszczuk%20Government%20will%20deliver,planned%20to%20commence%20next%20year

[30] See p. 14 https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en&hash=6BCC72F9535B8E5715216F8ECDB4451C

[31] See p.11 https://www.aer.gov.au/system/files/AER%20-%20Determination%20-%20SAET%20RIT-T%20-%2024%20January%202020.pdf

[32] https://www.aer.gov.au/news/articles/news-releases/aer-approves-costs-project-energyconnect

[33] The Panel notes that PEC was a transitional project, and was therefore not subject to the ISP feedback loop. The TNSPs elected to progress like a normal RIT-T.

[34] See p. 4 https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Victorian_Transmission/2019/PACR/Western-Victoria-RIT-T-PACR.pdf

All ISP projects have seen significant capex cost increases as they have gone through the project development cycle. This is why the 2022 and current ISP Consumer Panels have placed so much focus on the accuracy of the capex estimates[35]. Projects can be placed into the counterfactual on the basis of poor capex estimates and once they are there they stay there, and consumers have no idea about their value. All that matters to AEMO in following its responsibilities is that Governments have committed to the projects and AEMO only has a role when the State jurisdictional rules allow the application of the feedback loop. PEC did not go through the feedback loop because it was a transitional project under the rules. WRL did not because of the Victorian framework.

Aside from AEMO's methodology, other factors are gradually reducing the stated level of net benefit transparency for consumers:

- The expansion in State derogations means more and more projects are getting into the 'committed and anticipated' and 'actionable' lists through input/assumptions of State policies rather than an assessment of individual project net benefits eg projects under the QEJP and NSW Roadmap do not go through the AER RIT-T process and do not have to demonstrate net benefits; South Australia's proposed[36] state-based planning function is another example.
- Even if a project that does become actionable through the ODP and must go through a RIT-T process, the AEMC is proposing that the assessment of a project's net benefits would only occur as part of the ISP, not as part of the RIT-T process. Its conclusion at Stage 3 of the recent Transmission Planning and Investment Review was[37]:

  > "The Commission also considers that there may be further opportunities to reinforce the ISP as the central process for considering the net benefits of the group of projects that form the optimal development path (ODP) and the RIT-T to focus on improving the robustness of efficient cost estimates of an individual project identified in the ISP."

  We assert that this is because this approach would save time. This is despite the ISP using capex estimates that are, in many cases ± 30 - ± 50% and history suggests capex costs may well exceed the upper bound. The AEMO submission to the AEMC noted[38]:

  > "AEMO believes this assessment of potential time savings is reasonable. TNSPs spend significant time and resources quantifying the benefits associated with an ISP project. The removal of the need to assess benefits as part of the options assessment process will inevitably free resources to speed up delivery of the remaining deliverables required....AEMO is of the view that the removal of the benefits assessment as outlined in the strawperson is likely to deliver material improvements in the timely delivery of ISP projects compared with the counterfactual[39]. This is because the resources dedicated to this exercise can be utilised in other activities and deliver these faster."

- AEMO responds that there is the feedback loop to protect consumers but of the 20 'actionable' and 'future' projects in Table 1 of the Draft ISP (p.12), only two – Humelink and

[35] See our submission on the Transmission Options Expansion Report https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-submission-on-teorfinal-14-june-23.pdf?la=en
[36] https://yoursay.sa.gov.au/regulations-for-planning-and-forecast-functions
[37] See p. i https://www.aemc.gov.au/sites/default/files/2023-05/stage_3_final_report_transmission_planning_and_investment_review.pdf
[38] See p. 6 https://www.aemc.gov.au/sites/default/files/2022-11/aemo.pdf
[39] Note that the use of the word 'counterfactual' here is in the context of the AEMC review and has a different meaning to 'counterfactual' in the ISP.

> Marinus – will go through the feedback loop as others are only subject to State based review processes (eg QEJP projects). The AEMC recently released a Draft Rule Change[40] to make the feedback loop timing/administrative arrangements clearer but it may apply to an almost empty box of projects.

AEMO uses the large net benefits of the ODP as a reason for consumers to support the ISP. Yet the modelling approach using the counterfactual as a reference point means consumers are not presented with the full picture of the costs and benefits of the transition that AEMO wants consumers to support. The treatment of the counterfactual projects as 'sunk costs' means AEMO's claim that the ODP represents the least costs should be reframed to something like:

> "Given the inclusion of committed and anticipated projects in the counterfactual, the measurement of the ODP net market benefits only refers to actionable and future' projects."

Recommendation

Given that both Government policy inputs and AER Guidelines mean that many of our concerns discussed above are outside of AEMO's control to change, we would recommend that AEMO provide greater clarity on how it applies this methodology and its limitations. This should be outlined in a consumer summary and not require readers delving into the complex Methodology appendix.

Executive Summary – Risks to the development of the ISP and the energy transition and Appendix 6.7

Why is this important?

Understanding risks in the context of ISP is critical, noting that energy markets are likely to experience greater uncertainty-

What does the Draft ISP say?

The Draft ISP's "Risks to delivery of the ODP and to the energy transition" (P14 to 16) provide an informative and considered assessment of risks.

Panel comments

One risk, despite being prominent for the ISP, is absent from this assessment: the risk of forecasting and prediction error. Despite AEMO's robust and rigorous approach to modelling and the Delphi process, there is no perfect foresight to draw on and there is a high risk that significant factors – such as energy demand, the development of markets, the cost of technology, Delphi scenario weighting – will prove very different in reality to what is forecast. AEMO's forecasts of energy demand over the last 20 years have borne this out.

Recommendation

AEMO should acknowledge and describe the risk of forecast errors in the relevant parts of the executive Summary and in Appendix 6

Part A, Section 1.1 – The two-part energy transition and its benefits (page 22)

[40] https://www.aemc.gov.au/rule-changes/improving-workability-feedback-loop#:~:text=Overview,of%20the%20feedback%20loop%20assessment.

Why is this important?

While reliability is important to everyone, what it is and isn't needs to be clearly expressed and understood by stakeholders and AEMO alike. Equally, its important any generalisations about consumer preferences remain accurate.

What does the Draft ISP say?

We provide two quotes from p.22:

> "Electricity is indispensable to our homes and businesses, and to the transport and communication networks we all rely on. All must have secure, reliable and affordable supply, and be confident it will be there when they need it."
>
> "Three types of consumers (heavy industry, businesses and households) have different needs when it comes to electricity.

Panel comments

The statement "All must have secure, reliable and affordable supply, and be confident it will be there when they need it," is repetitive in terms of the consumer expectation.

- While AEMO and energy market specialists differentiate between security and reliability, most consumers do not.
- Energy 'being there when and where they need it' is also reliability, therefore not required.
- If the ISP is to address consumer confidence, it should note confidence in affordability is at least as high a priority for consumers as confidence in reliability.

While there is mention of the three types of consumers that have different needs, the discussion around Figure 4 in the Draft ISP (p. 23) does not provide a clear explanation of what that means for ISP.

If the point is they have different needs for (by way of example) levels of reliability, then this misses that there is far more variability of needs between individuals and subsets of those groups than there is between the groups. While they might use different volumes of energy for different loads, be connected at different points in the system and have different capacity for flexible demand, they all still *need* the same thing: reliable and affordable energy.

Recommendations

> Simplify the statement of consumer needs – and similar statements elsewhere in the ISP -- to "All must have reliable and affordable supply".
>
> Explain more fully the three types of consumers and their different needs, as opposed to different connection points shown in Figure 4.

Executive Summary and Section 4.1- How the ISP results are represented – Coal is retiring faster than announced (Draft ISP Figure 1 and pp. 46-8)

Why is this important?

In the transition to achieving net zero emissions targets, the 'transition from' considerations can be as significant as the 'transition to' objectives. Coal fired electricity generation has been central to

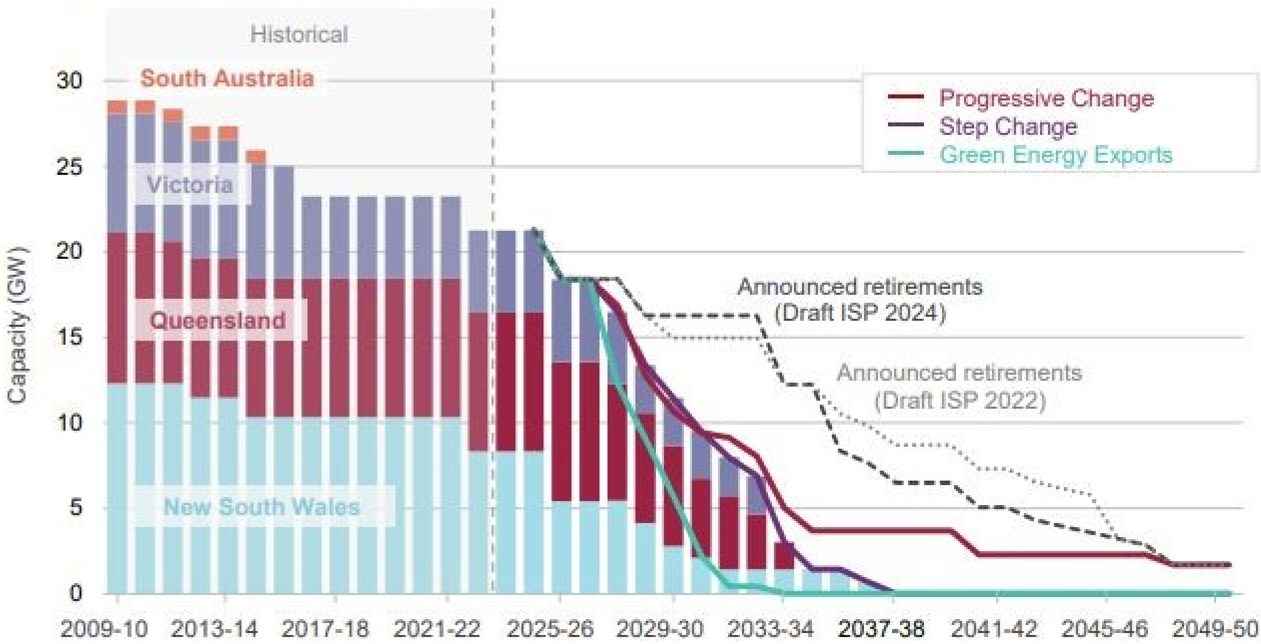
Australia's electricity generation for about a century, so it is well embedded in policies and practices in Australia and is part of the psyche of communities with a reliance on coal generation.

The aim of the ISP is to assess the ODP given inputs and assumptions including Government carbon targets. This leads to the development of a coal plant retirement profile. The ISP needs to be clear about how this profile is represented to consumers and what the so-called 'orderly exit' might mean.

What does the Draft ISP say?

The Draft ISP (p.8) refers to generator closure announcements that apply to all but one of the remaining fleet of coal generation power stations and provide for closure of about half by 2035 and the remainder by 2051. It then says (p.9) in relation to Table 1:

Figure 1 Coal capacity, NEM (GW, 2009-10 to 2049-50)



> "However, the ISP forecasts that the remaining coal fleet will close two to three times faster than those announcements. In the most likely Step Change scenario, about 90% of the current 21 gigawatts (GW) of coal capacity would retire by 2034-35, and all before 2040. Even in Progressive Change, only 4 GW of coal generation would remain in 2034-35."

AEMO go on to say in the context of the risks to the ODP (p.75):

> "While almost all owners of coal generators have announced their long-term retirement plans, they are only required to give three and a half years' notice of a closure, which would leave the NEM very little time to respond. Closures with short notice increase the risk of near-term reliability challenges and price shocks for consumers, and further accelerate the need for new generation."

Panel comments

Not surprisingly, this figure brought a lot of media commentary. What was not realised is that the conclusion of a closure profile much faster than announced is an outcome of the Government policy assumptions included in the modelling, not a forecast of what is going to happen. It is very unlikely to occur given that Governments have shown a willingness to do deals to keep coal plant open longer or, in the case of Queensland, publicly announce that they will adapt closing dates of State owned generators as required. Given this, a more transparent description for consumers of what the Draft ISP is saying is something like:

> "About 90% of the NEM's coal fleet is required to retire before 2035 to meet the Commonwealth and State carbon objectives."

The ODP is a very heavily constrained ODP given the extensive Government policy assumptions that take 15 pages in the Final IASR to explain[41]. In the 2022 ISP, the corresponding section on government policy was a mere 5 pages[42]. The ODP is an outcome of those assumptions with a carbon constraint central. Change the carbon constraint and the retirement profile changes.

What the ISP model does is decide which specific coal generators retire when. In NSW this is by unit rather than whole station, for Queensland it is an input from the QEJP retirement profile and, in Victoria, adjustments were made to align with State Government agreements.

Recommendations

That AEMO make the role of input policy assumptions on the ODP clearer in representing the ISP results regarding coal plant closure.

A more transparent description for consumers of what the Draft ISP is saying is something like:

> "About 90% of the NEM's coal fleet is required to retire before 2035 to meet the Commonwealth and State carbon objectives."

Part A Section 1.3 – Significant and diverse benefits (p. 28)

Why is this important?

Consumers need to have confidence that the claimed benefits of the transition are likely to be achieved.

What the Draft ISP says

The benefits are seen to be 'significant and diverse' where (p.28):

> "As a result of this investment, Australians are more likely to see:
>
> - greater insulation from the international shocks that affect gas, petroleum and coal prices, and that put unwelcome pressure on the cost of living…"

Panel comments

We agree with the sentiment. However, AEMO makes no reference to the adverse impacts that exposure to international costs from imported capex and skills will have on the costs of the transition. The cost of greater insulation from these international fuel cost pressures is coming at a time of greater exposure to international cost pressure on network and generation capex required to be spent to insulate consumers from the fuel cost pressures . While this is reflected in the inputs

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[41] See pp 24-38 https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios

[42] See pp 26-31 https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en

from the Transmission cost database and the GenCost reports, AEMO should note that the international context more fully.

Recommendations

AEMO to note the downside impact of connection to international material and equipment markets more explicitly.

Section 3.2 – The reliability, security, affordability and emissions reductions needs – balancing reliability and affordability

Why is this important

There is a natural tension between reliability and cost in the energy system, but there should be little left to the discretion of AEMO in the context of the ISP of finding a balance between these..

What the Draft ISP says

The Draft ISP says (p.36): 'balancing reliability and affordability is a matter of judgement', and notes the requirement 'network capability is sufficient to transport energy to consumers', without explaining what standard of reliability that entails.

Panel Comments

Recognising there are some aspects of the ISP that require differing levels of judgment, our view is there should be limited judgment involved in balancing reliability and affordability in the context of the ISP

The Reliability Standard should determine the level of reliability the system is planned for in the ISP, and the Value of Customer Reliability should determine the maximum operational costs incurred in avoiding outages. Both of those are determined independently of AEMO – by the AEMC Reliability Panel and the AER respectively – reflecting the value consumers place on reliability.

Recommendations

AEMO further explain, in the final 2024 ISP, how they have applied their judgement in balancing reliability and affordability, particularly recognising that reliability standards are set exogenously, in the context that:

- reliability settings for the ISP are determined by various prescribed elements, including the Reliability Standard and Value of Customer Reliability.
- AEMO assesses affordability according to the highest net benefits ODP to meet reliability and emissions requirements and within the relevant government policy constraints.

Section 3.2 – The reliability, security, affordability and emissions reductions needs- affordability as 'long term interests and net market benefits' (pp. 37-8)

Why is this important

Consumers and AEMO need to have a common understanding of what 'affordability' means.

What the Draft ISP says

AEMO considers 'affordability' in the ISP's purpose to meet the NEO requirement to act in the long term interests of consumers. AEMO says affordability (p.37):

> "…is measured by the 'net market benefits' that a development path may bring, which are in turn driven by 'low long-term system costs'. The lower those long-term costs are, all else being equal in an efficient market, the lower energy prices will be."

AEMO recognises that lower long terms costs will mean large investments will be made, generally 'up front'.

> "That means short-term affordability is only protected if investments are repaid over long-term schedules that do not penalise current consumers. The ISP assumes that these payment schedules are adopted by investors and reflected in wholesale energy markets."

Panel Comments

The Panel considers that 'net market benefits' is a flawed measure of 'affordability'. Our proposition is that:

- Consumers will not be able to 'afford' the annualised $16.4b ODP transmission costs[43] at the same time as all the other cost pressures they face; consumer support for the transition will not be sustained if they are forced to pay a substantial portion of the costs.
- Consequently, the issue of what is 'affordable' depends on 'who pays' and 'when' – how the costs are shared between Governments (taxpayers) and electricity and gas consumers and when consumers pay that cost.
- Governments have recognised this eg the recent Federal Government's decision to extend the Capacity Investment Scheme (paid for by taxpayers) rather than extending the RET (paid for by electricity consumers); the same is the case for the Rewiring the Nation fund.
- Then it not just the share that electricity consumer pay, it is how that electricity consumer share is divided up between different classes of consumers; this provides the opportunity for further discussion on the who pays question with the role of Government concessions and support for vulnerable customers who can be either small or large customers.

The Panel notes that financing through taxpayer funds rather than energy bills is more equitable as taxation is more progressive – higher income people pay higher tax rates, compared to financing through energy bills where lower income people pay proportionately more and have less capacity to reduce energy use from the grid. the pace of cost recovery is also important as it has implications for intergenerational fairness compared to the payback requirements from investors.

AEMO's assumption that repayment will occur over long periods is not going to occur in the financing of ISP projects flowing from the 2024 ISP. The AEMC's draft rule change on financing of ISP projects[44] provides for accelerated depreciation that increases the cost burden on consumers in the short to medium term. It also transfers risk from networks (who are best placed to bear it) to consumers (who have limited means to mitigate unless they are prepared to invest in rooftop solar but they will still be paying the network fixed cost component).

The question of 'who pays' is outside of AEMO's remit and it does not forecast electricity prices in the ISP – which would require assumptions on the 'who pays' story and knowledge of the distribution and retail tariff policies. It is also outside of AEMO's remit to discuss the distribution impacts now and in the future of implementing the ODP.

[43] Draft ISP p.14
[44] https://www.aemc.gov.au/rule-changes/accommodating-financeability-regulatory-framework#

This presents AEMO with a dilemma – it's remit means it cannot make any conclusion about affordability. It can only make a conclusion about highest net benefits which is not affordability. However, the need to convince consumers that the transition is 'affordable' is key to getting 'consumer social licence' to support for the ISP. This means consumer support for the ODP is crucially dependent on the level of Government financial support to ensure consumer affordability.

Consideration of consumer social licence is relevant to the work AEMO and the Panel have undertaken on consumer risk preferences. One concern the Panel had about the possible approach to measuring preferences was the lack of consideration of the distributional aspects of risk preferences.

Another important aspect of the distributional impacts is the barriers for many including low income groups, renters and people in embedded networks, who are generally unable to access the benefits of rooftop solar. Yet they are paying the cost that behind the meter investment imposes on networks and the costs AEMO incurs in managing the 'duck curve' that results from this rooftop solar.

Recommendations

AEMO should provide more clarity around how it sees its approach to measuring consumer affordability is valid.

AEMO should seek to develop measures of the distributional impact of the ISP.

Section 3.3 Preparing the ISP – Three potential scenarios for the future (p.40)

Why is this important?

The selection of the scenarios is central to the ISP process as highlighted above. Scenarios, combined with sensitivity testing, are a significant part of dealing with uncertainties about how the future will evolve in terms of the key factors that drive future energy demand and supply. This includes demographic, climate and economic factors along with technological, social, and political/policy changes and international developments.

What does the 2024 Draft ISP say?

The rationale and design of scenarios is most clearly explained in Section 2 of the 2023 Final IASR, rather than the Draft ISP. Having regard to the AER's CBA Guidelines, AEMO outlined five core principles for scenario development, namely[45]:

- Internal consistency
- Plausible
- Distinctive
- Broad
- Useful

While maintaining some consistency with the 2022 ISP, AEMO selected 3 scenarios– Step Change, Progressive Change and Green Energy Exports (GEE). The 2022 ISP "Slow Change' was removed as it was inconsistent with the more recent carbon policy decisions of governments in Australia.

[45] See p.14 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-inputs-assumptions-and-scenarios-report.pdf?la=en

However, these three scenarios are complemented by AEMO conducting up to 10 sensitivity tests in the Draft ISP. AEMO may also consider additional sensitivities in the final ISP. AEMO summarises how sensitivity analysis complements the three scenario: (Final IASR p.22):

> "There is inherent uncertainty around the set of inputs that make up each scenario, which creates risks for scenario based planning approach. … Sensitivities can be used to test how variation of significant inputs in the scenarios influence the outcomes of the resulting plan."

Panel Comments

The 2024 Panel supports AEMO's approach of limiting the scenarios while expanding the set of sensitivity tests. This approach provides some confidence that the 2024 ISP is not 'locking in stone' the specific scenario inputs. Rather, AEMO's approach of multiple sensitivities provides useful information in response to the concerns of stakeholders - it addresses the 'what if…?' questions around several of the key assumptions in the scenarios.

While the Panel supported AEMO's overall approach to developing the scenarios, the outcomes of the Delphi process has highlighted several challenges that will need to be addressed in the 2026 ISP.

The two key challenges in the current scenario settings are:

(a) The closeness of the ranking of two of the three scenarios:

As shown in the figure above, the Step Change and Progressive change ratings are very close, 43% and 42% respectively. In effect, these two scenarios are 'tied'. In contrast the rating for the Green Energy export is a low 15%, suggesting that the Delphi Panel participants were, overall, doubtful about the likelihood of this scenario. This is not necessarily a major concern for the selection of the ODP which is based on **weighted** net market benefits and weighted least-worst regrets, albeit we outline some potential issues below.

Other parts of the analysis presented in the Draft ISP focuses on the results of the Step Change scenario only, including the timing of transmission developments and demand for gas generation. It is not clear how these two approaches (weighting scenarios, and sole reliance on Step Change scenario) work together in guiding the final optimisation of the energy transition process, particularly post the 2030s when the paths of the two scenarios begin to diverge (see figures below). The Panel also note the comments from the AER's recent transparency review of the Draft 2024 ISP. The AER stated in the review with respect to AEMO's focus on the Step Change scenario[46]:

> "Further, much of the output in the draft ISP and its appendices is only presented in the step change scenario despite the progressive change scenario having a similar weighting.
>
> We expect AEMO to provide details in an addendum to the draft ISP for any sensitivity analysis undertaken for scenarios other than the step change scenario, or explain the reasons for why it has not undertaken the additional analysis. "

It also raises questions around the application of the scenario selection principles cited by AEMO (see above). For example, do the inputs to the Step Change and Progressive Change vary sufficiently to meet the principles of 'distinctive' and 'broad'? Or is it more the case that that while the inputs vary, the outcome of these assumptions are not significantly different until after 2030? The Panel sees this as an open question that may need to be considered prior to the 2026 ISP.

[46] See pp.2-3, https://www.aer.gov.au/news/articles/communications/transparency-review-aemo-draft-2024-integrated-system-plan-complete

(b) The significant difference between the two scenarios above and the Green Energy Export (GEE) scenario

The GEE scenario describes a very different world than the other two scenarios. Not only does the GEE scenario reflect very rapid decarbonisation of the energy sector (and other sectors) through strong use of electrification, domestic green hydrogen and biomethane, it also envisages a significant hydrogen export industry emerging after 2030.

AEMO's analysis illustrates the extent to which the GEE scenario diverges from the other two scenarios in terms of electricity consumption, and transmission and generation investments, particularly from 2029/30. This is a result of the forecast rapid growth of both the internal and external (export) hydrogen markets. This is illustrated in the two figures below on annual consumption[47] and transmission investments.[48]

Figure 1 Annual electricity consumption by scenario

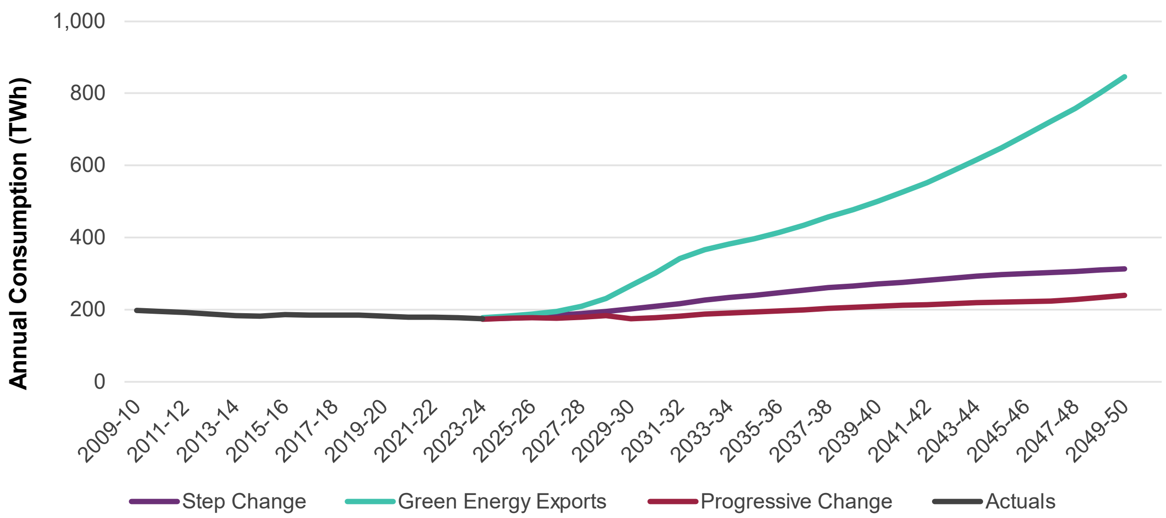
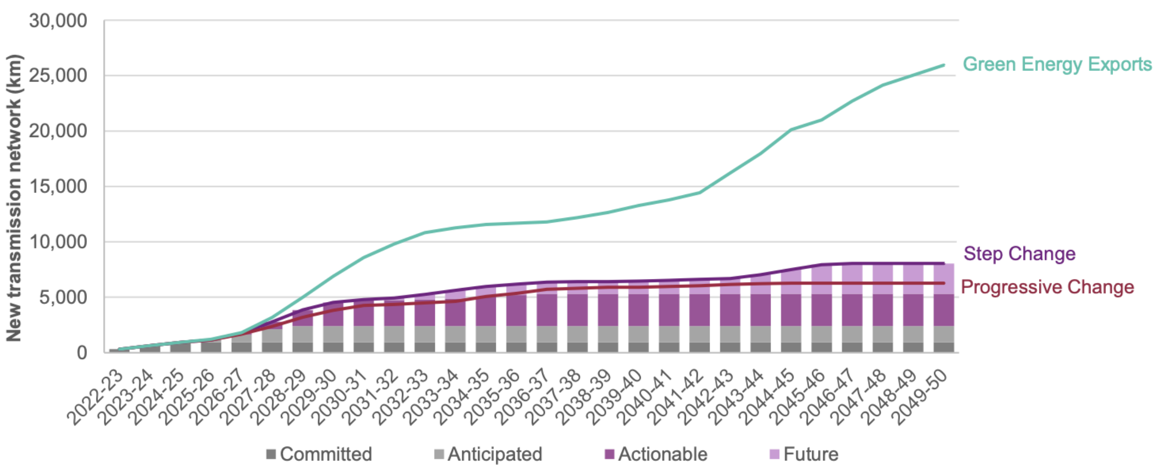


Figure 2 New transmission network investments required in the least cost development path



[47] Chart provided with thanks by AEMO, February 2024.
[48] The transmission investment chart can be found in the Draft 2024 ISP, Appendix 5, p. 9.

The Table below[49] provides further detail on how the GEE scenario diverges by 2040 from the other two scenarios, particularly with respect to the rate of electrification and the components of underlying forecast consumption.

Table 5 Scenario comparison at 2040

	Reference value for scenarios	*Green Energy Exports*	*Step Change*	*Progressive Change*
Electrification and energy efficiency savings				
% of road transport that is EV	2022-23: <1	72	60	32
% of residential EVs still relying on convenience charging	2022-23: ~75	38	46	56
Business electrification (TWh)	Max. potential: 41 A	36	25	20
% increase from current business consumption	n/a	26	18	15
Residential electrification (TWh)	Max. potential: 12 A	9	9	6
% increase from current residential consumption	n/a	16	15	11
Energy efficiency savings (TWh)	n/a	41	36	26
Underlying consumption				
NEM underlying consumption (TWh)	2022-23: 193	345	299	230
Hydrogen consumption (domestic) (TWh)	2022-23: 0	50	28	15
Hydrogen consumption (export, including green steel) (TWh)	2022-23: 0	183	7	0
Total underlying consumption (TWh)	2022-23: 193	578	335	246
Supply				
Distributed PV generation (TWh)	2022-23: 24	92	77	45
% of household daily consumption potential stored in batteries	2022-23: 1%	22%	21%	3%
% of underlying consumption met by CER	2022-23: 12%	16%	23%	18%
Share of electricity emissions in economy-wide emissions (NEM states only)	CY2021: 36%	1%	1%	9%
Estimate of NEM emissions production (MT CO_2-e)	CY2021: 132	2	1	22

Note: Totals tabulated above may not tally due to rounding.
A. For the purposes of this table, the 'maximum potential electrification' reflects the 2050 electrification forecast for the *Green Energy Exports* scenario. This scenario assumes that residential buildings are able to fully electrify by 2050 and that industries that are theoretically able to electrify have adopted those electrification technologies by 2050. In this way, the 2040 electrification values for each scenario can be put into context by comparing to this 'maximum potential electrification' value.

The Panel's concerns in this instance relate to the significantly different outputs produced under the GEE scenario and to the impact of this difference on the selection of the CDPs/ODP, most particularly when AEMO uses the weighted scenario outcome in its selection process.

The Table above, describes the modelling inputs and outputs in 2040 for each of the three scenarios. For example, in terms of underlying consumption, the forecast for GEE is over 70% greater than Step Change (578TWh vs 335TWh). This flows through to the requirements for new renewable generation, storage and transmission infrastructure. However, 183TWh of the total consumption for the GEE scenario relates to either the export of hydrogen or hydrogen processing for export of green steel.

The Panel therefore concludes that the inclusion of the GEE scenario in its current form and while there is so much uncertainty around the timing of and even the overall prospects for the development of markets for export hydrogen and green energy projects, the GEE scenario may not

[49] See Table 5, p. 21 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-inputs-assumptions-and-scenarios-report.pdf?la=en

meet AEMO's principles of 'plausibility' and 'usefulness' (see above).[50] This is not to say the issue should not be considered at all, but perhaps considered as a sensitivity, or as a separate analysis in the Final 2024 ISP. At the very least, if the GEE scenario (in its current form) is retained in the Final 2024 ISP, the outsized influence of the GEE scenario should be acknowledged and the implications for the selection of the ODP more carefully considered.

The development of the export market raises other important questions. For example, at some stage there will need to be transparency (from AEMO or other relevant parties) on the financing structures and on 'who pays' for this expansion of transmission, storage and renewable energy. Will Australian energy consumers be expected to pay in their energy prices for the development of energy infrastructure designed for commercial export markets?

For example, If the justification for Marinus 2 relates principally to meeting the demand identified under the GEE market scenario, then who should fund it and who should take the commercial risk of the additional infrastructure.

In our view, the inclusion of this GEE scenario has an 'outsized' influence on the selection of the ODP from the set of CDPs for the following reasons.

AEMO has selected CDP11 as the preferred ODP for the 2024 ISP with a weighted net market benefit of $17.45b. Looking at the individual scenarios for CDP11, the net market benefit for the Step Change scenario is $17.35b, Progressive change is $7.24b and GEE is $46.35b.

The table below[51] illustrates the net market benefits (and worst weighted regrets) for the top five CDPs.

Table 45 Top five candidate development paths across scenarios (in $ billion) – in order of descending weighted net market benefits

CDP	*Step Change*	*Progressive Change*	*Green Energy Exports*	WNMB	WNMB Rank	Worst weighted regrets	WWR Rank
11	17.35	7.24	46.35	17.45	1	0.33	3
14	17.25	7.06	46.93	17.42	2	0.26	1
3	17.85	7.25	44.41	17.38	3	0.62	8
8	17.78	7.44	44.10	17.38	4	0.66	10
7	17.79	7.07	44.97	17.36	5	0.53	4

AEMO has selected CDP11 as the preferred ODP for the 2024 ISP. CDP11 is the same as CDP3 except CDP11 includes Marinus Stages 1 and 2 while CDP3 includes Marinus Stage 1 only.

For CDP11, the table above shows that the net market benefit for the Step Change scenario is $17.35b, Progressive change is $7.24b and GEE is $46.35b**.** The total weighted net market benefit ('WNMB') is $17.45b (col 5).

While GEE is weighted only 15% in the Delphi process, in practice it contributes close to 40% of the total weighted net market benefits ($17.45b) because the net benefits of this scenario are so much greater than the other two.

Similarly, CDP14 (which is the only other CDP in the top five candidates that includes Marinus Stage 2, but also includes QNI), is rated second, but this appears to be again influenced by the high net

[50] The challenges facing the development of a competitive hydrogen market are also discussed below.
[51] Appendix 6 p. 69

market benefit rating under the GEE scenario. Meanwhile, CDP7 (which excludes Marinus 2 but includes QNI) scores highly on the preferred Step Change scenario ($17.79b). However, its overall net weighted ranking (WBNB) is dragged down by the lower net benefits under the GEE scenario.

Focusing on AEMO's preferred individual scenario (the Step Change scenario), CDP3 has the highest net market benefits (Col 2). Moreover, under the Progressive Change scenario CDP3 is second in terms of net market benefits.

That is, without the impact of the inclusion of GEE in the weighted net benefits assessment, CDP3 would arguably be the preferred ODP, even though it has a higher score (worse score) on the worst-weighted regrets (0.62 in Col 7). However, this latter poorer score is driven, at least in large part, by the electricity supply needs of the GEE scenario[52].

The question is whether this matters in terms of the extent and timing of transmission, renewable energy and storage proposed in the ISP?

AEMO's further analysis of the same top five CDPs, shows the potential *actionable* projects that could be delivered in the next decade for each of the top five CDPs. This is set out in the table below.

Candidate development paths by actionable projects. (Appendix p.69)

Table 46 Potential actionable projects in the top five CDPs

In these CDPs …		...These projects would be actionable:										
		Gladstone Grid Reinforcement	Queensland SuperGrid South	QNI Connect	New England REZ Transmission Link	New England REZ Extension	Sydney Ring	HumeLink	VNI West	Project Marinus Stage 1	Project Marinus Stage 2	TAS Central Highlands REZ Upgrade
3	*Step Change* least-cost	✓	✓		✓	✓	✓	✓	✓	✓		✓
8	CDP3 without actionable New England REZ Extension	✓	✓		✓		✓	✓	✓	✓		✓
7	CDP3 with actionable QNI Connect	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
11	CDP3 with actionable Project Marinus Stage 2	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
14	CDP3 with actionable Project Marinus Stage 2 and actionable QNI Connect	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

In the table above, AEMO uses as its comparison base CDP3, '*Step change* least cost' (i.e., the CDP with the highest net market benefit rating ($17.85b,as per the previous table).

In CDP3, two major transmission projects - QNI Connect and Project Marinus Stage 2 - are ***not*** 'actionable' projects, in contrast to CDP11 (the chosen ODP) where Marinus Stage 2 is actionable.

The cost of developing Marinus Stages 1 and 2 comes at a significant premium to developing Marinus 1 alone. It is also classified as an actionable project due for *full capacity* delivery in June 2032 under the ODP (CDP11). This date for delivery of the full capacity of the Marinus Stage 2 transmission link is

[52] Notably, CDP14 has the 'best score' (i.e., lowest score) on worst weighted regrets measure of 0.26 (Col 7 in the table above), which is not surprising as it includes the building of *both* Marinus 2 and QNI as actionable projects.

well ahead of the time it is required under the Progressive Change scenario (2036-37)[53] and even more so under the Step Change scenario (2047-48[54]).

Overall, the Panel finds it concerning that AEMO promotes CDP11 as the ODP when the statistical methodology skews the total impact of a very low probability scenario. We are concerned that it may promote the development of Marinus Stage 2 (and the associated additional transmission in Tasmania and related Victorian infrastructure) in the actionable development window without sufficient justification[55].

The Panel's concerns are heightened by a press release from Minister Bowen and the premier of Tasmania in September 2023 on the development of Marinus Stage 1 and Stage 2[56]:

> "The project will be focused on one cable in the first instance, with negotiations to continue on a second cable [Stage 2] to be considered after FID on cable 1. AEMO ISP modelling finds the majority of benefits from Marinus Link are realised in the first cable – close to two thirds. In addition, Tasmania will also get an added energy security benefit from cable one, providing critical redundancy for Basslink." [emphasis added]

The AER also recognised the uncertainty regarding the Stage 2 development in its Stage 1 early works revenue determination for Marinus Project (December 2023). The AER stated[57]:

> "One transmission project identified is Marinus Link, included in the 2022 ISP as an 'actionable project' under the optimal development path (ODP). The [2022] ISP recommends commencing operation of cable one in 2029 and cable two in 2031. On 3 September 2023, Marinus Link shareholders announced the project will focus on delivery one cable one cable at an estimated cost of $3.0-$3.3 billing, with negotiations to continue on a second cable."

Each of these statements reinforce first, that Marinus Stage 1 is a viable actionable project and should be part of the 2024 ISP. However, each of the statements also indicate a level of uncertainty about the benefits and the timing of Stage 2. In our view, the progress to Stage 2 does not appear currently to have the full confidence of either Governments or shareholders.

The reason for providing this detail is not to criticise AEMO's analysis, AEMO has conducted an appropriate process within the Delphi model framework in applying the scenarios (as we discuss below), albeit AEMO's reasons for the inclusion of the Green Energy Export as a scenario, are not sufficiently transparent at least in AEMO's public documents.

It is reasonable to suggest, for instance, that AEMO could have chosen a third scenario with all the parameters of the GEE scenario (including rapid decarbonisation) but leaving out the export trade.

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[53] See Appendix 6, Table 8, pp.24-25. Draft 2024 ISP.

[54] See Appendix 6, Table 8, pp.24-25. Draft 2024 ISP.

[55] This is particularly concerning as AEMO has identified Marinus 2 as part of a single actionable project that includes Marinus 1 and Marinus 2 with a single RIT-T. Marinus 1 can and should proceed according to AEMO's timetable, but there appears to be little requirement (other than if the GEE goes ahead in the early 2030s) for expenditure on Marinus Stage 2 in the current actionable period. We note too, that the RIT-T for actionable projects includes a review of costs but does not include a reassessment of the benefits, further increasing the risk of adopting this part of the Marinus project.

[56] See joint press release September 2023: https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-investing-future-tasmanian-energy-marinus-link

[57] See p.iii https://www.aer.gov.au/system/files/2023-12/AER%20-%20Revenue%20Determination%20-%20Marinus%20Link%20Stage%201%20Part%20A%20%28Early%20works%29%20-%20December%202023.pdf

The impact of the export trade could then be investigated on a stand-alone analysis – or as an additional sensitivity as noted above.

Overall, the assessment of the scenarios illustrates the importance of the task of selecting the initial scenario set. The task should be undertaken in conjunction with reviewing the principles for selecting scenarios that AEMO has identified (see above). The Panel questions whether AEMO has adequately considered the principles it has already espoused when defining the scenarios and then selecting the ODP. The influence of the GEE scenario on the ODP selection process belies its low 'likelihood' ranking by participants in the Delphi process.

The analysis above indicates the need for the process of selection of the scenarios and their attributes be revisited at an early stage in the development of the 2026 ISP and with a fuller consultation process that includes a range of industry and consumer stakeholders.

We suggest the revised scenarios should avoid including a scenario, such as the Green Energy Exports scenario that is so different from a conceptual perspective and subject to so much uncertainty around the inputs.

The Panel also observes that as Jurisdictions legislate for interim carbon reduction targets and further implement policies on consumer led activities (such as CER) as part of their transition to their net zero target dates, then the scope for variation in scenarios for future ISP consideration is diminished.

Recommendations:

For the 2024 ISP:

- AEMO more transparently set out its position on Marinus 2, and whether the Marinus Stage 2 component of the Marinus Project should be classified as an actionable project in the 2024 ISP.
- If AEMO chooses to proceed with the inclusion of Marinus Stage 2 as actionable project in the 2024 ISP, then AEMO should explain why it has included the second stage as an actionable project and with delivery due in early 2030s.
- AEMO should demonstrate how this decision is consistent with the AER's CBA Guideline which requires AEMO to balance the risks to consumers of (inter alia) 'premature' investment in the transmission network[58].

For the 2026 ISP:

- AEMO revisit the three scenarios for the 2026 ISP bearing in mind the issues raised by the Panel in the selection and use of the scenarios, including application of its own principles of 'diversity', 'broad', 'plausible' and 'useful' (particularly with respect to the inclusion of the GEE scenario).
- The core principles to be used in the selection of scenarios should be revisited with the 2026 Panel.
- AEMO commence a process of a wide-ranging consultation on the scenarios earlier in the 2026 ISP process including industry and consumer stakeholders, as well as the 2026 ISP Panel.
- The core principles to be used in the selection of should be revisited with the 2026 Panel.

[58] For example, see p.17 https://www.aer.gov.au/documents/aer-cba-guidelines-final-amendments-clean-6-october-2023. The requirement to balance the risks of over-or premature investment in the AER's CBA Guideline follows the requirements in NER Clause 5.22.5(e)(1).

AEMO commence a process of consultation on the scenarios earlier in the 2026 ISP process and based on consultation with a range of industry and consumer stakeholders, including the 2026 ISP Panel.

Section 3.3 Preparing the ISP – Three potential scenarios for the future Delphi Panel selection of scenario weights (p. 41)

Why is this important?

In the previous section, we discussed some of the challenges of selecting and defining in detail the scenarios that satisfy the principles laid out by AEMO. In this section, we focus on the Delphi process which AEMO uses to weight the scenarios it has selected.

The process for selecting scenarios and the subsequent relative weighting of the chosen scenarios is a crucial and early step in the process of developing the CDPs and the final ODP as we highlighted above. Compared to the 2022 ISP, there is arguably more certainty about inputs on emissions policies, but a great deal of uncertainty about how different future external market environments may evolve. Scenarios are a way of managing this uncertainty, particularly when combined with a range of sensitivities AEMO has developed in the 2024 ISP, and which the Panel supports.

The AER's CBA 2023 Guideline[59] requires the development of scenarios as part of the ISP process (p 8). The Guideline defines the role of scenarios as(p 17):

> "Scenarios are different external market environments that are used in the CBA [cost benefit analysis] to assess and manage uncertainty about how the future will develop. They are based on variations to input variables and parameters that drive supply and demand conditions…The market benefits of a given development path will change across different scenarios, and this allows AEMO to understand the impacts of key uncertainties on each development path."

The Panel recognises the importance of scenario development and sensitivity testing, not only for AEMO's understanding, but also for the multitude of users of the ISP and AEMO's other forecasting and planning documents such as the ESOO and GSOO.

What does the Draft ISP say?

AEMO has progressively developed the process for defining and weighting of the scenarios, with each ISP building on the previous ISPs. For the 2024 ISP it selected three scenarios, removing the 'slow change' scenario in the 2022 ISP, given the extent to which governments' carbon policies have developed in the interim[60].

AEMO initiated use of the Delphi technique in the 2022 ISP to develop these weights. The 2022 Consumer Panel made several recommendations to improve this process for the 2024 ISP[61]. The 2024 Panel worked closely with AEMO to co-design a much more comprehensive Delphi Panel process for the 2024 ISP. This covered panel member selection to ensure appropriate breadth and

[59] https://www.aer.gov.au/system/files/2023-10/AER%20-%20CBA%20guidelines%20-%20final%20amendments%20%28clean%29%20-%206%20October%202023_0.pdf

[60] See for example, p. 6 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-inputs-assumptions-and-scenarios-report.pdf?la=en

[61] See pp 32-35 https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en

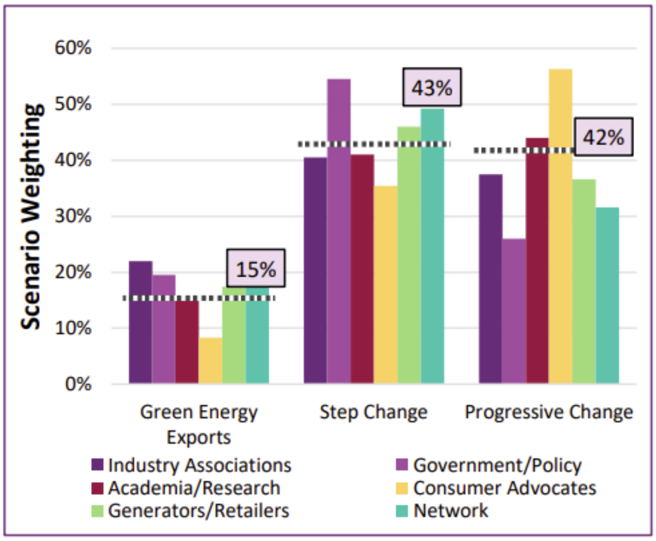
depth of stakeholder participation – particularly for consumers who were under represented in the 2022 Delphi Panel; the question that was asked, the time allowed for the process and the pre-read.

The question asked was:

> "Based on your knowledge of the future of the energy sector, what is the relative likelihood of each of AEMO's three core scenarios for the 2024 ISP?"

The result was a 'likelihood' of 43% for Step Change, 42% for Progressive Change and 15% for Green Energy Exports[62]. Consumers strongly favoured Progressive Change, networks and 'Government/Policy' participants strongly favoured Step Change. Consumer participants pointed to supply chain and social licence challenges that led to more support for Progressive Change.

Figure 3 – 2024 ISP Delphi Panel scenario likelihood by group



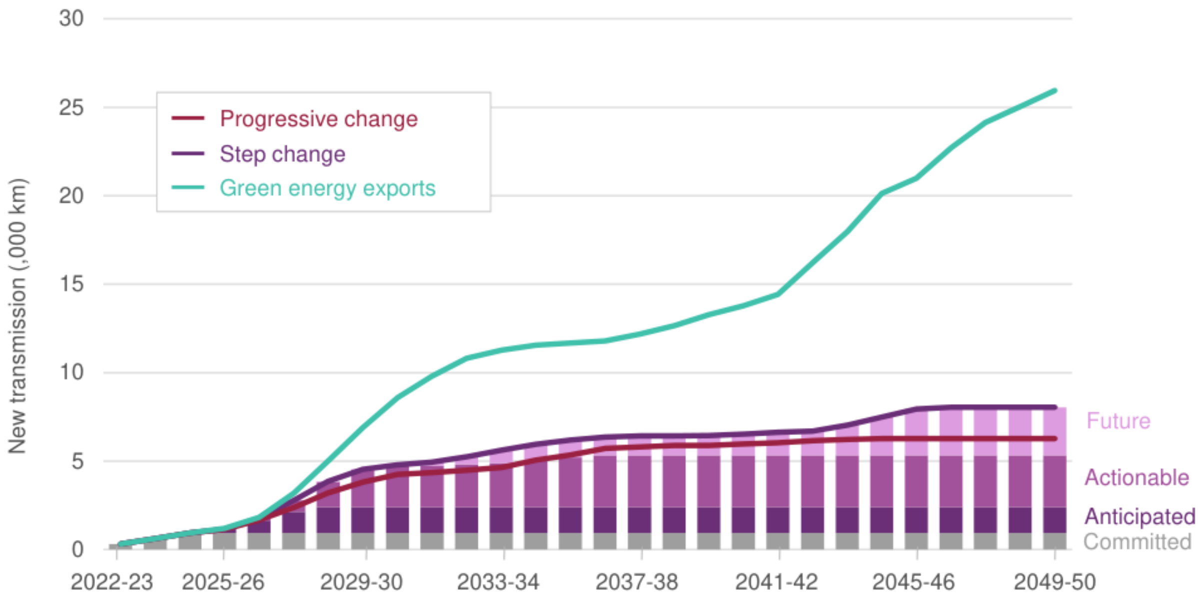
AEMO concluded that the Step Change scenario was the 'most likely' scenario for this Draft 2024 ISP.

The ODP (and the allocation of projects between the 'actionable' and 'future' categories) is based on scenario weightings, not just the 'most likely' scenario. The new transmission build under the Step Change scenario is only marginally higher than the Progressive Change scenario until the late 2030s as illustrated in the figure below. Both scenarios have ~5,000 kms of new transmission lines in the next decade, about half of which is either 'committed' or 'anticipated'[63]:

[62] https://aemo.com.au/-/media/files/major-publications/isp/2023/2024-isp-delphi-panel---overview.pdf

[63] See Draft ISP p.55

Figure 18 New transmission in least cost development paths (kms, 2022-23 to 2049-50)



Panel comments

We appreciated the open and transparent engagement with AEMO in the development of the 2024 Delphi process. The end result was a considerable improvement on the robustness of the results from the 2022 ISP. Our comments focus on the question the Delphi Panel participants was asked:

> "Based on your knowledge of the future of the energy sector, what is the relative likelihood of each of AEMO's three core scenarios for the 2024 ISP?"

As the Panel has reviewed the Draft ISP and seen the significant impact of Government policy on the results, we would suggest reconsideration of the question for the 2026 ISP. All three scenarios are required to meet the carbon budget policy [64] and the net zero by 2050 constraints. They differ on the pace of achieving that constraint with there being very little difference between the CDPs for Progressive Change and Step Change scenarios for the next 10 years. The Delphi participants responses are constrained to assume that the only pathways to achieve the 2050 carbon constraint are those represented by the three scenarios. They are not given the choice to say something like:

- 'I do not believe that a carbon constraint in the public policy inputs will occur in practice the way it is represented in the three scenarios, so I do not vote for any scenario' or
- 'I don't believe that the Federal Government's 83% renewables by 2030 target will be achieved'.

What we have is the 'most likely' of a constrained choice. Participants were not able to take account of the scenario risks in assessing likelihood. We do not have a ready answer for what an alternative might be, only that this question be considered for the 2026 ISP Delphi Panel process be the subject of further discussion with the 2026 ISP Consumer Panel.

[64] AEMO estimates a carbon budget (cumulative carbon equivalent emissions allowance) based on international agreements, Australia's obligation to contribute to these targets and the energy industries contribution to Australia's emissions.

Recommendation

AEMO to continue active engagement with the 2026 ISP Consumer Panel to explore further improvements that may be made to the Delphi process.

Section 4.2 – Four times today's consumer energy resources (pp. 47-8)

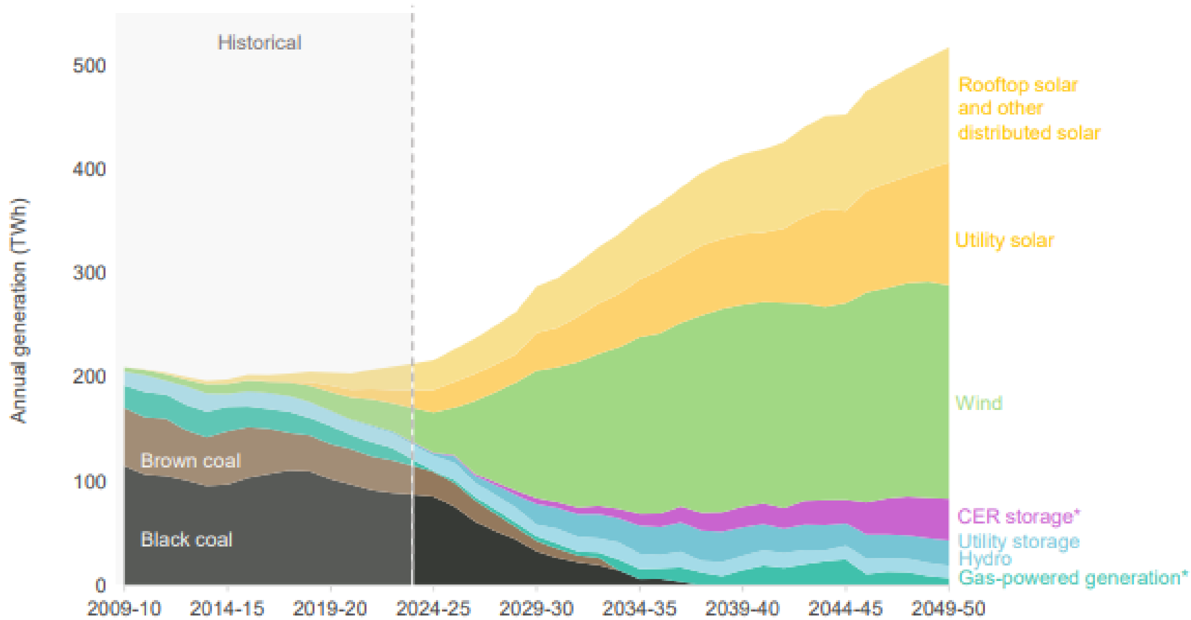
Why is this important?

The role of Consumer Energy Resources (CER), sometimes referred to as distributed energy resources (DER) is increasingly important for the transition. Firstly, because consumer managed energy resources creates 'agency' for consumers, enabling many households, businesses and communities to feel more in control of their own energy costs and reliability. Secondly, CER is increasingly significant for the amount of electricity generated and the capacity for DER to reduce peak demand and the associated network investment costs. For an example, of the potential magnitude of CER in the NEM, the AEMO 2023 South Australian Electricity report[65] shows that rooftop PV for 2022-23 was 24.03% of 'registered capacity' for the state while there have been periods where the entire SA electricity demand has been met by PV.

Much of the focus on CER/ DER for the past decade or so has been on rooftop PV, owned and utilised by customers. More CER attention is now turning to storage, primarily batteries, electric vehicles and third-party providers. These include aggregators eg virtual power plants (VPP's) and home management systems utilising software to efficiently manage energy use.

What does Draft ISP 2024 say?

Figure 9 Generation mix, NEM (TWh, 2009-10 to 2049-50, *Step Change*)



Notes: Annual generation for 2023-24 has been estimated for the full financial year.
The forecasted gas-powered generation includes some potential hydrogen and biomass capacity.
"CER storage" are consumer energy resources such as batteries and electric vehicles.

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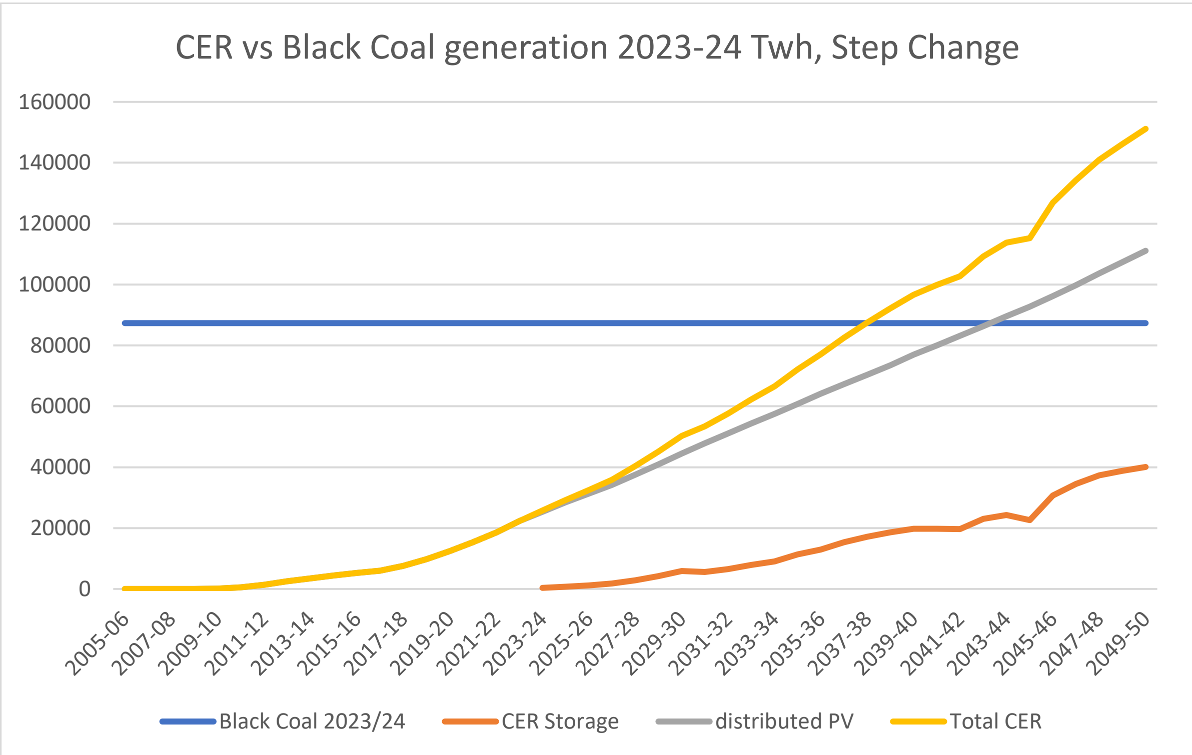
65 https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/sa_advisory/2023/2023-south-australian-electricity-report.pdf?la=en

This chart tells many stories. The Draft ISP states (p. 47):

- "Solar generation continues to rise. Today, one-third of detached homes in the NEM have rooftop solar. By 2034 in the Step Change scenario, over half of the detached homes in the NEM would do so, rising to 79% in 2050, driven by ever-falling costs. At that time, forecast total rooftop solar capacity is 72 GW.
- Residential and commercial batteries are becoming more numerous as costs decline, with adoption forecast to grow strongly in the late 2020s and early 2030s. The Step Change scenario forecasts growth in capacity from today's 1 GW to an estimated 7 GW in 2029-30, and then 34 GW in 2049-50.
- EV ownership is also expected to surge from the late 2020s, driven by falling costs, greater model choice and availability, and more charging infrastructure. By 2050, between 63% (Progressive Change) and 97% (Step Change) of all vehicles are expected to be battery EVs."

Panel comments

One of the less obvious stories from the figure above is that by about 2037-38 household and small business consumers will be generating as much electricity as coal is today (2024), using the Step Change scenario. The following chart defines Consumer Energy Resources (CER) as the sum of CER storage, rooftop solar and other distributed solar[66].



Arguably the largest CER change underway for the draft ISP 2024 is the purchasing of electric vehicles (EV). The projections for EV ownership are supported by 2023 vehicle sales which were released after the Draft 2024 ISP was published[67].

[66] Based on Draft ISP Figure 9 p. 30

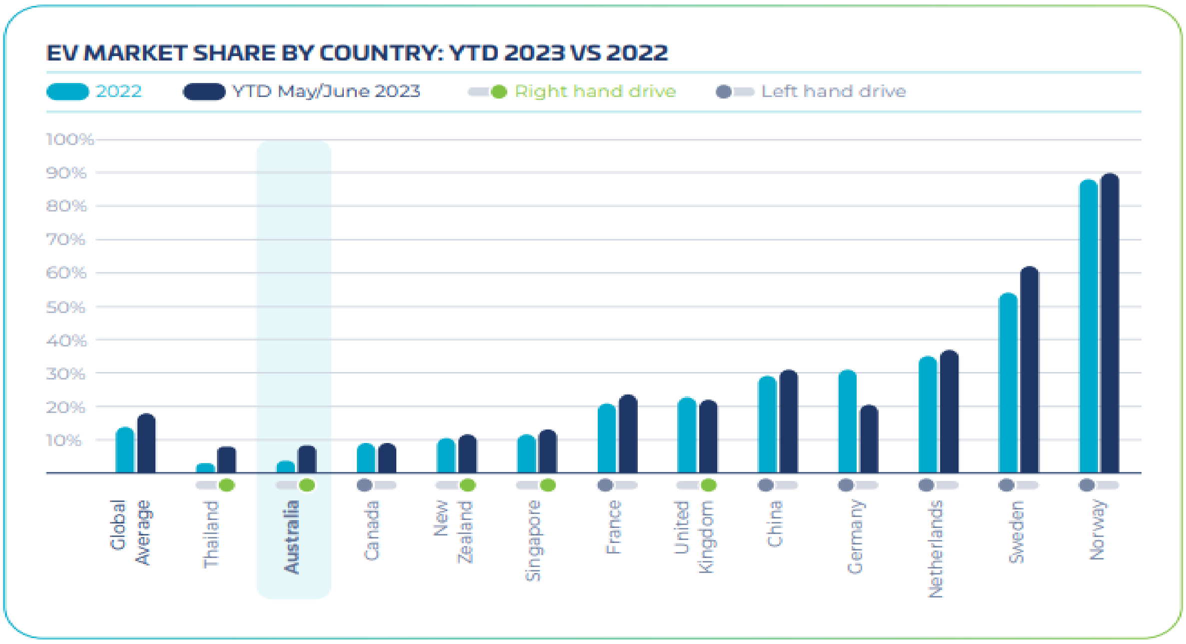
[67] See p. 7 https://electricvehiclecouncil.com.au/wp-content/uploads/2023/07/State-of-EVs_July-2023_.pdf

December 2023: New car sales by fuel type

Fuel Type	2023 Total	2022 Total
Petrol	588,622	551,526
Diesel	379,512	361,366
Hybrid	98,439	81,816
Electric	**87,217**	**33,410**
Plug-in Hybrid (PHEV)	11,212	5,937

This data shows that nationally, EV sales more than doubled in 2023 compared to 2022. The Electric Vehicle Council also reported that for the financial year ending June 2023, the ACT lead Australia with 21.8% of all new cars being EVs. This compares with a national wide rate of 7.5% of new vehicles being EV's, which is just one third of the ACT rate.

In considering whether this trend of electric vehicle sales is likely to continue, the Electric Vehicle Council has also released this chart showing that Australia's rates of EV sales are low compared to many other nations, indicating capacity for the trend of increased EV sales to continue over coming years[68].



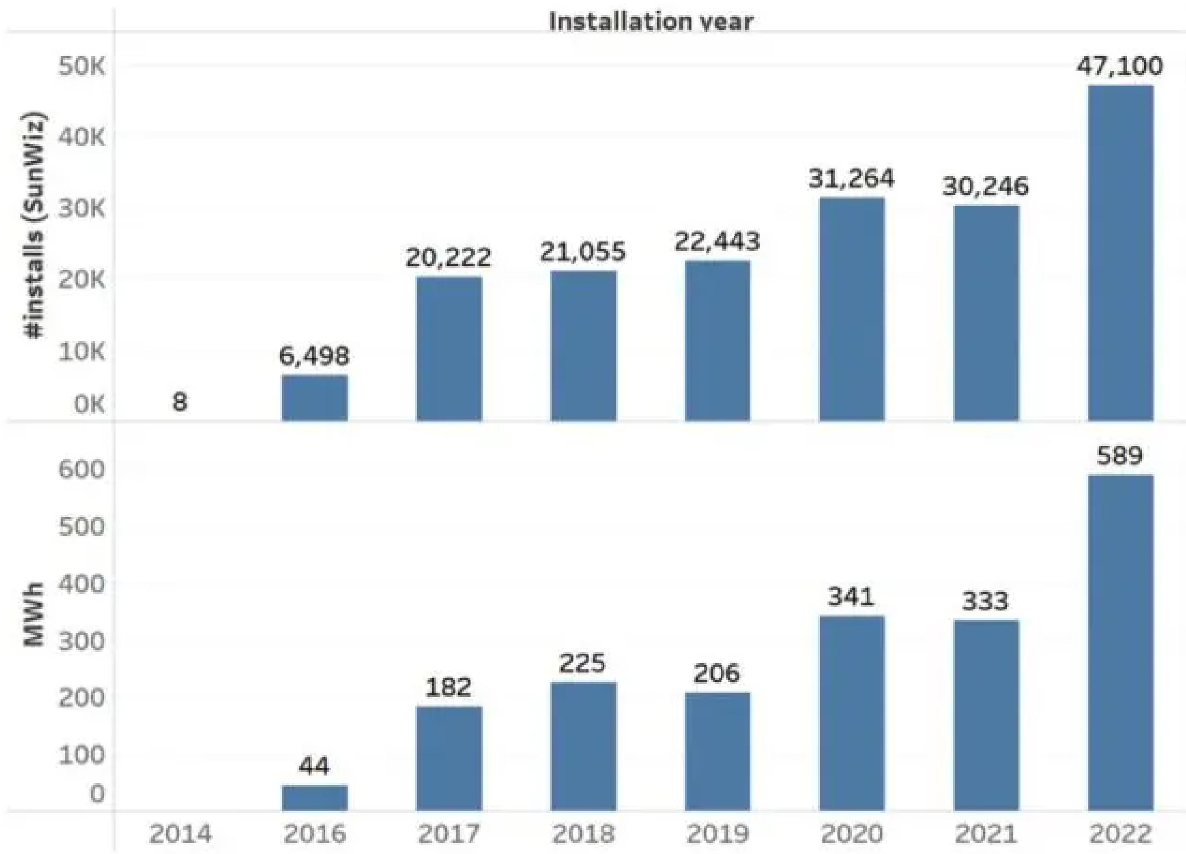
Only June 2023 data available for Australia, New Zealand, Norway. All other countries are YTD May 2023. Global average is based on IEA forecast for 2023.

Sources: International Energy Agency, New Zealand Ministry of Transport, China Association of Automobile Manufacturers, Thai Department of Land Transport, InsideEVs, Cleantechnica, EVVolumes, Electric Autonomy Canada, EV Database NZ, VFACTS.

The Draft 2024 ISP is right to give a clear focus to EV purchase rates. What remains less clear is the grid impact of EV charging. This could both increase peak demand, or EV's could be used as batteries to reduce peak demand. It is important that EV charging and tariffs policies are developed and implemented promptly so that the impact from EV's include electricity network and demand benefits.

[68] Ibid p. 9

As with EV's, home battery sales are increasing substantially with installations increasing by 55% from 2021 to 2022[69].



The Panel is not in the position to choose any forecast for EV and battery sales. What is clear is that consumer investment in electricity generation and storage including transport will likely be substantial and will impact on electricity demand and potentially on peak demand.

Factors that will impact positively or negatively on the ISP include:

- Utilization of electricity generated by rooftop PV
- PV export tariffs
- EV charging timing can exacerbate network peak loads or improve grid load factor
- Capacity of consumers to trust VPP providers and similar 'third party' providers, including aggregators
- There will likely be other impacts too.

The key to effective utilization of CER for the 'common' good is 'orchestration' which needs to be effective for the ISP ODP to be optimal. Yet orchestration is not an output of the ISP, it is a necessary precondition for the ISP that sits outside the ISP. As such, effective orchestration needs to be recognised as necessary for an effective ISP but it is the responsibility of parties outside the ISP process. Required components of orchestration that are the responsibility of other parties include:

[69] https://reneweconomy.com.au/home-battery-installs-jump-55-pct-as-solar-households-turn-to-storage-in-record-numbers/

- Tariff setting by networks, retailers and the AER as regulator that encourage the effective use of PV, home batteries and EV's to enhance the effectiveness of the grid.
- Policies and tariffs that enable a fair return on investment of consumers investing in CER
- Equity provisions so that people who are unable to acquire or utilize CER are not cross subsidizing those who can afford the upfront capital costs.
- Policies to require continuously improving energy efficiency of appliances and housing in particular.
- Consumer protection that protects customers from 'shonky' third party operators while supporting and encouraging effective, efficient and consumer focused third party providers.

To put the above into other words, we highlight that "Integrated" is the first word of the ISP, so a focus on 'orchestration' of separate and relevant government policies is a crucial aspect of the 2024 ISP and has impacts on the timing and efficacy of ISP projects (including energy efficiency, urban planning, subsidies for technology take up).

Section 4.2 of the draft ISP 2024 does not actively explore the role and impact of CER "third parties," including aggregators, Virtual Power Plants (VPPs) and energy home management systems. It is likely that these services will grow significantly over the near future and are likely to have an impact on the timing of demand for electricity, with implications for the efficient operation of the national electricity network and consequently the ISP. It is important that future ISPs include up to date data about the extent of third party services and the amount of electricity over which they have control.

As CER becomes ever more significant in Australian energy systems, a much better knowledge of the extent of engagement with and by third party operators is important. The Panel encourages AEMO to enhance its recording and reporting of third party involvement in the electricity market, eg number of customers who are part of a VPP and the amount of load that VPPs can manage / dispatch and the number of dwellings with 'smart' energy management systems and estimates of peak demand curtailed by these systems.

We understand that AEMO is aiming to explore the likely impact of orchestration on the Final ISP by undertaking sensitivity analysis. The Panel is very encouraging of this intent and consider that elements of orchestration deserve further consideration in the planning for the 2026 ISP.

ESB Report

On 7th February 2024 the Energy Security Board released a report "Consumer Energy Resources and The Transformation of The NEM – Critical priorities to support transformation: a call to action"[70].

The Executive Summary of the report says:

> "Consumers are playing their part in decarbonising Australia's electricity system. The task now is for governments, market bodies, consumer stakeholders and industry to ensure the regulatory, technical, governance and policy settings for CER harness the power of consumer and distribution-connected resources, as a key driver in decarbonising Australia's energy sector while supporting outcomes for all consumers."

It also identifies 6 priority area for action by governments working with market bodies, consumers:

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[70] https://www.energy.gov.au/sites/default/files/2024-02/ESB%20report%20-%20CONSUMER%20ENERGY%20RESOURCES%20AND%20THE%20TRANSFORMATION%20OF%20THE%20NEM.pdf

> "Priority 1: Define the functions that distribution network service providers (DNSPs) are accountable to perform in a high CER environment, as they evolve to a Distribution System Operator (DSO), including identifying the capabilities and the interfaces with the market operator and industry participants.
>
> Priority 2: A common data architecture for CER operation and orchestration, to reduce costly duplication and enable innovation and new services for consumers.
>
> Priority 3: Future-fit technical governance and compliance framework for CER standards.
>
> Priority 4: Consumer protections to address harms to consumers across their interactions as buyers of CER products and services.
>
> Priority 5: Protecting consumers today through proactive action to achieve widespread compliance with CER technical standards.
>
> Priority 6: Backstop capability that is robust and reliable in each jurisdiction to provide an emergency response improving operational security for all consumers."

This report has only just been released and the Panel needs time to consider its implications for the final 2024 ISP. Our initial response to understand the report as reinforcing the importance of 'orchestration' of CER and also for the role of DNSPs in this process.

Recommendations

The development of a national CER orchestration strategy should be implemented by energy Ministers as part of the development of the 2026 ISP while AEMO should seek to better quantify impacts of effective orchestration and measures to enable improvement.

As CER becomes ever more significant in Australian energy systems, a much better knowledge of the extent of engagement with and by third party operators is important. The Panel encourages AEMO to enhance its recording and reporting of third party involvement in the electricity market.

AEMO and the Consumer Panel to consider implications of the ESB report on CER and the transformation of the NEM in finalizing the 2024 ISP.

Section 4.3 – Seven times today's utility-scale wind and solar (pp. 48-9)

Why is this important?

This section of the draft ISP contains two consequential messages:

i. Dramatically more renewable generation will be required within a decade – 3 times current renewable generation.
ii. The nature of renewable generation means that some generation (up to 20% by 2050) will need to be 'spilled' or curtailed.

These two messages are valuable forecasts that identify opportunities for investment, both in producing renewable generation and in utilising the cheap electricity that will be the 'by-product' of the variability of renewable generation.

Quantifying the forecasts also provides some clarity to potential investors on the future uncertainty.

What does Draft ISP 2024 say?

The Draft 2024 ISP says (p.48):

> "By 2034-35, the NEM is forecast to need approximately 82 GW of utility-scale wind and solar, and 126 GW by 2049-50. This would be seven times the current NEM capacity of 19 GW, with another 5 GW committed or anticipated to be operational before the end of 2024."

On the issue of spilling or curtailing surplus renewable generation, the Draft 2024 ISP correctly states that building the network to *"use or store every last watt of energy makes little financial sense."* More efficient is to 'spill' generation when there is oversupply due to favourable conditions to generate renewable energy.

Panel comments

The quantification of renewable generation requirements and indicative levels of 'spilled' or surplus electricity from renewable generation is an excellent example of the merit of AEMO's data gathering, modelling and transparency. The data deserves to be used by businesses and investors, including those who can create the opportunities to utilise low cost electricity when supply is in surplus.

Recommendation

That in developing the 2026 ISP, AEMO explore the options for reporting on potential levels of future curtailment and spilling in order to maximise use of generation.

Section 4.4 REZ and network design to optimise capacities.

Why is this important?

Renewable energy zones (REZs) are a crucial aspect of the transition, identifying best locations for renewable generation with very good renewable energy resources (wind and/or sun) and proximity to transmission lines with capacity to carry more electricity.

Generation in REZs can also serve to create employment opportunity for communities that are losing employment as coal generation closes. While not directly a factor for the ISP, well sited employment can help improve 'social licence' while also providing efficient electricity generation to the benefit of consumers.

What does Draft ISP 2024 say?

The draft 2024 ISP identifies 43 appropriate REZ sites, using the potential sites first identified in 2018 for the first ISP. Sites are assessed against criteria of *"solar and wind resource, forecast generation capacity, transmission implications, climate and event risks, and forecast curtailment and spill levels."*

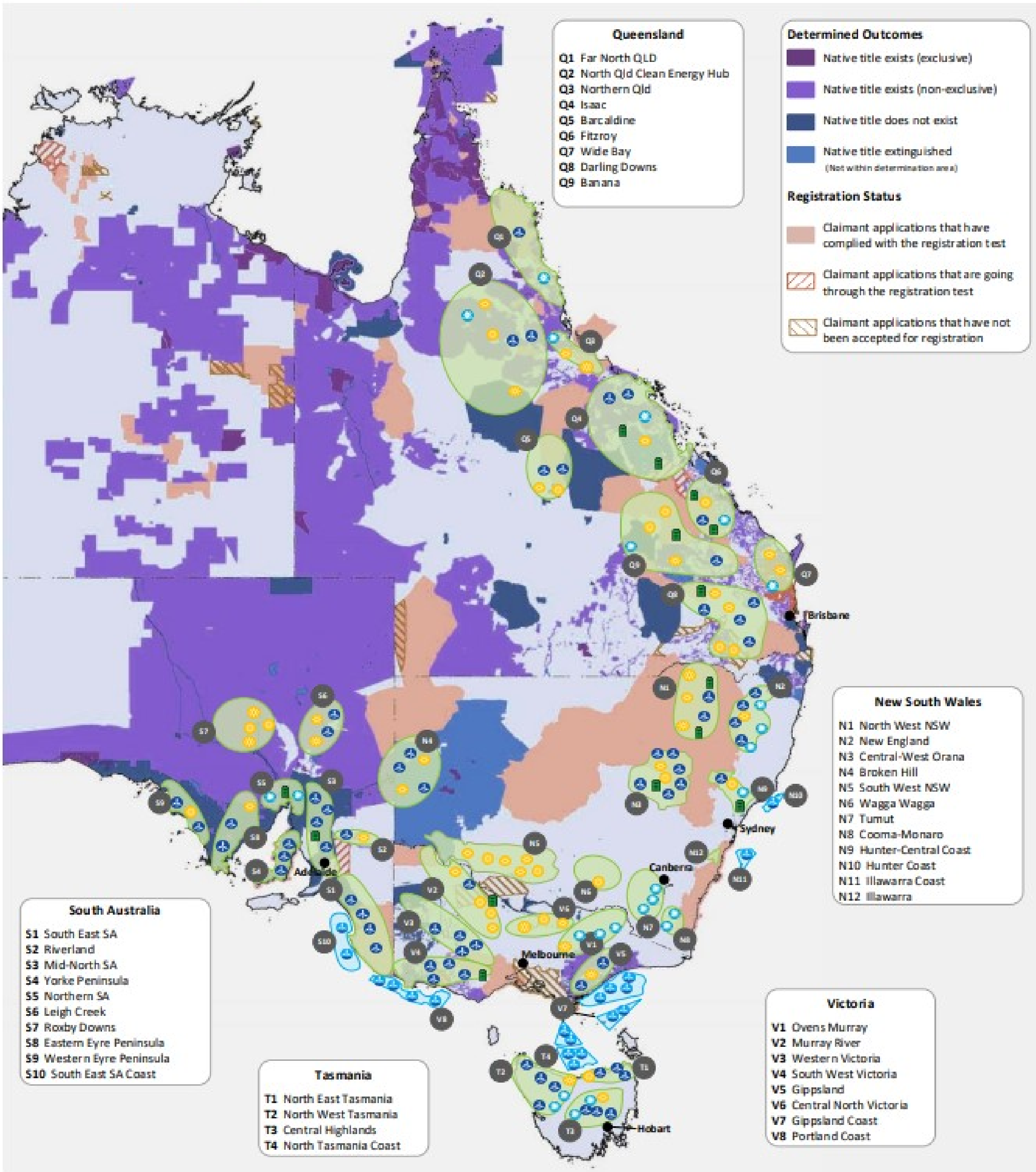
State generation needs by 2049-50 from REZ's are also identified, being: Tasmania – 3.7GW; Victoria – 22GW; South Australia – 9GW; NSW - 34GWw and Queensland – 46GW

Panel comments

The Panel notes the usefulness of Appendix 3, of the draft ISP 2024, Renewable Energy Zones, that provides a detailed score card for each of the 43 sites identified.

Figure 2 of Appendix 3 overlays "Candidate REZs shown on a National Native Title Tribunal, Native Title Determinations and Claimant Applications map", recognising Indigenous ownership, Title and claims. This helps potential renewable energy developers to readily identify potential indigenous partners and also provides a stimulus to government and energy businesses to commence their engagement with appropriate communities, very early in development considerations. Undertaken appropriately, in good faith, early and ongoing engagement, listening and responding can make a major contribution to achieving social license.

Figure 2 Candidate REZs shown on the National Native Title Tribunal, Native Title Determinations and Claimant Applications map



This figure has been reproduced with the permission of the National Native Title Tribunal.

The detailed assessment of the 43 candidate REZ's is an example of the excellent data and analysis undertaken by AEMO in developing the ISP. The REZ data and assessment is a valuable resource for developers and governments that we hope is well utilised in the coming years.

Recommendation

Recognising the importance of engagement with First Nations communities, we encourage AEMO to develop a strategy that would enable documentation of engagement with First Nations communities. to be included in future ISP documentation to identify effective and less effective recognition of the interests and concerns of First Nations communities.

Section 6.4 – Storage and Gas to Firm Renewables – Flexible gas for renewable droughts and peaking (pp. 65-6)

Why is this important?

There is considerable debate about the role of gas generation to provide firming for renewables. The Draft ISP has a significantly increased role for gas compared to the 2022 ISP. Current generation and storage support schemes eg Capacity Investment Scheme and the NSW Roadmap, however, explicitly exclude financial support for gas generation.

What does the Draft ISP say?

In the significant change from the 2022 ISP, the Draft 2024 ISP concludes (p.65):

> "… the NEM is forecast to need 16.2 GW of gas-powered generation. Of the existing 11.2 GW capacity, about 8 GW is forecast or announced to retire, so that capacity would be replaced and another 5 GW added.
>
> This gas generation is a strategic reserve for power system reliability and security, so is not forecast to run frequently. A typical gas generator may generate just 5% of its annual potential but will be critical when it runs. Most of that will be needed some days in winter … This is a change in the role of GPG from more continuous 'mid-merit' gas to a strategic, back-up role… These peaks are forecast to test the limitations of the gas supply network, and solutions will be needed to address them."

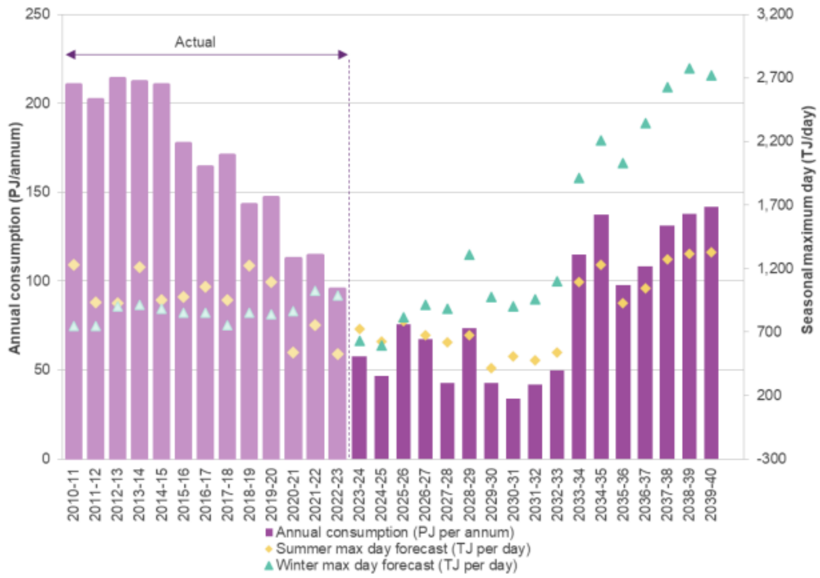
The change from the 2022 ISP which had 10GW[71] is a modelling outcome with Gen Cost capex assumptions and gas price forecasts making OCGTs cheaper than battery storage from the mid-2030s. Under the ISP projections, many of the batteries being installed today will be replaced by OCGTs, not batteries, at their end of life. The key requirement is flexibility. The OCGT plant is likely to only operate ~5% of the time, particularly in a 'dunkleflaute[72]' event of calm overcast cold conditions in winter in southern States[73]. Th figure below (Draft ISP p.66) shows that daily maximum demands in the late 2030s are more than double the levels in winter 2022:

[71] See p. 48 https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en

[72] Dunkleflaute refers to periods where this is no sun and little wind for generation from these two sources.

[73] See Slide 26 https://aemo.com.au/-/media/files/major-publications/isp/2023/draft-2024-isp-publication-webinar-presentation.pdf?la=en

Actual and forecast NEM gas-powered generation annual consumption (PJ/y) and seasonal maximum daily demand (TJ/d) in *Step Change*, 2019-40



These winter 2022 peak demand contributed to AEMO being given significant additional powers to direct gas supply to ensure supply to gas fired generators. The IASR has forecast price assumptions on natural gas, hydrogen and biomethane with the latter two higher than the former. Forecast NEM capacity refers to 'flexible gas'[74] to acknowledge that hydrogen and biomethane may contribute over the forecast period, if relative prices change from the forecasts. There are also options for diesel and onsite fuel storages.

Panel comments

The future gas story that is told in the Draft ISP is important and moves from the framing in some news and political debates that the gas story as an 'either/or' (fully electrified quickly vs a slower electrification recognising constraints in conversion) to one where gas is required to support the pace of electrification. A high level of electrification will still require gas in 'dunkleflaute' events.

The risk to the gas supply chain is both physical and commercial. Given that the urgency to build new GPG is not as urgent as the need to build new electricity transmission, there is time to properly analyse the issues. We recognise that many of these are outside the scope of the ISP or AEMO's remit.

- What market framework is required to provide the appropriate investment incentives to build the replacement and new GPG that will only be required for a very short periods of time each year? Our initial view is that variations in market price setting such as the market price cap is not an efficient approach for consumers.
- We look forward to the 2024 GSO discussing the impacts of the rundown in Bass Strait production highlighted in the 2023 GSOO[75] and how this will impact on medium to longer term gas availability given pipeline capacity from Queensland.

[74] See Figure 2 p. 10 Draft ISP
[75] See Figure 27 p. 53 https://www.aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2023/2023-gas-statement-of-opportunities.pdf?la=e

- If new pipeline capacity is required, what market framework will provide the incentive to build a 50-60 year pipeline assets that may only be fully utilised for a fraction of its asset life?
- A final question is how might gas commodity and transport prices be impacted?

Those matters relating to delivered gas costs over the medium to long term could be considered as part of a new report in the 2026 ISP to complement the GSOO. It could be similar in coverage for the gas supply chain as the Transmission Cost Report is for network costs.

On the need for additional gas transport capacity, if the Victorian Government goes anywhere near meeting its objectives under the Gas Substitution Roadmap[76] there will be significant spare capacity in the gas network by the late 2030s. This then begs the question as to who is going to be willing to maintain the gas network until then and beyond to deliver gas for peak demand for OCGTs from the mid-2030s?

On building new and replacement GFG, the Commonwealth Government's Capacity Investment Scheme and the various State schemes eg NSW Roadmap, explicitly exclude any form of support for natural gas generation. Currently investors in GFG will have to rely on the market price settings to encourage sufficient investment. A higher market price cap seems to be a very blunt and inefficient and high cost way of encouraging that GPG build. Given the government support schemes for renewables and storage, we doubt private investors will be willing to invest in OCGTs not just as replacement units but new units from the mid-2030s that will be in competition with Government subsidised generation and storage. We comment on these issues further below with recommendations for an expansion in gas market analysis in the 2026 ISP.

The AEMO forecasting approach means that the ACIL Allen gas price assumptions are based on the 2022 ISP with its much lower role for gas. AEMO do not have a single model that can simultaneously solve the demand, price and generation mix, whilst considering all variables. The use of multiple models results in a lag in some variables between publications like the GSOO and ISP.

These matters should be considered in the 2026 ISP through an analysis similar to the Transmission Cost Database and the CSIRO GenCost report. This would be part of an expanded IASR and provide the appropriate ISP modelling inputs that would also be used in the GSOO. We do not think a separate 'Gas ISP' would add value.

We note the work that Energy Ministers have recently initiated a review to 'supercharge' the ISP, particularly with respect to more comprehensive gas modelling[77]. The Panel made a confidential submission to the review covering these matters. While the ISP's focus is on building transmission, issues around gas take a long time to resolve and consideration of policies required to facilitate this GPG and pipeline investment should be a focus on the 2026 ISP.

Recommendations

The GSOO should identify the gas supply and pipeline augmentation requirements to meet long term GPG gas requirements.

[76] https://www.energy.vic.gov.au/renewable-energy/victorias-gas-substitution-roadmap

[77] The terms of reference for the review were published in August 2023, see: https://www.energy.gov.au/energy-and-climate-change-ministerial-council/energy-ministers-publications/terms-reference-review-integrated-system-plan. The review is expected to be completed in the first quarter of 2024, and while unlikely to be part of the 2024 Final ISP, the review could have an important influence on the 2026 ISP.

AEMO to develop a Gas Costs Database (akin to the Transmission Cost Database) as part of a wider IASR complementing the GSOO to better inform the 2026 ISP modelling.

Energy Ministers develop a work programme(potentially in conjunction with the results of the ISP review) on the changes that might be required in the NEM and gas pipeline regulatory frameworks to support the required investment in GPG and gas supply shown in the 2024 ISP.

Section 8.2 – Risks that market and policy settings are not yet ready for coal's retirement (pp. 75-6)

1. Planning and environmental approvals

Why is this important?

This is increasingly important as the scale of transition developments expand and developers are seeing Governments as a blocker. The Draft ISP 2024 risk section does not mention the difficulty in obtaining timely planning and environmental approvals for new generation.

What does the Draft ISP say?

The Draft highlights the risk of replacement generation not being available when coal plants retire which increases the risks to the energy transition and its benefits. However, the delays associated with obtaining planning and environmental approvals is not discussed as a factor.

Panel comments

There are two related aspects – the pace of Government approvals and the trade-offs between carbon reduction and environmental protection.

On the former, the situation in NSW is illustrative where developers claim it takes much longer than other States to get development approval[78]. If approved by the Independent Planning Commission later this year, Engie's slimmed down Hill of Gold wind farm is only the second wind project to be approved in NSW in the last 5 years[79]. In late 2023, the NSW Planning Department published a draft proposal that had very few areas as 'desirable' for wind projects (though many areas were 'desirable' for solar projects) as it sought to balance development of renewables and environmental and social impact[80]. The document noted that 'it is challenging' to find wind sites that do not have 'significant conflicts'. The draft proposal also included a requirement for significant fees to be paid as part of social licence approval[81]. NSW is not the only jurisdiction with delays[82].

After what was represented in media as significant pushback from developers, a new advisory a few days later removing the previous three descriptors of 'desirable', 'suitable'; and 'less suitable' and replaced them with two descriptors 'highly suitable' and 'suitable' wind locations[83]. Nevertheless,

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78 https://reneweconomy.com.au/a-decade-is-far-too-long-major-investors-slam-planning-delays-in-nsw/
79 https://reneweconomy.com.au/hills-of-gold-contested-new-england-wind-farm-wins-planning-approval/
80 https://reneweconomy.com.au/nsw-blots-out-nearly-entire-state-for-wind-projects-few-areas-deemed-desirable-for-turbines/
81 https://reneweconomy.com.au/wind-and-solar-projects-face-hefty-new-fees-as-nsw-seeks-to-accelerate-planning-process/
82 https://reneweconomy.com.au/queensland-wind-farm-delay-raises-red-flags-with-green-groups-as-lines-blur-over-environment/
83 https://reneweconomy.com.au/nsw-planning-backflips-on-wind-energy-map-messaging-everywhere-is-now-suitable/#:~:text=The%20NSW%20Planning%20Department%20has,was%20released%20earlier%20this%20week.

there appears to be a significant planning logjam in NSW for wind projects that are needed to complement solar projects. Developers are proposing radical changes to fast track approvals[84].

On the latter, several renewable projects are running into strong opposition on environmental grounds in other States as they seek planning approval. Given the role of the governments, especially the Commonwealth Government through its Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), hard choices will need to be made between carbon reduction goals and environmental impact. A desire to protect brolga breeding grounds effectively stopped a large wind farm at Port Fairy[85], concerns about encroachment into sensitive ecological and cultural heritage sites substantially reduced the size of the Chalumbin wind farm in Far North Queensland[86].

In December 2023, the Commonwealth Minister refused environmental approval for the Port of Hastings to be an assembly point for Victorian Government's offshore wind industry because of its location next to sensitive UNESCO designated RAMSAR wetlands. The Victorian Premier's response was that the transition must take precedence over protecting wetlands[87] while conservation groups said that the environment should take precedence over the transition[88].

Recommendations

The Final ISP has a discussion of the risks around Government planning approvals and the conflicts between carbon reduction and environmental quality that pose potentially considerable risks to whether replacement generation is available when coal plants close.

Modelling to include a sensitivity on project timing relating to a delay in planning and environmental approvals.

Section 8.2 Risks that market and policy settings are not yet ready for coal's retirement (pp 75-6) 2. The 'How' aspect of risk mitigation to achieve the ODP.

Why is this important?

These are complex issues. It is easy to say what is a risk, but that is of limited use to consumers who are interested in what AEMO, or other governments and regulatory authorities, think should be done to mitigate that risk.

What does the Draft ISP say?

The Draft ISP 2024 comments on the risks and notes that (p.75):

> "AEMO continues to work with governments, market bodies and industry on the technical requirements for a secure power system capable of operating at 100% renewables, and

[84] See https://reneweconomy.com.au/clean-energy-investors-propose-radical-rethink-of-planning-rules-in-nsw/
[85] See https://reneweconomy.com.au/simply-not-workable-cec-slams-planning-conditions-on-wind-and-battery-project/
[86] See https://reneweconomy.com.au/controversial-wind-farm-in-far-north-queensland-cut-in-half-gets-new-name/#:~:text=As%20RenewEconomy%20has%20reported%2C%20Chalumbin,ecological%20and%20cultural%20heritage%20sites.
[87] See https://www.afr.com/companies/energy/plibersek-delivers-massive-blow-to-victorian-wind-hub-20240108-p5evqq
[88] See https://www.acf.org.au/migratory-bird-that-visits-western-port-wetlands-added-to-threatened-species-list

> subsequent evolution of market frameworks and settings to deliver those requirements in both investment and operational timeframes."

But the discussion does not go any further.

Panel comments

We think that AEMO should be more willing to discuss with greater specificity the 'how' it sees these risk being mitigated. Given AEMO will be responsible for operating the market in the face of these risks, we think that consumers should have more transparency on how AEMO thinks the $17.4b net benefits can be made more certain.

Recommendation

AEMO consider more commentary on policy responses to mitigate the risks discussed in Chapter 8 regarding policy and market settings.

Appendix 6 – Cost Benefit Analysis – A 6.7 Testing the resilience of the candidate development paths (pp. 71-85)

Why is this important?

AEMO has adopted an approach in the 2024 ISP of reducing the number of scenarios to three but expanded the number of sensitivity analyses. The sensitivity analyses have in turn allowed a better understanding of the resilience of each CDP to the risks of 'alternative futures' than those defined in the three scenarios. Given the many challenges and risks identified in the 2024 ISP, the energy transition sensitivity analysis has become an even important component of the ISP's selection and validation of the ODP. This should provide consumers with more confidence in the ODP selection.

What does the Draft ISP say?

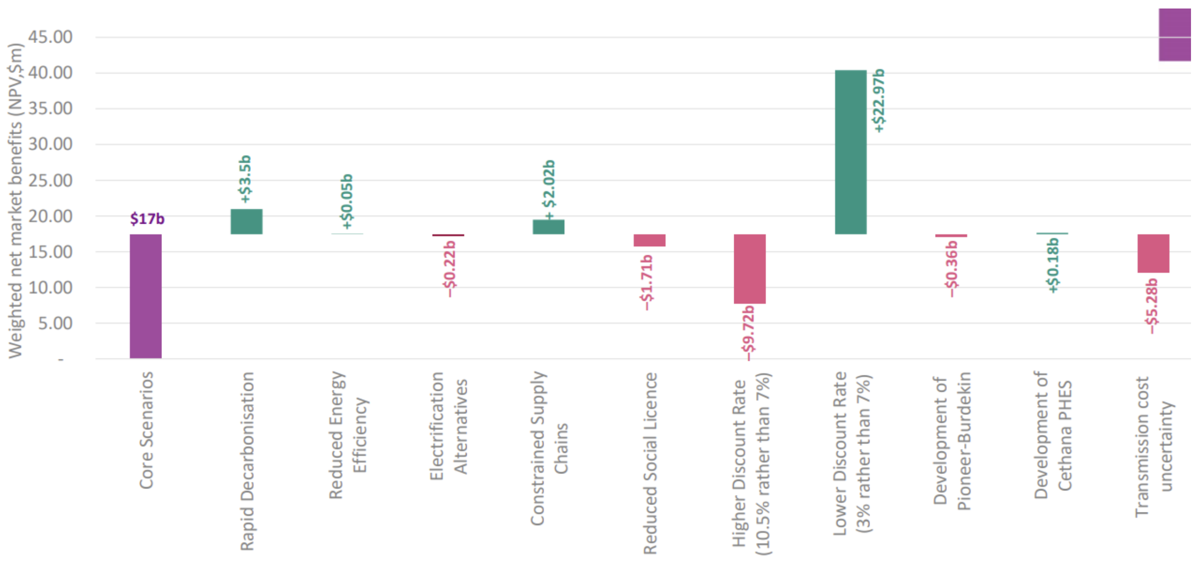
Sensitivity testing is discussed in detail in Appendix 6 to the 2024 Draft ISP. The ten variables selected for testing were – discount rates (high and low), rapid decarbonisation, reduced energy efficiency, delayed industrial electrification, constrained supply chains, reduced social licence, timing of the Pioneer-Burdekin and Cethana Pumped Hydro Projects according to respective State (Queensland and Tasmania) Government timetables ie earlier than in the ODP, and increased transmission capex.

The results are shown in the following graph and summary table with the major factors influencing (positively and negatively) the central case net market benefits of $17b being:

Description of sensitivity	Impact on net benefits $b
A higher and lower discount rate than the central 7% rate	3% - plus $22.97b 10.5% - minus $9.72b
Rapid decarbonisation (consistent with contributing to global temperature rise of 1.5° C by 2100), and	Plus $3.5b
Transmission cost uncertainty using the upper cost accuracy bound of each project[89] eg for VNI West with an accuracy band of ±30% with the base case using the midpoint estimate of $3.331b, the sensitivity test used $3.331+30%	Minus $5.28b

[89] See Table 8 p. 30 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-transmission-expansion-options-report.pdf?la=en

Reduced social licence – two year delay in timetable and varying levels of increased network capex	Minus $1.71b
Constrained supply chains – two years longer in transmission augmentation lead times	Plus $2.2b



The constrained supply chains sensitivity results in total renewable energy share of 62% in 2030 compared to the Government target of 82%[90], meaning that2029-30 emissions targets would not be achieved

Regarding the three 'top sensitivities' we discuss the following[91]:

- Discount rates:

  With the higher discount rate (10.5%), net market benefits are lower across all CDPs and scenarios due to the reduced present value of future market benefits, and the higher relative costs of bringing forward investment. In addition, the rankings of the CDPs changed 'markedly'.

  Those CDPs with delayed investments, and higher utilisation of existing assets such as existing GPG are elevated. Nevertheless, CDP11 (the ODP) remained the highest ranking on a weighted net market benefit score[92], suggesting AEMO's proposed ODP is resilient to upward movements in the discount rate.

  The lower discount rate (3%) sensitivity test drives an increase in the net market benefit across all the CDPs tested as future benefits are valued more highly. On a weighted net benefits test CDP14 with includes Marinus Stages 1 and 2 and QNI becomes the preferred scenario. However, CDP14 is followed closely by the second ranked CDP11 ($40.53b versus $40.42b).[93]

[90] See https://www.dcceew.gov.au/energy/strategies-and-frameworks/powering-australia
[91] Note, in Appendix 6, AEMO also discusses the impact of the sensitivities on the measure of least-worst regrets. While relevant to AEMO's assessments of the CDPs, for simplicity, we have not discussed this additional measure.
[92] See for example, Appendix 6, Table 2, p.10. The weighted net benefit of CDP11 was marginally greater than the other four CDPs at $7.73b, the lowest was CDP7 which includes QNI with weighted net benefit of $7.55b.
[93] Appendix 6 Table 50 p. 73.

- Rapid Decarbonisation:

  AEMO tests the outcome for the core scenario (Step Change) for the level of decarbonisation of the electricity industry consistent with our contribution to limit global temperature rise to 1.5^{0}C by 2100, and also with the assumptions on the level of emissions underpinning AEMO's Green Energy Export scenario. This sensitivity drives an earlier retirement of the existing coal fleet and its replacement with renewable energy and firming.

  Not surprisingly, this also changes the rankings of the CDPs on a weighted net benefits measure. CDP14, which includes both Marinus Stage 2 and QNI connect as actionable projects move up the rankings and CDP11 (with Marinus Stage 2 and not QNI), comes in third.[94]

  In the context of the ISP modelling, rapid decarbonisation will require significant early investment in transmission, as well as other greater investment in renewable energy and firming.

- Transmission cost uncertainty:

  AEMO has acknowledged the considerable increases in the costs of electricity transmission, generation and storage since the 2022 ISP, and noted that this is one of the factors that have reduced the net market benefits of the committed/anticipated projects and of all the 'actionable' projects.

  As a result, there is considerable uncertainty surrounding the future cost of these actionable projects. AEMO has a range of cost estimation accuracies that vary by project[95]. For example, VNI West has an accuracy band of ±30% with the base case modelling using the midpoint estimate of $3.331b. The sensitivity testing used the upper bound for each project which meant for VNI West the sensitivity capex was $3.331+30%. It does not test the lower cost bound, nor the generation and storage component.

  Again, this changes the rankings of the CDPs. Not surprisingly, the CDP with the least transmission (CDP3) comes in first, while CDP11 (with Marinus 1 and 2) is third, and before CDP14 which includes QNI direct as well as the two stage Marinus project.

Based on AEMO's analysis across all the sensitivities and considering both the net weighted benefits and the least-worst regrets test, AEMO using its 'professional judgement' confirms that the ODP 11 was sufficiently robust in the face of a range of risks.

Panel comments

Apart from brief discussion in Section 8 on the risks to the ODP there is little discussion on sensitivities in the Draft 2024 ISP main report. However, there is further analysis included as part of Appendix 6 (section 6.7). This Appendix has detailed results tables for each sensitivity that can be difficult to understand and interpret. The above figure came from the Draft ISP webinar in December and is not in the ISP documents. It would be helpful if this figure was included in the main ISP report and in Appendix 6.

We also note, however, AEMO's acknowledgment that in the end, it relies on its professional judgment in using the scenarios in the selection of the ODP. In this instance, for example, the ranking

[94] Appendix 6, Table 53. p.75
[95] See Table 8 p. 30 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-transmission-expansion-options-report.pdf?la=en

of CDP11 (the top CDP in the core scenario) was impacted on both economic measures (net market benefit and least-worst regrets) by risks such as the rate of decarbonisation and transmission costs. Nevertheless, in AEMO's judgement, it remained the preferred ODP.

The Panel believes AEMO could be much clearer on how it used its professional judgement. Our comments below, however, focus on the way in which AEMO has considered three of the most significant sensitivities:

- the alternative discount rates,
- the constrained supply chains, and
- transmission cost uncertainty (The transmission cost uncertainties are discussed further in the sections on social license sensitivity, the IASR addendum and CSIRO GenCost.)

<u>Alternative discount rates</u>

As discussed above, AEMO tests the resilience of the ODP to different assumptions on the discount rate as recommended in the AER's CBA Guideline[96]. The discount rate has the largest impact of the 10 sensitivities on the modelled net benefits in AEMO's modelling. This also provides valuable information to investors who will have different positions on their investment discount rates.

It is, therefore, important that, in addition to the impact of varying the discount rate (see above), the Panel reviews the methodology used by AEMO determine the central, upper and lower bounds used in the sensitivity testing.

In reviewing the discount rates, we have considered the mandatory 'requirements' and 'discretionary guidance' that the AER Guideline sets out for AEMO to follow when determining the discount rate(s) to apply in the ISP.[97]

AEMO's central discount rate is 7% real pre-tax[98], a figure determined by AEMO based on two independent studies conducted in 2022 and 2023. The first study, by Synergies Economic Consulting (Synergies)[99], was an updated measure based on their report for the 2022 ISP[100]. The study adopted a theoretical approach to estimating lower, central and upper bounds to the discount rate essentially applying the AER's framework for setting the weighted average cost of capital (WACC). The 2022 Consumer Panel was very critical of this theoretical approach[101]. The 2024 Consumer Panel was also critical of this first study and its 2022 update. In our submission on the Draft IASR the Panel recommended a second 'real world' study be undertaken by a different consultant[102]. This second

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[96] See p.40. https://www.aer.gov.au/documents/aer-cba-guidelines-final-amendments-clean-6-october-2023
[97] See Ibid p.16.
[98] The discount rates in this section are all expressed in terms of real, pre-tax percentages. The AER's revenue determinations publish a WACC expressed in nominal post-tax percentages. However, the associated spreadsheets allow calculation of the real pre-tax figures.
[99] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/synergies-updating-the-2022-discount-rate.pdf?la=en
[100] https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2021/synergies-discount-rate-report.pdf?la=en
[101] See pp. 54-62 https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2021/iasr/submissions/isp-consumer-panel.pdf?la=en
[102] See pp. 76-80 https://aemo.com.au/-/media/files/major-publications/isp/2023/58-2024-isp-consumer-panel-draft-2023-iasr-submission.pdf?la=en

study was conducted in mid 2023 by Oxford Economics Australia (OEA)[103] and involved surveys and interviews with investors, asset owners, developers, government, and network service providers.

The central estimate of the discount rates was broadly similar between the two studies, i.e., around 7%. The second study recommended that the upper bound discount rate was higher than reported by Synergies and in the order of 10.5%. AEMO selected this figure as the upper bound. The AER's CBA Guideline recommends AEMO adopt a lower bound discount rate based on the 'most recent' WACC determination by the AER. At the time of testing the sensitivities, the relevant lower bound discount rate was 3%[104].

In our response to the Draft IASR, the Panel commented extensively on the limitations of the two studies that AEMO relied on when selecting the central and upper bound discount rates[105]. We highlighted three issues.

Issue 1 : Applying a single discount rate to all CDPs[106]

Each CDP/ODP includes (amongst other things) a mixture of 'asset' types, namely transmission, renewable energy build and storage[107].

In turn, each asset type differs in their financing structures, financial and business risks, and capital requirements. For example, the transmission component of the project will *generally* be subject to the regulatory framework administered by the AER under the national energy rules[108]. The framework requires the AER to set a commercial rate of return for the investors in the network assets. The rate of return set by the AER on regulated assets is generally lower than that required by investors in the competitive sectors of the market. This reflects the financial protections, for example 'guaranteed revenue streams', provided by the regulatory arrangements. In contrast, investors in generation and storage are subject to higher levels of financial and business risk such as asset stranding and more volatile earnings. Therefore, investors in these types of assets require a higher rate of return to compensate for the additional risks.

The OEA survey results demonstrate this point. Different asset types are associated with different expected rates of return on investment. In particular, there was a clear differentiation between the

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[103] https://aemo.com.au/-/media/files/major-publications/isp/2023/iasr-supporting-material/cost-of-capital-survey-2023-for-aemo---oxford-economics---final-report.pdf?la=en

[104] AEMO's final 2023 IASR notes (p. 123) that the lower bound rate of 3.0% real, pre-tax, was taken from the 'most recent' AER regulatory determination https://www.aer.gov.au/system/files/AER%20-%20Transgrid%202023-28%20-%20Final%20Decision%20-%20Overview%20-%20April%202023_1.pdf The discount rate may be updated in the Final 2024 ISP to reflect the AER's more recent determinations.

[105] See pp57-66 https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-report-on-2023-iasr.pdf?la=en

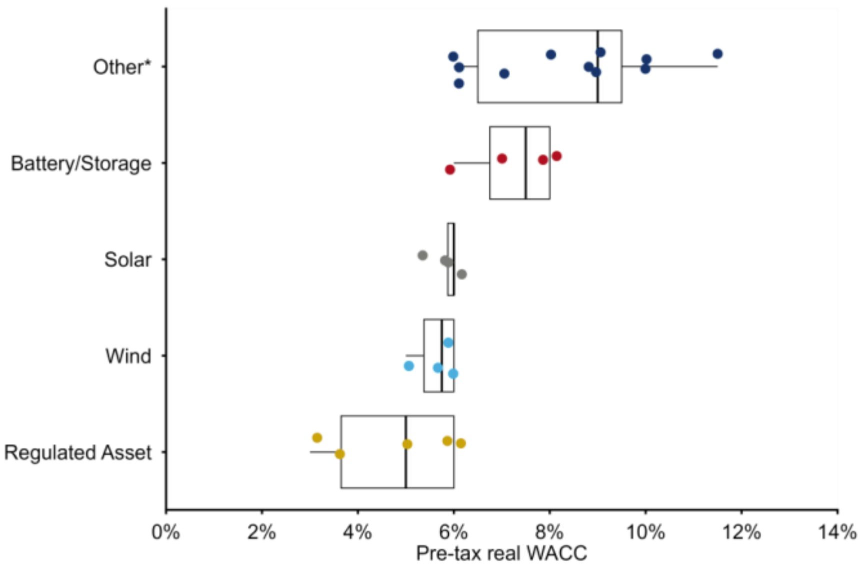
[106] Note, Issue 1 adopts AEMO's assessment of the discount rate for supply side investment. As discussed in Issue 3, each CDP proposes a certain uptake of consumer energy resources. The reports, and AEMO, however do not address the discount rate used by consumers when investing in demand side resources.

[107] Each CDP also includes assumptions on the level of consumer-based participation and orchestration including consumer energy resources (CER) such as PVs, EV sand domestic batteries. It also includes assumptions on the level of and demand management. The studies do not consider consumer-based discount rates.

[108] There is potential for non-regulated transmission, particularly in the Green Energy Superpower scenario.

expected pre-tax real WACC for regulated and unregulated assets. This is illustrated in the figure below from the OEA report[109].

Fig. 3. Survey response for Central Pre-tax real WACC by asset type†



In principle, therefore, it is problematic to assess a CDP project relative to another project, or to the counterfactual, using a single 'industry average' discount rate – some projects will rely more on regulated transmission, others will require less transmission but more investment in non-regulated assets such as renewable energy generation and storage.

In particular, the counterfactual development path (the reference point against which net market benefits for each CDP are calculated) has minimal investment in new regulated transmission assets and therefore requires considerably more investment in unregulated assets such as renewable energy, storage and gas generation to achieve the required carbon targets and reliability performance standards.

Using a 7% discount rate for the counterfactual DP, and for each CDP, therefore appears to contradict the AER's recommendation in the CBA to promote 'competitive neutrality' in the selection of the discount rate for ISP projects.

Issue 2: Limitations in the approach

As noted, both studies relied on by AEMO have limitations.

With respect to the Synergies' studies the Panel was most concerned with Synergies 'theoretical' approach to estimating the discount rate and the absence of market testing of this theoretical approach.

In addition, while Synergies applied the overall theoretical framework used by the AER in its WACC determinations to the lower, central and upper bound cases, in practice, Synergies varied some of

109 See Figure3 p.6 https://aemo.com.au/-/media/files/major-publications/isp/2023/iasr-supporting-material/cost-of-capital-survey-2023-for-aemo---oxford-economics---final-report.pdf?la=en

the detailed methodologies when estimating the central and upper bounds (as noted above, Synergies was instructed to adopt the AER's results for the lower bound).

For instance, Synergies adopted the Sharpe-Lintner capital asset pricing model to calculate the cost of equity (as does the AER). However, Synergies varied **how** it calculated inputs such as the market risk premium and the equity risk premium (both measures of risk). While they explained their methodology, Synergies did not provide reasons for varying the methodology.

The OEA study addressed the question of market testing of the rate of return. However, the study was conducted under a very tight timetable and while it made some interesting observations, any quantitative analysis was limited by the small number of respondents to the survey– 13 in total – giving a response rate of 27%.[110]

AEMO takes some comfort that the OEA study provides some support for Synergies' findings of a 'central' discount rate of 7%. However, given the impact on the ISP's assessment of net market benefits, the Panel believes that further work needs to be undertaken for consumers and investors to have full confidence in the AER's decision to use 7% as the central discount rate and 10.5% as the upper bound.

Issue 3: The need to consider the growth in behind the meter consumer investments.

A significant component of the 2024 optimisation modelling is the growth in consumer investment and associated changes in 'behind the meter' energy utilisation. This includes the growth in penetration of PVs and EV's, energy efficiency and demand response from larger users. The ISP also highlights the role of 'orchestration' of consumer energy resources.

What is missing is an understanding of what drives consumer led investments, as we have noted in previous sections of this report. Specifically, when consumers invest in new energy resources they, like supply side participants, either implicitly or explicitly consider a trade off between present higher costs with expected future benefits (to themselves or the community or the planet) and lower costs now but perhaps more risk in the future. In other words, consumers also have a 'discount rate', a rate that is not homogeneous between consumers, and is difficult to measure, yet important to understand in the context of the transition process. It sits alongside their preferences for risk in the supply of energy.

The Panel does not have a ready answer to how this issue could be addressed in any future ISPs, but consider it is worth further investigation. We note here, the AER's CBA Guideline discusses consumer 'risk neutrality' and 'risk aversion' and encourages AEMO to consult further on this with the relevant ISP Panel or other interested stakeholders [111]. This also suggests there may be some 'cross-over' between any future studies on consumer discount rates and risk neutrality or aversion. (or consumer risk preferences), the latter reflected in the consumer discount rate.

<u>Constrained supply chains</u>

The Draft ISP discusses (pp. 77-8) these constraints – the large worldwide competing demand for materials, technology and expertise which has been stimulated by the US IRA which '…has placed a global premium on these assets'. This competition may exacerbate three existing risks – schedule delays, increased costs and lack of skilled workers which would also increase costs.

[110] Ibid, pp. 25-26
[111] See pp 39-40:

So, it is difficult to understand why the constrained supply chains sensitivity, like the social licence sensitivity, refers only to schedule slippage, not increased costs. We think it should include both.

We comment in more detail below on the social licence sensitivities.

All sensitivities are calculated individually. While it is important to understand individual risk factors, in the real world a risk issue does not occur in isolation. Multiple risks factors can emerge simultaneously as they can be closely related. It is unclear what is constraining AEMO from undertaking combined sensitivities to reflect what is happening in the real world eg reduced social licence, constrained supply chains and transmission cost uncertainty are all factor impacting on Humelink, VNI West and WRL. Social licence delays finalisation of the route which influences capex in the absence of supply chain pressures, but the delay may increase the impact of supply chain pressures as other projects with less social licence risk and a shorter timetable compete for resources.

It is unclear whether a lack of modelling resources or the constraints of the PLEXOS model are factors contributing to AEMO's reluctance to model combined sensitivities.

Recommendations

AEMO should:

- have a more explicit summary discussion of sensitivity results in the main ISP (final) document and include the updated version of the summary figure from the December 2023 webinar
- for discount rates:
    - AEMO investigate the option of using different discount rates for regulated and unregulated assets in assessing the f the net market benefits for each of the CDPs for the 2026 ISP.
    - If AEMO is concerned that this approach would be inconsistent with the AER's 2020 CBA Guidelines (and we believe it is not), AEMO propose to the AER to amend the CBA Guideline.
    - AEMO undertake a more extensive consultancy on the market participants' perceptions of discount rates for different asset classes.
    - AEMO seek expert advice on how it should consider consumer discount rates in the context of the growing importance of consumers' decisions on behind the meter investments and/or agreement to engage in orchestration and demand management.
- have an increased cost as well as schedule delay for the supply chain sensitivity.
- undertake combined sensitivity testing when there are more than one 'sensitivity factor' identified for a particular sensitivity.

The following chart (cited previously) from the December 2023 webinar should also be included in the Final 2024 ISP report and in Appendix 6.

Appendix 7- System Security

Why is this important?

Many system security services or essential system services are currently provided by synchronous fossil fuelled generators as a by-product of their production of energy. This provision means that consumers are currently not paying for these services which are effectively provided as part of a package along with generation.

With these synchronous generators closing over the next 10-15 years these services will be sourced elsewhere. While technical developments may lead to inverter based renewable technologies and batteries filling some of that void eg fast frequency response, provision of these essential services will be become an additional explicit cost of the transition. Consumers need to have confidence that these costs have been adequately considered in the ISP.

The AER Transparency Reviews have commented on system security issues. The Review of the Final IASR commented that more detail was required on the mix of technologies that will be assumed to meet the system security requirements. The Review on the Draft ISP commented that AEMO needed to further explain[112]:

> "… how or whether the selection of the ODP is informed by the forecast of system security remediation costs".

What does the Draft ISP say?

AEMO forecasts that ~$8b is required by 2039-40 for system strength remediation under the step change scenario given the forecast inverter based generation in REZs. This is in addition to the base minimum system strength requirements that are now the responsibility of TNSPs[113] and which are not included in the ISP. This cost estimate compares to the 2022 ISP estimate of ~$4b to 2034-35

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[112] https://www.aer.gov.au/news/articles/communications/transparency-review-aemo-draft-2024-integrated-system-plan-complete#:~:text=The%20AER%20has%20conducted%20a,consultation%20on%2015%20December%202023

[113] See for example Powerlink's RiT-T https://www.powerlink.com.au/sites/default/files/2023-10/TAPR%202023%20Chapter%204.pdf

with the increase due to a combination of a 30% increase in remediation unit costs[114] and an increase in inverter based resources in the 2024 Draft ISP.

In the context of the potential for inverter based resources to provide some system services, AEMO concludes (p.12):

> "…there is not yet sufficient modelling or real-world experience available to quantify the implications and interactions of a system that is fully reliant on synthetic inertia and FFR [fast frequency response] providers. As such, it is likely that synchronous machines, including synchronous condensers and synchronous generating units, will remain a core component in meeting inertia requirements over time."

The minimum system strength in the 2023 System Security Report[115] and the secure operating levels in the 2023 Inertia Report[116] are assumed to continue unchanged to 2039-40. While new technologies may be developed, AEMO has assumed that system security will be based on:

> "…fitting high inertia flywheels to synchronous condensers, as an existing, commercially viable, technology that has been demonstrated at scale."

even given the rapid expansion in provision by batteries in recent years[117]. AEMO estimates the syn con costs at $1,818/MW based on $2 million per 1,100 MWs high inertia flywheel[118].

Panel comments

Our comments cover both technical and commercial matters.

On the former, the Panel are not technical experts. What we seek, like the AER, is a clear presentation of the issues and how the ISP has addressed them to give consumers confidence about the results. Here it would be helpful for AEMO to set out all of the essential system services (ESS) that will be required over the ISP timetable. The approach appears to be that:

- synchronous condensers with flywheels will be able to supply all required inertia.
- Appendix 7 discusses new tools and standards for FCAS to address needs in the sub 6-second range which improve AEMO's ability to maintain secure frequency levels[119]; it seems that the additional cost of FCAS is not considered material given the forecast expansion of batteries will provide downward pressure on FCAS prices.
- there will continue to be directions required for unforeseen circumstances, but that implementing the ODP will minimise the needs for directions; it is very difficult to forecast costs and the expected low level are unlikely to be material to the ODP net benefits.

[114] See Appendix 7 footnote 25 p. 17
[115] https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning
[116] https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/system-security-planning
[117] See Figures 68 and 69 p.47 https://aemo.com.au/-/media/files/major-publications/qed/2023/quarterly-energy-dynamics-q4-2023.pdf?la=en&hash=9E82966D60F4FA5050F1AF1109D5F158
[118] See Section 5.2 p.142 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-transmission-expansion-options-report.pdf?la=en
Section 5.2 p. 142 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-transmission-expansion-options-report.pdf?la=en
[119] See p. 6 Appendix 7

On the latter, the data provided in the Transmission Expansion Options Report is very high level - Class 5b cost estimates with a very wide ±50% cost estimate variation and a general description of lead time as 'medium' with no explanation of how the cost estimate was derived and why a symmetrical cost band of 50% was used. Supply chain pressures have prompted a change in the definition of 'medium' from the 2022 ISP. It is now 'within 6-7 years' rather than 4-5 for previous publications[120].

Table 12 System strength services cost options

Description	Expected cost ($ million)	Cost classification	Lead time
80 MVA synchronous condenser	71	Class 5b (±50%)	Medium
125 MVA synchronous condenser	96	Class 5b (±50%)	Medium
200 MVA synchronous condenser	132[A]	Class 5b (±50%)	Medium
250 MVA synchronous condenser	182	Class 5b (±50%)	Medium
Adjustment factors and risk			
All options	• Greenfield or Brownfield: Partly Brownfield • Location (regional/distance factors): Regional • Project network element size: no. of total Bays 1-5	• Known risks: Project Complexity was judged as partly complex due to the level of detailed studies required. • Unknown risks: Class 5b	

A. This cost is the result of halving the costs of the 2 x 200 MVA synchronous condenser network element.

Recommendations

AEMO provide greater clarity in their approach to:

- how all categories of system security costs are calculated and why they are included/not included
- the large cost accuracy range for synchronous condenser costs.

These issues should be examined more closely as part of the Methodology review in the 2026 ISP.

Appendix 8 – Social Licence

Why is this important?

Social licence has been recognised as a key risk to achievement of the ISP. AEMO has done considerable work since the 2022 ISP to bring it to the fore and examine its potential impact of achievement of the ODP. This includes formation of the Advisory Council on Social Licence (ACSL)[121], more detailed consideration of how social licences can be incorporated into planning and the ISP and explicit inclusion of social licence sensitivities in the Draft ISP.

What does the Draft ISP say?

The Draft ISP seeks to incorporate social licence in several ways– scenario details, value sensitivities, joint planning with TNSPs, REZ identification, location, resource limits and land use limits[122].

[120] See p. 41 https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-transmission-expansion-options-report.pdf?la=en
[121] https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/social-licence-advisory-council
[122] For a fuller description see Appendix 8 Table 1 p. 6

Following engagement with the ACSL and the Consumer Panel on sensitivity principles and parameters the goals of the sensitivity analysis were to[123]

- Explore generalised NEM impacts across all projects rather than differentiate among specific projects.
- Incorporate cost and delay impacts in the modelling.
- Consider social licence impacts on transmission projects, onshore wind and solar within REZs and pumped hydro, but exclude offshore wind, GPG and batteries, native title and indigenous land use agreements, underground transmission options and non REZ based generation.

With the following parameters selected[124]:

Table 3 Draft ISP 2024 social licence sensitivity parameters

Sensitivity	Details
Transmission timing Extending project lead times for all transmission augmentation options by two years.	• Reflects delay impacts from low social licence for transmission. The delay does not include committed and anticipated projects, as these projects are already progressed t be delivered and there is more certainty surrounding the completion date. • This reflects the impact of low social licence on extended lead times in obtaining transmission easements and property rights.
Transmission costs	• Add a cost impost to transmission augmentations to reflect scope changes to routes and designs. • Designed to capture small re-routings, re-design of towers, easement adjustments.
Project costs observed to increase by approximately 15%. Reflects changes in work scope due to low social licence.	• Also captures associated materials and labour. • Additional to existing cost estimates that already include scope changes and risks. • Reflects more adjustments and engagements will be needed for transmission projects. • This parameter has also been applied to pumped hydro projects. • Committed and anticipated projects included smaller adjustments, as they are progressed actionable projects that have already undertaken some measures.
REZ generation costs REZ generation costs observed to increase by approximately +5% to +60% based on private land parcel density, and applied to specific REZ generation costs by technology type (such as wind or solar).	• Applied to onshore solar and wind generation build costs within each REZ. • Add a cost impost to REZ generation to reflect increased social licence costs within a REZ such as scope changes and additional community engagement and benefit sharing. • Additional to existing cost estimates that already include community engagement and benefit sharing programs. • Reflects more dense REZs that may have more stakeholders and pose higher social licence risks. • Use a generalised approach towards all NEM REZs.

AEMO's approach to selecting the sensitivity parameters was[125]:

- The two year transmission timing delay was applied to the Earliest in-Service Date''(EISD) and not the proponent timing; it also does not apply to 'committed and anticipated' projects – FNQ REZ, WRL, PEC and CWO REZ and CopperString 2032 - on the assumption that these projects are well advanced in planning
- The increase in transmission costs varied:
    - For 'future' ISP projects – the full 15%
    - For 'actionable' projects – the increase varied by the accuracy of the existing capex cost estimate eg Sydney Ring currently ± 50% accuracy had 15% applied; Humelink currently -5% to +12% accuracy had <15% applied

123 See pp. 10-11 IASR Addendum
124 Appendix 8 pp. 10-11
125 2023 IASR Addendum p. 11

- The increases in REZ generation capex '…were increased by approximately +5% to +60%'[126] above existing cost estimates that would have included costs for community engagement and benefit sharing.

Panel comments

This was an important issue in submissions by the Consumer Panel on the 2022 ISP[127] and we welcome the additional focus on the issue in this Draft ISP.

Our first comment is the need to bring the social licence discussion into the one place. Apart from a summary in the main Draft ISP document there are:

- Appendix 8 – Social Licence that gives a limited explanation of the sensitivity methodology.
- Section 4 of the IASR Addendum that gives a lot more detail on the methodology, particularly the REZ capex.
- Appendix 6 – Cost Benefit Analysis that summarises the result of the sensitivity testing in tables that can be difficult to understand.
- As we noted above – the summary sensitivities table and chart is nowhere in the Draft ISP documents – only in the Draft ISP webinar slides; the value for social licence sensitivity in that figure is shown as one amount – (minus $1.71b) and it is not clear if that is referring to the combined impact of both social licence sensitivity parameters – timetable and cost.

Our remaining comments focus on the lack of transparency on how the parameters were selected, even with this disparate information sources.

- Given the principle to explore generalised NEM impacts across all projects rather than differentiate among specific projects, we understand the blanket application of the same period to all projects with AEMO acknowledging that delays may be shorter or longer than the proposed two years; however, this may bias the results.
- However, we do not accept AEMO's claim that there is no 'broad data set to inform the assumption' of a two year delay; we think there is a lot of data on project delay (no ISP project has been delivered on a proponent's timetable[128]) that could have been presented to justify the two years chosen.
- The issue of the inclusion of 'committed and anticipated' projects in the counterfactual and their effective exclusion from any further analysis carries over to their exclusion from sensitivity testing. The reasons AEMO uses to justify the exclusion, '…there is more certainty surrounding the completion date', are not provided. Recent history suggests that this confidence is often misplaced:

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[126] ibid

[127] For example, see Section 3.7 https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en

[128] The 2020 ISP said regarding PEC "…expected to be completed by 2024-25. The implementation of this project is currently tracking ahead of schedule with commissioning targeted in stages between late 2022 and late 2023 followed by 12 months of testing." See p. 84 https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en&hash=6BCC72F9535B8E5715216F8ECDB4451C

  - PEC – the 2018 ISP has implementation 'by the mid-2020s'[129]; the 2020 ISP had 'ideal timing' in the central case of 2024-25[130]; the 2022 ISP had 'proponent timing' of July 2026[131] which is the same in the Draft 2024 ISP
  - WRL - in the 2018 ISP WRL had indicative timing of 2023[132]; the 2020 ISP had it as a 'committed project' that was "…on track to be completed in two stages, by 2021 and 2025"[133]; 2022 ISP had proponent timing of 2026[134]; this Draft ISP (Table 1 p. 12) has proponent timing of July 2027
  - CWO REZ – the 2020 ISP said it was "…expected to be completed in 2024-25'[135]; the Draft ISP has a proponent timing of 'full capacity' by August 2028.

  It would be preferable that AEMO simply explain their exclusion from sensitivity testing (both timing and costs) because they are in the counterfactual, it is not a result of their greater project certainly on completion date.

- AEMO say the 15% transmission cost factor was based on a small sample of projects – given the publicly available data on project capex, we would suggest that a more comprehensive analysis could have been provided; for example, the re-routing of VNI West would in recent years would have provided a wealth of information, particularly when it became an actionable project prior to the current route being chosen.
- AEMO's explanation to the Panel[136] on the adjustment to transitions costs was:

  > "The selection of the quantum of transmission cost increases was based on a small sample of projects. AEMO analysed the costs of these projects specifically for design changes and re-routing to transmission elements. We have assumed transmission elements form 75% of the total project costs, yielding an average uplift of 15%."

- consumer energy resources Projects like VNI West and WRL have seen significant capex increases well above 15% due to social licence project delays. We expect that the proportion of that increase due to 'direct' social licence costs eg additional landowner and community payments, is a relatively small part of the total increase which has been predominately due to supply chain pressures. In the absence of the social licence issues, however, the projects would have been built earlier and would have had smaller supply chain cost pressures.

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[129] See p. 9 https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=en&hash=40A09040B912C8DE0298FDF4D2C02C6C
[130] See Table 6 p. 64 https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en&hash=6BCC72F9535B8E5715216F8ECDB4451C
[131] See Table 1 p. 13 https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en
[132] See p. 83 https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2018/integrated-system-plan-2018_final.pdf?la=en&hash=40A09040B912C8DE0298FDF4D2C02C6C
[133] See p. 84 https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en
[134] See p. 13 https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en
[135] See p. 84 https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en&hash=6BCC72F9535B8E5715216F8ECDB4451C
[136] Email on 19th January 2024

- AEMO provides no justification for its assumption that the same issues that have impacted VNI West and WRL will not also impact future ISP projects – suggesting that the 15% adjustment may be far too small – again greater transparency around AEMO's assumptions would provide greater justification for their position.

For actionable projects with a narrower cost accuracy band, again history is instructive. In the 2022 ISP the cost of Humelink was $(June '21)3.3b which Transgrid described as a AACE Class 4 estimate (accuracy range of -30% to + 50%)[137]; its cost in the 2024 ISP, which was provided by Transgrid is $(June '23)4.9b (-5% to +12%). Using a CPI escalator this is 33% higher In real terms[138]. The 2022 Draft ISP noted that were capex costs to be materially above the $3.3b then the project would be unlikely to be part of the ODP[139]; this decision rule was deleted from the final 2022 ISP[140] so consumers have no idea what level of capex results in a project not being part of the ODP.

- AEMO should provide the actual capex adjustment to each actionable project and a commentary on why that adjustment was chosen.
- The description of the REZ generation capex costs increases as '…approximately +5% to +60%' is misleading; of the 44 REZs, 36 were 5% or less and 2 were above 11%; the weighted average would have been <5%; the calculations behind Table 1 should be explained in a lot more detail.

Some final comments on the exclusions:

- Reduced social licence for offshore wind - AEMO acknowledges that it does exist but justifies its exclusion on a combination of[141]:
    - It is difficult to measure, and
    - It is only in the ODP in Victoria because it is Government policy.

  But this approach does not allow consideration of what would be built for a two year delay in meeting the Victorian Government's offshore wind targets. In any case the policy meets the rules requirements and hence is in the ISP, irrespective of the cost of the business case, so a cost sensitivity is irrelevant.

- Reduced social licence for non REZ based generation – the exclusion and explanation are confusing. We would have expected non-REZ based generation to have lower social licence before sensitivity testing because it is connecting to existing spare network capacity. AEMO excluded it on the assumption that generation in REZs offers more scale efficiencies and lower costs. But we would suggest that there is greater social licence risk for generation that

[137] See p. 24 https://www.transgrid.com.au/media/rxancvmx/transgrid-humelink-pacr.pdf
[138] Capex cost estimates for projects other than Humelink were based on the Mott Macdonald analysis of a range of escalators to get to June 2022 costs and then AEMO applied a CPI escalator to get to June 2023 costs. The Panel comments on the shortcomings of this approach in its submission on the Transmission Expansion Options Report https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-submission-on-teorfinal-14-june-23.pdf?la=en
[139] See p. 65 https://aemo.com.au/-/media/files/major-publications/isp/2022/draft-2022-integrated-system-plan.pdf
[140] See p. 69 https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en
[141] See p. 11 of Appendix 8

proposes to connect to yet to be built REZ compared with generation connecting to existing network.

Recommendations

AEMO provide much greater transparency on how it selected the social licence sensitivity parameters.

AEMO continue to maintain an active focus on improving the measurement of social license sensitivity as part of its work program.

2023 IASR Addendum – 13 Unknown risk factors for estimated transmission costs

Why is this important?

The AER Transparency Review of the Final IASR raised it as an issue. It notes that AEMO's approach to cost estimation differs from the Association for Advancement of Cost Engineering (AACE) cost estimation framework. In particular the AACE framework has asymmetrical accuracy bands to reflect the greater upside risks that projects face. The AER says that while AEMO adds a contingency allowance to the cost estimates to obtain a symmetrical accuracy band, it does not adequately explain how it has derived this unknown risk factor.

What does the Draft ISP say?

AEMO argues that the deviation from the AACE framework is 'superficial'. The AACE framework recommend refining the accuracy range based on actual cost estimates in the relevant jurisdiction. AEMO describes how GHD (p. 28):

> "studied the progression of the total cost estimate of 22 recent major project network elements between the Project Assessment Draft Report and the Contingent Project Application stage for projects as they progressed through the RIT-T, focusing on the changing/increasing cost needed to correct the accuracy offset of early estimates compared to the later versions. The sample distribution allowed consideration of the estimate accuracy band. This consisted of 9 stations and 13 overhead line network elements."

The conclusions of this analysis were:

- Accuracy ranges for early stage projects can be reasonably assumed to be ±30% for Class 5a estimates and ±50% for Class 5b estimates, and
- The unknown risk factor was 30%.

Panel comments

The 2022 and 2024 Consumer Panels have commented extensively on the level of the unknown risk factor and the validity of symmetrical cost estimates. Our conclusion has been that the justification for AEMO's position is weak and this response to the Transparency Review does not change that view.

The GHD 30% estimate was in a report published in May 2021, using 2020 data[142]. The 2022 Panel expressed serious reservations about the quality of the data set that GHD had relied on[143]. GHD was very cautious about the putting too much reliance on their estimates:

> "… the improving accuracy range as the cost estimate matures have been formed based on linear extrapolation of recent NEM projects early stage cost estimate accuracy range and the AACE RP 96R-18 optimistic accuracy range for more advanced stage cost estimate (as shown in Figure 9). We note that this representation of improving accuracy range is mostly academic and based on observation of recent NEM projects as their cost estimates matured. Given the lack of major transmission augmentation project works in the NEM in recent history and thus the absence of empirical actual cost information allowing the estimate vs actual cost analysis (with benefit of hindsight), further conclusive insight into the improving accuracy range is unavailable. As such the data in the following table should be viewed in this context."

AEMO is still using the same 'unknown risk' factor based on a 'mostly academic' analysis of very out of date cost data.

Recommendations

The development of the 2026 ISP Transmission Cost Database involve a thorough review of the 'unknown risk' factor based on more up to date data.

[142] https://aemo.com.au/-/media/files/major-publications/isp/2021/transmission-cost-database---ghd-report.pdf?la=en

[143] See pp. 72-85 https://aemo.com.au/-/media/files/major-publications/isp/2021/isp-consumer-panel-report-on-2021-iasr.pdf?la=en

Chapter 5. Topics for consideration in the 2026 ISP

This section discusses four topics that are relevant to the 2026 ISP – consumer risk preferences, the CSIRO Gen Cost report, hydrogen assumptions and the modelling approach. Our earlier discussion on gas firming renewables made recommendations around expanding the gas supply chain analysis in the 2026 ISP.

Supporting Documents- Consumer Risk Preferences

Why is this important?

Development of better information on consumer risk preferences was a key recommendation from the 2022 ISP Consumer Panel[144]. There is the need to balance the risks of under (network built too little too late to enable generation to efficiently replace coal plant closure) and over investment (network built too soon of too big given the alternatives) that increases the risk of stranded assets at both the start and the later years of network asset life.

What does the Draft ISP say?

AEMO sets out is views in the ISP Methodology:

> "…the selection of an ODP relies on the use of professional judgment in balancing the outcomes of the above decision-making approaches to select a path that has a positive net economic benefit in the most likely scenario. When applying this professional judgement, AEMO may choose to apply an assessment of consumer risk preferences to the ultimate determination of the ODP.

A summary of the consumer risk preferences project undertaken during 2023 was also produced as a Supporting document for the Draft 2024 ISP.

Panel comments

The Panel engaged actively with AEMO and the consultant appointed to the consumer risk preference project. We made the following summary comments that are given in the Supporting Document:

- Understanding consumer risk preferences is crucial for ISP development, and the Panel commends AEMO for its commitment and effort to deliver on the 2022 Panel recommendation.
- Ascertaining consumer risk preferences that can be quantitatively applied is challenging and novel. While good progress has been made during the development of the 2024 ISP, there is no data that can be confidently applied at this early stage to the modelling of the ODP.
- The initial 'metrics' from this data can usefully be tested using 2024 ISP outputs, as a test to better understand how a metric might be applied to future ISP processes and the likely materiality of applying risk preferences.

[144] See the Recommendations pp 9-11 https://aemo.com.au/-/media/files/major-publications/isp/2022/isp-consumer-panel-report-on-draft-2022-isp.pdf?la=en. The AER's 2023 CBA also refers to the importance of understanding consumers' level of risk neutrality or aversion, as discussed previously in this submission.

- More work is needed for the 2026 ISP, particularly around measuring preferences of commercial and industrial customers which were not included in the 2024 ISP work, learning from the process and possible metrics identified in the 2024 ISP development process.
- We observed that initial results suggest residential consumers, on average, prefer to accept some uncertainty and are willing to pay only a modest amount to reduce the risk of future volatility.

We continue to recognize the difficulty in the task of quantifying consumer risk preferences across the diversity of consumer perspectives. We also affirm the value in persevering. There are a number of examples of consumer risk preference that should be considered in future ISP's, including:

- people's preferences regarding funding investments today to avoid future price volatility, and level of acceptance of risk that what they pay for may not eventuate. (This is distinct from a measure of people's acceptance of price in and of itself.)
- people's preference for the means by which costs are recovered, either:
    - through regulated revenue, where consumers take on all risk with respect to utilisation and the efficacy of investments, and the costs to consumers are relatively certain (though the benefits often aren't), or
    - through contestable markets, where investors take risk with respect to utilisation and efficacy of investments and consumers are protected against the cost of overspending, but more exposed to the consequences of underspending.
- people's acceptance of variability and uncertainty of reliability. In particular, this entails understanding people's appetite for accepting and/or paying to minimise the tail risk of High Impact Low Probability and Wide Area Long Duration Outage events (that occur outside of the range of reliability studies), and their preparedness to accept that some reliability outcomes they pay for may not eventuate. Importantly, this is distinct from what people are prepared to pay for reliability in a general 'year on year' sense, which is revealed through other measures such as the AER's Value of Customer Reliability.
- people's acceptance of variability and uncertainty in terms of emissions reduction. This could include:
    - the risk of investment needs to decarbonise the energy system proving materially higher or lower than anticipated.
    - the risk of intended emissions reductions not eventuating; for example, that money spent on the shared transmission network in new Renewable Energy Zones doesn't result in the intended emissions reduction due to underutilization.
    - the risk of consumers paying multiple times, for example as taxpayers and through energy bills, for the same emissions reduction
    - the risk of consumers carrying costs for emissions reductions unnecessarily; for example, where money spent by consumers on enabling renewables, on the basis that private investors won't, proves unnecessary due to those investors making high profits through high energy prices.

Importantly, these emissions reduction risk preferences are not an assessment of people's willingness to pay for emissions reductions.

Recommendation

AEMO work closely with the ISP Consumer Panel to co-design the further development of consumer risk preferences for application to future ISPs.

Aurecon Costs and Technical Parameter Review and CSIRO GenCost Report

Why is this important?

The assumptions on current and forecast costs for generation and storage are a key input to the ISP modelling. Aurecon has prepared an updated report on the 2023 costs and CSIRO used that data to forecast costs out to 2050. They are a core input to the ISP.

What does the report say?

We are considering the next iteration of the Aurecon and CSIRO reports that were published as drafts in December 2023[145] (2023 editions) along with the Draft ISP. CSIRO published two forecasts – capex and LCOE with the former used in ISP modelling. The final CSIRO report is due to be published around the time of the Final 2014 ISP in mid-2024. It is AEMO's intention, at this stage, that the Final ISP modelling will be based on the 2022 edition of the CSIRO report. However, depending on submissions, they are open to considering using the latest drafts.

Panel comments

The Panel's interest in the reports relates to the generation and storage capex costs, not the LCOE forecasts as only the former are used in ISP modelling.

In the Panel's previous submissions on both the Draft and Final IASR, we commented on a range of issues with the Aurecon and CSIRO 2022 reports. All centered around whether the base year cost estimates (Aurecon) and forecasts (CSIRO) were underestimates.

The Panel does not have the expertise to know whether they are definitely underestimates. Our approach is to raise issues that we consider are important, see how they have been addressed in each report and seek further explanation/clarification from the authors where we consider there are gaps. Based on this analysis, we concluded that there was a high probability that at least some of the technology estimates were underestimates.

The issues we raised in our earlier submissions included the 'return to normal' date (CSIRO subsequently extended that to 2030 in two scenarios), the use of out of date base year costs, the use of out of date international benchmarks, the use of out of date ABS price indices, insufficient explanation of the impact of international developments on domestic costs (eg US IRA, strong international demand for labour and materials to support large-scale roll-outs of renewables, Chinese dominance of supply chains), lack of consideration of domestic market developments in EPC contracting, whether 'renewable commodities will follow similar price pathways to commodities in the past and little justification for not including the potential influence of State local content requirements.

[145] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/2024-forecasting-assumptions-update-consultation-page/csiro---gencost-2023-24-consultation-draft-report.pdf?la=en; and https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/2024-forecasting-assumptions-update-consultation-page/aurecon---2023-cost-and-technical-parameters-review.pdf?la=en

The reports measure 'overnight' costs[146] which is a standard approach to comparing technology costs. It does not include interest during construction. Aurecon has three cost categories – land and development, equipment and installation. The costs are representative of projects that could be typically installed in the NEM with technical characteristics of each technology based on Aurecon's experience of Australian projects. The estimates are based on an extensive list of technical and financial assumptions[147]. The latter includes no contingency.

> "The accuracy/certainty of the cost estimates is targeted as +/- 30% based on the spread and quality of data available and our experience with the impact of the above [financial] factors."

Our discussion of the 2023 editions of the reports covers some of the same issues as well as new ones.

The level of cost accuracy

Aurecon provides no detail on why the estimates are ±30% and why, given the level of uncertainty and exclusions discussed above, the cost estimate is symmetrical – which allows AEMO to take the midpoint as the modelling input.

The treatment of interest during the project development and construction phases

Following discussions with AEMO and CSIRO it seems that interest during both the project development and construction phases is not included in the modelling. Also, it appears that the costs of a delay in network construction to support generation or storage connection, are also not included. There is no discussion of why these exclusions were made and whether any analysis was done that might have suggested their exclusion was due to their immateriality. .

We are seeing extended project development timetables (due to delays in environmental and planning approvals and social licence) and delays in construction (due to supply chain issues) occurring all over the NEM. And all this at a time of relatively high interest rates. High interest rates have been a major factor in stopping US/UK offshore wind projects in the last 12 months[148].

Little detail provided on the approach to estimating 'development and land costs' estimates

These costs include –

- Legal and technical advisory costs
- Financing and insurance
- Project administration, grid connection studies, and agreements
- Permits and licences, approvals (development, environmental, etc)
- Land procurement and applications.

These costs for project and land procurement are:

[146] Ibid p.14
[147] See pp. 14-15 https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/2024-forecasting-assumptions-update-consultation-page/aurecon---2023-cost-and-technical-parameters-review.pdf?la=en
[148] https://www.nytimes.com/2023/12/11/business/energy-environment/offshore-wind-energy-east-coast.html

> "…highly variable and project specific. An indicative estimate has been determined based on a percentage of CAPEX estimate for each technology from recent projects and experience with development processes".

The other variable is 'Development time' which is defined as:

Development time	Time to undertake feasibility studies, procurement, and contract negotiations, obtain permits and approvals (DA, EIA), secure land agreements, fuel supply and offtake agreements, secure grid connection, and obtain financing. This period lasts up until financial close.

The following table illustrates the approach for onshore and offshore wind[149].

	Development time (yrs)	Cost of Land and Development	
		$m	% of total cost
Onshore wind	3-5	35.7	2.5%
Offshore wind – fixed	>7	319.4	5%
Offshore wind - floating	>7	130.2	4%

However, the Aurecon report and excel data base give little detail[150] :

> "An indicative estimate has been determined based on a percentage of CAPEX estimate for each technology from recent projects, and experience with development processes."

It would be good to have more transparency around this.

There is little further detail provided and more clarity on the reason for selection of these time scales and percentages would be helpful:

- The development time definition is confusing; while it includes the time to 'secure a grid connection' it is not clear whether it includes the time taken for the grid to be built (which is now subject to significant delays) to connect to a fully approved project
- For onshore wind, what development time has been assumed to get the 10% number? The cost can be quite different for 3 vs 5 years
- The public data on the experience of onshore wind projects in NSW is that they take a lot longer than 5 years; the same would apply for projects looking to connect to WRL or VNI West; we would expect some were looking at connecting back in 2018 and 2020 when these projects became part of the ODP; the Draft 2024 ISP has a proponent completion date of

149 While the cost category is described as 'land and development' this category is only used in table 4-3 for onshore wind. The tables for offshore wind (4-8 and 4-9) use the descriptor 'Development and project management' and we assume that is referring to the same cost component.

150 See p. 14 https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/2024-forecasting-assumptions-update-consultation-page/aurecon---2023-cost-and-technical-parameters-review.pdf?la=en

WRL of July 2027 and December 2029 for VNI West; wind developers have significant concerns about the extended development time for wind projects[151]

- For offshore wind how much longer than 7 years was the assumption underpinning the 5% and 4% numbers? It seems that the European experience has been used to assess the timetable (see Figure 4.1 p. 28) but no explanation is given as to why a timetable for a well-established industry building the 'nth of a kind' project should apply to building a 'first of a kind' project in Australia.

The exclusion of contingency

It is difficult to understand this given their comment under 'Global supply chain cost issues'(p.15):

> "Construction cost growth adds a further element of uncertainty to new construction projects and maintenance activities, as well as inflationary pressures to the economy. With construction costs up more than 25% over the past five years, project proponents need to factor in considerable contingencies in addition to prices stated in this 2023 report to allow for uncertainty and movement in construction costs, as well as for operating costs over the life of the project."

How 'short' are short term inflationary pressures?

This covers a range of issues – commodity prices, 'balance of plant' and local content.

Commodity prices - In our IASR submission we highlighted the impact of then high commodity especially 'green' metal prices eg lithium and nickel on technology costs. These commodity prices have fallen substantially since then and eased some of the immediate cost pressures. However, this price volatility is not unusual in commodity markets. Forecasting long term technology costs is not focussed on next years' commodity prices but what is a long term trend. Just as prices in early 2023 were not indicative of a long term trend, current prices are not either.

Our proposition was that CSIRO had assumed that future commodity price cycles for new 'green' metals would be similar to past price cycles for traditional minerals and metals – volatility around a long term downward trend in real prices. We suggested that CSIRO consider the case that the green metals commodities price cycle might be different from history given all of the developed and a large portion of the developing world are wanting them at the same time. CSIRO did partially reflect that view when they delayed the 'return to normal' price path from 2027 to 2030 for two of their scenarios.

Then there is the idea of a 'green premium' for other technology cost components eg aluminium made from renewable power and steel made from hydrogen[152] that could offset the long term technology learning assumptions reduction in costs. CSIRO has no comment on that implying they do not consider it to be influence on future technology costs. We are not saying that it will be a material influence, only that it should have been discussed and an opinion proffered on why it would not be an influence.

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[151] For examples see https://reneweconomy.com.au/a-decade-is-far-too-long-major-investors-slam-planning-delays-in-nsw/; https://reneweconomy.com.au/the-phantom-dwellings-that-could-be-project-killers-for-wind-farms/ and https://reneweconomy.com.au/massive-1500-mw-wind-project-in-nsw-gets-planning-approval-first-in-nearly-three-years/

[152] https://www.mckinsey.com/industries/metals-and-mining/our-insights/capturing-the-green-premium-value-from-sustainable-materials

The influence of China – we highlighted this in our submission on the Final IASR[153]. There are two areas – control of 'green' metals and dominance of some supply chains. The reduction in Chinese solar panel prices in the last 12 months is not an argument against the 'China' influence. Certainly, the Federal Government seems concerned about it as it is a factor in their critical minerals strategy and the development of a local manufacturing capacity is high on the list for National Reconstruction funding. In our final IASR submission we asked[154]:

> "Does CSIRO see Chinese costs as a key driver for their long term GenCost forecasts? In which case does CSIRO see the risks to that reliance as important factor in cost and delivery of clean energy targets as the US, EU and Australian Governments, as well as the IEA[155], clearly do?"

CSIRO does discuss lower technology costs in China (p.25):

> "The potential for local learning means that technology costs are different in different regions in the same time period. This has been of particular note for technology costs in China, which can be substantially lower than other regions. GALLME uses inputs from Aurecon (2023a) to ensure costs represent Australian project costs. For technologies not commonly deployed in Australia, these costs can be higher than other regions. However, the inclusion of local learning assumptions in GALLME means that they can quickly catch up to other regions if deployment occurs. However, they will not always fall to levels seen in China due to differences in production standards for some technologies. That is, to meet Australian standards, the technology product from China would increase in costs and align more with other regions. Regional labour construction and engineering costs also remain a source of differentiation"

It would be useful to have a fuller discussion of what this means, eg does Gallum assume the development of a local manufacturing capacity where local technology learning reduces, but does not eliminate the Chinese cost advantage and forecasts are based on this locally built technology? This can be influenced by Governments' local content policy.

Local content – this is another factor we discussed in our Final IASR submission (p.49). CSIRO justified excluding local content information based on a lack of objective information. The Panel argued that the GenCost study and the IASR are full of judgements that are made given the lack of objective knowledge, eg the revert to normal date assumption. The direct experience Panel members have with implementation of the NSW Roadmap is that local content is increasingly important consideration as Governments seek to sell the benefits of the transition in terms of industrial development and regional employment goals.

Balance of plant – These are the costs for site construction, installation and commissioning works. Aurecon defines them as (p.17):

[153] See pp. 50, 53-4 https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-report-on-2023-iasr.pdf?la=en
[154] See p. 54 https://aemo.com.au/-/media/files/major-publications/isp/2023/isp-consumer-panel-report-on-2023-iasr.pdf?la=en
[155] https://www.iea.org/reports/energy-technology-perspectives-2023/clean-energy-supply-chains-vulnerabilities

Installation cost	The component of the EPC contract sum that is primarily attributed to the site construction, installation, and commissioning works. *Note that the total EPC cost has been split into "equipment cost" and "installation cost" for the purpose of this study, based on a typical proportion for that technology. Other EPC cost factors such as engineering, overhead, risk, profit, etc have been distributed evenly between the two.*

To again take the example of onshore and offshore wind 'installation costs':

- Table 4-3 says '25% of EPC cost – typical' – and it is reasonable to assume there is a lot of historical data to support this.
- Tables 4-8 for fixed offshore says 'Approximately 27% of CAPEX cost – typical' and Table 4-9 for floating offshore says 'Approximately 38% of CAPEX cost – typical' but there is no reference to where this 'typical' came from; there are no projects built in Australia.

Our IASR submission highlighted the severe constraints on local labour, material and EPC resources with the multitude of large infrastructure projects underway and planned for the period to 2030. There are several reports showing the huge training task required to meet skills to meet Government renewable targets[156]. It would have been good to see how Aurecon arrived at these assumptions and why they are robust for inclusion in the long term CSIRO forecasts.

The overseas experience with offshore wind and Australian costs

While there is a passing reference in the Aurecon report (p.24) to the large cost pressures that are leading to the abandonment and delay of many projects in the EU, UK and US, surprisingly Aurecon's discussion (p. 25) of 'Recent Trends' in offshore wind makes no reference to it. It says:

> "Given that the current offshore development and delivery capability in Australia is virtually non-existent, costs for offshore wind in Australia are expected to be above the international average until experience is gained and supply chains established. Aurecon would recommend caution in assuming efficient translation of these global costs to Australian projects. If costs are applied for Australian projects, developers will need to factor in costs of shipping turbines and specialist installation equipment (for example, jack up vessels). For the purpose of this report, we have considered international average costs without considering any regional assumptive uplift of costs."

We highlight Aurecon's statement that there is no adjustment for higher local costs.

The cost analysis in Tables 4-8 and 4-9 is based on actual costs in 2022 which could be argued are almost irrelevant given the evidence of projects being cancelled and delayed over the last 12 months.

[156] The most recent being https://www.jobsandskills.gov.au/publications/the-clean-energy-generation

Table 4-8 Cost estimates of fixed foundation

Item	Unit	Value	Comment
CAPEX			
Relative cost	$ / kW	5,323	Based on US $3,461 / kW which was the 2022 global weighted-average installed costs for offshore wind. Capital cost includes a certain percent of grid connection cost, typically 8-24%. It is country specific, and in some countries (e.g., China, Denmark, and the Netherlands) developers are not responsible for electrical interconnection reducing their installed cost and bringing down the global weighted-average cost. Relative cost does not include land, lease, and development. Exchange rate at time of print: 1 USD – 1.538 AUD

Table 4-9 Cost estimates of floating foundation

Item	Unit	Value	Comment
CAPEX			
Relative cost	$ / kW	7,356	There is limited data available due to low deployment of technology especially at commercial scale. Relative costing has derived from the CATAPULT Guide to a Floating Offshore Wind Farm (associated costing spreadsheet) and aligned to consider the hypothetical project outlined in section 4.3.5). The variation between fixed and floating CAPEX noted is in line with other Offshore Wind costing analysis. Exchange rate at time of print:

If we have understood the report correctly, the 'equipment cost' in Tables 4-8 and 4-9 is based on a Guide[157] from 2019 for fixed and a Guide[158] from 2021 for floating, though the footnote links may suggest more recent cost estimates.

The CSIRO Gencost estimates for small modular nuclear reactors are based on an actual project in the US that fell over at the final hurdle in late 2023. We think that is a useful model for offshore wind. There are many examples of projects that 'fell over' in the last 12 months that were well publicised as Aurecon was preparing their report [159]. Lazard's mid-point estimate for offshore wind (assume fixed) in a mature market was $US4,000/kW in September 2023 - 15-20% above the Aurecon estimate for the 'first of a kind' build.

Did Aurecon consider the potential relevance of the price the UK Government has announced it will offer for offshore wind a CFD in 2024 (£176/MWh or $A341/MWh) 66% above the price offered in 2023 that resulted in no bids[160]? Aurecon explicitly states that it took no account of the lack of build infrastructure compared with northern hemisphere companies (similar arguments CSIRO has for high

[157] https://guidetoanoffshorewindfarm.com/wind-farm-costs
[158] https://guidetofloatingoffshorewind.com/wind-farm-costs/
[159] For example eg https://www.wsj.com/business/energy-oil/Americas-offshore-wind-ambitions-are-coming-with-bigger-price-tags-95693495; https://www.nytimes.com/2023/11/01/business/energy-environment/offshore-wind-farm-new-jersey.html; https://www.nytimes.com/2023/08/07/business/offshore-wind-costs-delays.html
[160] https://www.afr.com/companies/energy/britain-ramps-up-subsidies-for-struggling-offshore-wind-industry-20231117-p5ekov

SMR costs in Australia). Other significant factors in northern hemisphere costs like the lack of vessel capacity to transport and erect turbines[161] was also ignored.

The absence of a market testing sense check

Given the uncertainties on cost estimates in a rapidly rising cost environment that have been highlighted here, we think it would be reasonable to undertake some form of market engagement to get feedback on the estimates. This is the approach AEMO took to arriving at the discount rate with OEA surveying investors across generation, storage and transmission, although in this case, the sample was too small for quantitative analysis.

As was the case with discount rates, this information is not going to be provided through the public submissions process. It needs to be the result of confidential discussions. When we raised this possibility with CSIRO, they indicated they are considering engaging with ARENA and the CEFC. We would support that.

Summary

The common themes of our comments on both the Aurecon and CSIRO reports are:

- Either the absence of, or limited discussion on, major issues that are influencing current costs or may influence future costs, and
- The lack of explanation of the numerous judgement calls made on cost components.

The Panel is not saying that it has a better idea of what costs are or will be. What the Panel is saying is that given the importance of the topic the level of explanation and clarity of approach in both reports could be substantially improved. We consider that the onus is on Aurecon and CSIRO to provide more comprehensive explanations of their approaches. This allows much better informed consultation with stakeholders.

Given how costs are changing due to a wide range of moving parts, we think there is a case for AEMO to seriously consider using the Draft GenCost results in the Final 2024 ISP modelling rather than the previous GenCost results published in June 2023 that relied on 2022 costs.

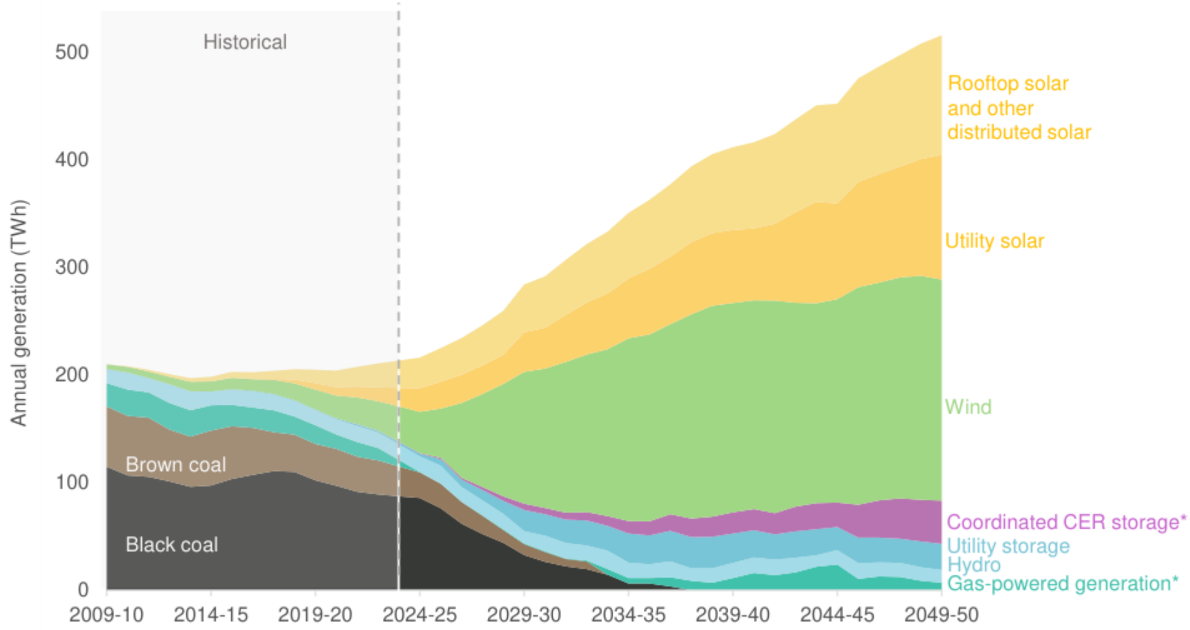
Recommendations

The final Aurecon and CSIRO Gen Cost reports should provide greater clarity on their approach to the issues discussed above.

The Panel supports AEMO seriously considering using the draft CSIRO GenCost results in the Final ISP modelling. We await other submissions' views on this matter.

[161] https://www.linkedin.com/pulse/addressing-vessel-shortage-offshore-wind-challenges-future-solari#:~:text=The%20Vessel%20Shortage%20Dilemma&text=With%20the%20soaring%20demand%20for,larger%20and%20more%20powerful%20turbines.

Figure 9 **Generation mix, NEM** (TWh, 2009-10 to 2049-50, *Step change*)



Hydrogen scenario

Why is this important?

The 2024 ISP Green Energy Exports has a nearly 20% reduction in the power consumption for hydrogen production compared with the corresponding Hydrogen Super Power scenario in the 2022 ISP[162]. The cost of hydrogen is driven by the delivered cost of renewable energy.

Panel comments

In the period during the development of the 2022 ISP scenarios there were significant public comments and a large range of Government policies around the development of a large hydrogen industry in Australia. This ambition was tempered in the 2024 ISP.

The evidence in the last 12 months since the 2024 scenarios were agreed is that, despite government policy, the business case for hydrogen will only enable the achievement of the Green Energy Exports scenario with a level of Government support significantly above that which is already committed. The Panel understands that the Australian Government is continuing to explore possibilities. The barriers to developing a large scale hydrogen industry were reflected in the low 15% weighting for this scenario by the Delphi Panel.

[162] Electricity consumption for domestic hydrogen fell from 64TWh to 50TWh; electricity consumption got export consumption (including green steel) fell from 221TWh to 183 TWh. See p.6 of https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en; and p. 5 of https://aemo.com.au/-/media/files/major-publications/isp/2023/2023-inputs-assumptions-and-scenarios-report.pdf?la=en

Achieving the Federal Government's target price of $2/kg required delivered solar energy at $20/MWh by 2030. This is considerably below the CSIRO GenCost forecasts simply for the generation component[163], let alone network costs. The head of ARENA has recently stated that[164]:

> "If we don't do that, we can't be a superpower because our electricity will be too expensive"

Otherwise:

> "We won't be able to compete with hydro in Canada or in Norway, we won't be able to compete with other technologies. Our superpower is underpinned by solar, but it has to be cheaper solar."

Recommendation

The development of scenarios in the 2026 ISP should take a more comprehensive approach to analysing the hydrogen cost assumptions and how they may influence the scenario variables

ISP Modelling

Why is this important?

The complexity of the ISP increases significantly at each iteration. Incorporating gas matters in the 2026 ISP, as well as changes flowing from the current Energy Ministers review of the ISP will be another step change in complexity. We understand that Energy Minister at their meeting on 1st March will reach agreement on a carbon pricing mechanism that will mean a carbon price is incorporated into the Final ISP modelling.

Panel Comments

We understand the PLEXOS modelling framework used for the ISP is deterministic rather that probabilistic. We understand that this means it produces a neat least cost optimisation solution in the ODP given the deterministic inputs. Yet the world it is trying to model has stochastic inputs that are probabilistic eg weather data.

Above we have proposed expanded sensitivity analysis including 'combined sensitivities' where there is more than one 'sensitivity factor' for a particular sensitivity. AEMO says that it does not have the resources to run these types of sensitivities given the huge computing task required.

AEMO does use multiple simultaneous stochastic modelling (Monte-Carlo simulation) for publications like the ESOO given the mathematical problem size for those studies is a lot smaller than the ISP. Through the use of the short-term models (similar to the ESOO models), AEMO validates the outputs from the capacity outlook model with more granularity, and within the modelling of development paths includes variable weather and demand profiles that (while still deterministic) ensure that the problem is solved with regard to a breadth of market conditions affecting solar, wind and hydro resource availability, and the impact that weather has on daily demand shapes.

We have had discussions with two stakeholders who have raised potential limitations with the PLEXOS approach in the future and we have encouraged them to make submissions on the Draft ISP.

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[163] See Figure 5-4 p. 62 https://www.csiro.au/en/news/all/news/2023/December/2023-24-gencost-consultation-draft—released
[164] https://www.afr.com/companies/energy/australia-a-hydrogen-superpower-only-if-solar-costs-plummet-20240125-p5ezvr

The research undertaken by one of them – Andrew Fletcher and Huyen Nguyen, who are Industry Adjunct Research Fellows at Griffith University Centre for Applied Energy Economics and Policy Research[165] - identified significant potential sector coupling benefits from potential future green ammonia value chain demand response, including the ability to contribute to addressing renewable energy droughts and seasonal energy imbalances.

They also identified that the current modelling of hydrogen does not consider the cost of hydrogen storage required to provide a constant supply of hydrogen to key use cases such as industrial heat and transport. They recommend investigating how to more accurately integrate green hydrogen and green ammonia value chains into modelling for the 2026 AEMO ISP. This could include co-optimisation modelling with greater definition of value chains including hydrogen storage, ammonia plants and ammonia storage. They also recommend developing an evidence base for sector coupling of other industrial decarbonisation loads such as industrial heat to inform how these loads could be modelled more accurately. We understand that these authors will be expanding on this issue in their submission on the Draft ISP.

Recommendation

AEMO continues to remain abreast of modelling developments and engages with stakeholders making submissions on modelling approaches.

[165] https://www.griffith.edu.au/griffith-business-school/research/centre-applied-energy-economics-policy-research