2025 IASR Consultation Summary Report

July 2025

Published in conjunction with the 2025 Inputs Assumptions and Scenarios Report (IASR)

We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country; and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have launched its first Reconciliation Action Plan in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation - a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Important notice

Purpose

AEMO has prepared this document to provide information about the Draft 2025 Input Assumptions and Scenarios Report (IASR) consultation pursuant to National Electricity Rules (NER) 5.22.8(b) and Section 2.5 of the Australian Energy Regulator's Forecasting Best Practice Guidelines. This publication is generally based on information available to AEMO as at 31 July 2025 unless otherwise indicated.

Disclaimer

AEMO has made reasonable efforts to ensure the quality of the information in this publication but cannot guarantee that information, forecasts and assumptions are accurate, complete or appropriate for your circumstances.

Modelling work performed as part of preparing this publication inherently requires assumptions about future behaviours and market interactions, which may result in forecasts that deviate from future conditions. There will usually be differences between estimated and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material.

This publication does not include all of the information that an investor, participant or potential participant in the National Electricity Market might require, and does not amount to a recommendation of any investment. Anyone proposing to use the information in this publication (which includes information and forecasts from third parties) should independently verify its accuracy, completeness and suitability for purpose, and obtain independent and specific advice from appropriate experts. Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this publication:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this publication; and
- are not liable (whether by reason of negligence or otherwise) for any statements, opinions, information or other matters contained in or derived from this publication, or any omissions from it, or in respect of a person's use of the information in this publication.

Copyright

Version control

Version	Release date	Changes
1.0	31/07/2025	Initial publication

Executive summary

AEMO delivers a range of forecasting and planning publications for the National Electricity Market (NEM), including the NEM *Electricity Statement of Opportunities* (ESOO), *Gas Statement of Opportunities* (GSOO), and *Integrated System Plan* (ISP). AEMO uses a common set of inputs, assumptions and scenarios in developing these publications. Many of these inputs and assumptions, and their scenarios, are also used in planning the Wholesale Electricity Market (WEM) in Western Australia.

Ahead of the publication cycle, AEMO works with stakeholders to update the inputs and assumptions that will be used in conducting the major planning activities. The 2025 *Inputs, Assumptions and Scenarios Report* (IASR) outlines the scenarios, modelling inputs and assumptions that AEMO will use in its forecasting and planning activities over the coming year, including the development of the 2026 ISP. AEMO consulted on the Draft 2025 IASR in accordance with the National Electricity Rules (NER) and the Australian Energy Regulator's (AER's) *Forecasting Best Practice Guidelines*[1]. This document summarises the material issues raised by stakeholders during its consultation process. These included submissions to two stages of the IASR's release, and several additional opportunities in AEMO's Forecasting Reference Group (FRG) meetings and consultations. The document outlines AEMO's responses to these material issues and describes the changes made to finalise the IASR taking into account these submissions and responses.

AEMO thanks stakeholders for their submissions

Engagement to develop the 2025 IASR was carried out regularly over 11 months from July 2024 to June 2025, with multiple opportunities for stakeholder input. AEMO considered 63 formal submissions to the Draft 2025 IASR consultation[2]: 36 submissions to the first stage and 27 submissions to the second stage respectively, and five confidential submissions. AEMO conducted additional consultation opportunities through its FRG[3], receiving 10 relevant publishable submissions[4] in April, May and June 2025, complementing discussions during FRG meetings. The Draft 2025 IASR consultation was preceded by consultation on the ISP scenarios, to which AEMO received 50 submissions[5].

Each major consultation was supported by webinars and opportunities for consumer advocates to provide their submissions (including verbal submissions).

Table 1 lists key themes received from stakeholders in these submissions, as well as frequency of mentions and the main cohort providing comments.

[1] AER. August 2020. *Forecasting Best Practice Guidelines,* at https://www.aer.gov.au/system/files/2025-05/AER%20-%20Forecasting%20Best%20Practice%20guidelines%20-%202020%20-%20Version%201.pdf.

[2] See https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr.

[3] FRG meeting minutes are published on https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/forecasting-reference-group-frg.

[4] Available in FRG Consultation folders on data centres and multi-sectoral modelling, at https://aemo.com.au/en/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/forecasting-reference-group-frg.

[5] See https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr-scenarios-consultation.

Table 1 Summary of key themes and material issues

Theme	Frequency*	Main cohort
Scenario set and parameters - greater support for the **Green Energy Industries scenario variant** than the proposed *Green Energy Exports* alternative, and various sensitivity suggestions to explore additional uncertainties.	31 stakeholders	Consumer, Community, Environmental or Climate group
Rate of return – with support for **technology-specific weighted average costs of capital (WACCs)**, alignment with the AER's Rate of Return Guideline approach, more focus on coal closures, outage rates and grid stability, and reassessment of pumped hydro cost estimates.	23 stakeholders	Consumer, Community, Environmental or Climate group
Network developments – support for AEMO's focus on **renewable energy zone (REZ) development** with encouragement to explore 'distribution-level REZ' opportunities, support for REZ locational cost factors, and clarification sought on the incorporation and quantification of social licence factors.	22 stakeholders	Consumer, Community, Environmental or Climate group
Demand-side factors – encouragement to strengthen understanding of the **role of distribution networks** to facilitate the operation of consumer energy resources (CER) and other distributed resources, and to consider community batteries and the variation in CER forecasts between scenarios.	20 stakeholders	Electricity or Gas network
Hydrogen considerations – recommendations regarding the **role of hydrogen**, including the scale of hydrogen blending, hydrogen energy storage systems (HESS) and carbon capture, utilisation and storage (CCUS), and to capture additional hydrogen-related costs including land pipes, firming and cost escalations, while AEMO's electrolyser location assumptions including off-grid proportion were supported.	20 stakeholders	Academic, Consultant or Individual
Sector coupling – seeking greater clarity on **multi-sectoral modelling**, with suggestions to lower carbon sequestration and electrification forecasts, additional energy efficiency drivers, and seeking more detail on the role of infrastructure to support fuel-switching.	16 stakeholders	Consumer, Community, Environmental or Climate group

Stakeholder feedback has been incorporated in inputs and assumptions for the 2025 IASR

AEMO considered the submissions received, and has made the following key changes to the inputs and assumptions for the final 2025 IASR:

- **Refined scenarios,** including renaming *Progressive Change* to *Slower Growth*, selecting the *Green Energy Industries* scenario variant over *Green Energy Exports*, and renaming this scenario *Accelerated Transition*.
  - Given stakeholder submissions referenced the original scenario names, this report broadly respects the names that stakeholders engaged with, in its submission summaries and AEMO's responses. AEMO considers this will minimise the risk of potential confusion for stakeholders who submitted to the IASR consultation processes.
- **Refined sensitivities,** identifying several potential sensitivities while ensuring flexibility is retained for sensitivity refinement during the ISP modelling.
- **Updated cost and technology assumptions,** including new distribution-connected mid-scale solar and battery assumptions, and updated pumped hydro energy assumptions.
- **Updated renewable energy zone (REZ) assumptions,** including the geographic areas, land use limits, resource limits and transmission limits.
- **Updated consumer energy resources (CER) assumptions,** including the removal of fuel cell electric vehicles (FCEVs), enhancements to the vehicle lifetime assumptions, and an expanded set of public charging categories.

- **Updated hydrogen assumptions,** including improved detail on hydrogen consumption locations, new forecast components for gas-powered generation and industrial hydrogen feedstock fuel-switching, refined committed projects, and refined minimum utilisation factors.
- **Updated multi-sectoral modelling assumptions,** including updated hydrogen prices, added market-led energy efficiency savings, and refinements to the descriptions for improved transparency.
- **Updated policies,** including the addition of the Federal Government Cheaper Home Batteries, and the removal of the Peak Demand Reduction Scheme.

Contents

Tables

Figures

1 IASR consultation overview

This Consultation Summary Report focuses on AEMO's consideration of stakeholder feedback from various consultation stages on the Draft 2025 IASR, and summarises how the 2025 IASR has adapted as a result of stakeholder feedback. This Consultation Summary Report has been prepared in accordance with the NER[6] and the AER's *Forecasting Best Practice Guidelines*[7].

In developing the 2025 IASR, AEMO consulted stakeholders at several stages. The IASR's scenarios were consulted on from July 2024 and formed the foundation of the Draft 2024 IASR[8], which itself was consulted on from December 2024 to June 2025 (including several additional consultations via AEMO's FRG). AEMO consulted on the 2026 ISP modelling processes, as defined in the *ISP Methodology*[9], over two stages, from October 2024 to June 2025. AEMO also conducted separate consultations on the *Electricity Network Options Report*[10] and the *Gas Infrastructure Options Report*[11], from May to July 2025.

In addition to these AEMO-led consultations, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) led the development of the *GenCost 2024-25 Report*[12], which has also been finalised and published alongside this IASR. Many of the submissions to the Draft IASR consultation stages provided useful insights considered by CSIRO as it finalised the *GenCost 2024-25 Final Report*. While AEMO does not use all components of the GenCost report – for example, CSIRO's development of levelised cost of electricity (LCOE) for various technology and technology mixes – the report does provide critical forward-looking generation and storage capital costs that are applied in AEMO's planning activities for the ISP.

Consultation has also covered additional inputs relative to previous IASRs, to acknowledge additional breadth needed in AEMO's planning models, particularly the ISP, to meet the requirements of the Energy and Climate Change Ministerial Council (ECMC) ISP Review[13].

1.1 Consultation on developing the 2025 IASR

Table 2 below outlines the key engagement milestones for the Draft 2025 IASR including submissions received. AEMO's 2025 IASR consultation webpage[14] contains all published papers and reports, written submissions, webinar recordings, and other consultation documents and reference material (other than material identified as confidential).

[6] NER clause 5.22.8(b).

[7] At https://www.aer.gov.au/system/files/AER%20-%20Forecasting%20best%20practice%20guidelines%20-%2025%20August%202020.pdf.

[8] At https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr-scenarios-consultation.

[9] See https://www.aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

[10] See https://aemo.com.au/consultations/current-and-closed-consultations/2025-electricity-network-options-report-consultation.

[11] See https://aemo.com.au/consultations/current-and-closed-consultations/2025-gas-infrastructure-options-report-consultation.

[12] At https://www.csiro.au/en/research/technology-space/energy/Electricity-transition/GenCost.

[13] At https://www.energy.gov.au/energy-and-climate-change-ministerial-council/energy-ministers-publications/energy-ministers-response-review-integrated-system-plan.

[14] At https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr.

Table 2 2025 IASR Consultation process and timeline

Consultation steps	Dates
IASR Scenarios consultation	17 July – 11 December 2024
ISP Methodology consultation	23 October 2024 – 25 June 2025
Draft 2025 IASR published (Stage 1 report)	11 December 2024
Draft 2025 IASR consultation webinar (Stage 1 report)	23 January 2025
Submissions on Draft 2025 IASR close (Stage 1 report) - 36 submissions received	11 February 2025
Draft 2025 IASR published (Stage 2 report)	28 February 2025
Draft 2025 IASR consultation webinar (Stage 2 report)	18 March 2025
Submissions on Draft 2025 IASR close (Stage 2 report) - 27 submissions received	31 March 2025
Forecasting Reference Group meetings and consultations • Data centre forecasts • Multi-sectoral modelling • Retirement costs and pumped hydro energy storage (PHES) technical parameters • Cost escalation factors 10 submissions received	 • 30 April 2025 • 22 May 2025 • 28 May 2025 • 17 June 2025
Draft 2025 *Electricity Network Options Report* consultation	22 May – 31 July 2025
Draft 2025 *Gas Infrastructure Options Report* consultation	22 May – 31 July 2025
2025 IASR published	31 July 2025

1.2 The ISP development process

The 2025 IASR is an important resource in Australia's highly complex and rapid energy transition, and a critical input to the 2026 ISP. Figure 1 below shows the ISP process, and current progress on its elements[15].

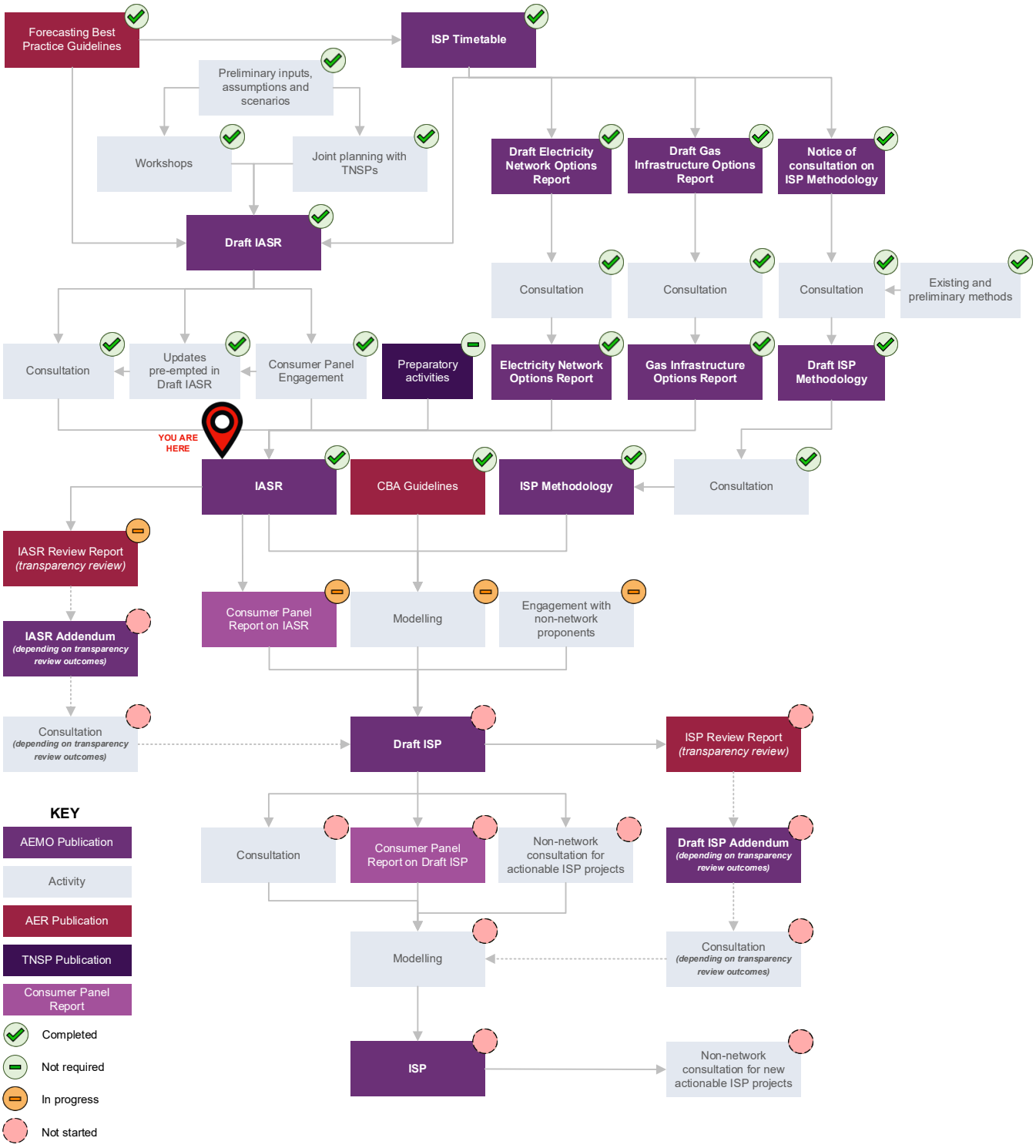
The ISP framework in the NER[16] and associated AER guidelines apply to the development of the 2026 ISP, including the AER's *Forecasting Best Practice Guidelines* and *Cost Benefit Analysis Guidelines*, and consideration of AER transparency reviews and ISP Consumer Panel reports.

Within this framework, and in consultation with stakeholders, AEMO designs and conducts the process to develop the ISP. Figure 1 provides a visual representation of this process, including both the elements of the regulatory framework (in purple, red and light purple boxes) and the activities undertaken by AEMO and stakeholders (in light grey boxes) and also identifies those steps that are complete.

[15] The 2026 ISP Timetable provides more information on the key milestones of the 2026 ISP development process, at https://www.aemo.com.au/-/media/files/major-publications/isp/2026/2026-isp-timetable.pdf?la=en. https://aemo.com.au/-/media/files/major-publications/isp/2022/2024-isp-timetable.pdf?la=en.

[16] NER rule 5.22.

Figure 1 Navigating the ISP process



Note: The diagram above has been amended from the version published in the 2026 ISP timetable by adding boxes for the draft and final versions of the "Electricity Network Options Report" and "Gas Infrastructure Options Report" with an additional "Consultation" box for each publication.

2 Submissions, key themes and summary responses

2.1 Stakeholders were highly engaged across the Draft IASR consultation opportunities

In response to the Draft 2025 IASR, AEMO received 63 non-confidential submissions and five confidential submissions. Stakeholders who provided publishable submissions to this consultation, and subsequent consultation opportunities, are listed in Table 3 below. **Bold text** indicates the acronym or abbreviation used later in this document.

Table 3 Stakeholders that provided submissions to the Draft 2025 IASR

Stakeholders that provided a published submission on the Stage 1 release of the Draft 2025 IASR		
Andrew Fletcher (**Fletcher**)	**Energy Estate**	Joy Thomas (**Thomas**)
Ausgrid	Energy Users Association of Australia (**EUAA**)	Justice and Equity Centre (**JEC**)
Australian Aluminium Council (**AAC**)	EnergyAustralia (**EA**)	**Marinus Link**
Australian Pipelines and Gas Association (**APGA**)	**EnergyCo**	Martin Kamener (**Kamener**)
Australian Solar Thermal Energy Association and Australian Solar Thermal Research Institute (**ASTRI & AUSTELA**)	**Engie**	Nexa Advisory (**Nexa**)
Bryan Pedersen (**Pedersen**)	**Ergon Energy and Energex**	Queensland Conservation Council (**QCC**)
Centre for Independent Studies (**CIS**)	**Erne Energy**	Queensland Electricity Users Network (**QEUN**)
Clean Energy Investor Group (**CEIG**)	Etrog Consulting (**Etrog**)	Rainforest Reserves Australia (**RRA**)
David Close (Director of the Gas Energy Transition Research Centre] (**Close**)	Gas Energy Australia (**GEA**)	**TasNetworks**
DeCarbonate Energy (**DeCarb**)	Heavy Industry Low-carbon Transition Cooperative Research Centre (**HILT CRC**)	**Transgrid**
ElectraNet	**Hydro Tasmania**	**Windlab**
Energy Consumers Australia (**ECA**)	**ISP Consumer Panel**	
Stakeholders that provided a published submission on the Stage 2 release of the Draft 2025 IASR		
Andrew Fletcher (**Fletcher**)	**ElectraNet**	**Jemena**
Australian Gas Infrastructure Group (**AGIG**)	Energy Networks Australia (**ENA**)	Julian Lawrence (**Lawrence**)
Australian Pipelines and Gas Association (**APGA**)	**Ergon Energy and Energex**	Justice and Equity Centre (**JEC**)
Ausgrid	**Erne Energy**	**Marinus Link**
Australian Energy Producers (**AEP**)	Etrog Consulting (**Etrog**)	Nexa Advisory (**Nexa**)
Bryan Pedersen (**Pedersen**)	Heavy Industry Low-carbon Transition Cooperative Research Centre (**HILT CRC**)	Origin Energy (**Origin**)

Stakeholders that provided a published submission on the Stage 1 release of the Draft 2025 IASR		
Centre for Independent Studies (**CIS**)	**Hydro Tasmania**	Powering Australia (**PA**)
Clean Energy Investor Group (**CEIG**)	Institute for Energy Economics Financial Analysis (**IEEFA**)	Queensland Conservation Council (**QCC**)
Climateworks Centre (**CWC**)	**ISP Consumer Panel**	SEE-CHANGE Fair Finance Group (**SEE**)
Stakeholders that provided a published submission to the FRG Consultations relevant to the 2025 IASR		
Andrew Fletcher (**Fletcher**)	**GHD**	**Transgrid**
AusNet	**Jemena**	
Australian Gas Infrastructure Group (**AGIG**)	Queensland Electricity Users Network (**QEUN**)	

AEMO considered these submissions and other relevant information in developing the 2025 IASR. AEMO also considered the feedback received from stakeholders in other consultations for the *ISP Methodology*[17] and 2025 *Electricity Network Options Report* which were relevant to the Draft IASR; this feedback is also included in this Consultation Summary Report.

Table 4 Stakeholders that provided relevant submissions to the *ISP Methodology* and 2025 *Electricity Network Options Report*

Stakeholders that provided a published submission to the *ISP Methodology* issues paper relevant to the 2025 IASR		
Australian National University 100% Renewable Energy Group (**ANU RE100**)	**Coalition for Community Energy**	**Transgrid**
Alliance of LDES Companies	**Dr Anne Smith**	
Centre for Independent Studies (**CIS**)	**Lighter Footprints**	
Stakeholders that provided a published submission to the Draft *ISP Methodology* consultation paper relevant to the 2025 IASR		
Australian National University 100% Renewable Energy Group (**ANU RE100**)	Centre for Independent Studies (**CIS**)	Justice and Equity Centre (**JEC**)
Australian Energy Producers (**AEP**)	Climateworks Centre (**CWC**)	**Marinus Link**
Stakeholders that provided a published submission to the Draft 2025 *Electricity Network Options Report* consultation paper relevant to the 2025 IASR		
Justice and Equity Centre (**JEC**)	Climateworks Centre (**CWC**)	Squadron Energy (**Squadron**)
Goldwind		

The remainder of this document details the material issues raised in submissions and feedback received across the 2025 IASR consultation opportunities, and AEMO's response to each issue. In many instances, the feedback has allowed AEMO to identify improvements to inputs and assumptions that have been reflected in the 2025 IASR.

AEMO thanks all stakeholders for their feedback throughout the development of the 2025 IASR.

[17] See https://www.aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

2.2 Summary of feedback and changes between draft and final 2025 IASR

This section provides an overview of the stakeholder feedback by key theme, and summarises at a high level the changes between the draft and final 2025 IASR that AEMO has made in considering the feedback received. The order of themes corresponds to the order in Section 3, which provides more detail on stakeholder feedback and recommendations, and AEMO's responses, for each of the key themes.

Green Energy scenario

Regarding the proposed *Green Energy* scenario variants, stakeholders provided the following suggestions.

Theme	Summary	Stakeholders
***Green Energy* scenario**	The majority of submissions were supportive of the *Green Energy Industries* scenario variant over the *Green Energy Exports* variant, with stakeholders: • focusing on value-add hydrogen products such as green iron and steel, for domestic and export, excluding those developments that are expected to support hydrogen exports as an energy carrier • suggesting, if the *Green Energy Industries* scenario was chosen, that it reduce the forecast demand for hydrogen given the growing concerns with its viability in the NEM over the next decade or so • suggesting AEMO should adjust the assumptions in the *Green Energy Industries* scenario to strengthen electrification, energy efficiency, and storage, while reducing reliance on unlikely breakthroughs in hydrogen and direct air capture (DAC), ensuring a more realistic and achievable decarbonisation pathway.	**Fletcher, Ausgrid, AAC, CIS, CEIG, ElectraNet, ECA, Ergon Energy and Energex, Erne Energy, HILT CRC, Hydro Tasmania, ISP Consumer Panel, JEC, Marinus Link, QCC, TasNetworks, Close**

In considering the above feedback, the following changes have been made to the *Green Energy* scenarios:

- Of the two presented *Green Energy* scenarios, the *Green Energy Industries* scenario (now called *Accelerated Transition*) variant has been chosen for the final scenario collection in preference to the *Green Energy Exports* scenario variant with significant support for that selection from stakeholders.
- The forecast values of the *Green Energy Industries* scenario reflect updated hydrogen projects since the draft was published.

General design of scenarios

Regarding the general design and application of scenarios, stakeholders provided the following feedback.

Theme	Summary	Stakeholders
General design of scenarios	Stakeholders commented they: • agreed the scenario collection presents a reasonable evolution and refinement of the scenarios considered for previous ISPs • agreed with the moderation of coordination of CER in *Step Change* and *Progressive Change* to reflect a more likely future than that envisaged in the 2023 IASR • agreed the risk of offshoring of major industrial loads that features in *Progressive Change* reflects a plausible future consistent with the scenario's broader narrative • explain better how the IASR uses Representative Concentration Pathways (RCPs) in pursuing efforts to reduce temperature increase.	**AAC, AEP, AGIG, APGA, Pedersen, CIS, ECA, Erne Energy, IEFFA, ISP Consumer Panel, JEC, Kamener, Nexa, Origin, TasNetworks, Close, QCC**

In considering the above feedback, the following changes have been made to the scenarios:

- The description of the "four pillars of decarbonisation" and surrounding text have been adjusted to avoid confusion noted by stakeholders, while retaining the recognition that key mechanisms exist to decarbonise. It is now clear that road transport is included as a means to decarbonise.
- The description of industrial electrification has been enhanced, and directs readers to the CSIRO report for more information.
- The *Progressive Change* description of industrial closures has been broadened to commercial and/or industrial closures.

Scenario names

Considering the names of the scenarios that AEMO has defined, stakeholders provided the following feedback.

Theme	Summary	Stakeholders
Scenario names	Stakeholders suggested there should be changes to scenario names with: • support for simple names that are clear, no opportunity for bias or misinterpretation and that are indicative of each scenario. • support for retaining *Step Change* as a scenario name • calls for change to *Green Energy Industries* and *Green Energy Exports* to better reflect the scenario dynamics • support for changing the *Progressive Change* scenario name as the name does not convey the key dynamics of the scenario effectively • support for a simple evolution of scenario definitions and narratives	**ISP Consumer Panel, ElectraNet, Consumer Advocates Verbal Submission**

In considering the above feedback, the following changes have been made to scenario names:

- AEMO has renamed the *Green Energy Industries* scenario to *Accelerated Transition* to better reflect the breadth of drivers targeting a global temperature rise limited to ~1.5°C by 2100. This scenario represents strong and consistent decarbonisation policy signals from government, strong renewable energy deployments by energy proponents, and a higher level of consumer investment in CER and energy efficiency measures relative to *Step Change*. Similarly, consumer appetite for coordination of CER and demand-side participation (DSP) are highest in this scenario. Significant hydrogen and biomethane uptake remain a feature of *Accelerated Transition.* The *Accelerated Transition* scenario parameters drive more rapid decarbonisation of the energy system compared to *Step Change* against a backdrop of higher economic growth.
- The *Step Change* scenario name represents the scenario parameters accurately and has been retained.
- *Progressive Change* has been renamed to *Slower Growth* to more accurately reflect the lower levels of assumed economic growth, closure of industrial loads, lower coordination of CER and lower energy efficiency measures, corresponding on a global scale with a temperature rise of ~2.6°C by 2100[18]. While this scenario is characterised by weaker investment in decarbonisation, Australia's current policy requirements are still achieved, but with lesser investment signals after 2030 with a more accommodating carbon budget and lesser need from lower consumer demand in weaker economic conditions. In *Slower Growth* technology

[18] The multi-sectoral modelling did not fully exhaust the emission and carbon budgets of the *Progressive Change* scenario and a ~2.6°C outcome was over-achieved, as discussed in the 2024 CSIRO Multi-sectoral modelling report. See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf?la=en.

costs remain higher, and consumers invest, to the extent the economy permits, on CER for bill reduction with low levels of coordination.

The full description of the scenario parameters and their global warming outcomes is detailed in the 2025 IASR.

Note that this report broadly respects the names that stakeholders engaged with, given stakeholder submissions referenced the original scenario names in its submission summaries and AEMO's responses. AEMO considers this will minimise the risk of potential confusion for stakeholders who submitted to the IASR consultation processes.

Sensitivities

Stakeholders provided a range of suggestions regarding potential sensitivities that could complement the scenario collection, and provide useful insights for stakeholders.

Theme	Summary	Stakeholders
Sensitivities	Stakeholders suggested various sensitives, including (but not limited to): • analysis that considers varying timings for environmental and planning processes • support for variation to supply chain constraints • variations in the uptake of various CER, including photovoltaic (PV) installations, electric vehicles (EVs), and their degree of coordination via virtual power plants (VPPs) and vehicle-to-grid (V2G), as well as electrification and the timing of coal closures • recommending that AEMO enhance the *ISP Methodology* by enabling more timely updates and interim sensitivities to reflect rapid policy and market changes, suggesting earlier and more detailed data sharing with governments and stressing that key assumptions often become outdated before the ISP is finalised Some also suggested providing greater clarity and explanation on the results of the sensitivity analyses.	**Ausgrid, AEP, AGIG, APGA, CEIG, CIS, CWC, ElectraNet, ECA, EA, ENA, Ergon Energy and Energex, Erne Energy, Hydro Tasmania, ISP Consumer Panel, Marinus Link, Nexa, Close, QCC, Consumer and Community Reference Group**

In considering the above feedback, AEMO has reviewed and expanded the section on sensitivities to reflect stakeholder input and emerging information. Several new potential sensitivities have been added including a hydrogen export sensitivity and a gas capacity development sensitivity. Note that the sensitivity of key input assumptions is unpredictable, so flexibility needs to be retained to refine the sensitivity analyses in response to the model outcomes. The sensitivity analysis is therefore necessarily a dynamic, recursive process undertaken during the ISP modelling. As such, a final list of sensitivities is not appropriate to lock down in the IASR for use in the ISP.

Policy and emissions reduction – renewable targets

Stakeholders provided varied feedback regarding the role and application of government policies.

Theme	Summary	Stakeholders
Policy and emissions reduction – renewable targets	Stakeholders provided various suggestions relating to policy, emissions reduction and renewable generation targets, including that AEMO: • consider realistic scenarios in which current government targets are missed, moderated or removed • propose the most efficient way of getting to net zero by 2050 without having to consider all other government policies, as this would position the ISP above politics and remove the concern that the ISP is influenced by governments • revise all ISP scenarios to align with Australia's Paris Agreement commitments, including long-term temperature goals – including	**CIS, CEIG, CWC, ElectraNet, ECA, EUAA, Erne Energy, Etrog, Hydro Tasmania, ISP Consumer Panel, JEC, Thomas**

Theme	Summary	Stakeholders
	scenarios like *Progressive Change*, which aligns with a 2.6°C trajectory, undermines the ISP's credibility and risks promoting outcomes not in consumers' or the climate's best interests • formally request the Energy and Climate Change Ministerial Council to direct the Australian Energy Market Commission (AEMC) to expand the Emissions Target Statement to include the energy impacts of industrial decarbonisation and green export targets, arguing that AEMO should be allowed to consider policies with substantial commitment, even if not yet legislated, due to their significant implications for future energy demand.	

In considering the above feedback, the following changes have been made to policies:

- The Federal Government Cheaper Home Batteries Program has been incorporated into all scenario battery forecasts.
- The Peak Demand Reduction Scheme has been removed from the New South Wales demand forecast.
- Under the new Queensland Energy Roadmap currently being developed, previous renewable energy targets have been withdrawn and removed from modelling in all scenarios.
- The stamp duty exemption for electric and hydrogen fuel-cell vehicles in Tasmania has now concluded.
- The Hydrogen and Jobs Plan policy in South Australia was deferred in early 2025 and has since been discontinued.

Consumer energy resources

Stakeholders provided several areas of feedback regarding the role and investments in CER.

Theme	Summary	Stakeholders
Consumer energy resources	Stakeholder submissions related to CER: • encouraged AEMO to strengthen its understanding of distribution networks, particularly as distribution networks are the source of NEM load and will host a growing amount of generation and storage through consumer and distributed energy resources • noted apparently little variation between the CER assumptions adopted between scenarios, with greater weighting placed on CSIRO's forecasts, which reflect more conservative CER adoption assumptions • noted AEMO's approach to forecasting CER does not specifically identify community battery installations, which will play a critical role in supporting CER coordination and VPP adoption • noted EV battery technology improvement and V2G, charging profile and infrastructure.	**Fletcher, AusGrid, APGA, CIS, ElectraNet, ECA, Ergon Energy and Energex, Erne Energy, Hydro Tasmania, ISP Consumer Panel, Thomas, Marinus Link, Kamener, Nexa, Close**

In considering the above feedback, the description of CER has been amended to reflect that forecasts implicitly include consideration of behavioural factors.

The following updates have been made in relation to EVs specifically:

- FCEVs have been removed from *Progressive Change* and *Step Change* for residential and commercial vehicles, due to declining sales coupled with limited refuelling station development.
- Vehicle lifetime has been elaborated, and the public charging category has been expanded to include charging that occurs near drivers' homes.

Cost and technologies

Stakeholders provided a number of areas of feedback relating to technology costs and other technical considerations.

Theme	Summary	Stakeholders
Cost and technology	Submissions commented on cost and technical related topics, including WACC, with stakeholders: • supporting technology-specific WACCs • suggesting varying both the technology-specific WACCs and the single discount rate in line with the different scenario narratives • asking AEMO to consider whether the forecasting of WACCs and the discount rate should more closely align with the AER's Rate of Return Guideline. Stakeholders also suggested that: • AEMO should include different cost assumptions for behind-the-meter and mid-scale (distribution-connected) solar and battery assets • the IASR should include greater explanation and interrogation around the impact of closures of coal facilities • AEMO should determine whether a "near-end-of-life" premium should be added to outage rates of ageing coal generators • AEMO should update its pumped hydro energy storage (PHES) build limit assumptions as they may be outdated.	**Fletcher, ANU RE100, APGA, ASTRI & AUSTELA, CIS, EA, EnergyCo, Erne Energy, Etrog, Hydro Tasmania, ISP Consumer Panel, Thomas, Marinus Link, Nexa, QCC, QEUN, Squadron, Transgrid, Consumer and Community Reference Group**

In considering the above feedback, the following updates have been made in relation to cost and technologies:

- Information about dedicated linepack facilities has been included and all gas infrastructure information has been updated as per the 2025 GSOO.
- Cost assumptions for distribution-connected mid-scale solar and battery assets have been separated.
- Pumped hydro energy storage (PHES) maximum build limit and locational cost factor assumptions have been updated using more up-to-date information, including an updated view of publicly announced PHES projects and the most recent version of the Australian National University's (ANU's) PHES Atlases.
- The sub-regional allocation of potential PHES sites in the sub-regions has been updated.
- Retirement cost assumptions have been updated.
- Equipment cost factors have been updated.
- Weighted average cost of capital (WACC) assumptions have been updated to be scenario-specific.

Demand

AEMO received a number of items of feedback regarding the forecast aggregate consumer demand, including various methodological considerations that are an outcome of the application of AEMO's Forecasting Approach.

Theme	Summary	Stakeholders
Demand	• Stakeholders supported improved modelling of large industrial loads (LILs), among other methodological changes that were being consulted on during the *Electricity Demand Forecasting Methodology* consultation. • Stakeholders also proposed moderating the industrial load closures in *Progressive Change*, to ensure consistency with forecast demand growth across the NEM.	**Ausgrid, CIS, CWC, ElectraNet, ECA, ENA, Ergon Energy and Energex, GU, HILT CRC, Hydro Tasmania, Jemena, JEC, Marinus Link**

Theme	Summary	Stakeholders
	• Stakeholders welcomed additional weather stations associated with forecasting sub-regions and suggested that additional weather variables, such as humidity, should influence residential heating and cooling consumption forecasting. Some stakeholders considered that key regional locations in north-west Victoria and south-west New South Wales should also be considered. • Stakeholders urged deeper analysis of demand-side factors, highlighting the need for greater spatial granularity, transparency, and a shift toward a demand-side statement of opportunities. They stressed that evolving energy use patterns – driven by electrification, efficiency, and green exports – require place-based planning to avoid infrastructure misalignment and support timely investment decisions. • Stakeholders recommended broadening demand-side considerations beyond CER and distributed energy resources (DER) to include electrification and emerging large loads such as data centres, noting their potential to significantly influence network development needs.	

AEMO has recently concluded its review of its Forecasting Approach, regarding the electricity demand forecasting methodology. In some instances, such as the forecasting of large industrial loads, the methodology provides new clarity regarding expanded considerations that will apply to AEMO's upcoming planning publications, including the 2025 ESOO and 2026 ISP.

Regarding industrial closures, AEMO continues to recognise that the significant purpose of the *Progressive Change* scenario is to assist in the exploration of alternative futures, and to test over-investment risk AEMO considers the industrial closure risks remain an important feature to retain.

In addition, the description of the Demand Side Factors statement has been expanded. It is a key means of understanding opportunities and barriers to energy efficiency, demand flexibility, electrification, CER and distributed resources.

Multi-sectoral modelling

Regarding the role, assumptions and influence of multi-sectoral modelling, which was at the heart of the second release of the IASR, AEMO received several areas of feedback (across various engagement opportunities).

Theme	Summary	Stakeholders
Multi-sectoral Modelling	AEMO provided several consultation opportunities during the development of the IASR, which AEMO notes may not have allowed some stakeholders to efficiently and effectively engage early on with the forecasts. Stakeholders submitted that: • AEMO should provide further consultation opportunities to allow for more clarity around the complexity of multi-sectoral modelling and its implications • further clarity is required to explain the 'four pillars of decarbonisation', noting that there may be other important decarbonisation levers such as DSP and CER • AEMO should use a wide range of emissions reduction technologies in its multi-sectoral modelling to mitigate technology and supply chain risks associated with any single technology • AEMO should review the fuels consumed for calcination as multi-sectoral modelling results do not reflect reality, and • AEMO should provide more information about its models and approaches used to determine assumptions relating to projected industrial energy demand and the interaction these loads may have with energy grids.Such	**Fletcher, AEP, AGIG, APGA CIS, ElectraNet, Erne Energy, HILT CRC, IEEFA, ISP Consumer Panel, JEC, Jemena, Marinus Link, PA, QCC**

Theme	Summary	Stakeholders
	information would assist stakeholder engagement on industrial energy use, demand response, and decarbonisation. On carbon sequestration, stakeholders said AEMO and CSIRO should reduce or justify the carbon sequestration forecasts and consider alternative methods including other proven, cost-effective solutions like renewables, electrification and energy efficiency. On electrification, submissions indicated that some stakeholders considered residential and industrial electrification may be too high in *Step Change*, with more detail sought regarding industrial electrification, although other stakeholders considered that non-economic drivers may support additional electrification. Additionally, households may electrify before appliances reach end-of-life. Comments on energy efficiency included that additional drivers should be considered, including behavioural influences and relative cost-effectiveness. Stakeholders commented on fuel-switching that: • they supported the Draft IASR's biomethane assumptions and suggested these continue to be monitored, although suggested some refinements may be needed towards the end of the forecast horizon • infrastructure diversity, including new gas and water infrastructure as well as renewable gases, especially during times of drought, are important investments for Australia's energy transition.	

Regarding stakeholder requests for more engagement opportunities, AEMO recognised that there was a need for this considering the complexity of the modelling approach, its relationship with the demand forecasting approach, and the evolution of the CSIRO model and its assumptions since the 2023 IASR. AEMO therefore invited stakeholders to engage in the FRG, and provided another consultation opportunity following that improved access to CSIRO's expert modellers.

In considering the above feedback, the following updates relate to the multi-sectoral modelling:

- Wording has been revised to clarify that the EV forecasts are not an output of the multi-sectoral modelling. EVs are forecast from a consumer technology adoption model which accounts for variables like behavioural motivations of electrifying transport, constraints around charging, policy implications and vehicle availability.
- Fuels for calcination have been corrected.
- Hydrogen prices were updated.

The following changes have been made relating to electrification:

- The description of electrification has been amended to recognise that thermal comfort, health, and energy independence are outcomes of the uptake of energy efficiency, electrification, and CER.
- The IASR now acknowledges that appliance replacement is not assumed to only occur at end of life.
- Additional description regarding industrial electrification has been included.

On energy efficiency, market-led energy efficiency savings have now been included.

On fuel-switching, the IASR now clarifies that alumina production transitions from the lower temperature Bayer process to hydrogen only in the *Green Energy* scenarios.

Fuel prices

Regarding the forecast of fuel prices, AEMO received several points of feedback.

Theme	Summary	Stakeholders
Fuel prices	Stakeholders commented on fuel prices, saying: • AEMO should review industrial gas prices as the forecast only varies over a narrow range ($9-$11/gigajoules [GJ]) over an extended period of time, despite having varied by more than that in recent years • they were pleased to see greater analysis of biomethane production cost and available volumes • they recommended the IASR consider liquefied petroleum gas (LPG) and its renewable alternatives, as not doing so risks influencing over-investment in electricity transmission	**AAC, APGA, EA, GEA, Hydro Tasmania, ISP Consumer Panel, Marinus Link**

In considering these suggestions, AEMO has noted that gas prices will be an ongoing consideration in how the ISP develops gas development projections, a new consideration for the 2026 ISP.

No other updates related to fuel prices have been made.

Hydrogen

AEMO received many suggestions regarding the role and focus for hydrogen development in planning the future energy system.

Theme	Summary	Stakeholders
Hydrogen	Stakeholders shared a range of views on hydrogen: • provided mixed views on hydrogen blending in the gas distribution networks • recommended that AEMO's consideration of storage capacity options include hydrogen energy storage systems (HESS) both to contribute to energy storage forecasts and to contribute to projections for the development of the hydrogen industry • recommended improvements to AEMO's proposed methodology to capture the full cost of firming green hydrogen • stated AEMO should apply cost escalation consistent with large energy infrastructure projects • provided mixed feedback and calls for clarification on on-grid electrolyser percentages • recommended AEMO recognise the role of carbon capture, utilisation and storage (CCUS) in producing low-carbon hydrogen and decarbonising hard-to-abate sectors • Stakeholders provided mixed recommendations for minimum electrolyser utilisation factors. • AEMO should clarify how behind-the-meter (off-grid) electrolysers would impact electricity transmission infrastructure, noting that costs associated with hydrogen production for export should be borne by the hydrogen industry and not by Australian energy consumers • AEMO should increase the assumed on-grid proportion of electrolysers in New South Wales, Victoria and Tasmania, due to benefits of grid connection to operation and economics.	**Fletcher, AEP, APGA, AGIG, CIS, ENA, Energy Estate, HILT CRC, Hydro Tasmania, ISP Consumer Panel, JEC, Marinus Link, Close**

In considering the above feedback, the following changes have been made to the hydrogen forecasts:

- The hydrogen-related forecasts included in the *Inputs and Assumptions Workbook* (IA Workbook) are presented on a hydrogen consumption location basis (previously presented as hydrogen production location).
- Additional hydrogen consumption has been included to reflect hydrogen used as a fuel for gas-powered generation (applied to the *Green Energy Industries scenario* and potential *Green Energy Exports sensitivity*

only) and fuel-switching of feedstock hydrogen consumed in industrial applications, for example, existing ammonia production which currently uses hydrogen produced from steam methane reformation (SMR) which transitions to electrolytic hydrogen over time.

- Industrial hydrogen consumption forecast in Tasmania has been revised down in *Progressive Change* following AEMO's analysis of stakeholder feedback.
- The assumed minimum annual utilisation and REZ-based (previously on-grid) hydrogen production factors have been updated following AEMO's analysis of stakeholder feedback.
- The South Australian Hydrogen Jobs Plan electrolyser has been removed from the hydrogen forecast as the project is no longer committed. An additional green steel load has been applied in South Australia for *Step Change, Green Energy Industries* and *Green Energy Exports* following AEMO's analysis of government announcements. Additional hydrogen consumption has been applied to South Australia in *Green Energy Industries* and *Green Energy Exports* following AEMO's analysis of stakeholder feedback related to proposed hydrogen projects.
- Additional assumptions have been included in the forecasts following AEMO's analysis of stakeholder feedback, including the addition of electricity consumption associated with the treatment and desalination of water for electrolytic hydrogen production and a minimum facility size constraint applied to green commodity volumes per NEM region.
- The description of the AEMO's consideration of hydrogen blending in distribution networks has been reviewed, to clarify the difference between the constraint and the modelling results.

Renewable energy zones

Regarding the representation and potential development of REZs, the following feedback was received.

Theme	Summary	Stakeholders
Renewable energy zones (REZs) and transmission	Stakeholders shared a range of views on REZs: • supported AEMO's focus on the development of REZs at the transmission level to allow for strategic transmission network investments in areas of high renewable energy potential, while also suggesting additional focus at the distribution network level • supported moving to REZ locational cost factors as it helps explain build cost differential seen in renewable energy projects • asked how the impact of social licence on new transmission lines and generation has been incorporated in the inputs and assumptions • asked AEMO to explore the potential for project-level social licence evaluation factors to be quantified and applied as part of the data included in future IASRs • concerns that the ISP remains highly sensitive to wind capacity factor assumptions – to improve accuracy and reduce this sensitivity, recommend allowing confidential submissions of high-quality, on-site wind measurement data to calibrate AEMO's wind resource maps, conducting targeted sensitivity analysis on key REZs, and refining turbine power curve selection based on modelled wind speeds.	**Fletcher, Ausgrid, AAC, ASTRI & AUSTELA, CIS, CEIG, Decarb, ElectraNet ECA, ENA, Erne Energy, EnergyCo, Engie, Ergon Energy and Energex, ISP Consumer Panel, QCC, Squadron, TasNetworks, Transgrid, Windlab**

In considering the above feedback, the following changes have been made:

- The modelling of Victoria REZ geographic areas has been updated to reflect the draft REZs published by VicGrid in the Draft 2025 Victorian Transmission Plan, and additional information provided through joint planning with VicGrid.
- The geographic outline and offshore wind resource limits have been updated for the Bass Strait Offshore Wind Zone to reflect Federal Government updates to the offshore declared area.
- REZ resource limits for many New South Wales REZs have been updated to reflect the advice from EnergyCo, Transgrid and proponents relating to developer interest. The South West NSW (SWNSW) REZ resource limits in particular have had a large uplift.
- A number of updates have been made to REZ Transmission Limit group constraints to reflect the new Victorian REZ definitions and recently completed network upgrades (SWVIC1), updated network projects for South Australia (MN1 group constraints), New South Wales (SWNSW REZ group constraints) and Queensland (SQ1 group constraints).
- Land use limits for the *Green Energy Industries* scenario have been reviewed to better reflect upper land use and resource limits that may occur in some REZs prior to the generic 25% land use limit that is used for wind generation in this scenario.
- Import limits have been identified for candidate REZ options which may be selected as hydrogen electrolyser hosting REZs in the ISP assessment.

Additional feedback

A range of other feedback was also received.

Theme	Summary	Stakeholders
Additional feedback	Stakeholders also said: • the ISP process should include a feedback loop for costs and timing of already committed projects and note issues and lessons learned in implementation so feedback can be incorporated in future proposals • that liquefied natural gas (LNG) production is a considerable contributor to Australia's greenhouse gas emissions which, in some cases, may be reduced, through use of renewable gases • AEMO should align its LNG export forecast in *Progressive Change* to align with International Energy Agency (IEA) stated policies (STEPS) and keep the forecast post-2035 flat • AEMO should consider simplifying language around what the WACC considers and methodologies used to build broader reader understanding • sought more clarity in the ISP on how the scenario likelihood percentages are determined and applied.	**AEP, APGA, ASTRI & AUSTELA, CEIG, CIS, ECA, Erne Energy, ISP Consumer Panel, QCC, RRA, Transgrid, Close, Consumer and Community Reference Group**

In considering the above feedback, AEMO has updated several capacity factors for some REZs, having conducted an additional review of the method and data sources for the development of renewable energy traces. AEMO has also added further clarity in describing the financial parameters such as the WACC that is used in the ISP.

3 Detailed feedback

AEMO received 73 non-confidential submissions to the Draft 2025 IASR consultation opportunities, including those submitted to subsequent FRG consultation opportunities. This section provides information regarding key themes and material issues raised in stakeholder submissions, and AEMO's response to each topic, sorted into 12 broad categories:

1. *Green Energy* scenario (Section 3.1)
2. General design of scenarios (Section 3.2)
3. Scenario names (Section 3.3)
4. Sensitivities (Section 3.4)
5. Policy and emissions-renewable targets (Section 3.5)
6. Consumer energy resources (Section 3.6)
7. Cost and technology (Section 3.7)
8. Demand (Section 3.8)
9. Multi-sectoral modelling (Section 3.9)
10. Fuel prices (Section 3.10)
11. Hydrogen (Section 3.11)
12. Renewable energy zones (Section 3.12)
13. Additional feedback (Section 3.13).

3.1 Green Energy scenario variants

Summary of material issues raised in submissions

The Draft 2025 IASR described two variants: *Green Energy Exports*, which included development in domestic manufacturing and minerals processing to support Australia's transformed economy and a growing opportunity to support international decarbonisation efforts; and a second variant, *Green Energy Industries*, that focused on the domestic opportunities for manufacturing (including products that could be consumed domestically, or exported). The Draft 2025 IASR asked a key question of stakeholders – which of these variants was the preferred option for AEMO's higher growth, faster decarbonisation scenario.

Stakeholders generally supported the *Green Energy Industries* variant as the most appropriate of the two proposed. Various stakeholders supported planning consideration of domestic industry development that would use Australia's abundant renewable resources, but considered that exporting hydrogen products in a form of energy would overstate the investment requirements for domestic users. While stakeholders often provided unique perspectives for their support, general support for this preference was provided by **Ausgrid**, **APGA**, **CEIG**,

ElectraNet, **ECA, Ergon Energy and Energex, Erne Energy, Fletcher, Hydro Tasmania, JEC, Marinus Link, Close, QCC** and **TasNetworks**.

Additional comments in relation to the *Green Energy* scenarios are as follows:

- **ISP Consumer Panel** suggested that AEMO reduce the forecast demand for hydrogen, given the growing concerns with hydrogen production's viability in the NEM over the next decade or so.
- **HILT CRC** noted that without a global price on carbon, net zero commodities cannot compete on cost alone and additional policies will be needed to drive demand and support a green premium in global markets.
- **HILT CRC** also commented that it is likely that it will be more economic to produce value-added commodities for export than to export hydrogen or derivatives as an energy carrier.
- **Fletcher** highlighted that SMR with carbon capture – that is, what is often referred to as 'blue' hydrogen – should be an alternative hydrogen production pathway included in AEMO's multi-sectoral modelling for the *Green Energy* scenario.
- **JEC** suggested that AEMO should adjust the assumptions in the *Green Energy Industries* scenario to strengthen electrification, energy efficiency, and storage, while reducing reliance on unlikely breakthroughs in hydrogen and DAC, ensuring a more realistic and achievable decarbonisation pathway.

AEMO's consideration and response

AEMO welcomes the valuable feedback and support for the *Green Energy Industries* variant, as the preferred third scenario. AEMO has therefore decided to select it as the high growth, accelerated decarbonisation scenario, and will retain *Green Energy Exports* for potential use as a sensitivity, with minor changes in its hydrogen volumes with the finalisation of multi-sectoral modelling.

As outlined in Section 3.3, AEMO has now renamed this scenario as ***Accelerated Transition***, but given stakeholder submissions referenced its original *Green Energy Industries* name, this report continues to use this original name.

AEMO notes the feedback by the **ISP Consumer Panel** related to reducing the *Green Energy Industries* hydrogen demand. This scenario limits the bulk of the hydrogen commodity demand to green iron, and has minimal residential and commercial hydrogen demand. AEMO considers that the draft *Green Energy Industries* scenario already represented a substantial reduction from *Green Energy Exports*, and an even greater reduction relative to the 2024 ISP's *Green Energy Exports* forecast. The forecast parameters are designed to reflect the scenario narratives, ensuring alignment between the sectors within each scenario. Despite the material reduction for the role for hydrogen for NEM investment planning, AEMO considered that the scenario still reflected the narrative of this fast decarbonisation scenario, aligned with actions that would limit temperature rise to 1.5°C. Considering this, AEMO has decided to retain the hydrogen level in *Green Energy Industries* as proposed, with some minor refinements that have developed as the multi-sectoral modelling has been finalised.

AEMO agrees with **HILT CRC**'s comment that without a global price on carbon, net zero commodities cannot currently compete on cost alone and additional policies will be needed to drive demand and support for a green premium in global markets. AEMO recognises this as an internally consistent viewpoint with the narrative of this scenario – particularly that the scenario reflects strong global decarbonisation action, implying that consumers and governments domestically and internationally in this future will accept the need and value created by

decarbonising at a rapid rate, to achieve a 1.5° aligned transition. In addition, **HILT CRC** commentary regarding use of hydrogen for local commodity manufacture aligns with the current scenario narrative.

AEMO notes the suggestion from **Fletcher** that green hydrogen commercial viability should be tested by allowing SMR with carbon capture, recognising that there may be a role for blue and green hydrogen developments. AEMO considers that there may be an opportunity for blue hydrogen developments, particularly with carbon capture, though considers that the *Green Energy* scenario purposefully pursues lowest emissions options to achieve its low carbon budget, and that commodities developed to support broader decarbonisation are more likely to themselves be competitive if produced with green credentials. The Draft 2025 IASR described this as the "development of a hydrogen industry, focusing on value-add hydrogen products such as green iron and steel, for domestic and export"[19]. The purpose of the analysis is therefore not designed to identify the most appropriate hydrogen industry developments, which would require deeper analysis of hydrogen and other products and their potential substitutes, but to test underinvestment risks for the development of the power system in a future that features strong economic activities for green solutions, amidst a world that is embracing its low or zero emissions solutions. For this reason, blue hydrogen has been excluded from *Green Energy Industries*, and it is assumed that policies adopted will encourage lowest emissions hydrogen, offsetting potential commercial challenges compared with higher emissions alternatives.

AEMO agrees with **JEC** that electrification and energy efficiency are achievable decarbonisation pathways. AEMO considers that the decarbonisation potential of electrification and energy efficiency are reflected across the scenarios. The *Green Energy Industries* scenario narrative includes high levels of electrification and energy efficiency, and this was reflected in the multi-sectoral modelling projected as well, and with small volumes of alternative technologies complementing these investments.

3.2 General design of scenarios

Summary of material issues raised in submissions

In addition to the scenario preferences regarding the *Green Energy* scenario variant, stakeholders also commented on matters related to scenarios in general, which among others included:

- With regards to the breadth of AEMO's scenario collection, **APGA** mentioned the scenario suite presents a reasonable evolution and refinement of the scenarios considered for previous ISPs and agreed with the moderation of *Step Change* and *Progressive Change* to reflect a more likely future with lower consumer adoption of CER coordination. The **JEC**, however, proposed that the description of the *Progressive Change* scenario be expanded to include the implications for the Australian economy and the people impact.
- Regarding AEMO's treatment of industrial load closures in the *Progressive Change* scenario, **APGA** agreed the projected offshoring of major industrial loads in *Progressive Change* reflects a realistic future in this scenario. In contrast, **CIS** claimed that AEMO's inclusion of industrial closures represented a post-hoc revision to the scenario, rather than a continuation of original modelling assumptions. CIS claimed that this assumption was introduced only in the 2023 IASR, after *Slow Change* [2021 IASR] was removed, and

[19] See page 21: https://www.aemo.com.au/-/media/files/major-publications/isp/2025/stage-2/draft-2025-inputs-assumptions-and-scenarios-report-stage-2.pdf?la=en.

questioned whether AEMO made this adjustment to suppress industrial demand and make the cost of a renewables-dominant grid appear lower.

- **AAC** noted that AEMO's *Progressive Change* scenario assumptions about the future of Australia's four aluminium smelters, beyond their current electricity contracts, are worth reviewing. The **AAC** also noted that the pace of the energy transition will be limited by either the progress of technology developments toward industrial electrification or the rate that electricity transmission and supporting infrastructure could be feasibly delivered.
- Regarding AEMO's scenario alignment to global warming outcomes and policy alignment, **CWC** and **QCC** were concerned that there is only one scenario which aligns with the Paris Agreement commitment to target keeping global temperature rises to well below 1.5°C above pre-industrial levels. **CWC** proposed developing an additional scenario that is 1.5°C-aligned. **Kamener** mentioned that the primary assumption of "very strong decarbonisation activities domestically and globally to limit temperature increase to 1.5°C resulting in rapid transformation of Australia's energy sectors" can no longer be seen as the driver of the transition.
- **Erne Energy** said that the IASR should explain better how it uses Representative Concentration Pathways (RCPs) in pursuing efforts to reduce temperature increase, while also providing more clarity regarding how the Paris Agreement is related to scenarios. Along the same lines, **JEC** recommended that all ISP scenarios be revised to align with Australia's Paris Agreement commitments, including long-term temperature goals, arguing that including scenarios like *Progressive Change*, which aligns with a 2.6°C trajectory, undermines the ISP's credibility and risks promoting outcomes not in consumers' or the climate's best interests[27].

AEMO's consideration and response

AEMO welcomes feedback by **APGA** related to the moderation of *Step Change* and *Progressive Change* to reflect a more likely future where consumers adopt CER coordination at a lower rate and that the projected offshoring of industrial loads in *Progressive Change* reflects a more realistic future in this scenario.

AEMO does not agree with **CIS**' comments about *Progressive Change* and its inclusion of industrial closures. As outlined in previous ISP and IASR cycles, AEMO removed the *Slow Change* scenario [2021 IASR] as it was inconsistent with the policy and decarbonisation outcomes that had advanced with Australia's commitment to the Paris Agreement ahead of the 2024 ISP. In removing *Slow Change*, *Progressive Change* evolved to be the ISP's lowest economic growth scenario, purposefully to test over-investment risks, and therefore applied industrial closure risks in that scenario – a treatment that has consistently been applied to the lowest growth scenario in each planning cycle's scenario collection. This was described transparently in the 2023 IASR.

Regarding **AAC**'s comment on the treatment of existing aluminium smelters, the *Progressive Change* scenario narrative related to industrial closures was not to single out any specific industry groups but was intended to highlight the risk that "with weaker economic conditions, major industrial loads are much more likely to wind up Australian operations in favour of offshore alternatives"[20]. While the industrial load closures featured in *Progressive Change* are not specifically intended to target Australia's existing aluminium smelters, AEMO considers it appropriate to adjust the *Progressive Change* scenario description from describing "major industrial load" to

[20] See Draft 2025 IASR *Progressive Change* scenario description on page 19: https://www.aemo.com.au/-/media/files/major-publications/isp/2025/stage-2/draft-2025-inputs-assumptions-and-scenarios-report-stage-2.pdf.

energy intensive "industrial load" closures to avoid the perception that specific loads, such as smelters, are targeted for closure. AEMO notes this closure risk could be felt across the business sector given weak economic conditions rather than only by the industrial sector.

Regarding **AAC**'s comment that the energy transition is limited by technological progress, AEMO considers that the IASR recognises this by including a range of key assumptions reflecting various technologies' current and forecast technical capabilities and cost, including those changes that may influence consumers use of electricity (and other energy forms). The spread of these assumptions across scenarios allows for key uncertainties across the scenario parameters and technology options (including consumer electrification), and AEMO applies sensitivities as needed to explore these uncertainties in greater detail, as needed.

Additionally, AEMO notes the **JEC** comment proposing that the depiction of the *Progressive Change* scenario is expanded to include the implications for the Australian economy and the people impact. The scenario recognises the challenge and slows the pace of decarbonisation from consumers and from industry. In these conditions, consumers continue to embrace ways to support the transition, but with less capacity to invest in demand-side factors such as energy efficiency savings and CER, and are even less willing also to share control of their resources to third parties, instead preferring to maximise their individual benefits, leading to less coordination of these valuable assets.

AEMO notes **Kamener**'s comments related to the primary assumption of "very strong decarbonisation activities domestically and globally to limit temperature increase to 1.5°C". AEMO acknowledges that the global political landscape has changed since the publication of the Draft 2025 IASR, although the impact of these changes on Australia's economic outlook is limited[21] and there is still a significant part of the global economy aligned to the Paris agreement. AEMO will continue to monitor publications from the International Energy Agency (IEA) for major changes in scenario narratives. Indeed, the expectations of continued support for decarbonisation as a driver are reflected in **CWC** and **QCC**'s submission seeking additional scenarios aligned to 1.5°C. However, the detailed modelling required to produce AEMO's planning advice, and particularly for the ISP, precludes rigorous examination of more scenarios than the proposed three described in the Draft 2025 IASR. AEMO also recognises that aligning more scenarios with a pace of decarbonisation to support 1.5°C temperature rise would unnecessarily narrow the scenario outcomes, which is at odds with the 'broad' scenario design principle. For this reason, three scenarios are retained, as proposed, and *Green Energy Industries* was chosen as the third scenario over *Green Energy Exports*.

AEMO notes **Erne Energy**'s request for clarification around the adoption of RCPs and the Paris Agreement in the scenarios. The scenario narratives presented in the IASR are underpinned by the Intergovernmental Panel on Climate Change's RCPs that describe the different temperature outcomes to which each scenario is linked. This mapping of RCPs is adopted in the multi-sectoral modelling as equivalent economy-wide carbon budgets for Australia, and the multi-sectoral modelling identifies the contribution that the electricity sector, and the NEM specifically, should contribute to economy-wide emissions reduction.

[21] In June 2025, AEMO re-engaged Deloitte Access Economics (DAE) to provide an update on the latest global political, economic and trade conditions on the Australian economy. Generally, the impact of the United States' trade policies on Australia's economic outlook is minimal, owing to Australia's comparatively limited exposure to the United States import market and DAE's assumption of expected stimulus measures by trading partners. See Section 3.3.8 of the IASR for further details at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-Inputs-Assumptions-and-Scenarios-Report

In response to **Erne Energy** and **JEC**'s additional comments, AEMO notes that Australia's commitments under the Paris Agreement are considered by applying Australia's Nationally Determined Contribution (NDC) in each scenario. Australia's current NDC is specified in the *Climate Change Act (2022)* and sets out 43% emissions reduction below 2005 levels by 2030.

3.3 Scenario names

Summary of material issues raised in submissions

In addition to the feedback regarding the *Green Energy* scenario variant and general scenario considerations, AEMO received commentary on the suitability of the scenario names used in the Draft 2025 IASR. Stakeholder feedback on the scenario names included:

- **ISP Consumer Panel** recommended using names which are clear and indicative of each scenario. They recommended:
  - revising the *Green Energy Industries* and *Green Energy Exports* scenario names,
  - revising the *Progressive Change* scenario name, and
  - retaining the *Step Change* scenario name.

AEMO also observed several instances of perceived confusion regarding the dimensions and relativities of the scenarios, which often appeared to be driven by a misunderstanding as to whether the 'progressive' label was intended to reflect a stronger, or weaker, degree of change than the *Step Change* scenario.

AEMO's consideration and response

AEMO welcomes the **ISP Consumer Panel**'s feedback and has revised the scenario names for the 2025 IASR and 2026 ISP to improve clarity and simplify their perceived relativities, with stronger linkage to core features of the scenarios. The revised scenario names and descriptions are outlined in Section 2 of the IASR.

3.4 Sensitivities

Summary of material issues raised in submissions

Stakeholders submitted several suggestions for sensitivities focusing on key uncertainties such as varying timings for environmental and planning processes, supply chains, significant policy changes and CER-related variations:

- **AEP, AGIG, CIS, CEIG, CWC, EA, ElectraNet, Hydro Tasmania, ISP Consumer Panel, Marinus Link, Nexa** and **Powering Australia** supported the analysis of issues such as material shortages, workforce constraints and logistical bottlenecks in affecting the ability to achieve nearer-term policy targets. **CIS** and **ElectraNet** added that the sensitivity should also explore cost increases to generation and transmission projects, while **Powering Australia** suggested it should account for different wind and solar supply chain issues.
- **ENA** proposed a sensitivity which limits energy infrastructure builds based on historical build rates.

- **APGA, CIS, CEIG, IEEFA, ISP Consumer Panel**, **Origin** and **Nexa** suggested the *Alternative Coal Retirement Schedule* sensitivity should examine extensions to coal retirements and separately the impact of those retirements being brought forward. **Thomas** also recommended that the IASR include greater explanation and interrogation around the closure of coal facilities with regards to storage and firming capability.
- **CIS** recommended that AEMO incorporate the potential for delays in coal generator retirements into the ISP to reflect recent announcements in New South Wales and Queensland. It argued that excluding these scenarios would limit the ISP's ability to represent a sufficiently broad and realistic range of future energy pathways[22].
- **ISP Consumer Panel** recommended using sensitivities to test the impact of significant policy changes and considering policies that have not yet met the eligibility criteria for consideration under the NER.
- There were multiple suggestions relating to CER sensitivities, including variations to the scale of virtual power plant (VPP) participation, electric vehicles (EVs), vehicle-to-grid (V2G) and flexible charging from **Ausgrid, ECA, ElectraNet, ISP Consumer Panel** and **QCC**. There were also suggestions for variations in other demand-side factors such as electrification and energy efficiency from **Ausgrid, ECA** and **QCC**.
- **ElectraNet** and **Origin** suggested AEMO explore the impact of variations in large industrial loads (LILs), such as data centres or hydrogen facilities, as emerging demands from new industrial sectors are more uncertain and their impact is critical to the progress and timing of transmission infrastructure.
- **Erne Energy** proposed a sensitivity on the *Step Change* scenario that limits temperature increase to less than 1.5°C and requested detail on the differences in generation and transmission requirements that may arise.
- Noting AEMO's proposed move to technology-specific WACCs in the Draft IASR, **CIS** and **Fletcher** suggested the inclusion of a sensitivity that applies a technology-neutral WACC.
- **CWC** recommended that AEMO publish more timely updates to sensitivities between ISP cycles to reflect rapid policy and market changes. It suggested that such sensitivities may support government policy-making if outcomes were shared with governments, and stressed that key assumptions often become outdated before the ISP is finalised[23].
- **Marinus Link** said that AEMO's gas supply expansion modelling should inform ACIL Allen's gas price forecasts, and that ACIL Allen should explore gas price sensitivities aligned with risks outlined in the GSOO, for example, delays in liquefied natural gas (LNG) import terminals, pipeline expansions and faster-than-expected depletion of the southern industrial gas fields.
- **ISP Consumer Panel** suggested the fuel price forecasts be reviewed prior to completion of the final IASR.

[22] This stakeholder feedback was received through the Draft *ISP Methodology* consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

[23] This stakeholder submission was received through the Draft *ISP Methodology* consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology

AEMO's consideration and response

AEMO welcomes the suggestions and support for sensitivity analysis provided by stakeholders to the Draft 2025 IASR. AEMO's approach deploys a range of sensitivities to explore key uncertainties affecting the selection of the optimal development path in the ISP, and exploring other uncertainties that can improve information available to support broader decision-making. AEMO expects that the modelling of the scenarios will reveal areas of key influence that will benefit from sensitivity exploration, and prefers to determine specific sensitivities to be applied as a dynamic component of the modelling approach within the ISP. With expanded scope within AEMO's *ISP Methodology*, including greater consideration of distribution networks and gas infrastructure, AEMO anticipates that some prioritisation will be necessary to focus sensitivity analysis on those uncertainties which are most impactful and provide the most valuable insights.

In developing the ISP, AEMO will consider the insights available through the base scenario modelling, and explore uncertainties it considers most useful to support the ISP's conclusions, and stakeholders' use of the ISP in investing in the energy transition. AEMO looks forward to continued engagement and suggestions for additional analyses from sensitivities as it produces and consults on the Draft ISP.

AEMO welcomes the support for sensitivities relating to CER and other demand-side factors**.** AEMO notes the stakeholder interest in various demand-side factors (including CER), and considers that this aligns with the ECMC's ISP Review recommendations, and the subsequent 'improving consideration of demand-side factors in the ISP' rule change[24]. Given the expanded rules, AEMO will develop a Demand Side Factors statement that examines the role and impact of demand-side investments. The statement will take the form of a new appendix to the 2026 ISP and will utilise sensitivity analysis to provide insights. The 2025 IASR also includes a high level description of the statement.

3.5 Policy and emissions – renewable targets

Summary of material issues raised in submissions

Stakeholders provided a range of viewpoints related to policy, emissions and renewable targets:

- **CEIG** recommended that the carbon budget reflect the electricity sector's ability to decarbonise faster than other sectors, supporting the earlier decarbonisation of the broader economy.
- **CIS, EUAA** and **Hydro Tasmania** suggested AEMO should propose the most efficient way of getting to net zero by 2050 without having to consider all government policies, including, for example, a central scenario that includes all policies, another scenario indicating potential policy direction, and the third scenario falling short of stated policy objectives.
- In addition, **CIS** and **JEC** said that by embedding government targets as fixed constraints across all scenarios, the ISP framework and AEMO's interpretation of it has limited the usefulness of the scenario collection, undermining its ability to assess investment risks and the feasibility of alternative pathways.

[24] See https://www.aemc.gov.au/rule-changes/improving-consideration-demand-side-factors-isp.

- **CIS** suggested that AEMO implement a broader range of emissions trajectories and carbon budgets across the scenario collection, as the application of policy targets narrows the proposed carbon budgets and introduces the risk that over-investment is not being tested for.
- **Coalition for Community Energy** and **Lighter Footprints** suggested AEMO include newly released information from the Australian Conservation Foundation[25] on the carbon intensity of gas[26].
- **ISP Consumer Panel** requested that AEMO provide further explanation for the allocation of carbon budgets to each of the NEM states based on multi-sectoral modelling outcomes and stated policies, as predictions of state-based economic growth and the stability of environmental policies are inevitably fraught.
- **JEC** highlighted the risk that the use of carbon budgets in isolation may function as a ceiling for aspiration rather than a baseline, and that they allow the NEM to become a "backstop" for economy-wide emissions reductions.
- **CWC** recommended that AEMO formally request the ECMC to direct the Australian Energy Market Commission (AEMC) to expand the Emissions Target Statement to include the energy impacts of industrial decarbonisation and green export targets. It argued that AEMO should be allowed to consider policies with substantial commitment, even if not yet legislated, due to their significant implications for future energy demand[27].

AEMO's consideration and response

AEMO notes **CEIG**'s recommendation that carbon budgets should reflect the electricity sector's ability to accelerate its decarbonisation. This is already considered in the multi-sectoral modelling from which the carbon budgets are derived, where the electricity sector is a first mover for decarbonisation efforts and, when coupled with the electrification of other sectors, enables earlier economy-wide decarbonisation.

AEMO notes recommendations from **EUAA, CIS** and **JEC** that the core modelling scenarios should consider policy uncertainty and not include all government policies as standard. However, it is AEMO's view that government policies that AEMO has assessed as eligible to be considered, consistent with NER 5.22.3(b), should be included across all scenarios. Selectively excluding committed policies in certain scenarios would reduce the likelihood that those policies will be met. This is because the modelled economic benefit of projects that help to meet policies would be reduced by placing weight on scenarios where the policies are not met. AEMO considers that inefficient outcomes are likely to emerge where power system planning does not adequately consider committed government policy. This approach is consistent with the AER's *Cost Benefit Analysis Guidelines*[28]. AEMO may explore the possibility that government policies cannot be met under specific circumstances through sensitivity analysis, such as due to supply chain limitations.

[25] At https://www.superpowerinstitute.com.au/news/new-groundbreaking-satellite-monitoring-tool-shows-significant-underestimation-of-methane.

[26] This stakeholder submission was received through the *ISP Methodology* issues paper consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

[27] This stakeholder submission was received through the Draft *ISP Methodology* consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

[28] At https://www.aer.gov.au/industry/registers/resources/reviews/2024-review-cost-benefit-analysis-and-regulatory-investment-test-guidelines/final-decision.

AEMO acknowledges the **CIS, EUAA** and **Hydro Tasmania** suggestion that it should propose the most efficient way of getting to net zero by 2050 without having to consider all government policies. However, policies can have broader benefits than can be evaluated in ISP modelling – such as broader social or economy-wide benefits (for example, local manufacturing, regional development, workforce planning, economic stimulus, and infrastructure prioritisation). It is the role of governments, not AEMO, to evaluate the benefits of policies.

AEMO acknowledges concerns from **CIS** regarding the narrowing of the scenario collection's carbon budgets due to the consideration of committed policy targets. The carbon budgets presented in the IASR and used in ISP modelling are derived from multi-sectoral modelling outcomes, and while the scenarios feature varying levels of decarbonisation ambition in the long term, they are also influenced by various near-term emissions reduction and renewable energy targets affecting the electricity sector and broader economy as committed to by multiple jurisdictions, including the 2030 Paris Agreement commitment of 43% emissions reduction. AEMO considers these to be important to consider when planning power system needs, and has not adjusted its treatment of these in the IASR.

AEMO notes feedback from **Coalition for Community Energy** and **Lighter Footprints** regarding the potential use of Open Methane, a tool using satellite technology to measure methane emissions across Australia, and its findings regarding hotspots around sites of coal or gas extraction. The ISP modelling focuses on scope 1 emissions, which reflects direct emissions from the power sector only. As for multi-sectoral modelling, emission factors are sourced from Australian National Greenhouse Account Factors 2024[29], and therefore reflects emissions on a fuel basis.

Regarding the **ISP Consumer Panel**'s request for further explanation around state-level emissions budgets, AEMO clarifies that two emissions reduction targets influence the ISP modelling:

- Carbon budgets derived from multi-sectoral modelling outcomes are applied NEM-wide, and AEMO's capacity outlook models determine the most efficient means of developing and operating the power system, considering costs and technical capabilities of existing and potential generation, storage and network investment options. These NEM-wide carbon budgets are scenario-specific and ensure adherence to the temperature outcomes from multi-sectoral modelling.
- State-level carbon budgets are calculated independent of multi-sectoral modelling outcomes, and reflect emissions reduction targets committed to by relevant jurisdictions. These are applied alongside and in addition to the NEM-wide carbon budgets. These state-level carbon budgets ensure adherence to state emissions policies, as required per the AEMC's emissions targets statement[30].

AEMO disagrees with **JEC**'s suggestion that the carbon budgets may act as a ceiling for aspiration. AEMO considers that the breadth of emissions reduction action included across the scenario collection demonstrates the capability for the electricity sector to provide support for emissions reduction across the economy, although recognises also that other sectors will also need to provide key contributions. If economically efficient to do so, AEMO's capacity outlook model may also 'beat' the carbon budgets and achieve greater emissions abatement than is needed. As identified in the multi-sectoral modelling, the electricity sector is a key early-mover for Australia's decarbonisation, enabling broader decarbonisation if paired with electrification across the economy.

[29] At https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-factors-2024.

[30] At https://www.aemc.gov.au/regulation/targets-statement-emissions.

Lastly, on **CWC**'s recommendation that AEMO formally request the ECMC to direct the AEMC to expand its Emissions Targets Statement, AEMO considers that it is the role of governments to set policy (including the purpose and scope of the targets statement). AEMO notes that the ECMC and Ministers of participating jurisdictions can already direct the AEMC to include or remove targets from the targets statement[31]. AEMO considers it is for jurisdictions to direct the AEMC to include relevant emissions reduction policies in the targets statement. In setting this direction and including policies in the targets statement, or by demonstrating sufficient commitment to meeting the other criteria defined in NER 5.22.3(b), jurisdictions are supporting the application of these policies in all of AEMO's scenarios, and therefore in further regulatory processes to assess projects that utilise the assumptions and scenarios of the IASR.

3.6 Consumer energy resources

Summary of material issues raised in submissions

On the topic of CER, stakeholder submissions focused on various topics including the rate of uptake, the degree of coordination, distribution network constraints, costs and government support.

- Regarding the level of uptake and the associated weighting of consultant CER forecasts:
  - **Fletcher** recommended that only CSIRO CER projections should be used for *Step Change*, with Green Energy Markets (GEM) used as a sensitivity, arguing that both consultants' projections are built on overly optimistic cost projections from CSIRO's GenCost, while GEM's battery projections assume both rapid build cost reduction and system size increases, which are unlikely.
  - **Ergon Energy and Energex, JEC,** and **Nexa** mentioned apparently little variation between the CER assumptions adopted between scenarios, with greater weighting placed on CSIRO's forecasts, which reflect more conservative CER adoption assumptions.
  - **Nexa** expressed concern that the CER forecast weightings could underestimate CER uptake in the Draft IASR, noting that more dynamic and cost-reflective pricing and "second order" drivers of CER uptake should be considered, for instance, worsening system reliability owing to future coal generator outages could drive accelerated CER uptake as a source of back-up.
  - **ISP Consumer Panel** suggested AEMO consider a sensitivity where the three sectors (business, consumers and government) do not act in sync with each other, particularly for the *Progressive Change* and *Step Change* scenarios, to address a plausible situation where consumers invest in CER in response to less supportive policy conditions affecting utility-scale developments. In this circumstance, consumers would effectively act to protect themselves from policy and utility-scale uncertainties, and in doing so have a stronger contribution to the transition.
- Regarding CER coordination:
  - **Ergon Energy and Energex** asked AEMO to highlight and openly discuss assumptions regarding the level of CER coordination, with a view to their associated risks and limitations.

[31] Section 32A(2) of the National Electricity Law (NEL); section 72A(2) of the National Gas Law (NGL); section 224A(2) of the National Energy Retail Law (NERL).

  - **PA** recommended lifting the assumed level of CER coordination in the *Progressive Change* and *Step Change* scenarios, citing the rapid pace of innovation and strong commercial drivers for consumers and network operators.
  - **ISP Consumer Panel** asked AEMO to explain why CER uptake and coordination have decreased in the 2025 IASR, and for these reasons to be outlined in the final IASR. Alternatively, it requested CER forecasts be increased by considering behavioural factors that drive uptake of CER, in addition to financial considerations.
- Regarding the need for attention to distribution network constraints to CER:
  - **Ausgrid** encouraged AEMO to strengthen its understanding of distribution networks, particularly as distribution networks are the source of NEM load and will host a growing amount of generation and storage through CER and distributed energy resources (DER).
  - **CIS** highlighted that the ECMC directed AEMO to incorporate distribution network constraints in CER projections, and, by excluding distribution constraints from CER forecasts in the IASR, the forecast uptake may be over-estimated.
  - **Ergon Energy** and **Energex** also recommended AEMO consider expanding the breadth and depth of the CER analysis in subsequent ISPs, given the complexity associated with modelling CER and forecasting its impacts on the power system. This could include modelling CER at a more granular level, distinguishing between different types of CER, and considering distribution network limitations and opportunities.
- Regarding specific categories of CER warranting further attention:
  - **ENA** suggested AEMO should incorporate aggregated mid-scale CER modelling to capture non-residential based CER opportunities, including solar on industrial sites and warehouses, and community batteries. ENA argued that these mid-scale CER opportunities can connect to existing available capacity in the network with a limited or no need for network augmentation.
  - **Ergon Energy and Energex** mentioned AEMO's approach to forecasting CER does not specifically identify community battery installations, which will play a critical role in supporting CER coordination and VPP adoption, while considering a more aggressive outlook for VPP.
  - **ISP Consumer Panel** asked AEMO to update and increase the forecasts for photovoltaic non-scheduled generation (PVNSG), especially for the *Progressive Change* scenario, to reflect that motivations for mid-scale systems extend beyond economic considerations.
- Regarding the assumed level of government support:
  - **CIS** also raised concerns that the CER forecasts rely on speculative policy assumptions, particularly the inclusion of an assumed battery system subsidy.
  - **Fletcher** also requested more transparency around the assumed level of government support for batteries.
  - **Hydro Tasmania** commented that growth rates of CER in the *Step Change* and *Green Energy* scenarios should be revised downwards, as lowering or removing assumptions around government rebates from the CER forecasts would also be more consistent with the policy inclusion criteria.
  - **Kamener** suggest that AEMO include a target for domestic batteries in the IASR.

- Regarding the costs and benefits of CER:
  - **CIS** and **Erne Energy** mentioned it would be useful for the 2026 ISP to outline the expected capital cost of CER, as it would allow governments to understand the scale of investment needed and how to actively facilitate it.
- Regarding the CER forecast methodology:
  - **CIS** and **ElectraNet** encouraged AEMO to adopt a whole-of-system optimisation approach in the ISP, incorporating CER and distribution-level resources in the optimisation process.
  - **ECA** highlighted that consumers have differing levels of interest in engaging with their electricity decisions and suggested that, to capture this, AEMO should add granularity to its data and models to disaggregate consumer groups, rather than assuming that all residential demand behaves equivalently.
  - **Fletcher** encouraged AEMO to release load and CER traces and any other required inputs that would allow stakeholders to replicate CER sensitivities in PLEXOS.
- On the topic of EVs, stakeholder feedback focused on specific technologies and vehicle type uptake:
  - **Ausgrid, Hydro Tasmania** suggested EV sensitivities to explore the potential for technology improvements such as battery life, including V2G capability that may influence the EV uptake rate.
  - **Fletcher** and **JEC** said that AEMO should remove FCEVs from *Progressive Change* and *Step Change* as a model option for residential and commercial vehicles, due to declining sales coupled with limited refuelling station development.
  - **CIS** mentioned AEMO should substantially reduce battery EV (BEV) sales projections compared to internal combustion engine (ICE) and hybrid vehicles based on current sales trends, citing recent data and sharing concerns about the scale of network upgrades and charging infrastructure necessary to support EV charging. **JEC** added that the IASR should be corrected as it incorrectly inverted the figure labelling for fleet and sales share (Figure 25 in the Draft 2025 IASR, stage two release). Regarding this EV representation in the IASR, **JEC** suggested AEMO should clarify how sales and fleet shares is consistent based on average life of different vehicle types.
- Regarding dynamic pricing and V2G:
  - **ENA** suggested AEMO should provide further clarity on how cost factors are applied across different technologies and provide more visibility on the assumptions going into EV dynamic pricing.
  - **Hydro Tasmania** suggested that AEMO should clarify why the year-on-year increase in electricity demand from V2G in the *Progressive Change* scenario is much larger than year-on-year increase from total EV in the *Progressive Change* scenario.
- Regarding EV public charging infrastructure specifically:
  - **Ausgrid** and **ENA** suggested AEMO not limit the use of public chargers to destination charging or en-route charging for extended journeys as there is significant use case for public charging close to home, typically overnight. Ausgrid further advised that AEMO should continue evolving the shape of public charging as the load profile assumed in the Draft IASR may not be fit-for-purpose in the long term.

  - **ENA** and **Ausgrid** also suggested AEMO explore the availability of public charging and consider consumer preferences for destination versus en-route charging.
  - **QCC** suggested that AEMO should consider its potential role in supporting or enabling greater public charging infrastructure since more public charging is contingent on enabling infrastructure.
- Various stakeholders supported AEMO's EV forecasts.
  - **ElectraNet** agreed with the projected long-term trend of plug-in hybrid EVs (PHEVs), as it is informed by recent survey data and balanced with considerations of the merits of PHEVs and BEVs.
  - **Marinus Link** supported the updated EV forecasts.
  - **Ausgrid** welcomed the inclusion of a higher degree of dynamic pricing in the Draft 2025 IASR forecasts, as pricing signals that incentivise time-of-use dynamic charging are another mechanism to deliver CER coordination.

AEMO's consideration and response

CER uptake

Regarding **Fletcher**'s recommendation that only CSIRO CER projections should be used for *Step Change*, with GEM used as a sensitivity, AEMO notes the consultants have contrasting views regarding key uptake drivers, such as installation cost and system size projections, reflecting underlying uncertainty in this area. AEMO agrees with **Fletcher** that multiple ideal conditions need to be met simultaneously for GEM's forecasts to be realised, which is why AEMO chose to put more weight into CSIRO's forecasts in the 2025 IASR. However, AEMO considers partial weighting of GEM's higher projections are needed to reflect the uncertainty. AEMO also notes that other stakeholders (**Ergon Energy and Energex**, **ISP Consumer Panel** and **Nexa**) have provided a contrary view, suggesting that the forecasts be increased. AEMO therefore considers that given the breadth of views on this matter, there is insufficient evidence to warrant changing the draft forecasts based on the consultant weighting approach.

AEMO notes **Nexa**'s concerns about whether the risk of future grid reliability should be incorporated in the CER forecasts, reflecting a possible higher uptake of CER in response to any unreliability risk. AEMO considers the levels of CER uptake in the IASR represent a broad range of possible outcomes consistent with the scenario narrative and assumptions. AEMO's view is that any future reliability concerns – either real or perceived – are not sufficiently strong to warrant additional increases to the CER forecasts, and considers that consumer appetite to adopt CER is already appropriately incorporated in the forecasts.

Regarding the **ISP Consumer Panel**'s request for more information regarding reduced CER uptake in the 2025 IASR, revised assumptions on average system size and costs explain the decrease in the Draft 2025 IASR, compared with the 2024 ISP. More details to support this decision have been provided in the IASR, with further insights available in the consultant's reports, which are footnoted in the IASR.

Regarding the **ISP Consumer Panel**'s suggested sensitivity where business, consumers and government are out of sync, particularly for the *Progressive Change* and *Step Change* scenarios, AEMO acknowledges the merit in exploring this as a sensitivity and will consider this suggestion, and other sensitivity suggestions, with priority given to those uncertainties that are most able to support the selection of the ISP's optimal development path, and those that support significant insights that will provide broader decision-making support through the transition.

CER coordination

With regards to VPPs, also raised by **Ergon Energy and Energex,** the **ISP Consumer Panel** and **PA**, AEMO notes the current low level of VPP participation was a consideration in the determination of the slightly lower coordination settings in the scenario parameters relative to the 2024 ISP, consulted on in 2024[32]. AEMO considers the current breadth of VPP assumptions presented in the Draft IASR scenarios as being appropriate, recognising too that the 2026 ISP's Demand Side Factors statement may offer an opportunity to continue to explore the impact and benefits of CER uptake and/or coordination. AEMO anticipates that the development of the Demand Side Factors appendix to the 2026 ISP will provide useful insights on consumer investment options, benefits and impacts, and that it is likely that the level of insight within this new addition will likely increase progressively as the appendix matures.

Distribution constraints

AEMO welcomes **Ausgrid**'s suggestion related to AEMO strengthening its understanding of distribution networks. In response to the Review of the ISP and the AEMC's final rule on improving consideration of demand-side factors in the ISP, AEMO is extending the scope of the ISP to consider the distribution network and its impact on the operation of the CER as well as on the uptake and operation of small-scale distributed resources.

AEMO notes **CIS**' concerns that distribution network constraints are not incorporated in CER uptake projections. As outlined in its report[33], CSIRO considers network constraints as one of the many factors that can potentially limit growth in their assumption of projected average PV system size. However, its uptake model, which is used to forecast the number of installed PV systems, does not consider network constraints (and neither does GEM's, as **CIS** highlights in its submission). While network limitations are known to limit the export capacity of rooftop PV systems, network curtailment is unlikely to materially affect the consumer's investment decision and therefore the forecast uptake of PV systems installed. This is because self-consumption is the dominant driver of the purchase decision for PV systems, which is unaffected by network curtailment. Curtailment of PV system exports owing to network constraints will be modelled in a subsequent modelling process (outlined in the *ISP Methodology*).

AEMO appreciates **Ergon Energy and Energex**'s recommendation to consider expanding the breadth and depth of the CER analysis in subsequent ISPs and notes that AEMO is currently expanding the scope of CER analysis. For the 2026 ISP, AEMO has collaborated with DNSPs to develop appropriate assumptions to examine the distribution network augmentation opportunities to support forecast CER operation and potential for development of other distributed resources within the distribution network. Additional relevant assumptions are provided in the 2025 *Electricity Network Options Report*.

CER forecasts are now published at subregional level in the IA workbook.

CER categories

Regarding **ENA**'s suggestion that AEMO should incorporate aggregated mid-scale CER opportunities in the IASR, AEMO has considered the information within the IASR and increased the clarity regarding the level of mid-scale developments forecast within the CER forecasts. AEMO's forecasts do include a level of growth for mid-scale

[32] AEMO. 2025 IASR Scenarios Consultation, December 2024, at https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr-scenarios-consultation.

[33] See https://aemo.com.au/-/media/files/major-publications/isp/2025/CSIRO-2024-Solar-PV-and-Battery-Projections-Report.pdf.

developments within the PVNSG and large commercial battery sectors, which includes community batteries. As has been described in the *ISP Methodology*, development opportunities for other mid-scale distributed resources will be modelled within the 2026 ISP, in addition to the impacts of distribution network infrastructure capabilities on CER operation, including distribution augmentation opportunities to alleviate potential CER curtailment. This extended scope of modelling, coupled with more sub-regional considerations of CER opportunities, also addresses **Ergon Energy and Energex**'s recommendation to consider expanding the breadth and depth of the CER analysis.

AEMO notes **Ergon Energy** and **Energex**'s comments regarding community batteries, and wishes to clarify that while community batteries are not forecast as a discrete CER type that may be disaggregated, community batteries, such as those currently being funded by government programs, are forecast in the "large commercial" battery uptake forecasts.

AEMO acknowledges the **ISP Consumer Panel** request to increase PVNSG forecasts to reflect motivations for mid-scale systems extend beyond economic considerations. While this may be a reasonable perspective, AEMO considers that the expanded consideration for distribution network impacts and other distributed resources within the distribution network will enable new opportunities for additional mid-scale investments beyond those that are forecast. AEMO considers this represents an appropriate balance between forecasting and modelling for the 2026 ISP.

Government support

Regarding **CIS'** concern that CER forecasts are based on speculative policy assumptions, AEMO notes that in the latest IASR forecasts, consultants' views on policy were more aligned, with both GEM and CSIRO assuming a moderate level of battery subsidy in the future, according to scenario definitions. The forecast subsidies were subsequently supported by the announcement of the Federal Government Cheaper Home Batteries Program and its subsequent implementation in legislation[34]. Post adjustments have since been made to incorporate the accelerated uptake of the policy in the draft CER forecasts.

AEMO notes **Fletcher**'s request for details on the assumed level of government support for batteries and agrees that while details are provided in the individual consultants' reports, these assumptions have not translated into sufficient detail in the IASR itself. AEMO has amended the IASR to describe the assumed level of government support in CER forecasts.

AEMO acknowledges **Hydro Tasmania**'s suggestion that growth rates of CER in the *Step Change* and *Green Energy* scenarios should be revised downwards by lowering or removing government rebate assumptions. AEMO considers that the assumed support for CER is representative of the scenario narratives, noting that the support was decreased compared to previous forecasts in response to stakeholder feedback in previous consultations. The scenarios effectively capture a breadth of ongoing consumer and government support for CER, from effectively no expanded support in *Progressive Change* to more supportive assumptions in other scenarios.

AEMO notes **Kamenar**'s suggestion of a target for domestic batteries and observes that there are currently no legislated targets in any relevant jurisdiction. AEMO will apply targets in the CER forecasts if, and when, such targets are set. In the meantime, AEMO incorporates various jurisdictional subsidies.

[34] Renewable Energy (Electricity) Amendment (Cheaper Home Batteries Program) Regulations 2025.

CER costs and benefits

AEMO notes **CIS** and **Erne Energy**'s suggestion to incorporate the expected capital cost of CER in the ISP. AEMO recognises the interest in this area but notes that the uptake of CER are independent financial decisions made by households and businesses not only related to the electricity market. At present, the scope of CER costs for the purpose of the ISP cost benefit analysis is limited to the incremental costs of CER coordination.

Methodology considerations

Regarding **CIS** and **ElectraNet**'s recommendation to optimise the level of CER investment, AEMO has made considerable enhancements to improve consideration of demand-side factors in the ISP assessment, although not a full optimisation as requested. Addressing feedback also provided by **Ausgrid**, the 2026 ISP's scope has also been extended to consider distribution network opportunities to facilitate the improved operation of CER and other distributed resources. For details, refer to the *ISP Methodology*. AEMO recognises that the uptake of consumer devices such as rooftop solar and EVs are individual household and business decisions driven by individual preferences and prevailing market conditions, so optimising the uptake of those devices is not currently feasible in the *ISP Methodology*. Instead, AEMO expects to assess the impact of alternative CER uptake levels on the optimal development path, while assessing and optimising options to increase CER operation and other distribution-connected investments. Combined with the inclusion of distribution network opportunities that facilitate the operation of CER and other distributed resources, utility-scale generation connected in distribution and transmission, AEMO's 2026 ISP will provide a more complete assessment of the whole electricity system when determining the optimal development path. AEMO notes that this depends on the availability of quality data in low voltage distribution networks, which will improve for future ISPs.

Regarding **ECA**'s recommendation to consider different consumer segments in CER forecasts, while AEMO agrees there are likely to be insights to enhanced segmentation in CER forecasts, there is currently limited data available differentiating adoption rates and usage behaviour by customer segment. AEMO will continue exploring potential enhancements to CER forecasting data and methodology, including options for improved customer segmentation. AEMO notes the current low level of VPP participation was a consideration in reducing the coordination scenarios parameters relative to the 2024 ISP (for example, *Step Change* reduced from High to Moderate).

AEMO notes **Ergon Energy and Energex**, **ISP Consumer Panel,** and **JEC**'s comments regarding behavioural factors in CER uptake forecasting and agrees that it may offer an alternative future approach to the current techno-economic consumer adoption modelling approach. AEMO notes that by leveraging historical trends in CER uptake, the current forecasts *implicitly* includes the results of multiple behavioural factors that have influenced historical investments. AEMO has expanded the IASR's description of CER to this effect.

AEMO notes **Fletcher**'s request for AEMO to publish load, CER traces and other inputs related to CER sensitivities. AEMO is committed to improve the transparency of its modelling processes. AEMO's normal practice is to publish all available trace and load information with the IASR and/or the ESOO, and will consider the publication of any additional traces and load information when the Draft ISP or final ISP are published if these have been developed for sensitivity analyses.

EV technology and vehicle types

Feedback from **Ausgrid** and **ECA** included the value of sensitivities to explore EV battery life, public charger availability, and vehicle/charging use patterns. AEMO notes there is a range of implicit and explicit assumptions on these and other EV matters in the IASR and consultant's report across the scenarios, and AEMO will consider EV sensitivities relative to the value and purpose of other major uncertainties.

AEMO has taken on board **Fletcher** and **JEC**'s suggestion and removed FCEVs from *Progressive Change* and *Step Change* as an option for residential and commercial vehicles, due to declining sales coupled with limited refuelling station developments. FCEV trucks and buses are not completely removed from the forecasts, as the percentage is very low and AEMO and CSIRO consider that limited degree of market development is already factored into the forecasts.

AEMO notes **Fletcher** and **JEC**'s suggestion to clarify how cost factors are applied across different vehicle technologies. Under CSIRO's updated payback methodology developed in response to the New Vehicle Efficiency Standard (NVES), vehicle costs are now complemented with other drivers to improve vehicle efficiency levels targeted by the policy, thereby reducing the relative role of cost in a consumer's vehicle purchasing decision in the model. AEMO will monitor the evolving FCEV landscape including environmental regulations and consider forecast refinements and use of explicit cost factors in future forecasts as appropriate. AEMO has added this additional context about the relationship between cost factors and policy drivers in the IASR.

AEMO has taken onboard **JEC**'s suggestion to further clarify the average life assumptions of ICE vehicles. The final IASR now details that an average lifespan of 12 years is assumed. Combined with a large fleet share for internal combustion vehicles, fleet share is expected to fall relatively slowly, reaching less than 10% only after 2053 in *Step Change*.

AEMO notes **CIS** has expressed concern that BEV's fleet share exceeding 90% by 2036 may be unrealistic without significant investment in network upgrades and charging infrastructure. AEMO acknowledges that a charting error occurred in the Draft 2025 IASR which may have led to this view, with Figure 25's chart title incorrectly labelling the sales and fleet share charts. The figure on the right depicted BEV sales share reaching approximately 90% by 2040 (for *Step Change* scenario, and relating to cars), not the fleet share. The chart label has been fixed as suggested by **JEC**. AEMO acknowledges that there are several active supportive policies that are expected to contribute to favourable sales outcomes for EVs, including Victoria's Zero Emissions Vehicle (ZEV) Roadmap and Queensland's Zero Emission Vehicle Strategy (both target 50% of new light or passenger vehicle sales to be zero-emission by 2030, with the Queensland policy growing to 100% of sales by 2036) and similar supporting policy in South Australia.

Dynamic pricing and V2G

Regarding **ENA**'s suggestion on providing more clarity on assumptions going into EV dynamic pricing, AEMO notes that Time-Of-Use (TOU) based profiles do not use a specific TOU price assumption. Rather, an empirical data set informed by real world charging behaviour observed during trials encompassing TOU is used. AEMO will continue to monitor pricing data availability for potential inclusion in future forecasting models.

Regarding **Hydro Tasmania**'s query on why the increase in V2G load exceeds the increase in EV load for the *Progressive Change* scenarios, AEMO notes that in the event of improved market signals, V2G may be taken up by existing EVs, as well as new EVs. The forecast V2G load increase may therefore exceed the forecast EV load

increase as the number of existing vehicles considerably exceeds annual vehicle sales. AEMO notes this mechanism holds not only for *Progressive Change* but for all scenarios.

Public charging infrastructure

Based on **Ausgrid** and **ENA**'s feedback, AEMO has expanded the public charging category to include charging that occurs near drivers' home, typically overnight. AEMO further notes **Ausgrid**'s feedback that it should continue evolving the shape of public charging profile as assumed load profile may not be fit-for-purpose in the long-term with many users opting for public charging near their home to charge overnight. AEMO considers, with input from CSIRO, that changes to the long-term profiles could only be made once more data on overnight charging for kerbside is available, or cost of this technology becomes publicly available to understand the financial viability of kerbside chargers against fast chargers.

Regarding **QCC**'s observation that public charging could be planned or managed to support the electricity grid, AEMO agrees that charging infrastructure availability will enable positive charging choices for consumers that can potentially mitigate grid impacts, and it is possible that more information on the interaction that EVs may have with the grid could be explored within the new Demand Side Factors statement, subject to appropriate modelling prioritisation.

3.7 Cost and technology

Summary of material issues raised in submissions

Stakeholders provided a range of feedback to both stages of the Draft 2025 IASR on cost and technology-related items in their submissions including gas storage, PHES, fuel prices, transmission, and WACC – the main topics are listed below, with GenCost-specific questions provided to CSIRO to consider:

- Regarding assumptions and methodological considerations of gas integration:
  - **APGA** mentioned it anticipated that Stage 2 of the IASR will cover the contribution of gas storage in the form of linepack and underground storage facilities such as Iona.
  - **CIS** noted Simshauser and Gilmore's study[35] on policy sequencing suggests that gas firming costs will be much higher than AEMO anticipates, noting the study highlights gas shortages during peak demand days in winter, leading to severe price spikes and potential supply shortfalls.
  - **CIS** also sought more explanation and transparency in relation to how AEMO identifies exact storage needs of REZ and regional developments through time-sequential dispatch and power flow modelling.
- Regarding thermal generator outage rates and performance degradation near end-of-life, **Nexa** suggested AEMO should determine whether a "near-end-of-life" premium should be added to outage rates of ageing coal generators, while **QCC** recommended updating coal and gas outage rates to reflect the continued deterioration of coal availability at ageing power stations.

[35] Paul Simshauser & Joel Gilmore. 2024. "Policy sequencing: on the electrification of gas loads in Australia's National Electricity Market". Centre for Applied Energy Economics & Policy Research, Griffith University. Working Paper Series 2024-10. At https://www.griffith.edu.au/__data/assets/pdf_file/0033/2059917/2024-10-NEM-Electrification.pdf.

- Regarding generator cost assumptions:
  - **CIS, Erne Energy** and **QCC** supported the idea of applying first-of-a-kind cost premiums to emerging generation technologies, but sought greater clarification regarding the proposed factors and their application, as they were seen as potentially being too low.
  - **ISP Consumer Panel** recommended that different cost assumptions be used for mid-scale solar and battery assets.
  - **CIS** and **EA** suggested AEMO should update its retirement cost assumptions, as they are currently not defined for large-scale batteries, and for existing technologies may be incomplete and not reflective of the true cost of decommissioning, disposal and site rehabilitation.
  - **Fletcher** mentioned that installation cost forecasts should factor in cost increases due to decarbonisation, as increased costs affecting inputs such as steel, concrete, and freight impact estimate accuracy and risk inconsistencies in scenario planning.
  - **Fletcher** also recommended that the equipment cost component of the locational cost factors for new generation and storage should be based on distances to ports rather than distances to capital cities, and that GenCost projections should include the specific split of projections for each cost component.
- Regarding the availability and costs associated with pumped hydro energy storages:
  - **ANU RE100** and **EnergyCo** commented that PHES limits may be outdated as there have been major updates to the reference data and significant developer interest since these limits were first developed. **Hydro Tasmania** similarly suggested that AEMO should engage with current and future PHES operators to ensure PHES build and operating costs are reflective of current experiences.
  - **Hydro Tasmania** sought clarification for the change in fixed operating and maintenance (FOM) cost for PHES, from $19/kilowatt (kW)/year in 2023 to $84/kW/year in the Draft 2025 IASR.
- Regarding costs, methods and assumptions for coal generation technologies:
  - **CIS** questioned the exclusion of new coal developments from the list of new candidate generation technologies, given there is an expectation that the ISP assesses all alternative technologies for least-cost optimisation.
- Regarding network development costs and assumed timings:
  - **DeCarb** said that there is a lack of policy incentives for transmission network service providers (TNSPs) and distribution network service providers (DNSPs) to transition from old network design and operation to advanced technologies like Grid Enhancing Technologies (GETs), and encouraged AEMO to assess and adopt more efficient high voltage (HV) transmission infrastructure, such as Aluminium Encapsulated Carbon Core (AECC) conductors, that could enhance capacity, efficiency, cost-effectiveness, and deployment speed. **DeCarb** discouraged the use of old technologies such as steel core conductors.
  - **ElectraNet** highlighted that many states in the NEM have faced delays and cost overruns, making it crucial to assess project benefits carefully. **ElectraNet** also noted that it has a strong record of on-time, on-budget transmission projects, and supported incorporating an approach that considers TNSP delivery performance into AEMO's forecasting.

- **Erne Energy** noted that it would be helpful to provide an updated cost for the optimal development path, incorporating the latest cost estimates for all transmission projects that make up the optimal development path.
- **Transgrid** noted that transmission costs in the IASR tend to increase in real terms consistent with the escalation built into AEMO's Transmission Cost Database, while the costs of some generation technology options decline in real terms due to the application of technology learning curves in the CSIRO GenCost model. This will have the result of favouring generation development close to load centres, rather than transmission, over time.
- **Transgrid** added that locational cost-scaling factors applied to projects in metropolitan regions may not accurately reflect the high cost and low availability of land within a reasonable distance of existing transmission infrastructure, which may overestimate the development potential and underestimate the costs and lead times of these regions.
- **Alliance of LDES** recommended AEMO consider applying zero or low-cost transmission tariffs for long duration energy storage (LDES) providers to incentivise its deployment[36].

- On the topic of WACC:
  - **Etrog** and **ISP Consumer Panel** suggested varying both the technology-specific WACCs and the single discount rate in line with the different scenario narratives. **ISP Consumer Panel** added that AEMO should consider whether Oxford Economics Australia's macroeconomic analysis of the WACCs and the discount rate should more closely align with the approach adopted by the AER.
  - **ISP Consumer Panel** also recommended further analysis of the implication on a project's WACC (of various technologies) where it receives government support, while conducting an update before the Draft 2026 ISP (but preferably in advance of the final 2025 IASR) given the uncertain national and international environment and related policy uncertainty.
  - **CIS** commented that the proposed WACCs favour transmission projects over generation and storage due to the lower WACC of regulated transmission projects, which may be seen as problematic given transmission projects are not less risky than other projects and have faced large cost blowouts in recent years.
  - **Marinus Link** and **Hydro Tasmania** supported technology-specific WACCs as proposed, and said it should recognise expected benefits from concessional finance, while **ASTRI & AUSTELA** suggested that WACCs should be time-varying and converge back to average as a technology matures and deployment progresses.
- Regarding other technology developments:
  - **ASTRI & AUSTELA** also suggested that concentrated solar thermal (CST) should be modelled dynamically with controllable storage in the ISP, as this is likely to lead to greater adoption that better reflects its flexibility.

[36] This stakeholder submission was received through the *ISP Methodology* issues paper consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

- **SEE** recommended that AEMO should consider its proposed 'Fair Finance' model to allow groups of consumers to form their own electricity companies to generate, store and distribute power in addition to the existing systems under AEMO.

Following formal consultation on the Draft 2025 IASR, AEMO engaged GHD to update PHES technical parameters and presented an update to the FRG on 28 May 2025. Following the meeting, AEMO received two FRG Consultation submissions, from **Fletcher** and **Transgrid:**

- **Fletcher** commented that GHD's assessment of potential PHES build limits appeared overly optimistic, as it did not explicitly consider a range of constraints such as technical considerations, hydrology and environmental impacts, and included abandoned sites in its estimates. **Fletcher** referenced the Queensland Government's PHES site identification and selection process, in which only two sites out of 2,000 proceeded to the final stage, as evidence of this viewpoint.
- **Transgrid** sought clarification on the sub-regional mapping of some of the proposed PHES sites in the Sydney, Newcastle and Wollongong (SNW) sub-region, as their locations on the boundary with Central New South Wales (CNSW) may mean they are more accurately represented in CNSW to reflect the location of their connections with the transmission network.

AEMO and Oxford Economics Australia also made updates to installation cost escalation factors and presented an update to the FRG on 17 June 2025. Following the meeting, AEMO received two FRG Consultation submissions, from **Fletcher** and **GHD:**

- **Fletcher** commented that the cost factors AEMO uses across all modelling should be consistent and so too should the approach from AEMO's consultants: Oxford Economics Australia for construction costs, GHD for transmission costs in the *Electricity Network Options Report*, and also GHD for gas costs in the *Gas Infrastructure Options Report*.
- **GHD** noted that if decarbonisation applies to construction inputs, then oil would become a smaller and smaller proportion of average construction costs, and it would appear uncertain whether the alternatives to oil would be more or less costly.

AEMO's consideration and response

Gas integration

AEMO acknowledges **APGA**'s comment and notes that the Stage 1 IA Workbook provided technical information on gas storage facilities in the east coast gas market including injection, withdrawal and storage capacity. AEMO also notes that the integration of gas development projections in the 2026 ISP will allow greater consideration of the role of gas storage. The balance of gas in pipeline linepack is primarily an operational tool that can be utilised on-the-day to supply gas consumers. The availability of linepack is dependent on system pressures and is not guaranteed, so it is appropriate to exclude it as a source of supply in adequacy assessments and thus it is not included in the IA Workbook. AEMO has now included information about dedicated linepack facilities and updated all gas infrastructure information as per the 2025 GSOO in the IA Workbook.

AEMO acknowledges **CIS**'s suggestions to improve modelling of pipeline transmission constraints and better account for the costs of gas transmission. The integration of gas development projections in the 2026 ISP will allow a greater consideration of different gas supply outcomes and the impact of pipeline constraints. AEMO's

integration of gas in the 2026 ISP will include modelling and analysis of gas that will go beyond what was included in the Simshauser and Gilmore study. The gas development projections will also consider the cost of various new gas infrastructure options.

Regarding interest in identification of REZ and sub-regional developments storage needs (**CIS** and other stakeholders), AEMO notes that the recently published *ISP Methodology* provides details on the methods that AEMO uses to determine these developments. While AEMO does not specify connection-point locations for the storage, time-sequential modelling is used to validate the appropriateness of locations identified by the capacity outlook modelling, typically via an assessment of network utilisation. Power flow modelling may be used to assess the suitability of locations in some cases, for example if an actionable project is under consideration.

Generator outage rates

AEMO acknowledges **Nexa** and **QCC**'s suggestions to reflect deteriorating outage rates for ageing coal generators better. For existing coal generators, AEMO applies a forward-looking trajectory of unplanned outage rates over the next 10 years that is informed by participant projections of plant reliability; this trajectory already captures expected declines as generators near the end of their technical lives, and projected improvements in plant reliability as generators invest in maintenance. These aggregate outage assumptions are applied consistently for both ESOO and ISP analysis. The ISP assumptions beyond 10 years do not reflect further declines in reliability beyond what is projected within the 10-year horizon. However, given the generator retirement schedule typically forecast by the ISP, this is unlikely to be a material assumption.

Generator cost assumptions

AEMO welcomes **CIS**, **Erne Energy** and **QCC**'s support for applying first-of-a-kind premiums to build costs for less mature technologies. Noting concerns around the appropriateness of the factors themselves and acknowledging the fact that they were sourced from the US Energy Information Administration and may not reflect development experiences in Australia, AEMO has updated its assumptions in the final 2025 IASR based on advice from CSIRO in the GenCost report[37]. This has resulted in an increase in the starting first-of-a-kind premiums to 63% for offshore wind and 42% for technologies with carbon capture and storage (CCS), based on the construction time for each technology and the principle that technologies that take longer to build will face higher first-of-a-kind premiums due to complexity in their planning.

AEMO acknowledges **ISP Consumer Panel**'s suggestion to include separate cost assumptions for distribution-connected mid-scale solar and battery assets. These have now been included as separate technologies in Aurecon's *Energy Technology Cost and Parameters Review*[38] and the final 2025 IASR.

AEMO agrees with the suggestion from **CIS** and **EA** that retirement cost assumptions should be updated to capture more recent and relevant information and include all candidate technologies such as battery storage. AEMO has updated the assumptions through engagement with GHD. These updated assumptions are presented in GHD 2025 *Energy Technology Retirement Cost OM Estimate Review* report[39] and the final 2025 IASR.

[37] See https://www.csiro.au/en/research/technology-space/energy/electricity-transition/GenCost.

[38] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/Aurecon-2024-Energy-technology-cost-technical-parameter-review-report.

[39] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/GHD-2025-Energy-technology-retirement-cost-OM-estimate-review.

AEMO notes the comment from **Fletcher** that decarbonisation costs should be factored into installation cost forecasts. AEMO and Oxford Economics Australia acknowledge that there are currently price premiums for green materials such as steel and cement due to the difficulty to abate emissions in these areas, and that this premium is likely to reduce over time as technology improves. However, there is high uncertainty around the size of the premium and the extent and timing of any decrease in premium, and as such, decarbonisation costs have not been incorporated in the current set of installation cost forecasts. This may be considered in future forecasts as data becomes more readily available.

AEMO accepts **Fletcher**'s recommendation to update equipment cost factors to be based on distances to ports rather than capital cities, as was presented in the Draft 2025 IASR. These factors have been updated accordingly in Aurecon's *Energy Technology Cost and Parameters Review*[40] and the final 2025 IASR. Regarding the suggestion to provide cost projections by component in GenCost, CSIRO noted in the *GenCost 2024-25 Final Report* that this level of detail is not required by any of the modelling teams for which GenCost is targeted, and its inclusion would not be sustainable to maintain over time.

AEMO confirms there is alignment in both Oxford Economics Australia's and GHD's approaches to cost factors, in response to **Fletcher**'s comments. Oxford Economics Australia's installation cost escalation factors for generation and transmission consider escalations due to real increases in the costs for key construction materials and labour inputs, while GHD similarly applies a set of escalation factors to account for increases in labour and construction works in the transmission cost forecasts underpinning the Transmission Cost Database. Both approaches consider the influence of increasing demand for electricity infrastructure project resources and forecast real long-term escalations in these indices above inflation. Cost escalations factors for gas infrastructure have been developed separately by GHD and AEMO will apply these escalation factors to natural gas and hydrogen infrastructure. It is not appropriate to use electricity infrastructure cost escalation factors for gas infrastructure.

AEMO and Oxford Economics Australia acknowledge **GHD**'s suggestion regarding the impact of changing demand for oil as a construction input (and whether alternatives will be cheaper or more expensive). This suggests that a deeper model of installation cost escalation could incorporate changes to the weights in the model over time (that is, more dynamic weighting) as decarbonisation impacts take hold, as well as further research into how prices for less carbon-intensive substitute materials will form. While this may be an insightful area of further investigation, it is premature to speculate on the impact of changing oil demand and more research is required in this area before it can be considered in the installation cost forecasts.

Pumped hydro energy storage

AEMO acknowledges the comments from **ANU RE100**, **EnergyCo** and **Hydro Tasmania** that PHES costs and build limits may be outdated, in particular build limits which have not been updated since 2018. To address this, AEMO engaged GHD to update the PHES maximum build limit and locational cost factor assumptions using more up-to-date information including an updated view of publicly announced PHES projects and the most recent version of the ANU's PHES Atlases. The updated assumptions are presented in GHD 2025Pumped hydro energy

[40] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/Aurecon-2024-Energy-technology-cost-technical-parameter-review-report-solar.

storage cost parameter review report[41] as well as the final 2025 IASR, accounting for adjustments acknowledged below following engagement with the additional FRG Consultation on this topic.

AEMO and GHD acknowledge **Fletcher**'s comments about the potential overestimation of PHES build limits. Explicit build cost estimates and consideration of commercial constraints were specifically excluded from the scope of GHD's assessment as this is already considered in AEMO's capacity expansion modelling, which applies GenCost data to inform the future development of all technologies, including PHES, through least-cost optimisation. GHD's scope was a technical assessment to determine practical maximum build limits for PHES, which are then applied as ceilings for PHES development in capacity expansion modelling. GHD's study further adjusts build limits to 25% of the theoretical maximum to reflect that many sites may not be practical to develop due to various constraints including hydrology and other environmental impacts. AEMO considers this to be a reasonable assumption that balances stakeholder views.

AEMO accepts **Transgrid**'s suggestion to review the sub-regional allocation of potential PHES sites in the SNW sub-region. Upon review, some sites have subsequently been allocated to CNSW as this better represents their location with respect to the transmission network. These changes are reflected in the PHES parameters presented in the final 2025 IASR and in GHD's report.

AEMO notes **Hydro Tasmania**'s request for clarification on the FOM assumption for PHES. This assumption was previously based on outdated values from Entura's *Pumped Hydro Cost Modelling* report in 2018, and was subsequently revised for the Draft 2025 IASR to use estimates from Aurecon's *Energy Technology Cost and Parameters Review*[42], which more closely align with the FOM for conventional hydro of $105/kW/year. All cost estimates in Aurecon's report are based on experiences with recent projects, tenders or publicly available information. For further information, see Aurecon's report.

Coal-fired generation

AEMO notes comments from **CIS** about the exclusion of coal-fired generation from the list of candidate technologies. AEMO still considers this exclusion to be appropriate, as coal-fired generation is highly unlikely to be developed in the NEM due to its incompatibility with current emissions reduction policies and its relatively high cost and investment risks compared to other cheaper forms of dispatchable generation. If policy positions or scenario settings were to be amended in future such that the reasoning for this position was less certain, then it is likely this assumption would be revised.

Network costs and timings

AEMO acknowledges the comments made from **DeCarb** regarding incentivising advanced transmission technologies. AEMO does not incentivise specific technologies or dictate which options TNSPs/DNSPs should consider. However, if TNSPs propose alternative technologies, AEMO will jointly plan with the TNSPs to consider the inclusion of those technologies as part of the preparation of the transmission network-related inputs (consulted on through the *Electricity Network Options Report* for the 2026 ISP). Additionally, AEMO's Transmission Cost Database does in fact include high-capacity conductor options such as high temperature low sag conductors,

[41] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/GHD-2025-Pumped-hydro-energy-storage-cost-parameter-review.

[42] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/Aurecon-2024-Energy-technology-cost-technical-parameter-review-report.

ensuring that a broader range of solutions are available beyond the more traditional steel-core and aluminium (with steel reinforcement) options.

AEMO acknowledges **ElectraNet**'s comment on project delays and cost overruns. AEMO has engaged closely with TNSPs in the preparation of transmission network option cost estimates for the final 2025 *Electricity Network Options Report*. However, locally specific cost estimates based on environmental and land cost factors can be adjusted for each project if it is estimated using AEMO's Transmission Cost Database. Similarly, TNSP-specific lag times will not be considered in the sensitivity analysis, as these delays are primarily driven by workforce and supply chain issues affecting all NEM TNSPs.

AEMO accepts **Erne Energy**'s request to provide updated optimal development path costs using the latest transmission costs, and confirms this will be provided as part of the Draft 2026 ISP.

AEMO acknowledges **Transgrid**'s comment regarding cost escalations for transmission compared to generation and storage. Given the maturity of electricity transmission, it is reasonable to expect that there is limited potential for further learning and cost reductions compared to relatively new types of generation and storage technologies, which can be expected to experience cost reductions due to technological innovation and scaling up of deployment. As noted in the Draft 2025 IASR, AEMO has also engaged Oxford Economics Australia to produce installation cost escalation forecasts arising from increasing costs of installation such as labour and raw materials for different energy infrastructure assets. These installation cost escalation forecasts are then factored in as inputs to the GenCost build cost trajectories.

AEMO acknowledges **Transgrid**'s comment about the appropriateness of the locational cost factors in metropolitan regions. AEMO has recently updated the Transmission Cost Database to include cost escalations and reflect recent land and project costs. As part of consultation on the *Electricity Network Options Report*, AEMO has consulted on the costing of projects in these areas to ensure appropriateness of the costs being applied. The land and development factors used in the locational cost factors for new generation and storage projects also use the same land factors as those underpinning the Transmission Cost Database, to ensure consistent treatment of land and development costs across transmission, generation and storage. For particular projects, notably those proposed near or in the Greater Sydney area, AEMO and Transgrid have jointly planned to inform the cost estimates and reflect appropriate land cost values in the final AEMO review of project proponent estimates, as presented in the final 2025 *Electricity Network Options Report*.

AEMO thanks the **ECA** for its suggestion of a feedback loop for costs and timings of already committed projects, however, the reassessment of costs or timing for projects which are already identified as under delivery (that is, categorised as committed or anticipated) is not within the scope of the ISP assessment and inconsistent with the AER's *Cost Benefit Analysis Guidelines* and AEMO's *ISP Methodology*.

AEMO acknowledges **Alliance of LDES**'s recommendation and clarifies that transmission use of system (TUOS) charges are not included in the ISP's cost benefit analysis as they are considered out of scope. TUOS charges are a regulated cost recovery mechanism for transmission services rather than a market cost or benefit. While they may influence investment decisions, the underlying transmission asset costs are already included as a class of benefit in the ISP. More information on the classes of benefit considered in the ISP is in the *ISP Methodology*.

Weighted average cost of capital

AEMO accepts **Etrog** and **ISP Consumer Panel**'s suggestions that technology-specific WACCs should also vary based on scenario narratives. In response, AEMO engaged with Oxford Economics Australia again to provide WACC assumptions for all three core scenarios in line with their narratives and underlying assumptions. These are presented in the final 2025 IASR. Noting **ISP Consumer Panel**'s comment on the approach to deriving the WACCs and discount rate, Oxford Economics Australia engaged with the AER prior to finalising its WACC findings.

AEMO acknowledges **ISP Consumer Panel**'s recommendation that there should be an update to the WACC in light of recent international and national developments. WACCs are applied over the economic life of a technology and intended to be forward-looking over the whole ISP modelling horizon. AEMO considers that short-term volatility in policy is unlikely to impact long-term trends, and due to time limitations, it would not be practical to refresh the WACC assumptions so soon after the original study.

AEMO notes the comments from **CIS** that regulated transmission projects may be favoured due to their lower WACC. For regulated transmission projects, the project's WACC is set in accordance with the AER's Rate of Return instrument[43]. As such and per AER guidance, Oxford Economics Australia has set the central and lower bound WACC in the IASR of 3.0% for regulated transmission to be an inflation-adjusted simple average of the AER's most recent determinations, while the upper bound is determined by a market survey of the upper bound used by market participants for their regulated assets.

For unregulated transmission assets, the WACC is more aligned to mature generation technologies. For more details, see Oxford Economics Australia's *Discount Rates for Energy Infrastructure*[44]. AEMO also notes that WACC represents the cost of capital and reflects the risk associated with return, not the risk that consumers may bear due to cost blowouts.

AEMO welcomes the support from **Marinus Link** and **Hydro Tasmania** on technology-specific WACCs. AEMO will consider concessional finance benefits to be shared with consumers consistent with the approach set out in Section 2.8 of the *2025 Electricity Network Options Report.*

AEMO notes the comment from **ASTRI & AUSTELA** that WACCs should vary over time in accordance with technology maturity. The extent to which a technology's maturity and deployment changes over time is already captured within the learning rates that drive the capital cost projections from GenCost, and AEMO will additionally apply a first-of-a-kind premium to the build cost for initial developments of emerging technologies in the ISP. Considering this, AEMO does not intend to also impose time-varying WACCs.

Other technology developments

Regarding **ASTRI & AUSTELA**'s suggestion to model CST dynamically given its relatively higher capital cost in relation to the combination of large-scale variable renewable energy (VRE) and storage, AEMO considers that modelling CST as a controllable storage would increase computational complexity with little benefit given current inputs and assumptions that would likely preclude the model selecting the technology. AEMO also notes that the static discharge traces for CST have previously been modified to discharge during periods of high demand and at

[43] See https://www.aer.gov.au/system/files/AER%20-%20Rate%20of%20Return%20Instrument%20-%20Explanatory%20Statement%20-%2024%20February%202023_1.pdf.

[44] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/Oxford-Economics-Australia-Discount-rates-for-energy-infrastructure-report.

night, to better represent the value provided by the dispatchability of CST. AEMO does not consider this simplification warrants change at this time, given the marginal technical improvement relative to the high cost in added simulation time.

AEMO notes **SEE**'s recommendation to implementing a "Fair Finance" model. At this stage, such a model is outside of AEMO's remit and cannot be reflected in the scope of the ISP modelling assessment. AEMO will continue to update its assessment processes as the regulatory frameworks evolve.

3.8 Demand

Summary of material issues raised in submissions

Stakeholder submissions relating to demand focused primarily on DSP and major industrial loads (including both their growth and closure potential):

- Regarding DSP and demand flexibility more broadly:
  - **CIS** mentioned that DSP percentages in the *Step Change* scenario were at an extraordinarily high level and represent a transformational shift in people's attitudes towards electricity use and availability. It said it seems unrealistic to assume that consumers could be readily induced to forego the convenience that always-available electricity provides for any sensible degree of compensation without inducing a strong political backlash.
  - **ElectraNet** noted that Australian industrial output constitutes a relatively low share of GDP compared to that in the United States or Europe. Consequently, it said a target level for DSP of 8.5% of peak demand level in Australia is too high, particularly given that the DSP does not include the flexibility provided by electrolysers, which is modelled separately.
  - **Fletcher** encouraged AEMO to generate more contemporary, local assessments of demand flexibility potential rather than relying on international studies in the United States and Europe.
- Regarding industrial load growth and closures:
  - **ElectraNet** and **Jemena** supported AEMO's improvement in demand forecasting for major industrial loads, including data centres, while **Ausgrid** offered to collaborate in developing a consistent methodology for forecasting data centre loads.
  - **Hydro Tasmania** and **Marinus Link** said that AEMO should moderate the scale of industrial load closures assumed in *Progressive Change* and that targeted closure of specific facilities should be supported by a clear rationale.
- **Ergon Energy and Energex** supported AEMO's proposal to expand the number of Queensland weather stations, while suggesting additional weather variables, such as humidity, be included in the residential heating and cooling consumption models.

Following formal consultation on the Draft 2025 IASR, there were updates to the draft data centre forecasts, which were presented to the FRG on 30 April 2025. Following the meeting, AEMO received three FRG Consultation submissions, from **Ausnet**, **Origin** and **QEUN:**

- **AusNet** and **Origin** both expressed support for AEMO's efforts in developing robust data centre forecasts, while recommending greater transparency of Oxford Economics' short-run modelling assumptions, particularly around historical data, locational factors, and ramp-up periods. Furthermore, **Origin** recommended that AEMO consider the potential rebound effect, where overall energy demand may increase due to improvements in cost and performance. **Origin** also recommended that AEMO take into account the co-location of data centres with renewable generation, as well as the potential delays in new data centre loads coming online due to supply infrastructure readiness challenges.
- **QEUN** recommended that AEMO demonstrate how transmission and distribution connections are considered in data centre forecasts, including any reliability implications, and suggested incorporating data connectivity factors (such as international fibre cable landing points in Queensland) and accounting for sovereign risks associated with offshore data hosting.

On 28 May 2025, AEMO presented draft 2025 electricity consumption forecasts to the FRG. Following the meeting, AEMO received three FRG Consultation submissions relating to LIL consumption from **Origin, ElectraNet,** and **Fletcher**:

- **Origin** broadly supported the proposed methodology to include prospective LIL projects in the *Step Change* scenario, but suggested AEMO should provide both the size (in megawatts [MW]) and load profile of these new loads.
- **Fletcher** similarly supported the inclusion of a NEM-level LIL forecast but said that providing regional breakdowns and categorisation will improve transparency and risk. He also noted ambiguity around whether electrification-related load growth from the multi-sectoral modelling is captured under the LIL subcategory or classified separately and suggested AEMO provide a diagram to clarify the interaction between multi-sectoral modelling and the various demand categories for better clarity.
- **ElectraNet** supported the inclusion of anticipated LILs in the *Step Change* scenario but raised concerns that the draft forecasts still significantly underestimate both the scale and diversity of South Australian LIL projects. It noted that mining, green steel, and desalination collectively account for the majority of the 1,300 MW of expected demand – nearly half of which is classified by **ElectraNet** as anticipated. **ElectraNet** recommended that these projects should be incorporated in AEMO's forecast scenarios.

AEMO's consideration and response

AEMO notes the concerns of **ElectraNet** and **CIS** regarding the DSP target and **Fletcher**'s suggestion to develop a more contemporary, local assessment of demand flexibility potential. While the cited international studies represent the best available data on demand flexibility potential at this time, AEMO agrees that a local, more contemporary assessment would be preferable. AEMO will continue to engage with industry and the research community to improve its understanding of demand flexibility potential in Australia.

AEMO notes the support from **Jemena** and **ElectraNet** regarding the development of a dedicated data centre forecast as a separate component of the demand forecasting process. AEMO also acknowledges **Ausgrid**'s offer for collaboration. AEMO's approach has benefited from joint planning sessions with many of the NSPs informing the methodology and assumptions, and AEMO integrates information from each NSP's standing information requests each year into the forecasting approach. AEMO anticipates that ongoing collaboration will help to refine future inputs and method enhancements, including data centres.

AEMO acknowledges the support from **Ergon Energy and Energex** for AEMO's proposal to increase the number of weather stations in Queensland and recommended the inclusion of additional weather variables. AEMO also acknowledges the suggestion of incorporating humidity in residential consumption models for Queensland. AEMO notes that the 2024 *Forecast Accuracy Report* identified humidity as a potential source of variance in the 2023 electricity consumption forecasts for Queensland, and while the recent consultation on the *Electricity Demand Forecasting Methodology* has not introduced a new model adjustment to explicitly factor humidity, AEMO will consider methodology enhancements in future that may improve forecast accuracy.

AEMO notes the recommendations made by both **Marinus Link** and **Hydro Tasmania** to moderate the scale of industrial closures assumed in the *Progressive Change* scenario, but considers that the scenario, with consideration of key industrial closure risks, continues to be an appropriate part of the scenario collection, which in particular enables due consideration of over-investment risks. The breadth of scenarios modelled by AEMO enables a range of plausible futures to be explored across all NEM states.

AEMO acknowledges the feedback from **AusNet** and **Origin** following the 30 April FRG, noting that the assumptions made in the modelling of the data centre forecasts have been included in Oxford Economics' report and published on the AEMO website.

As highlighted by **Origin**, AEMO accounts for the rebound effect, where improved efficiency lowers costs and increases demand for data services. Oxford Economics' analysis captures the rebound effect by modelling final and intermediate consumption on data centre services across industry, government, and households. This approach allows the forecasts to incorporate the emerging digital services demand while anchoring projected demand to the broader size of the economy. In the long run, it is assumed that electricity consumption associated with digital services will stabilise as the integration of these capabilities into the economy reaches a more mature stage, reflected in the forecasts that slow after an initial, rapid level of growth. Regarding the suggestion to reflect the co-location of data centre load and renewable generation, AEMO held discussions with data centre developers and received scepticism regarding co-location, largely due to the strong development bias toward metropolitan areas given proximity to customer demand for data services, specialist data centre workforce considerations, grid reliability and improved network connectivity. Regarding network augmentation and the need for coordination, Oxford Economics Australia recognises that the pace of development is highly dependent on the availability of energy infrastructure, and therefore blends a short-term project based approach which estimates electricity consumption of known existing and prospective data centre developments, and a longer-term econometric approach, which forecasts data services demand by linking economic activity, technological adoption and broader scenario-driven energy use.

AEMO acknowledges the feedback from **QEUN** following the 30 April FRG, and notes that the data centre forecasts include a breakdown of transmission and distribution connections; however, reliability impacts associated with different connection types were not considered by Oxford Economics, as sufficient infrastructure to provide reliable and secure electricity supply will be developed in response to the forecast scenarios as part of the ISP process. AEMO also acknowledges the importance of data connectivity and sovereign risk. The base forecasts provided by Oxford Economics represent the best current estimate of data services development given developer interest, but AEMO recognises that there is uncertainty in this forecast, and has included a data centre sensitivity on regional diversification, highlighting the impact of factors such as fibre optic cable locations and concentrations of skilled workforces.

AEMO acknowledges the requests from **Origin** and **Fletcher** following the 28 May FRG for more detailed disclosure of LIL forecasts, including project size and load profiles. However, due to the commercially sensitive nature of this information, AEMO is only able to publish aggregated forecasts at the regional level for each scenario. AEMO acknowledges Fletcher's feedback regarding the ambiguity over whether electrification load growth from multi-sectoral modelling is included in the LIL sector or another category. AEMO notes that the 22 May FRG demonstrated how AEMO applied the multi-sectoral modelling outputs to the consumption forecasts – electrification is not incorporated in the LIL forecast nor as part of the long-term business sector growth, but is instead separately incorporated in the business electrification forecast.

AEMO has considered **ElectraNet**'s feedback following the 28 May FRG, together with feedback from other stakeholders, to revise the approach to forecasting LILs, as set out in the recently updated *Electricity Demand Forecasting Methodology*. In adopting this revised approach, AEMO has observed a material increase in forecast load for South Australia in both the *Step Change* and *Green Energy Industries* scenarios relevant to the 2026 ISP. The revised forecasts incorporate almost 6 terawatt hours (TWh) of prospective industrial load in the *Step Change* scenario, and an even larger level in *Green Energy Industries*. That substantial level of prospective load is not included in the *Progressive Change* scenario, to maintain consistency with the scenario parameters and taking into account the level of commitment of these loads. AEMO anticipates that inclusion of these key prospective loads in two of three scenarios will be an important consideration for assessing the power system needs in South Australia in the 2026 ISP.

3.9 Multi-sectoral modelling

Summary of material issues raised in submissions

The majority of stakeholder feedback relating to multi-sectoral modelling was received following the second release of the Draft 2025 IASR in February 2025, which revealed an initial draft of key outputs from the work conducted with CSIRO. Following formal consultation on the Draft 2025 IASR, AEMO and CSIRO made updates to multi-sectoral modelling outcomes and presented an updated draft to the FRG on 22 May 2025, enabling stakeholders a further opportunity to understand the modelling inputs and outputs, and to provide further feedback. Following the meeting, AEMO received three additional consultation submissions. This section provides a summary of all feedback received across these consultation opportunities.

Stakeholders raised various general feedback regarding the multi-sectoral modelling, including the four-pillars of decarbonisation, the range of emission reduction technologies considered, calcination fuels and industrial demand:

- **ISP Consumer Panel** and **IEEFA** suggested AEMO should provide further consultation opportunities to allow for more clarity around the complexity of multi-sectoral modelling and its implications.
- **ISP Consumer Panel** also mentioned further clarity was required to explain the four pillars of decarbonisation, and suggested AEMO add DSP and CER to those pillars, while **JEC** suggested AEMO should include storage as a pillar of decarbonisation.
- **AEP** recommended AEMO should use a wide range of emissions reduction technologies in its multi-sectoral modelling to mitigate technology and supply chain risks associated with any single technology.

- **Fletcher** noted that coal or natural gas are currently used in the calcination process, referencing data from the Australian Aluminium Council, while multi-sectoral modelling results presented on the 22 May 2025 FRG meeting assumed that coal is the only fuel currently used.
- **HILT CRC** suggested AEMO should provide more information about the models and approaches used to determine assumptions relating to projected industrial energy demand and the interaction these loads may have with energy grids, as such information would assist stakeholder engagement on industrial energy use, demand response, and decarbonisation.

Stakeholders raised issues regarding the carbon sequestration forecasts, specifically the technology alternatives considered:

- **ISP Consumer Panel, Erne Energy, IEEFA,** and **QCC** suggested that AEMO and CSIRO should reduce or justify the carbon sequestration forecasts and consider alternative methods given the significant amounts of carbon sequestration being forecast across scenarios, in particular the major growth in land-based sequestration compared to existing levels.
- **IEEFA** and **QCC** commented that CCS and direct air capture (DAC) are not reliable methods of carbon sequestration, and that CCS and DAC assumptions should be revised to ensure costs and potentials are based on real-world experiences. **JEC** also recognised that cost-effective solutions like renewables, electrification and energy efficiency would be preferable technologies to avoid reliance on unproven solutions.

Stakeholders raised a diversity of perspectives regarding the future prospects of electrification:

- **APGA** suggested AEMO should consider revising residential *Step Change* electrification to be similar to that of *Progressive Change*, and also suggested that industrial electrification is permitted to be too high.
- In contrast, **Jemena** questioned the assumptions around maximum electrification limits for industry subsectors and asked whether they are based off research undertaken with large gas users in the market.
- **ISP Consumer Panel** said AEMO should include more detail about industrial electrification, since it represents a significant decarbonisation lever.
- **ISP Consumer Panel** and **JEC** suggested AEMO should account for additional drivers of electrification, including non-economic drivers, which could provide higher result in the scenarios.
- **ISP Consumer Panel** and **JEC** said that AEMO and CSIRO should let residential households electrify before appliance end-of-life.
- **AGIG** suggested that AEMO should review the assumptions underpinning uptake of electrification and whether renewable gases will play a bigger role in final energy consumption in commercial and industrial sectors.

Energy efficiency assumptions for the IASR were developed by Strategy. Policy. Research. (SPR) and are separate to the CSIRO multi-sectoral modelling. However, SPR consulted with CSIRO and aligned some of the assumptions that were common to both approaches. The energy efficiency results from CSIRO's multi-sectoral modelling approach act as a validation of the results provided by SPR.

AEMO received a number of submissions regarding SPR and CSIRO energy efficiency forecasts that were provided in the Draft 2025 IASR Stage 2:

- **ElectraNet** commented that SPR's results appear to be sufficiently aligned with and validated by CSIRO's multi-sectoral modelling.
- **ISP Consumer Panel** recommended that additional drivers and enablers be considered when modelling levels of energy efficiency in the scenarios, including influence of diverse drivers on behaviour change and relative cost-effectiveness.
- **ISP Consumer Panel** also suggested ensuring the scenarios incorporate future improvements in energy efficiency at varying levels depending on scenario.
- **ISP Consumer Panel** recommended that AEMO acknowledge that the highest cost for delivered energy will be in scenarios with the highest level of decarbonisation, and that these higher costs will be partly driving greater energy efficiency savings. **JEC** also highlight that the incentive for energy efficiency increases with higher energy costs, and that energy efficiency is a more credible decarbonisation option than hydrogen and DAC in the *Green Energy* scenarios.
- **APGA** and **QCC** offered an adjacent perspective that pointed to energy bills being higher in scenarios with the least energy efficiency savings, with this potentially incentivising greater energy efficiency savings.
- **ISP Consumer Panel** sought clarification about whether residential market-led (autonomous) energy efficiency savings were included in the results, and if not, that these savings be included for all scenarios.

Stakeholders raised issues regarding fuel-switching, including the biomethane outlook, the future role of gas and alumina transitions:

- **AGIG** and **Jemena** supported AEMO and ACIL Allen's biomethane assumptions and suggested continuing to monitor developments in the biomethane industry.
- **Jemena** suggested that AEMO should articulate the important role of gas network infrastructure in Australia's energy transition, and its role in supporting the optimal development path across scenarios in the ISP.
- **AGIG** further requested a review of biomass assumptions and consideration of how energy consumption of biomass may be converted for biomethane use.
- **IEEFA** said AEMO should explain the drivers behind the change in biomethane outlook for *Step Change* related to the forecast being upgraded from negligible levels in the 2023 IASR to exceeding 60 petajoules (PJ) a year by 2050 in the Draft 2025 IASR.
- **AGIG** sought clarity on why rapid uptake of biomethane in residential use in the *Green Energy* scenarios until the 2040s is followed by a decline to zero in the 2050s, with **Jemena** further suggesting that demand from customers that wish to decarbonise while continuing to use gaseous energy will remain strong past 2050.
- **Fletcher** was concerned that alumina transitions from using the lower temperature Bayer process to use of hydrogen in *Step Change* despite this option not being currently pursued by industry due to the cost and inefficiency of hydrogen compared to electrification.
- **Jemena** noted that the bulk of biomethane in AEMO's modelling is sourced from landfill and other lower-cost waste streams, while higher volume agricultural residues remain largely untapped because of their current levelised cost. **Jemena** suggested that the continuation of policy development for this industry across

national and state jurisdictions will continue to lower the costs associated with these feedstocks, and in turn bring more biomethane into future iterations of the multi-sectoral modelling.

- **AEP** recommended that the long-term importance of natural gas across the economy should be recognised, and that natural gas is essential for reaching net zero in Australia, while suggesting reference to "fuel-switching from fossil fuels" as a pillar of decarbonisation should be removed from the IASR.

Fuel-switching commentary relating to hydrogen is covered in Section 3.11.

AEMO's consideration and response

General feedback to multi-sectoral modelling

Consistent with the **ISP Consumer Panel** and **IEEFA**'s suggestions, AEMO also recognised the need to increase the engagement opportunities in addition to the two stages of Draft IASR release regarding multi-sectoral modelling, considering its role in forecasting the transition across the scenarios. As AEMO and CSIRO continued to refine its forecast, including in response to feedback received through the Draft IASR (Stage 2) consultation submissions, AEMO added another consultation opportunity via an FRG meeting on 22 May 2025, dedicated to multi-sectoral modelling, in which CSIRO presented on modelling outcomes. At this time, AEMO also published CSIRO's companion technical report on its modelling outcomes.

AEMO acknowledges **ISP Consumer Panel**'s view that further clarity is required regarding the "four pillars of decarbonisation". The concept of the four pillars frames the modelling approach and was applied in other energy sector modelling work[45]. It was also referenced in earlier iterations of the multi-sectoral modelling[46]. The final 2025 IASR provides more information on what are now referred to as 'key decarbonisation levers' and their role in the context of AEMO's scenario-based forecasts.

ISP Consumer Panel also suggested that DSP and CER should be included as pillars of decarbonisation, while **JEC** also recommended that storage be additionally recognised. AEMO agrees that these technologies will provide a strong contribution to the energy transition. For clarity, consumer investments in CER and demand response were already embedded features of the primary mechanisms to decarbonise the economy, referred to as 'pillars of decarbonisation' in the Draft 2025 IASR. DSP is implicit through electrification and energy efficiency, while CER is a technology choice to assist in reducing electricity sector emissions. Storage likewise will be a key part of the electricity investment mix that supports renewable energy operation to decarbonise the electricity sector.

AEMO notes **AEP**'s recommendations to use a wide range of reduction technologies in its multi-sectoral modelling to mitigate technology and supply chain risks associated with any single technology. CSIRO's multi-sectoral modelling does consider a wide range of technologies, across the sector's Australia's economy. The model selects from a range of technologies to achieve the emissions pathways, relying on actions in the energy sector (including fuel-switching, energy efficiency improvements and renewable energy developments) as well as actions in other

[45] See *Pathways to Deep Decarbonisation in 2050: How Australia can prosper in a low carbon world: Technical report*: https://climateworkscentre.org/wp-content/uploads/2014/09/climateworks_pdd2050_technicalreport_20140923-1.pdf.

[46] See reports for previous iterations of multi-sectoral modelling:

- 2021 report: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2021/csiro-multi-sector-modelling.pdf.
- 2022 report: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/csiro-climateworks-centre-2022-multisector-modelling-report.pdf.

parts of Australia's economy (including the agriculture and land use sectors). Detailed information is available in CSIRO's multi-sectoral modelling report[47].

AEMO welcomes **Fletcher**'s correction of fuels for calcination and agrees that natural gas is also used. The final 2025 IASR has been updated accordingly.

AEMO notes feedback by **HILT CRC** requesting greater transparency related to industrial energy demand. AEMO highlights that the CSIRO multi-sectoral modelling report provides relevant context for key specifications and assumptions, and that the May 2025 FRG session provided additional transparency.

Carbon sequestration

AEMO acknowledges the recommendation to reduce or further justify the carbon sequestration inputs and forecasts. Emissions sequestration is an essential part of achieving net zero emissions while there are residual emissions still occurring in other sectors. The carbon sequestration forecasts from CSIRO's multi-sectoral modelling are an outcome of an optimisation that performs a trade-off of emissions reductions across different sectors based on a cost-quantity curve of sequestration options derived from CSIRO's Land Use Trade-offs (LUTO) model. This model calculates the volume and cost of sequestration that would be profitable to supply (where delivery of carbon credits would provide a higher economic return than competing agricultural land uses) and does not consider using international offsets to meet Australia's emissions reduction targets. Conservative assumptions were applied to the profitability of carbon forestry (five times the hurdle rate of economic return to other agricultural land uses). In addition, there is a constraint on new plantings in the LUTO model that informs the sequestration limit, which restricts the area of new plantings to a maximum 260,000 hectares per annum in the long-term. This results in around 5-6 million hectares of plantings by 2050, or approximately 4% of Australia's existing forest area[48]. Further details about carbon sequestration inputs and methodology are in CSIRO's multi-sectoral modelling report.

AEMO acknowledges the concerns from **IEEFA**, **QCC** and **JEC** over the reliance on DAC and CCS for sequestration, given these are relatively unproven technologies, and agrees there is uncertainty around these assumptions. The assumptions for DAC and CCS and their sources are referenced in CSIRO's multi-sectoral modelling report. For DAC, costs are based on best estimates from literature[49] and the IEA[50] and have been updated since the 2022 multi-sectoral modelling study, while CCS costs are based on global estimates for industry CCS. Both DAC and CCS are relatively expensive options compared to other forms of emissions reduction available to the model, and as such, their uptake is limited, except in the *Green Energy* scenarios where the more stringent carbon budget necessitates investment in these technologies. These sequestration outcomes in the *Green Energy* scenarios are also consistent with other modelling studies of 1.5°C scenarios, such as the Climate Change Authority's *Sectoral Pathways Review*[51]. While this emerging technology is immature presently, AEMO considers it reasonable to anticipate some increased maturity of these technologies over time, particularly in the

[47] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf.

[48] Australia has approximately 133.6 million hectares of existing forest area. See https://www.agriculture.gov.au/abares/forestsaustralia/australias-forests.

[49] Most parameters are sourced from *Techno-economic assessment of CO_2 direct air capture plants*, Fasihi et al (2019), at https://www.sciencedirect.com/science/article/pii/S0959652619307772.

[50] See https://www.iea.org/reports/direct-air-capture-2022.

[51] See https://www.climatechangeauthority.gov.au/sector-pathways-review.

Green Energy scenario. As the technologies evolve, AEMO will continue to consider the relative use of DAC and CCS in future assumptions.

Electrification

AEMO notes feedback from **APGA** on revising residential *Step Change* electrification to be similar to that of *Progressive Change*. However, AEMO considers that differences between residential electrification in the two scenarios is expected. As described in Table 2 of the Draft 2025 IASR, economic growth in the *Progressive Change* scenario is lower than in *Step Change*. This difference in economic projections will impact residential consumers and lead to a divergence in electrification forecasts.

In addition, **APGA** suggested that the availability of electric alternatives for gas for industrial processes does not mean that these alternatives are suitable and that they can or will be taken up by industry. AEMO agrees with this view, and notes that the electrification constraints in the multi-sectoral modelling define maximum permissible electrification (by industry subsector) rather than electrification targets which must be reached[52]. AEMO acknowledges that electrification will be challenging, with each customer likely to face different circumstances, and is observed as a progressive development in the modelling for this reason. Biomethane, which is an alternative decarbonisation option to electrification, features more prominently in the 2024 multi-sectoral modelling compared to the 2022 multi-sectoral modelling. Natural gas also partially replaces coal as a fuel for industrial processes, most notably in alumina and iron and steel, which was not a feature of the 2022 multi-sectoral modelling.

AEMO acknowledges feedback from **Jemena** on the suitability of assumptions underlying industrial electrification limits. AEMO considered this feedback and revised certain maximum electrification limits where suitable evidence was available, particularly for industrial sectors most challenged, within the confines of the sophistication of the CSIRO model. AEMO notes that these limits are not targets which must be reached, but maximum bounds on permissible electrification.

AEMO welcomes feedback from **ISP Consumer Panel** that more detail about industrial electrification should be included in the IASR, and recognises the value of this suggestion. AEMO has adjusted the final 2025 IASR to include additional description regarding industrial electrification, and notes that CSIRO's report[52] is also available for more information.

AEMO notes the suggestions by **ISP Consumer Panel** and **JEC** to account for additional drivers of electrification, including non-economic drivers, which may lead to an increase in electrification. AEMO is not able to incorporate these factors for the finalisation of the multi-sectoral modelling as the AusTIMES model inherently relies on technology options that can be compared and quantified on a cost-equivalent basis, and has not identified a means to convert non-economic drivers to cost equivalents within the model's configuration. AEMO notes qualitatively in the final 2025 IASR that thermal comfort, health, and energy independence, are outcomes of the uptake of energy efficiency, electrification, and consumer energy resources.

AEMO also notes advice from **ISP Consumer Panel** and **JEC** that residential households should be allowed to electrify before appliance end of life. AEMO confirms that households are permitted to electrify before appliance end-of-life in the AusTIMES model and has provided more clarity around this in the 2025 IASR. The statement in

[52] See CSIRO *Multi-sectoral modelling 2024*: https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf?la=en.

Table 15 of the Stage 2 release of the Draft 2025 IASR[53] suggested an acceleration in uptake when appliances need to be replaced, however this was not intended to suggest that replacement only occurred at end-of-life. AEMO has increased clarity on this in the final 2025 IASR.

AEMO notes the suggestion from **JEC** that the rate of electrification in the *Green Energy* scenarios could be more rapid through government policy and investment. AEMO considers these interventions are appropriately accounted for in the scenario narrative and other technology alternatives, and that they are reasonably represented by the electrification forecasts in the 2025 IASR.

AEMO acknowledges the suggestion from **AGIG** that renewable gases may have a larger role to play in the commercial and industrial sectors. Development of renewable gases is an option within the multi-sectoral modelling, and the degree of adoption of biomethane is higher in this IASR than was forecast in the previous multi-sectoral modelling. The decarbonisation outcomes are an outcome of carbon targets and relative costs of technologies and their fuels (including the cost of appliance switching, as appropriate). The speed and timing of electrification in large industry sectors was informed by insights from LIL surveys and AEMO's consideration of the capability of the technical processes being electrified. These settings varied by industry sub-sector and technology type, and by scenario. Uptake rates of electrification in buildings and small industry sectors are based on literature review regarding speed and overall limits of electrification. These rates are scaled down based on the mapping to IEA scenarios. The report by CSIRO[54] is transparent about these rates; AEMO considers the overall outcomes regarding renewable gas opportunities and electrification are reasonably balanced, and has not changed these levels for the final 2025 IASR.

Energy efficiency

AEMO acknowledges the **ISP Consumer Panel**'s suggestion to include diverse behavioural drivers in energy efficiency modelling, which aligns with their CER modelling recommendation. Similar to CER modelling, the energy efficiency forecasts use history as a basis, and that history implicitly incorporates all drivers, including behavioural elements (behavioural elements are currently captured in the market-led energy efficiency category). There are some socio-behavioural elements in the current IASR scenarios, such as CER coordination assumptions. Further explicit consideration of the suggested drivers would require development of scenarios that more fully incorporate socio-behavioural elements.

For future policy development suggested by **ISP Consumer Panel**, SPR's policy-led forecasts assume additional development in line with scenario narratives to achieve temperature and emissions outcomes. SPR has also provided a sensitivity on *Step Change* where energy efficiency developments are frozen (stopped), assuming that current policies do not continue beyond currently regulated timeframes or targets. This forecast may be deployed to explore energy efficiency impacts as part of the development of the Demand Side Factors statement in the Draft 2026 ISP and final 2026 ISP.

Regarding **ISP Consumer Panel**, **APGA, JEC,** and **QCC** submissions on the impact of consumer costs to energy efficiency developments, AEMO acknowledges that energy efficiency investments may be increasingly valuable to reduce energy consumption as the marginal cost of energy increases. These have been considered by SPR and

[53] See Draft 2025 IASR Stage 2: https://aemo.com.au/-/media/files/major-publications/isp/2025/stage-2/draft-2025-inputs-assumptions-and-scenarios-report-stage-2.pdf.

[54] See CSIRO *Multi-sectoral modelling 2024*: https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf?la=en.

CSIRO in delivering the energy efficiency results applicable to the scenarios. Energy efficiency assumptions incorporate uptake rates and technical limits informed by the IEA World Energy Outlook, with limited plausible additional savings beyond the *Green Energy* scenario settings.

In recognition of the market-led clarification question asked by **ISP Consumer Panel**, AEMO has reviewed the results and has now included market-led energy efficiency savings (also referred to as autonomous energy efficiency improvement) in the final 2025 IASR.

Fuel-switching

AEMO welcomes the support from **AGIG** and **Jemena** related to ACIL Allen and the biomethane assumptions. AEMO will continue to monitor developments in the renewable gases sector through its engagement with stakeholders and industry groups.

AEMO notes **ENA**'s comments relating to the consideration of future gas infrastructure requirements, including new gas pipelines and the availability of water. AEMO includes cost premiums within the ISP model for both the hydrogen pipeline infrastructure and water consumption costs as a consideration for these factors. Further, it is assumed the water required for green hydrogen production would be sourced from desalination and transported from the coast to the point of hydrogen production, rather than competing with local fresh water sources. AEMO acknowledges **Jemena**'s suggestion relating to the role of gas infrastructure in the ISP. The inclusion of gas development projections in the 2026 ISP will allow greater consideration of gas network, storage and supply infrastructure when determining optimal investments in electricity infrastructure. Since the publication of the Draft 2025 IASR, AEMO has published and consulted on gas infrastructure options, resulting in the final *Gas Infrastructure Options Report*, published alongside the 2025 IASR. Further clarity on the role of gas infrastructure is also provided in the recently updated *ISP Methodology*.

On **AGIG**'s request to review biomass assumptions, CSIRO acknowledges that growth in biomass consumption for heating may be overrepresented in the multi-sectoral modelling, as conversion pathways for biomass are not implemented in AusTIMES, and therefore residential biomass consumption follows projected residential activity levels[55]. AEMO notes CSIRO's view that large-scale fuel-switching from biomass is unlikely to result in a substantial increase in electricity consumption, due to the very low efficiency of wood heating. The treatment of biomass and its potential physical conversion to biomethane will be considered for inclusion in future multi-sectoral modelling.

AEMO notes **IEEFA**'s comment related to the biomethane volume increase in the *Step Change* scenario between the 2023 IASR and the Draft 2025 IASR. This is a result of the updated biomethane forecast by ACIL Allen, especially related to pricing levels, which are now lower, combined with CSIRO's multi-sectoral modelling outcomes. ACIL Allen's report is published alongside the 2025 IASR and contains more details[56].

AEMO welcomes the questions and feedback from **AGIG** and **Jemena** on the use of gaseous energy in residential and other sectors. Biomethane can be used to decarbonise the use of natural gas in existing processes and especially in residential buildings, delaying the transition of gas appliances in the short to medium term in the *Green Energy* scenarios. In the longer term, the eventual electrification of residential buildings (and their

[55] See CSIRO *Multi-sectoral modelling 2024*: https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf?la=en.

[56] See https://www.aemo.com.au/-/media/files/major-publications/isp/2025/acil-allen-2024-fuel-price-forecast-report.pdf?la=en.

appliances) reduces the relative demand for gaseous fuels, including biomethane. This result represents possible pathways to achieve carbon reduction targets subject to defined scenario settings, considering relative cost of fuels[57].

Regarding **Fletcher**'s comment on alumina production transitioning from fossil fuels to hydrogen in the lower temperature Bayer process, AEMO confirms that this only occurs in the *Green Energy* scenario, not in *Step Change*.

AEMO agrees with **Jemena** that continued development of the biomethane industry, and policy development across national and state jurisdictions, may impact feedstock costs, and supports Jemena's suggestion to monitor policy and industry developments ahead of future multi-sectoral modelling.

AEMO notes **AEP**'s recommendation that the long-term importance of natural gas across the economy should be recognised and that natural gas is essential for reaching net zero in Australia. AEMO acknowledges the importance of natural gas in the transition to net zero which includes renewable energy, combined with transmission and distribution infrastructure, storage, and backed up by gas.

In relation to fuel-switching, the scenario narrative includes "action to reduce the emissions intensity of molecular forms of energy", recognising that the emissions intensity of natural gas is less than other forms of fossil fuels.

3.10 Fuel prices

Summary of material issues raised in submissions

On the topics related to fuel prices and sources, stakeholder submissions generally focused on the gas price outlook, coupled with recovering infrastructure fixed costs and alternative fuel sources:

- **AAC** highlighted that industrial gas prices are only forecast to vary over a narrow range ($9-$11/gigajoules [GJ]) over an extended period of time, despite having varied by more than that in recent years, which directly impacts prices for gas-powered generation flowing through to electricity prices.
- **EA** mentioned that gas price forecasts should reflect the increasing need to recover fixed costs of existing and new gas supply infrastructure from a shrinking customer base, or should be explored in AEMO's modelling of gas system interactions.
- **APGA** said it was pleased to see that AEMO had engaged ACIL Allen to forecast biomethane production cost and available volumes by feedstock type, state, and scenario, while **GEA** recommended that AEMO require CSIRO to use ACIL Allen renewable gas analysis in IASR-related modelling.
- **GEA** also recommended that the IASR consider liquefied petroleum gas (LPG) and its renewable alternatives to comply with the national electricity objective (NEO), as the IASR and its associated studies show no evidence of recognising LPG as an energy source for residential, commercial, and industrial consumers.

[57] For more, see CSIRO *Multi-sectoral modelling 2024*: https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf?la=en.

- **Marinus Link** and **Hydro Tasmania** said ACIL Allen should revise its coal price forecasts for captive mines to account for rising costs due to emissions reduction requirements and higher financing costs as institutions limit support for carbon-intensive activities.

AEMO's consideration and response

AEMO notes that, as raised by **AAC**, the industrial gas price forecasts for Western Australia range around $9-11/GJ in the long term. The key long-term driver for this price range is forecast international LNG prices (which in turn are based on the World Energy Outlook long-term forecasts), with international LNG prices increasingly influencing Western Australian domestic prices in the long term. This is influenced by the assumption that the Western Australian reservation policy is unlikely to keep downward pressure on prices without new large sources of local supply coming online, so domestic prices will trend more in line with different expectations around international LNG prices. If more and larger sources of supply are found, this could bring about a lower long-term price than what has been projected, however the existing scenarios do not include a large volume of new supply coming online in Western Australia beyond current anticipated projects.

AEMO notes the **EA** comment and confirms that costs for new sources of gas, including both field development and supply infrastructure, are accounted for in all east and west coast gas price forecasts provided by ACIL Allen. While pipeline tariffs have been accounted for in the forecast gas prices, changing tariffs (which would reflect changing utilisation of existing infrastructure) have not been included in the gas prices.

AEMO welcomes the **APGA**'s support of ACIL Allen's forecast of biomethane cost and available volumes in the IASR. In response to **GEA**'s comment, AEMO confirms that ACIL Allen's biomethane forecasts were used in CSIRO' multi-sectoral modelling[58].

AEMO also notes **GEA**'s comment related to including LPG in modelling, and confirms it was incorporated in CSIRO multi-sectoral modelling as a fuel type. LPG is included in the Draft 2025 IASR, Figure 1 under "Other fossil fuel"[59] and in the final 2025 IASR in Figure 1[60]. Additional information is in CSIRO's multi-sectoral modelling report[61].

In relation to comments from **Marinus Link** and **Hydro Tasmania** around coal price forecasts, AEMO does not at this time have sufficient evidence that coal mining costs will materially change as a result of financial market preferences to invest in emissions-intensive industries. At this point it would be premature to introduce a cost impact to the fuel price, without considering broader sectoral impacts on emissions-intensive industries more broadly. As such, AEMO has not adjusted its coal price forecasts, recognising too that coal retirements are not typically forecast in the ISP due to economic closure signals, but rather are influenced more significantly by the carbon budget constraints in each scenario. More information on the closure methodology is in the *ISP Methodology*.

[58] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf.

[59] See https://www.aemo.com.au/-/media/files/major-publications/isp/2025/stage-2/draft-2025-inputs-assumptions-and-scenarios-report-stage-2.pdf?la=en.

[60] See Figure 1: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-Inputs-Assumptions-and-Scenarios-Report.

[61] See https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/csiro-2024-multi-sectoral-modelling-report.pdf.

3.11 Hydrogen

This section includes hydrogen-related content that reflects stakeholder submissions to consultation opportunities for both releases of the Draft 2025 IASR, and other AEMO consultations such as:

- *ISP Methodology* (describes the method used by the ISP suite of models to determine location of electrolysers and electrolyser capacity)
- *Gas Infrastructure Options Report* (includes cost of hydrogen pipelines), and
- *GenCost* report (includes costs of electrolysers and water treatment).

Where relevant, feedback provided that correspond to these reports are directed to the appropriate report in the responses below.

ACIL Allen developed hydrogen-related assumptions which were used as exogenous inputs for the CSIRO multi-sectoral modelling. The assumptions include hydrogen delivery costs to end users and the hydrogen volumes for export and use in green commodities. The assumptions provided by ACIL Allen are reflected in the multi-sectoral modelling outcomes.

Summary of material issues raised in submissions

Stakeholder submissions covered hydrogen blending in gas pipelines, electrolyser utilisation factors, on-grid percentages, water costs and cost estimates for hydrogen:

- **APGA** and **AGIG** suggested AEMO should increase the maximum 10% (vol) constraint on hydrogen blending into distribution networks, **IEEFA** supported the 10% level, while **ISP Consumer Panel** and **JEC** suggested that the limit should be lowered to 2%.
- **APGA** also recommended that AEMO consider longer-term storage options, include hydrogen energy storage systems (HESS), in the energy storage forecasts and projections for the development of the hydrogen industry.
- **Fletcher** said that AEMO is under-estimating the cost of green hydrogen, and potentially biasing the results of the multi-sectoral modelling towards green hydrogen over blue hydrogen. **Fletcher** also suggested that AEMO's proposed methodology be improved to capture the full cost of firming green hydrogen beyond the cost of hydrogen storage, including the oversizing of other hydrogen value chain components and additional costs facing hydrogen users due to variability of supply.
- **Fletcher** also recommended that AEMO adopt multiple input assumption changes relating to cost of hydrogen:
  - Amending REZ transport costs estimates to include costs such as pipe material costs.
  - Using Australian industry consultant estimates for hydrogen storage.
  - Applying locational cost factors, which appear not to have been applied.
  - Applying cost escalations consistent with large energy infrastructure projects to historical cost estimates.
- Multiple stakeholders commented on minimum electrolyser utilisation factors:

  - **CIS, Marinus Link**[62]**, Hydro Tasmania, ISP Consumer Panel** recommended either higher utilisation factors, or later start of the decline in utilisation factors. **Marinus Link** and **HydroTasmania** noted that each project should retain the minimum utilisation factors at the time of deployment over the full project life.
  - **ElectraNet** supported the proposed minimum utilisation factors for on-grid electrolysers, while noting that they would not be achievable for off-grid electrolysers.
  - **GU** and **JEC** proposed lower utilisation factors.
  - Individual hydrogen experts from within The Australian Hairdressing Council membership indicated that the utilisation profile would depend on the project structure and business case, and could range from lower to higher than the proposed factors, and others suggested focusing on average or expected utilisation rather than minimum.
  - **Lawrence** noted that electrolysers should be treated as flexible demand.
- There was a wide range of responses to the assumptions around the percentage of on-grid electrolysers, along with requests to clarify the concept and its implementation.
  - **APGA** and **ElectraNet** supported the proposal, with the latter noting that current prospective projects cover the full range from 0% to 100% on-grid.
  - **ISP Consumer Panel** commented that most electrolysers should be off-grid, and **Fletcher** proposed lower on-grid proportions in South Australia and Queensland.
  - **Ergon Energy and Energex** requested justification for lower on-grid developments in Queensland (compared to other states), and further information on how impacts of off-grid developments will be considered in the ISP.
  - **Nexa** suggested reconsideration of the use of on-grid percentages for electrolysers, due to added complexity, and requested further clarity on the approach.
  - **ENA** suggested AEMO clarify how behind-the-meter (off-grid) electrolysers would impact electricity transmission infrastructure, noting that costs associated with hydrogen production for export should be borne by the hydrogen industry and not by Australian energy consumers.
  - **PA** said it preferred higher on-grid proportion of electrolysers due to benefits of grid connection to operation and economics.
- **HILT CRC** suggested dynamic modelling of heavy industrial processes should be carried out in future to inform future planning. **Fletcher** suggested removing seasonal and inter-annual variation in hydrogen production from the forecasts. **CIS** said the assumed large seasonal variations in hydrogen production are unreasonable.
- **ENA** recommended that AEMO should consider infrastructure needed for growth, including new gas pipes and water availability for renewable gases, especially during times of drought; **ISP Consumer Panel** requested that AEMO review the assumptions in hydrogen forecasts for the cost of water infrastructure.

[62] This stakeholder feedback was received through the Draft *ISP Methodology* consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

- Furthermore, **Marinus Link and Hydro Tasmania** suggested AEMO should continue working with government and subject matter experts to ensure hydrogen load assumptions reflect the latest and most accurate data while ensuring regions can accommodate projected growth.
- **CIS** commented that the electrolyser cost curve was unrealistic, and there is no credible prospect of immediate, significant and sustained decreases in such prices in an economic environment that is characterised by a glut of manufacturing capacity, as some of the additional production capacity would already be priced into the cost curve.
- **Energy Estate** suggested the ISP use alkaline electrolysers rather than proton exchange membrane (PEM), as they currently are preferred over PEM in the market and PEM electrolysers are more expensive and not proven at scale.
- **Close** said that inclusion of hydrogen for power generation is not well founded, as the infrastructure to support delivery of hydrogen is unlikely to be available on a 20-25 year timeframe.
- **AEP** said that AEMO should consider carbon capture, utilisation and storage (CCUS – a specific form of CCS that allows use of the captured carbon in alternate forms to underground storage, such as for building materials) as an emission reduction pathway for low-carbon hydrogen production or with respect to low-carbon steel, ammonia or methanol production. It urged incorporating CCUS into the ISP and IASR, supported by IEA findings and the 2024 National Hydrogen Strategy, as a cost-effective hydrogen production pathway using natural gas particularly for hard-to-abate sectors[63].
- **Fletcher** recommended that no green iron production should be allocated to states without existing iron ore mines or steel production.
- **Erne Energy** suggested that AEMO consider the greenhouse effect of fugitive hydrogen emissions in the modelling.

AEMO's consideration and response

AEMO notes that modern gas distribution networks in the East Coast Gas Market could be readied for high hydrogen blends with some modifications, and that there are plans to move to 20% (volume) blending in pilot projects. However, AEMO notes that timing, cost and logistics of appliance change-outs and switch-over are necessary to consider, rather than just the technical capabilities of the pipelines. AEMO also notes that stakeholder suggestions to increase the upper limit of hydrogen blending have not been required, as the multi-sectoral modelling did not reach the 10% blending constraint in any scenario, due to very low forecast uptake of hydrogen in residential and commercial sectors. AEMO has now clarified the 2025 IASR to avoid the perception that the blending limit (in this case, 10%) was the level of hydrogen that should be blended in distribution networks.

AEMO notes in relation to **APGA**'s storage recommendation that the consideration of storage for hydrogen is covered in the *ISP Methodology*, which has adopted a weekly balancing period for hydrogen.

[63] This stakeholder feedback was received through the Draft *ISP Methodology* consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

In relation to **Fletcher**'s feedback, AEMO considers that the hydrogen cost estimates used for multi-sectoral modelling, while approximate only, sufficiently support the multi-sectoral modelling's assessment of relativities against other fuels and hydrogen technologies. A change of input costs may not result in changed merit order, and thus different volumes. The storage durations assumed in the multi-sectoral modelling were high level, for the purpose of calculating a cost premium on hydrogen price in the multi-sectoral model, and not intended for use in the ISP. Consideration of storage in the ISP model is covered by the *ISP Methodology*.

AEMO notes that blue hydrogen was allowed as an option in the multi-sectoral modelling in *Progressive Change* and *Step Change*, but was not selected by the model due to the requirement to meet emissions reductions. The assumed emission intensity for blue hydrogen in the multi-sectoral modelling was 8.99 kilograms of carbon dioxide per kilogram of hydrogen produced (kgCO2/kgH2).

AEMO considers that the ISP sufficiently recognises uncertainty in hydrogen via the large variation in its potential role across the scenarios, and further refinement of hydrogen costs is not considered justified. The draft IA Workbook hydrogen prices were updated following reruns of the multi-sectoral model in response to other stakeholder feedback, resulting in a reduction of the prices for the *Progressive Change* scenario. The hydrogen prices listed in the IA Workbook are highly uncertain, and are not intended for use beyond estimating fuel costs in the ISP modelling.

Regarding feedback from a number of stakeholders on electrolyser utilisation factors, AEMO reviewed the wide range of responses on minimum utilisation factors, and agreed with the majority of stakeholders who proposed increasing the minimum utilisation factors, and the suggestion to start the decline later. AEMO revised the trajectory upwards, with the decline starting later to reflect the small number of projects advancing in the short term. The 'stock-based' modelling approach was not adopted, as this implies an assumption that the minimum utilisation factors is inflexible with time; it is expected that the optimum utilisation factor for any given project will change over time based on market dynamics and developments, as has been observed across large energy infrastructure projects. For example, coal generators have historically operated with much higher capacity factors than they operate with today, due to changing market dynamics affecting coal generation. AEMO anticipates the same dynamic to influence potential utilisation of electrolysers over time.

AEMO agrees with multiple stakeholders that the topic of on-grid percentage of electrolysers is complex, and requires additional clarity and explanation. Following further review, AEMO redefined the concept of on-grid percentages to a broader definition of REZ-based hydrogen percentages. Off-grid electrolysers that are not located in a REZ will not be included in the ISP's hydrogen demand forecast. However, any electrolyser geographically located in a REZ (REZ-based hydrogen production), whether fully on-grid, fully off-grid or a hybrid, will be included in the ISP hydrogen demand forecast. This will avoid double-counting of the available renewable energy in each sub-region, as described in Figure 2 and Figure 3 below. All REZ-based hydrogen production will be included as hydrogen demand in the ISP, which will similarly assume that the full amount of renewable energy in the REZs is available to meet that load (regardless of connection status of the renewable energy). This approach acknowledges that developers may initially source most or all of the energy for hydrogen from the grid but may elect to develop their own additional behind-the-meter generation later (possibly coupled with expansion of the electrolyser facilities), while retaining a restricted connection to the grid.

Figure 2 REZ-based hydrogen % definition

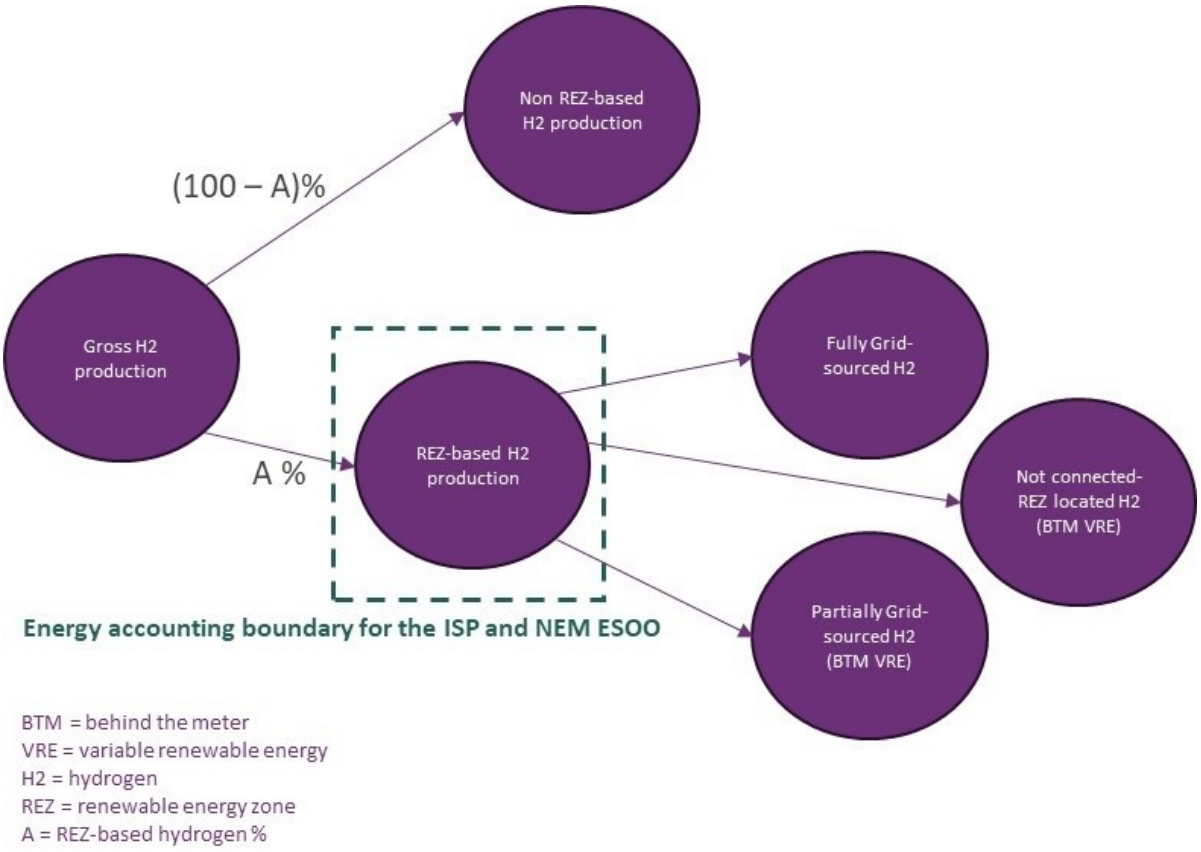
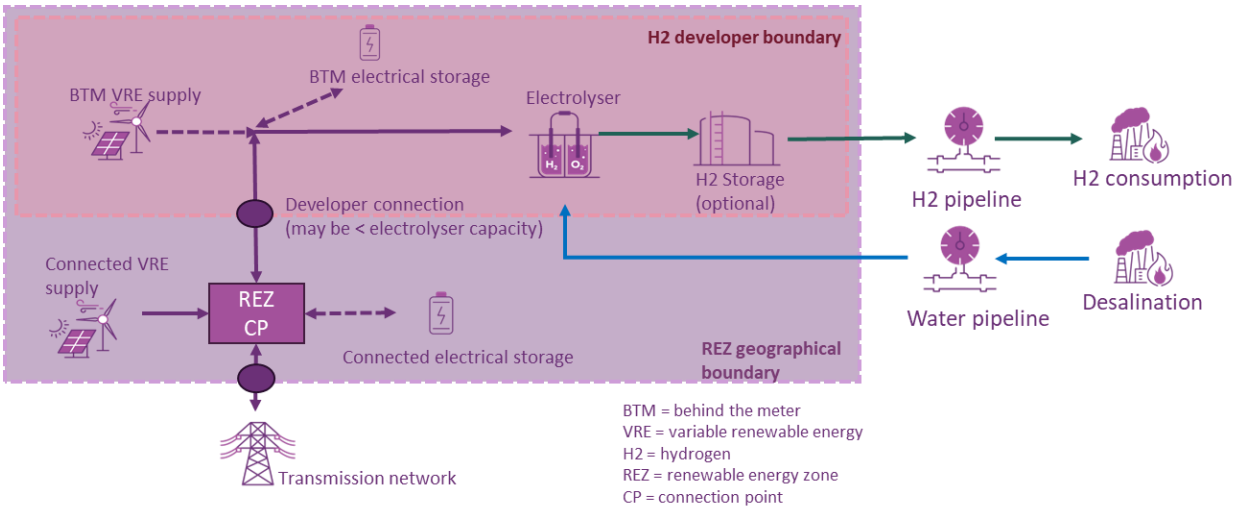


Figure 3 REZ-based electrolyser connections schematic



AEMO is satisfied that the REZ-based hydrogen percentages for New South Wales, Victoria and Tasmania will remain at 100%, as supported by most respondents. Queensland and South Australia are still expected to have a significant proportion of non-REZ-based hydrogen production, due to their higher proportion of areas remote from the transmission system. Due to the limited availability of project data and the mixed feedback received, AEMO has adopted a flat REZ-based hydrogen percentage of 40% for Queensland and South Australia across the time

span of the ISP. There is likely to be a wide range of potential business models and there are a low number of installed projects to date, meaning this remains a key uncertainty regarding potential hydrogen development and electrical supply. The revised factor remains within the range of the originally proposed figures, and also reduces modelling complexity. The 2025 IASR now includes more information on these connection assumptions.

Regarding feedback from **HILT CRC, Fletcher** and **CIS** on industrial process and seasonal variations, AEMO agrees that downstream hydrogen users may have low flexibility, and has adjusted the monthly production targets, resulting in lower variation across the year. In future modelling, if material to the purpose, AEMO may consider more dynamic modelling of industrial processes where relevant.

AEMO recognises concerns from **ENA** and **ISP Consumer Panel** that water infrastructure is an important component of hydrogen production. While noting that the assumed cost of provision of water is small (<5% of the overall cost of hydrogen), AEMO has included the energy required for desalination of water for hydrogen production in the electricity consumption forecast to account for this key dependency. In addition, AEMO has applied a cost premium to the electrolyser cost in the 2025 IASR to account for the cost of hydrogen pipelines from REZs to the demand centres, and water pipelines from the coast to the electrolysers. The cost of water treatment will also be included in the ISP. Details of these assumptions are in the 2025 IASR and the IA Workbook.

AEMO notes **Marinus Link** and **Hydro Tasmania**'s feedback on hydrogen load assumptions. The proportion of Tasmania's load from hydrogen has been reduced in early years of the latest forecast in the *Progressive Change* scenario, reflecting lower uptake in industry.

Regarding **CIS**' concern about unrealistic reductions for electrolyser build costs, the *GenCost 2024-25 Final Report* has removed a factor for economies of scale that was previously applied to electrolysers on the basis that cost reductions from large-scale electrolyser deployments have not significantly materialised yet. Consequently, electrolyser build cost projections have increased compared to those in the *GenCost 2024-25 Consultation Draft*, and are reflected in the final 2025 IASR.

In response to the submission from **Energy Estate**, AEMO notes that the 2026 ISP will adopt alkaline electrolysers as they are consistently cheaper than PEM. AEMO has provided clarity in the 2025 IASR to reflect this, and updated the electrolyser efficiencies accordingly.

AEMO notes that the use of hydrogen as an option for power generation in the ISP will be restricted to the *Green Energy* scenarios, as this aligns with the narrative for these scenarios.

Regarding **AEP**'s submission, CCUS is an alternative decarbonisation option to using hydrogen for steel, ammonia or methanol. The only CCUS option in the multi-sectoral modelling is to use blue hydrogen for direct reduced iron. This was not selected in the *Green Energy* scenario, as AEMO considered that the narrative of that scenario expected hydrogen consumers would demand a green product, rather than a low-carbon product. The multi-sectoral modelling also allowed CCUS for methanol production, but this was not selected as the lowest-cost option for decarbonisation.

AEMO welcomes the feedback from **Fletcher** on green iron production locations. Green iron is only developed in the *Green Energy Industries* scenario. In this scenario, with high decarbonisation activity and the development of new green commodities and associated infrastructure, AEMO considered it appropriate to allow green iron to be capable of being produced in any region, given that transport costs of iron ore are relatively low. However, AEMO acknowledges that there are costs (and time) associated with developing new infrastructure and industry, and has

delayed development in each state until minimum production volumes were forecast, effectively representing a benchmark scale requirement for key commodities. In addition, a maximum of one location (sub-region) per commodity per region is assumed to be developed.

Regarding **Erne Energy**'s submission on the treatment of fugitive emissions from hydrogen, AEMO notes this may be a key consideration in project development and carbon accounting but, for the purposes of the ISP, AEMO does not consider that it has sufficient data or that the issue is sufficiently certain to influence the investment outcomes within the modelling approach. In regard to ISP modelling specifically, by treating direct emissions (scope 1) only, greater internal consistency exists across all technologies by not considering upstream, or indirect emissions.

3.12 Renewable energy zones

Summary of material issues raised in submissions

Submissions mostly related to social licence, locational cost factors and the visualisation representation of REZ progress:

- Several issues were raised regarding the role of distribution networks:
  - **Ergon Energy and Energex** acknowledged and supported AEMO's focus on the development of REZs at the transmission level to allow for strategic transmission network investments in areas of high renewable energy potential. In addition, **Ergon Energy and Energex** encouraged AEMO to explore the opportunities associated with REZs at the distribution level as well, as this has not historically been considered in its IASR or ISP analysis. **Ausgrid** and **Transgrid** also showed support for the inclusion of distribution level REZs.
  - **ENA** said that, to ensure accurate and comprehensive data for the distribution network, AEMO should extend the timeframes for data requests.
  - **Ausgrid** cautioned that transmission lead time and installation cost assumptions are not a suitable proxy for distribution network projects when considering options to increase REZ capacity. This was based on its experience with projects such as the Hunter-Central Coast Renewable Energy Zone (HCC REZ), where it suggested pole-supported lines with smaller easements in a brownfield development will deliver more favourable time, cost and community outcomes when compared to greenfield transmission options with steel-lattice designs and larger easement corridors.
- **Fletcher** and **QCC** said they supported the shift to location cost factors derived at the REZ level, as it helps explain variation in build costs seen for renewable energy projects in different areas of the NEM. However, **QCC** suggested that benchmarking locational costs to the nearest port would be more realistic than benchmarking to the nearest capital city, as equipment for renewable generation projects in regional Queensland will not be transported via Brisbane.
- Social licence for transmission, generation and storage infrastructure was a common theme from stakeholders:

  - **Dr Anne Smith** suggested AEMO should establish regulated buffer zones in its modelling to protect ecologically sensitive marine areas from the impacts of offshore installations[64].
  - **ISP Consumer Panel** highlighted the importance of community trust and suggested AEMO explore the potential for project level social licence evaluation factors to be quantified and applied as part of future IASRs.
  - **Erne Energy and QCC** requested further detail on how social licence on new transmission lines would be incorporated.
  - **Pedersen** also sought further consideration of social licence in the development of REZs, and suggested the current method does not give sufficient consideration to local concerns when determining land usage, while land use penalty factors and land use limits are over-simplified.
- **CEIG** and **QCC** both noted the importance of consulting with state planning bodies on the development of REZs. **CEIG** welcomed AEMO's commitment to consultation with VicGrid on the development of Victorian REZs.
- **ISP Consumer Panel** requested that AEMO outline that its role is to identify REZs, and broadly outline what the next phases of the process are and who is responsible for these, ahead of a REZ declaration or a transmission route plan.
- **ISP Consumer Panel** also asked for the visual representation of REZs to be amended to clearly identify the stage of each individual REZ and, where it is not yet declared, to communicate the imprecise nature of the boundaries.
- **QCC** highlighted that the availability of land for renewable energy within a REZ will be dependent upon the environmental and existing land use values, particularly agricultural, within an area.
- **Windlab** supported the update to the *ISP Methodology* to include multiple resource areas for large REZs to reflect diversity of wind resource available in a region, while also mentioning that social licence issues will vary at each REZ.
- **ENA** suggested AEMO should undertake more risk analysis when preparing the optimal development path in the ISP, to ensure robustness, system security and reliability under various conditions such as minimum system load and dunkelflaute weather events.
- **Transgrid** said the secondary limit on existing generation within the South West NSW REZ (SWNSW1) should have its current limit of 1,200 MW on the existing generation and South West REZ changed to 1,000 MW, to align with limits and assumptions of recent Transgrid studies.
- **ASTRI & AUSTELA** said that solar thermal projects will be co-located with large-scale PV systems, but will preferentially generate when PV does not, so solar thermal plants should have a lower marginal loss factor (MLF) than solar PV projects in the ISP modelling.
- **EnergyCo, Engie, Windlab, Goldwind** and **Squadron** all noted that wind proponents have measured higher capacity factors in the South West NSW REZ than what is modelled by AEMO for the ISP, and that the wind

[64] This stakeholder submission was received through the *ISP Methodology* issues paper consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

resource quality should be reviewed for this REZ. **CEIG and Windlab** also expressed concern around the ISP's sensitivity to wind capacity factor assumptions, and recommended allowing confidential submissions of on-site wind measurement data to calibrate AEMO's wind resource maps. **EnergyCo and Squadron** also provided recommendations to increase the resource limits for wind, based on proponent interest.

- **Engie, Squadron** and **Windlab** noted that they expect fewer social licence issues for wind generation projects in the South-West NSW REZ, based on their in-person consultation outcomes, due to there being large parcels of land with low population density, large-scale agriculture operations, and reduced biodiversity impacts.
- **QCC** said that the availability of land for renewable energy within a REZ will depend on existing land use within the area. In particular, **QCC** noted that Far North Queensland has areas of high environmental value such as national parks. **QCC** also noted that a hard limit of 5% maximum land use is appropriate for initial assessments, but the underlying land assumption to which the limit is applied should be updated to reflect the land usage.
- **CIS** noted that exact storage locations are identified by AEMO considering the need of each REZ and regional and sub-regional developments along with internal AEMO expertise, and highlighted the need for more transparency on how AEMO determines suitable storage locations in the ISP assessment.
- **CIS** observed that AEMO's proposed retail price input settings for transmission costs, when preparing electricity price indices, are to use AER pricing proposals and determinations actuals up to 2028/29. **CIS** has suggested that some large transmission projects such as the NSW REZs may therefore not be included. **CIS** requested that AEMO clarify the basis on which short-term transmission pricing proposals and determinations are made if there is no Contingent Project Application for the project.
- **Transgrid** encouraged AEMO to apply realistic time-based build limits to REZs and transmission developments[65].

AEMO's consideration and response

AEMO welcomes the support from **Transgrid**, **Ausgrid**, and **Ergon Energy and Energex** on the development of utility-scale generation and storage connected within the distribution network, and is open to including specific distribution network options to connect utility-scale generation and storage at a large scale, subject to joint planning to ensure alignment between the proposed options and the ISP modelling approach for the power system. AEMO has explored several proposals for distribution network augmentation for utility-scale generation and storage as part of preparing the final 2025 *Electricity Network Options Report*, and included options which:

- are joint planned between DNSPs, TNSPs , jurisdictional planner and AEMO
- add more than 350 MW of additional network capacity, and
- will be compared against other REZ options.

AEMO notes **ENA**'s concerns about the time required for DNSPs to provide accurate and comprehensive information for input into the ISP. However, for distribution network opportunities and data to be considered as an

[65] This stakeholder feedback was received through the *ISP Methodology* issues paper consultation and is at https://aemo.com.au/consultations/current-and-closed-consultations/2026-isp-methodology.

input for the 2026 ISP, following the AEMC's completion of the rule determination on improving consideration of demand-side factors in the ISP, the date it needed to be received was in the first quarter of 2025. This was to allow for it to be used for the Draft 2025 *Electricity Network Options Report* and to be converted to relevant constraint equations to be applied to the ISP model. AEMO confirmed with DNSPs that this first data provision was not a mandatory requirement, and AEMO agrees that a fuller data exchange process should be achievable over successive ISPs.

AEMO welcomes the support of **Fletcher** and **QCC** in moving to REZ locational costs factors, and will continue to improve the implementation of REZs through joint planning. AEMO agrees with **QCC** that equipment costs factors based on nearest port would be more representative, and notes that updated values provided by Aurecon now have equipment costs factors based on the distance from the nearest port.

AEMO acknowledges the feedback from **Dr Anne Smith** regarding introducing regulated buffer zones in its offshore REZ modelling and notes that AEMO only models the offshore REZs that are declared areas by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), and updates the offshore REZ boundaries and resource limits to match the updated declared areas when these are refined by DCCEEW following community engagement. AEMO acknowledges **ISP Consumer Panel**'s interest in incorporating social licence considerations into future IASRs, and can see the value of the Panel's proposed schema, including suggestions to quantify and apply project-level evaluation factors. However, applying this kind of approach is not within AEMO's role as national transmission planner – rather, transmission planning bodies already have similar considerations, and AEMO incorporates the outcomes into the ISP options through joint planning. AEMO recognises the importance of social licence in transmission planning, and will continue to explore how to incorporate social licence considerations in the development of the ISP.

AEMO welcomes **Engie Energy**'s and **QCC**'s requests for clarification on how social licence will be factored into new transmission line costs. AEMO has continued to incorporate social licence considerations into the conceptual transmission network options considered in the ISP and acknowledges that this is an area of continued learning and development. In the development of the 2025 *Electricity Network Options Report*, AEMO has incorporated the results of new land use complexity analysis into the transmission network options as one way to reflect an element of social licence in early-stage transmission project planning. Additional costs have been included in network options, through increased easement lengths, to represent the potential need to change proposed transmission line routes to avoid traversing particularly complex areas for delivering transmission infrastructure, signalling potential realignment of transmission lines to less complex areas. AEMO has not included community sentiment research results in these early, conceptual options, because this research is not sufficiently granular and because community sentiment changes over time. AEMO understands the high importance of prioritising community and stakeholder engagement as projects develop beyond the conceptual stage.

AEMO acknowledges **Pedersen**'s concern that there is insufficient consideration of local concerns when considering land usage, and that the land use penalty factor and upper land use limits are over-simplified. While AEMO agrees that these factors are expected to vary between REZs, it is not AEMO's role as the national transmission planner to undertake the level of local consultation required to determine these aspects. AEMO joint plans closely with TNSPs and other jurisdictional bodies to incorporate their local advice to adjust bespoke limits or costs for individual REZs.

AEMO agrees with **CEIG** and **QCC** on the importance of consultation with state planning bodies in the development of REZs**,** and welcomes CEIG's support of the ongoing joint planning with VicGrid. AEMO will continue to work collaboratively through the joint planning process to align with state planning.

AEMO supports **ISP Consumer Panel**'s request for additional information about AEMO's role in developing candidate REZs and outlining the next phases of their development. This information has been included in the ISP toolkit[66], which will set out the roles and responsibilities in the energy sector, and in the final 2025 *Electricity Network Options Report*.

AEMO notes **ISP Consumer Panel**'s request for a visual representation of the development stage of each REZ. AEMO does not currently support the inclusion of this visual representation, because each jurisdiction has different frameworks which it applies to the development of REZs, and AEMO considers that jurisdictional planning bodies' websites and their other channels for engagement and information sharing are the most up-to-date source for this kind of information.

AEMO acknowledges **Ausgrid**'s feedback regarding supply chain constraints affecting major transmission builds, including infrastructure required for REZs. AEMO expects to explore these challenges through a *Constrained Supply Chains* sensitivity in the 2026 ISP. Additionally, recent increases in transmission project costs have been incorporated into the updated AEMO Transmission Cost Database and applied to project cost estimates included in the final 2025 *Electricity Network Options Report*.

AEMO welcomes **Windlab**'s support for the updated methodology that includes multiple resource areas within large REZs, which aims to better reflect the diversity of wind resources across regions.

AEMO acknowledges **ENA**'s recommendation to enhance risk analysis in the ISP to ensure system robustness, security, and reliability under a range of conditions, including minimum system load and 'dunkelflaute' events (for example, extended VRE droughts). In fact, AEMO is strengthening its approach to system security in the 2026 ISP, including modelling both minimum and efficient levels of system strength. A detailed 20-year assessment of security services will be included in the ISP's system security appendix. Complementing this, the *Transition Plan for System Security* will provide a whole-of-system view to assess interactions and ensure secure operation under all conditions. The Transitional Services Framework, including Type 1 contracts, will also support the procurement of critical services needed to manage emerging risks such as declining minimum system load. AEMO considers that these steps will go some way to addressing **ENA**'s recommendation.

AEMO acknowledges **Transgrid**'s request to change the secondary limit on existing generation in South-West NSW REZ (SWNSW1) and has reviewed the data provided in its submission. AEMO notes that the disparity between **Transgrid** and AEMO initial limit values is due to the inclusion of recent non-network upgrades. After joint planning closing with **Transgrid**, AEMO has confirmed that 1,200 MW is the appropriate initial limit. Further, through this process AEMO has worked closely with **Transgrid** to also provide a new limit for after full capacity release of Project EnergyConnect, set at 1,600 MW, and has included transmission augmentation options in the final 2025 *Electricity Network Options Report* which could be used to remove this power system constraint.

AEMO agrees with **ASTRI & AUSTELA**'s view that due to the storage aspects of solar thermal, MLFs would be expected to be more favourable for solar thermal projects than for similarly located solar PV projects. Due to the

[66] At https://aemo.com.au/newsroom/news-updates/toolkit-released-to-support-stakeholder-understanding-and-engagement-in-the-isps-development.

nature of the cost benefit analysis undertaken for the ISP being a least-cost outcome, it is noted that the influence of MLFs on commercial returns are not a direct influence on the optimal outcomes. As developing bespoke MLFs is quite an involved process, AEMO considers that this level of additional study is not warranted.

In relation to the feedback relating to the wind quality in the South-West NSW REZ, including **EnergyCo, Engie, Windlab, Goldwind** and **Squadron**, AEMO has now reviewed the basis and inputs for the wind trace data used for the market modelling, and the results show that the wind quality data for the South-West NSW REZ were lower compared to what they would have been if higher hub height for new entrant wind farms was assumed and higher-granularity data set was used. This updated methodology and data source has also now been applied to other REZs to ensure consistency.

AEMO appreciates the feedback relating to proponent interest in the South-West NSW REZ, and, following further review and discussion with **EnergyCo**, will also significantly increase the wind resource limits for this REZ. The limit has been raised from 3,900 MW to 14,000 MW, based on feedback from a number of developers, consistent outcomes from the independent AEMO review of wind resource quality, updated land use assessments, and similar advice from **EnergyCo**.

AEMO acknowledges and appreciates the feedback relating to the higher social acceptance for wind projects in this REZ. While AEMO does not directly apply project-level social licence or community sentiment factors in the ISP modelling, in some cases, social licence matters are considered through joint planning with TNSPs and jurisdictional bodies as part of preparing the assumptions relating to land cost, project complexity, lead times, and transmission line deviation requirements for associated transmission upgrades, as well as the now increased resource limits. While AEMO has not changed the land-use penalty factor, as it does not have good data to determine what an appropriate revised cost would be, it is noted that with the increased resource limits explained above, the land use penalty factor is not applied until a higher level of wind generation is achieved within the South-West NSW REZ and will now have a much reduced impact on outcomes.

AEMO agrees with **Squadron** that non-network solutions have the potential to address or defer identified needs for transmission projects, potentially with a shorter project lead time or less disruption to communities. AEMO notes that non-network options must be considered through the regulatory framework and assessed against a specified identified need. AEMO called for non-network options as part of the Draft 2025 *Electricity Network Options Report*. During this process AEMO received non-network options for the South West NSW REZ. However, AEMO notes the existing proposed non-network option for South West REZ is already appropriately sized to utilise short-term ratings of new lines, and suggests that further exploration of South West NSW REZ non-network options can be explored through engagement with Transgrid and EnergyCo. Further information is provided in response to that submission in the 2025 *Electricity Network Options Report* consultation summary report.

AEMO agrees with **QCC**'s feedback that available land within a REZ will depend on the existing land usage. In developing resource and land use limits, AEMO currently accounts for known restrictions such as state and national parks. Further, AEMO calls for any data that would inform a more reflective maximum land usage for each REZ.

AEMO acknowledges the **CIS** request for more transparency in the determination of "exact storage locations". AEMO clarifies that it does not determine precise connection locations – rather, storage is modelled only as connected to an individual REZ or to a sub-regional reference node. AEMO considers this approach to be sufficiently precise for the nature of the ISP modelling exercise, with further granularity on exact storage locations to be considered by project proponents as part of developing storage projects. AEMO also provides a range of

information for project proponents relating to network connection information, including the recent introduction of the *Enhanced Locational Information* report[67].

AEMO recognises the **CIS** request for clarity on how AER pricing proposals are determined if there is no Contingent Project Application. AEMO notes that where a project is subject to a jurisdictional framework rather than the RIT T framework it could be accounted for through a variety of avenues – for example in the case of the NSW REZs being delivered by EnergyCo, the AER default market offers include cost outcomes from the NSW Roadmap, of which the REZs are a part. In preparing its electricity price indices, AEMO refers to recent AER pricing proposals and determinations in addition to the most recent AER default market offers. However AEMO notes that in some cases these retail price projections may not yet capture additional costs associated with transmission projects not included in current revenue determinations.

AEMO acknowledges feedback from **Transgrid** to apply time-based build limits to REZs and transmission developments and notes that AEMO models build limits for three operational conditions like peak demand, winter reference and summer typical to consider various operational conditions based on demand and seasonal variability. AEMO believes introducing more granularity into this limit will introduce modelling runtime challenges and may not be as impactful for a system-wide optimisation, and that this level of detail is more suited for follow-on regulatory investment test for transmission (RIT-T) studies.

3.13 Additional feedback

Summary of material issues raised in submissions

Other topics raised in submissions covered a wide range of issues including cost and timing of current and future projects, labour considerations, renewable fuels usage and social license:

- **EUAA** suggested that the ISP process should include a feedback loop for costs and timing of already committed projects and note issues and lessons learned in implementation, especially related to cost and timing differences, so feedback can be incorporated in future proposals.
- **ISP Consumer Panel** highlighted the importance of labour considerations in ISP project costs and recommended that the IASR use the labour demand forecasts provided by RACE for 2030 and also consider adding a forecast for electricity sector wage price index to the IASR data set.
- **APGA** mentioned there would a considerable incentive for LNG producers to reduce the emissions intensity of their compression trains, which may be achieved in some cases through use of renewable gases compared to electrification which would place considerable additional demand on the NEM.
- **AEP** noted that AEMO proposed to align its LNG export forecast in *Progressive Change* to the IEA Stated Policies scenario (STEPS) and keep forecast post 2035 flat, but AEP believed that this scenario should reflect the 2024 World Energy Outlook's forecast of increasing global LNG demand.
- **Close** recommended the inclusion of gas system parameters, including:

[67] At https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/enhanced-locational-information.

  - sufficiency of investment in upstream gas production (capability of system to sporadically deliver high rates)
  - sufficiency of investment in gas transport and storage (to supply gas-powered generation at levels required), and
  - existence/scale of east coast gas export industry (impact of export demand on local availability).
- **Ausgrid** noted that Sydney, Newcastle and Wollongong (SNW) together make up a significant portion of the NEM, but it is treated as only a single sub-region in the ISP model, limiting assessment of this region.
- **QEUN** recommended a number of items, including an increase in the objective scrutiny of a proponent's advice on the progress of all generation, energy storage and transmission projects due to possible delays and cost increases, a six-monthly review, and a sixth commitment criterion to classify the commitment status of all government projects, specifically whether a final investment decision has been made by federal, state or territory governments.
- **ElectraNet** asked that AEMO provide a method or standard that describes the circumstances in which it would or will exercise its ability to apply a 0% weighting to one or more scenarios for a future actionable ISP project RIT-T, as allowed for in the AER's *Cost Benefit Analysis Guidelines*.
- **Lawrence** proposed a new framework which inherits its ideas and terminology from the supply chain methodologies. This would separate generators, load and storage (inventory) into historic, current and future components.
- The **ENA** recommended accounting for both state-led and actionable ISP projects with emphasis on timely least-regrets investment – a plan that is resilient to project delivery challenges.
- Several submissions included commentary on social licence.
  - **Pedersen** commented that it is not clear where the responsibility for community engagement lies due to the mix of federal and state government bodies and lack of leadership. There is nothing in the NEM rules or IASR to ensure community engagement happens.
  - **QCC** asked AEMO to take more responsibility for building social licence of renewable energy, from coordination of CER to large-scale REZs, including by coordinating national strategic land use planning.
- **ECA** suggested that more clarity is needed in the ISP on how the scenario likelihood percentages are determined and applied.

AEMO's consideration and response

Regarding **EUAA**'s suggestion to include a feedback loop for costs and timings of already committed projects, AEMO does not assess projects in the ISP where they have already been assigned a status of committed or anticipated. In terms of cost estimates for potential future projects, as required by the *Cost Benefit Analysis Guidelines*, AEMO does check cost estimates for ISP projects against recent contingent project applications, recent tender outcomes governing transmission network augmentations, and final project outcomes (including variations). This process, including how AEMO's Transmission Cost Database is updated, is outlined in the 2025 *Electricity Network Options Report.*

AEMO acknowledges **ISP Consumer Panel**'s comments on the importance of labour considerations in ISP project costs. AEMO provided the workforce estimates based on the 2024 ISP results, in partnership with RACE for 2030

and the Institute for Sustainable Futures, for information for stakeholders and policy-makers. In the *ISP Methodology*, AEMO notes that supply limits (including workforce) are not applied within the ISP model as it is an optimal plan. Consideration of workforce limits is undertaken by other energy policy studies and models.

AEMO acknowledges **APGA**'s feedback and would like to note that, much like forecasts of electrification of existing industrial facilities, the forecast electrification of LNG production is advised directly by the LNG producers, via the GSOO survey process. AEMO does not further forecast LNG production electrification.

AEMO agrees with **AEP** that the 2024 World Energy Outlook's STEPS scenario sees an increase in global LNG demand, however AEMO considers that the Queensland LNG industry is unlikely to grow in capacity to meet the increasing global demand. The increased global (and particularly Asian) demand for LNG is more likely to be met by LNG production from the Northern Territory or Western Australia, or elsewhere in the world, rather than adding additional LNG trains to Queensland's Curtis Island facilities.

AEMO thanks **Close** for the feedback. As part of the 2026 ISP, AEMO will consider the impact of the east coast gas system on the future NEM, and the potential gas development projections that may be required to ensure adequacy in both systems, taking into account peak day delivery. Additional information on the inputs and assumptions that AEMO will be using in the development of the gas development projections has been provided in the *Gas Infrastructure Options Report*. This includes how AEMO will be considering gas production, transport and storage developments.

AEMO acknowledges **Ausgrid**'s concern that Sydney, Newcastle and Wollongong are represented as a single sub-region within the ISP model. While AEMO will continue to work collaboratively with TNSPs and DNSPs to improve the capability of the model, further splitting the SNW sub-region was ruled out for the 2026 ISP, due to the additional ISP model complexity that would be created by such a split. The additional level of detail required for the sub-region will be left to joint planning between the TNSPs and DNSPs.

AEMO thanks **Lawrence** for the feedback and recommendations on a new framework to approach the ISP. However, AEMO considers that the current ISP assessment methodology provides more detailed analysis about the NEM than the proposed alternative.

AEMO understands **ElectraNet**'s preference to understand how or when AEMO may choose to apply its discretion to apply a 0% weighting to one or more scenarios for the delivery of a RIT-T for an actionable ISP project, and will continue its practice of extensive joint planning with TNSPs as actionable ISP projects are considered and identified in ISPs. However, AEMO considers that this decision must be made on a case-by-case basis depending on the relevant market and power system context for each individual project, and so does not propose to specify a methodology on this matter.

Regarding **QEUN**'s feedback, AEMO includes committed and anticipated generation and transmission projects in the base modelling, in accordance with the *ISP Methodology* and the AER's *Cost Benefit Analysis Guidelines*. AEMO applies these same criteria to state-led projects, when assessing their actionability and inclusion in the optimal development path, noting that the criteria already considers treatment of final investment decisions when classifying project statuses. Generally, transmission projects will be classified as anticipated once they have received a final contingent project decision from the AER or equivalent funding approval for the construction phase of the project.

Regarding **ENA**'s feedback to consider minimising potential investment regrets, AEMO notes that the *Cost Benefit Analysis Guidelines* allow, and the *ISP Methodology* provides for, AEMO to select an optimal development path based on the outcomes of a risk averse decision-making approach, provided AEMO justifies and explains its choice. Consistent with recent ISPs, for the 2026 ISP, AEMO intends to rank candidate development paths using both a weighted net market benefits approach, and a least-worst weighted regrets (LWWR) approach to ensure the optimal development path is robust across a range of future states of the world, while also taking into account consumer risk preferences. In applying this methodology, AEMO considers that it enables appropriate consideration of risks and benefits, and the ability for AEMO to recommend an optimal development path that is robust to various futures and uncertainties.

AEMO notes **Pedersen**'s comment around a perceived lack of clarity in community engagement responsibilities held by different groups across the energy sector, and **QCC**'s suggestion that AEMO take a more active role in building social licence for renewable energy, such as through coordination of CER to large-scale REZs, and national strategic land use planning.

While not a topic explicitly covered by the IASR, AEMO has engaged closely with TNSPs, jurisdictional bodies and consumer advocates to enhance social licence and community sentiment considerations in its early conceptual transmission planning in the 2025 *Electricity Network Options Report.* This includes expanding social and environmental land use categories, highlighting recent sentiment research insights, and detailing the key social licence and community engagement activities led by various parties across the transmission planning process. Community engagement related to projects should be undertaken by jurisdictional bodies and project developers, as described in Section 2.11 and Figure 16 of the *Electricity Network Options Report*. AEMO encourages jurisdictional bodies and project developers to continue to engage communities early and meaningfully to understand local impacts and concerns, in accordance with national guidelines and industry best practices.

AEMO notes the **ECA** suggestion that more clarity is needed in the ISP on how the scenario likelihood percentages are determined and applied. The *ISP Methodology* describes the weighting process and provides one example of how input on weightings may be obtained[68].

[68] See Sections 5.7.1, 5.7.2: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/isp-methodology-2023/isp-methodology_june-2023.pdf?la=en

Abbreviations

Abbreviation	Meaning
AAC	Australian Aluminium Council
AECC	Aluminium Encapsulated Carbon Core
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AEP	Australian Energy Producers
AER	Australian Energy Regulator
AGIG	Australian Gas Infrastructure Group
ANU	Australian National University
ANU RE100	Australian National University 100% Renewable Energy Group
APGA	Australian Pipelines and Gas Association
ASTRI & AUSTELA	Australian Solar Thermal Energy Association and Australian Solar Thermal Research Institute
BEV	Battery electric vehicle
CCS	carbon capture and storage
CCUS	carbon capture, utilisation and storage
CEIG	Clean Energy Investor Group
CER	consumer energy resources
CIS	Centre for Independent Studies
CNSW	Central New South Wales
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CST	concentrated solar thermal
CWC	Climateworks Centre
DAC	direct air capture
DAE	Deloitte Access Economics
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DER	distributed energy resources
DNSP	distribution network service provider
DSP	demand-side participation
EA	EnergyAustralia
ECA	Energy Consumers Australia
ECMC	Energy and Climate Change Ministerial Council
ENA	Energy Networks Australia
ESOO	*Electricity Statement of Opportunities*
EUAA	Energy Users Association of Australia
EV	electric vehicle
FCEV	fuel cell electric vehicle
FOM	fixed operating and maintenance
FRG	Forecasting Reference Group
GEA	Gas Energy Australia

Abbreviation	Meaning
GEM	Green Energy Markets
GET	Grid Enhancing Technology
GJ	gigajoule/s
GSOO	*Gas Statement of Opportunities*
HESS	hydrogen energy storage system
HILT CRC	Heavy Industry Low-carbon Transition Cooperative Research Centre
HV	high voltage
IA Workbook	*Inputs and Assumptions Workbook*
IASR	*Inputs, Assumptions and Scenarios Report*
ICE	internal combustion engine
IEA	International Energy Agency
IEEFA	Institute for Energy Economics Financial Analysis
ISP	*Integrated System Plan*
JEC	Justice and Equity Centre
kgCO2/kgH2	kilograms of carbon dioxide per kilogram of hydrogen produced
kW	kilowatt/s
LCOE	levelised cost of electricity
LDES	long duration energy storage
LIL	large industrial load
LNG	liquefied natural gas
LPG	liquefied petroleum gas
LUTO	Land Use Trade-offs
LWWR	least-worst weighted regrets
MLF	marginal loss factor
MW	megawatt/s
NDC	Nationally Determined Contribution
NEL	National Electricity Law
NEM	National Electricity Market
NEO	national electricity objective
NER	National Electricity Rules
NERL	National Electricity Retail Law
NGL	National Gas Law
NVES	New Vehicle Efficiency Standard
PA	Powering Australia
PEM	proton exchange membrane
PHES	pumped hydro energy storage
PHEV	plug-in hybrid electric vehicle
PJ	petajoule/s
PV	photovoltaic
PVNSG	PV non-scheduled generation

Abbreviation	Meaning
QCC	Queensland Conservation Council
QEUN	Queensland Electricity Users Network
RCP	Representative Concentration Pathway
REZ	renewable energy zone
RIT-T	regulatory investment test for transmission
RRA	Rainforest Reserves Australia
SEE	SEE-CHANGE Fair Finance Group
SMR	steam methane reforming
SNW	Sydney, Newcastle, Wollongong
SPR	Strategy. Policy. Research.
STEPS	Stated Policies Scenario
TNSP	transmission network service provider
TOU	time-of-use
TUOS	transmission use of system
TWh	terawatt hour/s
V2G	vehicle-to-grid
VPP	virtual power plant
VRE	variable renewable energy
WACC	weighted-average cost of capital
WEM	Wholesale Electricity Market
ZEV	Zero Emissions Vehicle