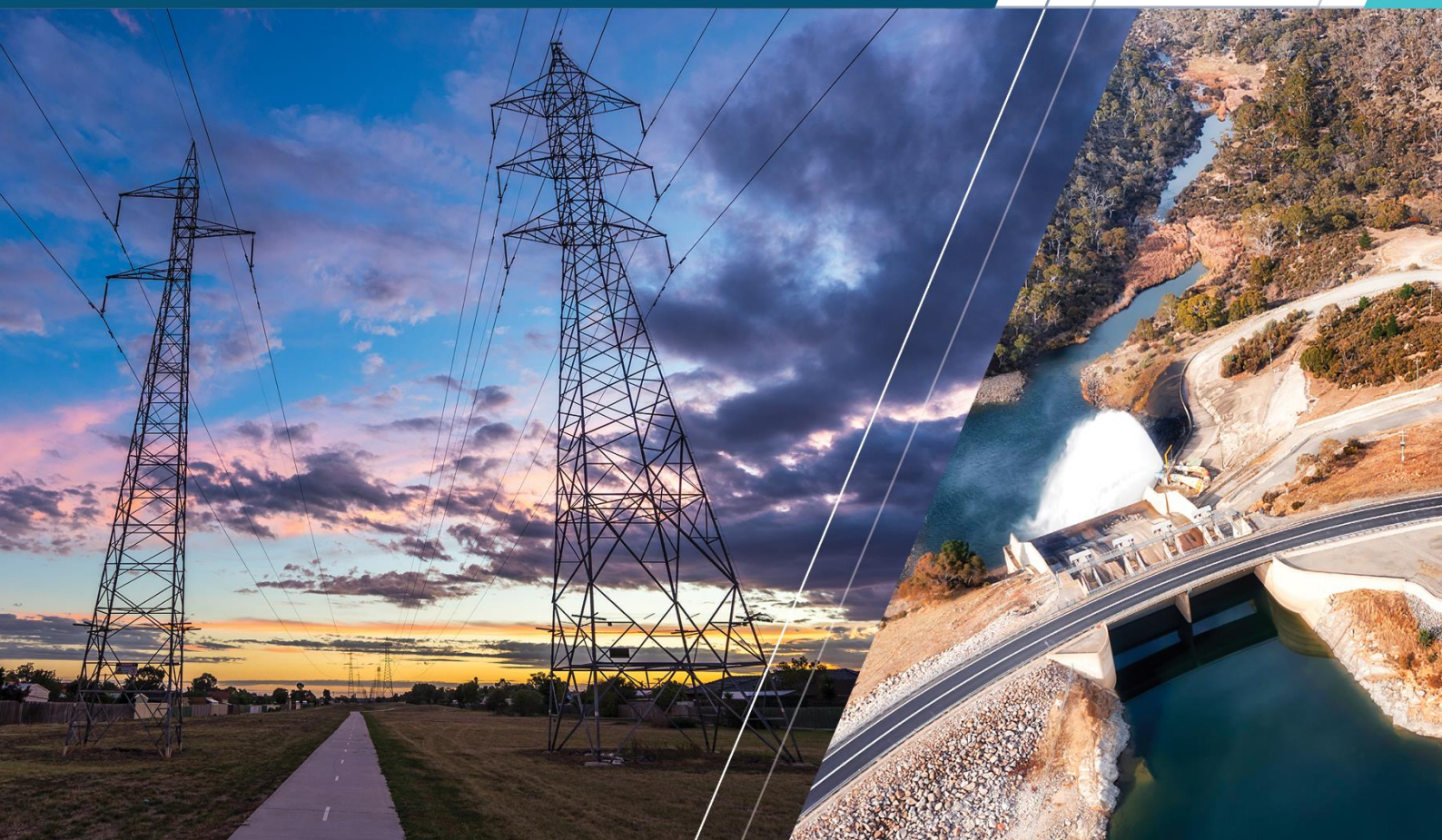
Review of the Integrated System Plan

Final Report

energy and climate change ministerial council



Australian Government

The Department of Climate Change, Energy, the Environment and Water prepared this report on behalf of Energy and Climate Change Ministers from Australian, state and territory governments.

Acknowledgements

The authors thank stakeholders for their input into this review of the Integrated System Plan.

Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.

Foreword

We are at a critical juncture in the energy transformation. An acceleration of investment activity and project delivery is required to ensure that we achieve Australia's decarbonisation objectives while maintaining energy security and managing costs to energy users. The decisions taken today will have ramifications for our ability to increase renewable energy uptake, take advantage of emerging technologies and create a prosperous future for all Australians. Such decisions need careful management and must be made based on the best available information.

In October 2022 and in this context, Energy Ministers agreed to a review of the Australian Energy Market Operator's (AEMO) Integrated System Plan (ISP) framework. The ISP is intended to provide a 'whole of system plan' for supplying affordable and reliable electricity to homes and businesses in the National Electricity Market (NEM), while supporting Australia's net zero ambitions. The commissioning of this review does not reflect a lack of confidence in AEMO or its processes in undertaking the ISP to date. Rather, the intention is to consider whether the scope of the ISP remains appropriate given the task at hand.

The ISP is an important planning document for investment across the NEM and the broader energy system. A key challenge facing energy markets is how best to deliver the transition of the energy sector to net-zero emissions by 2050, at the lowest cost to consumers. This is particularly challenging given the need to maintain system reliability, ongoing market development uncertainties and the continuing development of technologies. With the right settings, the ISP will gain further influence in providing coherent planning and setting the energy transformation agenda for investors, governments and the public.

The ISP Review (the review) has benefited from targeted stakeholder feedback from energy industry bodies, network service providers, energy consumer groups, environment and climate change non-governmental organisations, and the research and academic sector. This report has been prepared with advice from energy market bodies and the review's technical advisor HoustonKemp and data and modelling advisor Frontier Economics. The System Planning Working Group thanks all those who have contributed their valuable input through this process.

Based on the outcomes of stakeholder feedback and expert analysis, the review found that while AEMO should not lose its vital role in transmission planning, there is considerable scope for the ISP framework to be 'supercharged' to appropriately plan for the infrastructure needed for energy markets and to become a genuine whole of system plan. The evolution of the energy system and the expanding role of the ISP highlights the need to take a more nuanced approach in system planning to consider a broader range of investment options across the spectrum of the energy system. The review proposes 15 recommendations that seek to enhance the consideration of these factors in planning. The review's recommendations aim to ensure that the ISP is up to the challenge of guiding the energy transformation into the future.

While the review relates specifically to the ISP and the role it does and could play in the NEM and east coast gas markets, findings will be shared with other jurisdictions to assist in setting the best possible planning frameworks nationally. The recommendations and policy advice of the report have been settled through the System Planning Working Group under the National Energy Transformation Partnership and reflect a consensus position.

We endorse the Final Report of the ISP Review.

System Planning Working Group

Contents

List of Abbreviations

Name in full	Acronym
Australian Energy Market Commission	AEMC
Australian Energy Market Operator	AEMO
Australian Energy Regulator	AER
Candidate development path	CDP
Consumer energy resources	CER
Commonwealth Scientific and Industrial Research Organisation	CSIRO
Cost benefit analysis	CBA
Department of Climate Change, Energy, the Environment and Water (Commonwealth)	DCCEEW
Distribution network service provider	DNSP
Environment, Protection and Biodiversity Conservation Act 1999 (C'wth)	EPBC Act
Electricity Statement of Opportunities	ESOO
Electric vehicle	EV
Energy and Climate Change Ministerial Council	ECMC
Gas Statement of Opportunities	GSOO
Gas-fired power generation	GPG
Inputs, Assumptions and Scenarios Report	IASR
Integrated System Plan	ISP
Medium Term Projected Assessment of System Adequacy	MTPASA
National Electricity Market	NEM
National Electricity Rules	NER
National Energy Objectives	NEO
National Gas Law	NGL
Nationally Significant Transmission Project	NSTP
Optimal development path	ODP
Regulatory Investment Test for Transmission	RIT-T

Name in full	Acronym
Renewable energy zone	REZ
Transmission network service provider	TNSP
Victorian Gas Declared Transmission System	DTS

1. Executive Summary

Australia's energy system is evolving at a rapid pace, and it is critical to ensure that our planning processes similarly evolve. A key challenge facing the National Electricity Market (NEM) and east coast gas market is how best to deliver the transition of the energy sector to net-zero emissions by 2050, with the interests of energy consumers remaining the key focus.

This is particularly challenging given the need to maintain system reliability, ongoing market development uncertainties and the continuing advancement of technologies. It is clear that transmission will be required to connect a broader set of new generation and storage assets, however the energy transition is also bringing in additional interrelated investment options that must be considered, including gas infrastructure, opportunities to reduce operational demand, and demand-side participation such as consumer energy resources (CER) and virtual power plants. The way in which generation has traditionally been provided to the NEM is also rapidly changing, with ageing coal-fired power stations being replaced by renewable generation firmed by storage and backed up by gas.

The changing role of the ISP

Transmission planning has been a long-held function of the Australian Energy Market Operator (AEMO). Following the Finkel Review in 2017, AEMO's Integrated System Plan (ISP) was established to create a 'whole of system' plan for the NEM and provide consistent projections about the location of generation and storage capacity to support transmission planning (Finkel 2017). AEMO prepares the ISP by carrying out a cost-based engineering optimisation process that incorporates market benefits, projecting overall transmission system requirements in the NEM over the period to 2050.

The role of the ISP has expanded considerably since its first publication in 2018, reflecting the evolving role that AEMO is playing in rapidly changing energy markets. The ISP now has a significant influence on several segments of the electricity supply chain, in addition to its on role as an electricity transmission plan. Governments and industry stakeholders all rely on the ISP to support investments in electricity infrastructure.

This increased prominence of the ISP necessitates its 'supercharging' to serve the needs of stakeholders better while still maintaining its purpose as a transmission plan. As the ISP has now completed almost four iterations since 2018, there is a sufficient evidence base to consider how the ISP is performing and what changes may be required to evolve the planning arrangements for the NEM.

Objectives of the review

Given the importance of system planning to support the energy transition, in October 2022 Energy Ministers agreed to undertake a review of AEMO's ISP framework. The aim of the ISP Review (the review) is to enhance system planning, by ensuring that the ISP remains fit for purpose to deliver the energy transition.

The review focused on the key themes emerging from the Terms of Reference: supporting emissions reduction, integrating gas and electricity planning, enhancing energy demand considerations, transformation of Australia's energy mix, jurisdictional policy interactions and the timely delivery of ISP projects (Appendix C).

Recommendations and summary of the findings from the review

The review found that, although it is important that AEMO should not lose its vital role in transmission planning, there is considerable scope for the ISP to be 'supercharged' to appropriately plan for the infrastructure needed for energy markets and to become a genuine whole of system plan. The evolution of the energy system and the expanding role of the ISP highlights the need to take a more nuanced approach in system planning to consider a broader range of investment options across the spectrum of the energy system.

The review proposes 15 recommendations that seek to enhance the consideration of these factors in planning. The review recommends that in developing the ISP, AEMO should ensure that gas and CER assumptions are more accurate in modelling processes. This requires the appropriate consideration of the infrastructure requirements that are needed to support the CER and gas generation identified in the ISP, the economics and incentives that support these investments, and a consideration of how these in turn are expected to impact consumer uptake. This is aimed at ensuring reliable and secure energy is available through a least-cost transition for consumers. The review also recommends modifications to existing processes to improve transparency and clarity around how some procedures are undertaken and how outcomes are reached within the ISP modelling. As the review's recommendations are implemented in future ISPs, and the energy system continues to evolve over time, the review also recommends that the System Planning Working Group continue to consider expanding the range of investments that can be optimised within the ISP framework to support the energy transition as it unfolds.

Integrating gas into the ISP

Recommendation 1: Integrating gas into the ISP

That AEMO expand its consideration of gas market conditions in the 2026 ISP. This should include but not be limited to:

- carrying out additional analysis of future gas demand and gas pricing,
- developing projections about the future utilisation of gas infrastructure
- collating information about dates of expected gas pipeline or GPG closure or conversion
- updating medium- and long-term projections of gas generator fuel costs to reflect expectations about gas market developments
- providing more information in the ISP about how ISP modelling scenarios are integrated in its gas supply model.

Working closely with stakeholders and drawing on the deeper understanding of future gas market conditions, AEMO should include 'development projections' in the 2026 ISP for the gas sector and:

- use this capability to identify and iteratively analyse the gas sector project trade-offs with electricity development needs, with the sole aim of optimising electricity infrastructure investments in the ISP;
- update the development projections to reflect the outcomes of this analysis; and
- publish the updated development projections in the ISP.

The development projections should set out AEMO's projections on how it expects the gas sector to develop (both in terms of demand, and infrastructure investment to supply expected demand) under prevailing policies and market incentives.

The ISP review found that almost all stakeholders agreed that the ISP could be improved by better consideration of gas market conditions, and there was broad support for better integration of gas and electricity planning, particularly considering the importance of gas fired power generation in the NEM and the gas market supply challenges emerging in southern Australia.

The review found a need for a deeper and more explicit consideration of gas market conditions, including but not limited to:

- additional analysis of future gas demand and gas pricing
- developing projections about the future utilisation of gas infrastructure
- collating information about dates of expected gas pipeline or GPG closure or conversion
- updating medium- and long-term projections of gas generator fuel costs to reflect expectations about gas market developments.

The ISP review found that the most effective way to integrate gas and electricity planning while avoiding unintended negative consequences is for AEMO to work closely with stakeholders to develop gas development projections, which set out AEMO's projections on how it expects the gas sector to develop (both in terms of demand, and infrastructure investment to supply expected demand) under prevailing policies and market incentives. This would reflect information that AEMO receives from market participants about how the sector is likely to develop to inform planning for the electricity sector.

AEMO should then use the gas development projections in combination with its electricity sector modelling to iteratively identify and analyse cost/benefit trade-offs of projects across the two sectors, to support development of the ISP. In this way, the gas development projections would inform market participants and policymakers about the investments that need to be made in the electricity sector, given the likely future path of the gas sector. It would also make explicit AEMO's assumptions in the ISP about the future of gas and describe a consolidated industry view of what the future may look like in the various scenarios (based on AEMO's engagement with industry), without interfering with market signals for private investment.

This recommendation does not require AEMO to carry out a multi-sector co-optimisation of infrastructure development across the entire electricity and gas sectors. Instead, AEMO can use a more targeted project-based approach to analysing trade-offs between the gas and electricity sectors, when required.

The review found that there would be limited benefits to AEMO producing an 'optimal development path' (ODP) for gas as the drivers for investment in the gas sector are very different to electricity. For AEMO to identify the equivalent of 'actionable projects' for gas would be ineffective without additional incentives for gas investors but could undermine the ability of the market to respond flexibly to market conditions by causing investors to shy away from any proposed infrastructure not identified through the gas ODP.

Enhanced energy demand forecasting

Recommendation 2: Demand forecasting in the ISP

That AEMO enhance demand forecasting in the 2026 ISP by:

- Undertaking targeted stakeholder engagement (including but not limited to Distribution Network Service Providers (DNSPs)) to develop more robust assumptions underpinning CER and distributed resources projections in the ISP. The new assumptions should reflect a comprehensive view of initiatives affecting CER and distributed resources uptake and evaluate the implications for operational demand.
- Analysing how electrification and CER / distributed resources development sensitivities affect operational demand projections and consider these directly in the ISP modelling where relevant.
- Subject to available information, analysing how DNSP investments, programs and annual plans, may impact CER and distributed resources development, and thereby the ODP for transmission, and include these findings in the ISP in order to send clearer signals to inform DNSP planning.
- Developing a framework, methodology and guidance material to support DNSPs and jurisdictions to develop projections and undertake analysis in a consistent manner to support the ISP's development.

- Including a statement in the 2026 ISP, and subsequent ISPs, aimed at informing the market and policy makers about the expected development of CER and distributed resources. The statement should be sufficiently detailed to provide a baseline for the identification of opportunities to promote the uptake of CER and distributed resources within each jurisdiction.

Recommendation 3: Jurisdictions' support for AEMO's demand forecasting

That jurisdictions and AEMO work together to ensure the provision of key inputs for the 2026 ISP that includes information about relevant jurisdictional policy developments and scenarios and projections about industrial and consumer electrification demand in NEM sub regions.

The review received clear feedback from stakeholders that there is a desire to see a more robust assessment of demand-side aspects in the ISP. The review considered how demand is currently considered in the ISP development process and notes AEMO's recent and ongoing improvements to its demand forecasting approach, however some areas of enhancement have been identified.

The review recommends the ISP provide a greater focus on how demand uncertainty affects development path outcomes, particularly given the rapid evolution and technological opportunities expected through CER. This would be informed by improvements to the information that the ISP currently provides in relation to demand forecasting, and the development of a framework, methodology and guidance material to support Distribution Network Service Providers (DNSPs) and jurisdictions to develop projections and undertake analysis in a consistent manner to support the ISP's development.

The review also recommends AEMO analyse how electrification, CER and distributed resources development sensitivities affect operational demand projections. This analysis would need to be supported by jurisdictional governments and AEMO working together to share information on relevant policy developments and projections about industrial and consumer electrification in NEM sub-regions, where available and supported through the new standardised framework proposed by the review.

The review found that the ISP contains relatively little information on the assumptions underpinning its CER forecasts, particularly in terms of distribution network development, tariff design or other policies or market incentives. The review recommends that a statement on the expected development of CER and distributed resources be included in the 2026 ISP, to help address these limitations. The statement would identify CER and distributed resources investments that are projected to occur, given prevailing market, policy and regulatory settings and consideration of the types of projects that would be required to meet the identified needs, over the ISP's time horizon. The review expects that this would necessitate a more 'bottom-up' assessment based on consultation with DNSPs, than is currently conducted for the ISP.

Further opportunities to optimise CER and distributed resources

Recommendation 4: Optimising CER and distributed resources

That the System Planning Working Group and AEMO work with the relevant stakeholders, including DNSPs, to develop a suitable approach to trade off the cost of unlocking increasing tranches of orchestrated CER and distributed resources against other investment options for use in the earliest ISP practicable.

Recommendation 5: Review progress in optimising CER and distributed resources

That the System Planning Working Group report to ECMC on progress made in implementing Recommendation 4 following the 2026 ISP.

Orchestrated CER and distributed resources are anticipated to play an increasingly important role in the energy system moving forward. The review notes that while the 2022 ISP includes consideration of CER and distributed resources, it does so from the perspective of forecasting the impact of CER and distributed resources on operational demand rather than seeking to understand the potential trade-offs between large- and small-scale energy investments, particularly against additional transmission, generation and storage investments.

The review considers that there is scope to develop an approach (based on identifying the appropriate value of orchestrated CER) for trading off the cost of unlocking increasing tranches of orchestrated CER and distributed resources against other investment options. Over time, as more data becomes available, AEMO would be enabled to conduct a more integrated analysis of risks and trade-offs between: electricity transmission; generation and storage investments; and CER and distributed resources investments. This would allow AEMO to co-optimise for the most affordable transition path for the energy sector.

Enhancing consideration of energy storage and renewable generation

Recommendation 6: Deeper analysis of coal-fired generation shutdown scenarios

That AEMO analyse the sensitivity of the ODP to alternative coal-fired generation shutdown scenarios in the 2026 ISP, allowing for consideration of facilitating investments in firming capacity and including this more prominently as part of the ISP narrative, subject to appropriately managing commercial sensitivities.

Recommendation 7: Improving the information available in the ISP

That AEMO centralise the available information on renewable generation and storage, such as by summarising important material from other relevant documents in the ISP and/or including links to other relevant documents in a manner that facilitates easy access for stakeholders. This may be implemented via reference to the Enhanced Locational Information Report, if appropriate.

Recommendation 8: Enhanced analysis of system security

That AEMO give greater consideration of system security trade-offs for assessing the optimal mix of generation, storage, transmission and other infrastructure in the 2026 ISP.

The review considered whether it was appropriate for the ISP to be more explicit about the location of where and when generation and storage developments are needed, and the technology types required to ensure an orderly transition from coal generation. In response to stakeholder feedback, the review also considered whether the ISP should give greater consideration of system security constraints when modelling the optimal mix of generation, storage, transmission, and other infrastructure.

On balance, the review assessed that the analysis undertaken as part of the ISP is largely appropriate in this regard. However, the review recommends some enhancements to the presentation of analysis in the ISP and provision of information to better assist market participants in developing generation and storage projects including deeper analysis of thermal generation shutdowns, enhanced analysis of system security constraints, and improved locational information in the ISP.

Delivering the ISP in the context of jurisdictional plans, policies, and construction constraints

In addition to the key recommendations outlined above, the review considers that other changes to the ISP process would increase its relevance and deliverability in the context of the significant planning and policy reform underway to support the energy transition across Australia.

Recommendation 9: Consultation guidelines for jurisdictional planning and policies

In the interests of transparency, that AEMO develop and publish clear, structured and transparent guidelines for its consultation process with jurisdictions around consideration of policy inclusion in the 2026 ISP modelling.

Recommendation 10: Clarifying jurisdictional policy inclusions

In the interests of transparency, that AEMO provide more clarity on if and how uncertain or unfunded policies are considered in the 2026 ISP to enhance stakeholder understanding and engagement.

Feedback from stakeholders underscored that the existing approach under the NER for considering jurisdictional policies in the ISP remains fit for purpose. However, there is opacity around the process that AEMO follows when it determines what jurisdictional infrastructure and policy commitments meet its threshold for inclusion in the ISP. Stakeholder feedback also indicated confusion regarding how AEMO's analyses of unfunded or uncertain policies, which are relevant to the ISP's ODP, have been applied to past ISPs.

The review found that this presents an opportunity for AEMO to establish a clear, structured and transparent process for consultations with NEM jurisdictions on policy inclusion in ISP modelling and for this process to be clearly articulated. The review also recommends that AEMO provide more clarity on how uncertain or unfunded policies are considered in the 2026 ISP to enhance stakeholder understanding and engagement.

Recommendation 11: Improving the accessibility of the ISP

That AEMO develop additional targeted communications products and activities to support community groups and consumers to engage with the 2026 ISP planning process, separate to the ISP document itself, and informed by a communications strategy.

Recommendation 12: Incorporate community acceptance considerations into transmission expansion options

That AEMO have regard to community concerns or sensitive locations in the identification of the ODP, and consider existing and available data on community sentiment, where available for the 2026 ISP (for example, from CSIRO surveys or as the result of TNSP community engagement as part of preparatory activities).

Recommendation 13: Additional planning inputs to the ISP

That AEMO take advantage of the significant focus being given to environmental and regional planning for energy infrastructure, improving data on supply chain limits, workforce constraints and community sentiment, and consider where the outputs of this work can be incorporated into the 2026 ISP.

Stakeholders provided largely consistent feedback on the challenges to the timely delivery of actionable ISP projects. They noted that there are difficulties in energy infrastructure planning and construction due to supply chain delays, a lack of available workforce and from community opposition to ISP projects.

The review assessed the considerable work being undertaken by governments and other NEM participants in addressing supply chains, workforce and community acceptance constraints. In this context, the review found that there is opportunity for the ISP to help build broader community

understanding of the need for new ISP projects through the development of targeted communication products that explain the benefits of the ODP at a high level. The review also found that AEMO could take advantage of the significant focus being given to these issues, and use the data coming from new initiatives to help inform the development of the ODP or transmission expansion options (as appropriate). This includes information about environmental values, local concerns and/or sensitive locations, as well as information from new regional planning and other initiatives. New information about supply chain risks and workforce constraints may be considered by AEMO in informing estimations of the likely costs and timing of ODP projects.

Recommendation 14: Greater visibility of updated inputs and assumptions
That AEMO take steps to increase the visibility of the latest Forecasting Assumptions Update on its website, linked clearly from material relating to the ISP and in time for the 2026 ISP.

The review examined the ISP's development framework to ensure its efficiency in delivering the ISP. The review found that the current process was largely appropriate. The review also engaged with stakeholders to understand how the ISP and its associated documents are currently used. Stakeholders advised that there would be merit in more frequent updates to AEMO's Inputs, Assumptions and Scenarios Report. This is because industry utilise these inputs and assumptions for strategic modelling, informing their capital investment decisions, operational planning, and risk management. Similarly, jurisdictions and researchers draw on these outputs for their modelling needs. AEMO currently update the majority of inputs and assumptions in the IASR through the Forecasting Assumptions Update undertaken to inform the ESOO. Stakeholders were largely unaware of this update. As a result, the review considers there would be merit in making this update more prominent.

Recommendation 15: Review of the 2026 ISP
That the System Planning Working Group undertake a further review following the release of the 2026 ISP to determine if this review's recommendations have been appropriately implemented, and whether the format and purpose of the ISP report remains fit-for-purpose.

The review assessed the appropriate presentation of the ISP in light of the proposed recommendations and in response to stakeholder concerns about the potential increasing complexity and size of the publication with an enhanced scope. The current format of the ISP reflects AEMO's analytical focus on supporting decisions for actionable ISP projects along the ODP. The review's recommendations, particularly those regarding expanded consideration of CER and gas, are intended to broaden the factors taken into consideration in this regard and to enhance the value to a of the ISP to a range of stakeholders.

The review found that the ISP's purpose to deliver a genuine 'whole of energy system plan' should not come at the expense of the extensive transmission planning requirements of the publication. It is recommended that a further review is undertaken following the release of the 2026 ISP to allow lessons from the implementation of the review's recommendations to be identified, and further refinements to be made if needed.

Supporting the transition to net zero emission with a balanced approach

The benefits of this broadening of the ISP through the provision of deeper analysis and insights on the interactions between the gas market, developments in CER and distributed resources, the transmission ODP and large-scale generation and storage are significant. It will provide the evidentiary basis to ensure that opportunities to lower costs to consumers through efficient trade-offs are realised. It will also provide information for market participants and governments to inform

project developments and policy decisions to support the energy transition without stifling private investments.

The review's recommendations are aimed at enhancing the ISP development framework to ensure it serves the needs of stakeholders as Australia's energy system transitions. However, the review is mindful that the implementation of these recommendations will significantly increase the scope of the ISP going forward, and that not all changes will be able to be incorporated in time for the next ISP in 2026. The review has considered the likelihood of these limitations and recommended potential staging of changes to the ISP where appropriate, for example for modelling new development pathways for CER and distributed resources in an incremental manner as new data becomes available. To ensure that the intended benefits of the review are fully realised, AEMO must continue to be supported in the implementation of these recommendations into the future.

2. Preface

In October 2022, Energy Ministers agreed to undertake a review of AEMO's ISP, aimed at ensuring its scope continues to be fit for purpose amidst evolving energy market conditions. This decision underscored a growing interest in addressing the emerging interdependencies between the National Electricity Market (NEM) and the East Coast Gas Market.

Following this agreement, in July 2023, the Energy and Climate Change Ministerial Council (ECMC) established broad-ranging Terms of Reference for the ISP Review (the review). The Department of Climate Change, Energy, the Environment and Water (DCCEEW) was designated to administer this review, with oversight from the System Planning Working Group under the National Energy Transformation Partnership.

In conducting the review, DCCEEW and the System Planning Working Group engaged approximately 70 stakeholder organisations with interests that span the entirety of the energy system, including the market bodies, representatives of state and territory governments, energy market participants, consumer advocates and academics and public interest groups.

To support the review, two targeted rounds of stakeholder consultation (during October and November 2023) were undertaken with industry bodies, network service providers, energy consumer groups, environment and climate change NGOs and the research/academic sector. The second round of consultation invited stakeholders to provide feedback on draft high-level directions for the review, and this feedback has been closely considered in developing the final recommendations. Relevant findings from other concurrent government consultation processes on system planning for the energy transition have also been incorporated into the review where relevant. The findings of the review have also benefited from external expert advice to validate policy positions and inform consideration of limitations associated with data availability and modelling capability.

The findings of the review are presented in this report for the consideration of Energy and Climate Change Ministers through ECMC.

The review has undertaken a preliminary examination of the relevant legislative and regulatory frameworks established by the National Electricity Law and Rules, as well as the National Gas Law and Rules, assessing their interplay with the review's recommendations. The review's initial assessment indicates that while many of its recommendations are capable of implementation without the need for legislative or regulatory reform, amendments to these frameworks could provide beneficial clarity regarding expectations for the ISP. The System Planning Working Group will provide further detail on the options for the implementation of these reforms to inform consideration of this report by Energy and Climate Ministers.

3. Introduction

Australia's energy system is undergoing its most significant change in a century. This pivotal change stems from the urgent need to decarbonise our energy sources to mitigate the effects of climate change. Substantial investment in new, renewable generation technologies, enhanced transmission infrastructure, and increasing electrification is facilitating this shift. Energy consumers reasonably expect that investments to support this transformation are not only effective but efficient and consider the whole energy value chain.

Currently, the ISP primarily focuses on forecasting demand growth to understand the optimal mix of large-scale generation and storage projects to meet this demand and inform the transmission investments needed to connect these projects. However, the landscape is now shifting. There is a need to consider a wide array of interconnected factors. The increasing penetration of variable, low-cost renewable generation necessitates an increased focus on reliability, alongside a thorough assessment of peaking capacity, energy storage options and demand-side responses. These considerations must be balanced against the backdrop of rapidly shifting project delivery costs and timeframes, influenced by factors such as supply chain challenges, workforce constraints, technological advances, fluctuating resource costs, and social and environmental concerns.

A well-designed ISP can play a vital, enduring role in guiding efficient investment and planning processes across the east coast energy markets. This function is crucial for the development and implementation of energy policy in all jurisdictions. However, to be truly effective, the ISP must also adapt to the evolving policy environment and complement jurisdictional planning activities.

This review aims to determine the ideal scope, function and form of a 'supercharged' ISP, as well as assess how current regulatory and operational frameworks support its development. As outlined in the Terms of Reference for this review (Appendix C) a 'supercharged' ISP is expected to be:

> An integrated transition plan for the NEM and the East Coast Gas Market (including hydrogen and renewable gases as the industries develop) that considers the generation, storage, transmission and distribution requirements to maintain affordable and reliable energy for all consumers as Australia transitions to net zero emissions.

This report identifies a series of recommendations for AEMO and other stakeholders aimed at supercharging the development of future ISPs (Appendix A). Processes were well underway to deliver the 2024 ISP prior to the commencement of the review and, as a result, scope for progressing the desired changes in the 2024 context has been limited. The review has therefore focused on a more ambitious set of enhancements to supercharge the 2026 ISP and subsequent ISPs, including changes that will require more substantial amendments to the ISP modelling approach and potential modifications to the supporting regulatory frameworks.

However, taking into account the Terms of Reference for the review, AEMO has made significant methodological changes to the previous ISP approach to meet the supercharging objectives, within current legal and policy frameworks. The improvements made to the draft 2024 ISP that are relevant to the matters raised in the Terms of Reference are outlined at Section 7 below.

Following the publication of this report, the review process will concentrate on the implementation of the recommendations and sharing the insights gained from the review with Western Australia and the Northern Territory.

4. Enhancing considerations of key themes to 'supercharge' the ISP

The ISP was established to provide consistent projections about the location of generation and storage capacity to support transmission planning. AEMO prepares the ISP by carrying out a cost-based engineering optimisation plan that incorporates market benefits, projecting overall transmission system requirements in the NEM over the period to 2050 (AEMO 2018, p. 3).

The role of the ISP has expanded considerably since its first publication. It now exerts considerable influence across multiple aspects of the electricity supply chain, in addition to its ongoing function as an electricity transmission plan. Governments and industry stakeholders rely on the ISP to inform a broad range of activities, including transmission planning, investments in electricity infrastructure and the development of government policies and planning frameworks:

- Jurisdictional governments use the ISP to develop policies and planning frameworks that align with specific jurisdictional objectives
- Regulators and regulated businesses draw on the ISP and its inputs, assumptions and scenarios to assess the efficiency and prudence of infrastructure investments, and
- Other industry stakeholders consult the ISP to gauge the expected utilisation and profitability of potential investments in generation assets, and in technologies to support processes in energy-heavy businesses.

This increased prominence of the ISP necessitates its 'supercharging' to better serve the needs of all stakeholders. Consistent with this, the review has made a series of recommendations designed to enhance the utility of the ISP as a planning document, with critical recommendations made in regards to gas sector considerations, consumer energy resources (CER), and distributed resources.

To 'supercharge' the ISP, the review recommends that AEMO develop comprehensive development projections for gas infrastructure to facilitate better informed analysis of gas market impacts on the ODP for transmission and associated large-scale generation and storage. These projections would outline likely or reasonable plausible development paths for the gas sector given expected gas demand and market, policy and regulatory environments.

Such an approach would enable AEMO to more accurately assess whether alternatives to gas, such as electricity storage solutions, might be more cost-effective than gas investments, thereby improving the ODP. It is also expected to increase stakeholder visibility regarding these options and their electricity sector alternatives, and better inform stakeholders of the potential future state of gas infrastructure throughout the energy transition, both of which may support efficient market conduct.

These projections would differ from the 'development paths (such as the ODP or candidate development paths)[1]' in the ISP, as they would not involve any 'actionability'. The primary aim would be to identify likely or plausible development trajectories for the gas sector and focus on how these developments impact on the electricity sector.

[1] The definition of 'development path' in the National Electricity Rules 5.10.2 means "a set of projects in an Integrated System Plan that together address power system needs".

Additional analysis of gas sector developments will require AEMO to engage further with gas market participants and, where appropriate, consider how possible alternative developments would impact on the ODP for electricity transmission. For gas infrastructure, AEMO may need to draw conclusions about which investments are more or less likely at any point in time by reference to industry information, which may include making some assumptions about rational behaviour by market participants. For clarity, this would not require AEMO to draw conclusions about which investments would be preferable given gas development projections would provide only a partial analysis of the full suite of considerations that would be required to inform gas market investments.

To 'supercharge' the ISP further, the review recommends that AEMO enhance its consideration of developments in CER and distributed resources, particularly regarding how Distribution Network Service Provider (DNSP) investments and programs might influence on these resources. More granular assessments for CER and distributed resources would:

- Outline expected investments in CER and distributed resources to 2050, considering prevailing market, policy and regulatory settings
- Provide information about the basis and assumptions underpinning CER development, and
- Highlight the risks and uncertainties associated with these infrastructure projections.

In the longer term, further analysis of CER and distributed resources, will provide the underpinning necessary to make assessments of trade-offs between large- and small-scale generation and storage investments.

In addition to recommendations on gas and CER and distributed resources, the review has identified other minor enhancements to support generation and storage developments. Overall the key elements for 'supercharging' the ISP include:

- centralisation of the available information on renewable generation and storage, such as by summarising important material from other relevant documents in the ISP and/or including links to relevant documents
- the continued role of the ISP to present an ODP, including identification of actionable transmission projects
- targeted engagement with gas market participants on sector developments and implications for electricity transmission investment
- obligation on gas pipeline businesses to inform AEMO of intentions to shut down[2]
- targeted engagement with DNSPs and other stakeholders involved in CER and distributed resources to understand implications of electrification and CER and distributed resources developments for electricity transmission investment
- provision of improved information on gas infrastructure and CER and distributed resources assumptions and sensitivities considered in developing the ODP
- development of projections for firmed energy requirements by location
- analysis to support AEMO providing its most likely projections for development in the gas and CER and distributed resources sectors
- publication of development projections for the gas sector.

[2] Note this issue is already being addressed through the *Stage 2 Reliability and Supply Adequacy Reforms* where Energy Ministers agreed to proceed with an advance notice of closure requirement (see DCCEEW 2023a).

The benefits of this broadening of the ISP through the provision of deeper analysis and insights on the interactions between the gas market, developments in CER and distributed resources, the transmission ODP and large-scale generation and storage are significant. It will provide the information basis to ensure that opportunities to lower costs to consumers through efficient trade-offs are realised, while providing information for other market participants involved in making market or policy decisions to support the energy transition.

(a) Supercharging the ISP for gas

Recommendation 1: Integrating gas into the ISP

That AEMO expand its consideration of gas market conditions in the 2026 ISP. This should include but not be limited to:

- carrying out additional analysis of future gas demand and gas pricing,
- developing projections about the future utilisation of gas infrastructure
- collating information about dates of expected gas pipeline or GPG closure or conversion
- updating medium- and long-term projections of gas generator fuel costs to reflect expectations about gas market developments
- providing more information in the ISP about how ISP modelling scenarios are integrated in its gas supply model.

Working closely with stakeholders and drawing on the deeper understanding of future gas market conditions, AEMO should include 'development projections' in the 2026 ISP for the gas sector and:

- use this capability to identify and iteratively analyse the gas sector project trade-offs with electricity development needs, with the sole aim of optimising electricity infrastructure investments in the ISP;
- update the development projections to reflect the outcomes of this analysis; and
- publish the updated development projections in the ISP.

The development projections should set out AEMO's projections on how it expects the gas sector to develop (both in terms of demand, and infrastructure investment to supply expected demand) under prevailing policies and market incentives.

Why considering gas is important for the ISP

Gas is and will remain an important energy source for the electricity sector throughout the energy transformation. Gas fired power generation (GPG) is relied upon to deliver electricity when other sources of generation are unavailable. In the short to medium term, GPG will be used to support system reliability as ageing thermal generators exit or become less reliable, and while new renewable generation takes time to be developed and brought online. In the longer term, GPG will continue to provide firming capacity as an alternative source of generation during periods of low variable renewable energy production.

The future of demand in the gas sector is anticipated to change as Australia progresses towards net zero, declining overall but with higher peak day demand driven by GPG use, particularly in southern Australia (DISR 2023, pp. 1-2,7). These changes will potentially result in different gas infrastructure use patterns, which will need to be considered as part of AEMO's analysis of future energy market conditions. The review recommendations have considered this.

The review also considered the differences between gas and electricity market. The gas market operates very differently to the electricity market, primarily through private contracts with limited involvement from AEMO or regulators. Investment in gas production, pipeline and storage infrastructure is typically underpinned by long-term contracts agreed privately between buyers of gas infrastructure services and service providers.

Current level of integration between electricity and gas planning in the ISP

The ISP currently incorporates gas market data and development options as part of its analysis. These inputs are combined with scenarios about the future extent of electrification and opportunities for hydrogen. The ISP also makes predictions about the ongoing need to retain and invest in peaking gas-fired generation. These assumptions are validated against gas pipeline and field developments using AEMO's gas supply model (AEMO 2022a).

However, the costs of gas infrastructure investments that enable these assumptions are not integrated into the ISP. That is, the gas supply model validation provides some assurance that needed gas market outcomes are possible but neither confirms nor ensures that these developments are least cost or that they contribute to a least cost energy transition.

This means the gas developments needed to satisfy the ISP assumptions may not be likely or commercially feasible, meaning that AEMO is assuming gas will be available to service gas-fired power generation that the gas market might not be able to deliver at the price or quantity assumed.

AEMO also publishes two other documents on the gas industry, namely:

- the annual Gas Statement of Opportunities (GSOO), which assesses the adequacy of reserves and infrastructure to meet domestic and export needs for gas over 20 years across eastern Australia (AEMO 2023a);
- the Victorian gas planning report, which AEMO prepares as part of its role as the operator of the Victorian gas declared transmission system (DTS), which provides an assessment of supply and demand, and pipeline adequacy for the DTS over five years, and is informed by confidential forecasts provided by participants in the Victorian declared wholesale gas market (AEMO 2023b).

The ISP Review notes that recent changes to the National Gas Law (NGL) will require AEMO to consider hydrogen, biomethane and other renewable gases from 2024. The intention of the review is that all gas market analysis proposed through the recommendations of the report would likewise include consideration of hydrogen, biomethane and other renewable gases and be consistent with this change.

Stakeholder feedback

Almost all stakeholders agreed that the ISP could be improved by better consideration of gas market conditions. Stakeholders were broadly supportive of better integration of gas and electricity planning, although views on how this could be achieved varied. Stakeholders highlighted the potential insights and efficiencies that may be achieved, given:

- the importance of GPGs in the NEM
- the supply chain challenges that the gas market is facing, particularly in southern Australia.

There was also broad consensus among stakeholders that:

- co-optimising future 'development paths' for the gas and electricity sectors would be complex and costly, since the regulatory frameworks and market structures of the two sectors differ considerably
- AEMO should conduct deeper analysis regarding gas demand and how to manage a gas system where the future pattern of gas demand is expected to change significantly, with

residential demand declining and GPGs increasingly having relatively short periods of very high demand.

There was mixed stakeholder feedback regarding AEMO's role in relation to the gas sector. Some stakeholders suggested that AEMO should have a gas planning role to provide more certainty, while others, particularly gas market participants, considered that doing so may undermine the current contract carriage model for investing in gas infrastructure and hamper required investment.

Further detail about stakeholder views is at Appendix B.

Improving consideration of gas market conditions

The review agrees with stakeholders that the ISP should include a deeper and more explicit consideration of gas market conditions. It recommends that AEMO carry out additional analysis of future gas demand and gas pricing, including considering in more detail behavioural drivers affecting gas demand and future gas market conditions, and develop projections about the future utilisation of gas infrastructure. This will require AEMO to iterate its expectations about developments in the electricity sector based on possible developments in the gas market.

To support this analysis, the review recommends that AEMO collate information about the dates of expected closure or conversion of gas pipelines, and that gas pipeline operators should be required to inform AEMO about the expected closures of their pipelines. The review notes that this issue is already being addressed through the *Stage 2 Reliability and Supply Adequacy Reforms* where Energy Ministers agreed to progress a proposal for the introduction of an advance notice of closure requirement, with a rule change request proposal currently under consideration by Energy Officials.

AEMO could then draw from this information both to support the proposed development projections for the ISP and analysis and to update medium- and long-term projections of gas generator fuel costs in a manner that reflects expectations about gas market development in the GSOO[3].

These steps address stakeholder feedback that the ISP should include better consideration of gas market conditions and will enhance investor certainty and confidence around the implications of the transition for natural gas and hydrogen infrastructure. This in turn will facilitate private sector investment to support the dispatchable electricity requirements of a net zero electricity grid.

Development projections for gas

Having considered the feedback of stakeholders, including the concerns raised by some gas market participants, the review is recommending that AEMO work closely with gas stakeholders to generate and publish a set of development projections for the gas sector in the 2026 ISP. The review acknowledges developing this new capability will require an iterative process of refining the development projections over subsequent ISPs, but due to the detailed considerations involved in AEMO's complex modelling task, has avoided providing a deterministic recommendation about how the iterative process should be undertaken.

The development projections will set out AEMO's expectations on how it the gas sector may develop (both in terms of demand, and infrastructure investment to supply expected demand) under prevailing policies and market incentives.

[3] The NGL states that the gas statement of opportunities must contain assessments of medium- and long-term demand for natural gas and for pipeline services, as well as supply and pipeline capacity. See NGL Version 71, ss 91D(2)(a)-(b).

This includes using the additional analysis outlined above and considering:

- the current policies relating to the transition to net zero emissions, and the implications for gas demand
- how the economics of gas infrastructure pricing may affect the demand for gas (and therefore electricity), as well as the prospect of closure and/or transition of gas infrastructure facilities
- assessing how gas demand would be expected to change over time, given expectations within the gas market, current policies, and interactions with the electricity sector.

AEMO would then use the development projections in combination with its electricity sector modelling to iteratively identify and analyse cost/benefit trade-offs of projects across the two sectors, and the potential impacts on to support development of the ISP. In this way, the gas development projections would contribute to the transition to net zero emissions through informing market participants and policymakers about the investments that need to be made in the electricity sector, given the likely future path of the gas sector. It would also make explicit AEMO's assumptions in the ISP about the future of gas and describe a consolidated industry view of what the future in the various scenarios may look like (based on AEMO's engagement with industry), without interfering with market signals for private investment.

In practice, this would involve:

- building on the analysis already undertaken as part of the GSOO on market developments
- projecting over a longer time period, gas demand and supply conditions, which will take into account developments in the electricity sector
- setting out expectations for gas market development reflective of these future expectations.

The review expects that this recommendation will enhance investor certainty and confidence regarding how developments in the gas sector will affect and inform the transition to net zero.

The review has considered that the detail of how AEMO implements this policy direction will depend on the quality of information that it is able to collate about potential gas sector developments and the usefulness of the conclusions that may be drawn from the analysis of trade-offs between investing in gas infrastructure and electricity sector investments. However, it is expected that additional and more granular data will be collated over time, allowing for AEMO to undertake more detailed analysis.

There are a range of options available for how best to implement the review's recommendations relating to gas from a modelling perspective and the review does not recommend a specific, prescriptive approach. Further detail about modelling and the potential to implement these changes via an "integration through iteration" approach is at Section 5.

Full co-optimisation of gas in the ISP is not recommended

The review does not recommend requiring AEMO to develop a fully co-optimised ISP that includes the gas sector and identifies optimal (or potentially future 'actionable') 'development paths' for investment. This is because:

- significant improvements in relation to consideration of trade-offs between the electricity and gas sectors can already be made through the provision of information on expectations about development of the gas sector

- there are complex economic, legal and technical barriers and potential economic costs associated with the development of a co-optimised ISP that includes the gas sector, as explored further below.

This reduces the informational requirements for AEMO to develop projections, as it would require information pertaining only to planned or likely gas sector developments, rather than a range of possible future investment opportunities to ensure that the development projections are optimal or least cost. AEMO would consult with gas market stakeholders to obtain this information.

Overall, the review considers that the incremental benefits associated with formulating an ISP that is co-optimised to include the gas sector are unlikely to be justified at the present time, when taking into consideration the cost, complexity and time required to develop the co-optimised process. For this reason, the review does not recommend requiring AEMO to fully co-optimise the gas and electricity sectors in developing the ISP.

Economic barriers to co-optimising the ISP for gas and electricity.

The creation of a co-optimised 'development path' for gas infrastructure in the ISP would entail more than simply the projection of a set of potential paths for future investments, which could be provided by the gas development projections. It would involve the preparation of a 'development path' for the gas sector that is deemed to be optimal, taking into account both developments in the electricity sector and the effect of both development paths in the electricity and gas sectors.

The preparation of this list of investments would provide a clear signal that the progression of these developments is preferred by market bodies and policymakers.

The review found that preparation of a co-optimised 'development path' for gas in the ISP:

- does not address a specific market failure in the gas sector, in the way that the development of an ODP addresses a market failure in the electricity sector, and therefore may not give rise to material benefits
- would likely give rise to material harms through spill-over effects on the competitive process that determines the timing, sequencing and cost of investments in the gas sector
- may not be economically feasible without substantial reconfiguring of standard commercial arrangements, in that a gas pipeline operator has much more limited ability to recover the cost of stranded assets associated with incorrect investment decisions, compared to an electricity transmission network service provider's corresponding ability to do the same.

These implications mean that requiring AEMO to implement a co-optimised 'development path' that includes gas development in the ISP is unlikely to generate positive net benefits and may lead to unintended consequences that are detrimental for consumers. For these reasons, the review recommends the use of targeted project-based analysis as an alternative to a sector-wide co-optimisation process.

No specific market failure addressed by integrating the ISP with the gas sector

The review has found no clear evidence that co-optimising gas sector investments in the ISP would address a specific market failure.

In the case of the electricity sector, all transmission network service providers are regulated monopolies and there is a lack of contestability around the development of many large transmission

projects. This lack of contestability leads to potential market failures that may be addressed by the development of an ODP within the ISP, or by investment tests, namely:

- the potential for regulated network service providers to face incentives to make investments that expand their future revenue base at the expense of customers[4]
- the prospect of competitive harm in adjacent sectors to the extent that an alternative option may give rise to better outcomes for consumers than a transmission project.

These specific market failures are less applicable to the gas sector, where there is a contestable market for designing, constructing, owning and operating new gas infrastructure. In the gas sector, a new investment in gas infrastructure will proceed only when it can attract sufficient contractual commitment from buyers to provide some degree of revenue certainty to the proponent. It follows that this process:

- is likely to result in only those projects that offer the best balance of cost and value to the market proceeding
- can consider all alternative means of serving the required energy needs more efficiently, such as through pipeline expansions, LNG terminals or investments in gas storage.

Further, the overall environment for investment being less attractive than for electricity networks, it follows that the gas sector faces less risk of market failure arising from gas infrastructure businesses overinvesting in their gas infrastructure, as compared to electricity transmission network service providers that have strong incentives to invest in their networks.

Material harms from spill-over effects on the competitive process in the gas sector

Requiring AEMO to develop a co-optimised path that includes the gas sector risks creating adverse spill-over effects into the competitive process in the gas sector.

Gas production, pipeline and storage infrastructure are typically underpinned by long-term contracts agreed between buyers of gas and providers of services. Gas buyers and service providers enter these long-term contracts through informal but competitive processes that determine the timing, sequencing and cost of investments in the gas sector.

If AEMO were to develop an ISP that co-optimises investment in the gas sector, this may unavoidably signal that policymakers prefer to progress specific gas infrastructure developments over others. This in turn may interfere with the existing competitive investment process in the gas sector, since:

- gas infrastructure businesses proposing alternative projects that are not on the co-optimised 'development path' will have less ability and incentive to compete strongly against projects that are;
- gas infrastructure businesses that are on the co-optimised 'development path' will face less competition from other projects and will therefore face reduced incentives to control costs and remain competitive, and reduced ability to respond flexibly and innovatively to changes in circumstances if the 'development path' influences commercial and/or policy actions.

[4] The potential for such incentives depends upon the elasticity of demand of the existing customer base and the extent to which the allowed rate of return exceeds the hurdle rate of a regulated business.

Existing institutional and regulatory arrangements limit the utility of a co-optimised electricity and gas plan

Any approach to the planning of infrastructure includes risks of over-building or under-building capacity as against the needs of customers. Who decides whether investments proceeds, and who bears the risks of stranded investments, is an important factor that influences incentives over whether and when to deliver investments.

The regulatory framework for electricity transmission places decision-making for investments in the hands of regulators (to approve the recovery of investment costs) and TNSPs (to proceed with investments). Customers generally do not directly contribute to decision-making, although they may participate in community consultation processes. However, through the regulatory process, customers bear long-term financial risks if the need for the project dissipates over time.

This framework for decision-making and risk allocation means that the designation of an ISP project as actionable, combined with a favourable investment environment for TNSPs, will likely lead to the project proceeding, or proceeding more quickly.

In the gas sector, inclusion of a project on a co-optimised 'development path' would likely not affect the prospects of the project proceeding because:

- large buyers will still go through the same commercial processes in order to decide whether to contract with the project proponents to underpin the investment
- the investment environment in the gas sector more generally remains weak, as we describe above.

Unlike in the electricity sector, the ability to increase incentives to proceed with projects by passing financial risks onto end users is limited because decisions to contract with gas infrastructure businesses are made by large buyers operating in a competitive environment. There is no mechanism to recover these costs through regulated charges and, even if there were, this would be ineffective because:

- most gas infrastructure businesses are not regulated in a way such that their charges are set directly by regulatory decisions
- some gas distribution businesses are regulated this way, but not in every state and territory, and only a small proportion of gas consumption in Australia is made up of residential and commercial customers who would be connected to these networks (AEMO 2023a, p. 24).

Consequently, a co-optimised 'development path' that incorporates the gas sector would be, on its own, unlikely to reduce the risk associated with private investment in gas infrastructure.

To improve private incentives to invest in gas infrastructure, it is likely that governments will need to take on some proportion of the financial risks associated with gas infrastructure projects, such as through providing concessional financing for the construction of such projects. The review considers that it is not clear that this intervention would be necessary or would benefit energy consumers. However, to the extent that this is a consideration for policy-makers, such decisions may equally be informed by a development projection (as recommended by the review), as it could through a more fully co-optimised approach.

Targeted project-based analysis as an alternative to a co-optimised 'development path'

The review considers that the proposed targeted, project-based approach to analysing trade-offs between the gas and electricity sectors will likely deliver most if not all of the benefits that might be expected from a co-optimisation modelling exercise.

This is because the degree of overlap in the key drivers of investment decision-making between the electricity sector and the gas sector is limited. In particular, factors such as global gas prices, price caps and resource royalties, which are external to the electricity sector, are key drivers of decision-making in the gas sector.

In turn, the limited overlap between the drivers of investment decision-making in the two sectors means that a targeted project-based analysis of investment trade-offs is likely to generate similar outcomes to those that would be produced from a sector-wide co-optimisation exercise.

In addition, a bespoke project-based analysis is likely to be simpler to implement while reducing the risk of unintended negative consequences that will be detrimental to consumers.

(b) Supercharging the ISP for demand-side participation

Australia's energy transition is driving fundamental change in the nature of energy demand. The interrelated factors underpinning this change are also likely to substantially increase demand for electricity, with the electrification of transport, households and industry forecast to nearly double the demand for electricity in the NEM by 2050 (AEMO 2022a, pp. 34-35). It follows that energy efficiency, including through modified consumption patterns, must also be central to system planning if Australia is to meet the electrification challenge without increasing climate impacts and energy costs. Equally, demand-side participation, if appropriately managed, has the potential to drive efficiencies in the NEM.

The energy transition has created an urgent need for the ISP's supply-side planning to better account for, and ultimately be integrated with, demand-side participation. Perhaps the most critical component of demand-side participation is orchestrated CER. CER includes consumer owned resources that generate or store electricity, including flexible loads that can alter demand in response to external signals. Examples include rooftop solar, batteries, electric vehicle chargers, and controlled loads such as water heaters and air conditioners. The review has adopted the term 'distributed resources' to refer to generation and storage assets that are installed within the distribution network (i.e. in front of the meter), such as community batteries.

As highlighted by Term of Reference 1(b), the recent and rapid growth of CER and distributed resources has been a major factor in the changing nature of energy demand. Given the emerging nature of CER and distributed resources, there is scope to enhance the way these matters are considered in the ISP. While the ISP assumes that there will be a rapid consumer-led transformation of the energy sector, it does not identify the steps needed to realise the transformation or trade-off the relative costs and benefits of unlocking additional tranches of orchestrated CER and distributed resources relative to other generation, storage or transmission investments.

A common theme in the stakeholder input to the review was that improved analysis of demand-side participation opportunities may lower the future cost of energy provision and prevent overinvestment in the electricity transmission network.

This section sets out the case for reforms that would make an important contribution to supercharging the ISP, including:

- improvements to the information that the ISP currently provides in relation to demand forecasting
- the development of a framework, methodology and guidance material to support DNSPs and jurisdictions to develop projections and undertake analysis in a consistent manner to support the ISP's development
- the inclusion of a statement on the expected development of CER and distributed resources in the 2026 ISP
- the development of an approach (based on identifying the appropriate value of orchestrated CER) for trading off the cost of unlocking increasing tranches of orchestrated CER and distributed resources against other investment options.

The review considers that the implementation of these recommendations will transform the way that the ISP currently treats demand side participation by providing a more integrated analysis of the risks and trade-offs between electricity transmission, generation, storage, CER and distributed resources. This will better enable the ISP to promote the least cost delivery of electricity, in the long-term interests of consumers. Of equal importance, these recommendations will help to realise the vision of the ISP as a 'whole of system plan' capable of supporting Australia's journey towards net zero.

Improving the assessment of demand-side factors in determining operational demand

As AEMO has observed in its 2020 and 2021 Forecast Accuracy Reports, it has under-forecasted distributed solar PV capacity in some NEM regions, which in turn has impacted the accuracy of its forecasts of consumption, minimum and maximum demand (AEMO 2020, pp. 3-4; AEMO 2021, pp. 3-4).

AEMO has since improved its methodology as part of its 2021 Electricity Statement of Opportunities (ESOO) forecast. It now has well-established measures and processes in place aimed at ensuring the ISP's demand forecasting (and that of its supporting documents) is as accurate as possible. This includes AEMO's consultation on its Demand Side Participation Forecasting Methodology, which concluded in December 2023 (AEMO, 2023c).

The review is also conscious of the findings of the external expert review of AEMO's 2020 Forecasting Accuracy Report Methodology and 2022 Forecast Accuracy Report (and its predecessors). In this review, the University of Adelaide concluded that the quality of AEMO's accuracy reporting methodology and annual reports are both very high and noted that AEMO had implemented several recommendations from the earlier 2019 review (Bean & Ross 2023, p. 2).

While the review is mindful of AEMO's recent and ongoing improvements to demand forecasting, the ISP could be enhanced by a greater focus on how demand uncertainty affects development path outcomes, particularly given the rapid evolution and technological opportunities expected through CER and distributed resources. The review envisages that this would involve AEMO undertaking targeted stakeholder engagement (including but not limited to DNSPs) to ensure the assumptions underpinning CER and distributed resources projections reflect a comprehensive view of initiatives affecting their uptake, and the implications for operational demand, e.g. by including consideration of the impact of policies to promote energy efficiency on operational demand in the ESOO.

The review has identified that there is scope to improve the ISP's analysis of opportunities to enhance demand-side participation in the market, which may in turn reduce the future cost of providing energy. Consequently, the review considers that AEMO should also analyse how

electrification and CER and distributed resources development sensitivities affect operational demand projections. This could be considered directly in the ISP modelling, where appropriate.

Such analysis can benefit from support from jurisdictional governments and DNSPs, each of which should seek to support AEMO's demand forecasting role through the provision of available information about policy developments and the preparation of scenarios and projections about industrial and consumer electrification demand in NEM sub regions. This should be undertaken in a manner consistent with an AEMO-defined framework, which should include to support jurisdictions to develop consistent scenarios and projections and draw on them to inform their own demand forecasts.

The review also heard from several stakeholders that the role of the ISP should be expanded into distribution network planning. While there may be a certain first-principle logic to this suggestion, the review is mindful that this would present a significant computational challenge from a modelling perspective and considers that DNSPs should continue to be responsible for distribution network planning at this time. However, there also is merit in better integrating the ISP with existing DNSP annual planning processes, which would improve the evaluation of CER and distribution networks. In particular, the review offers the observation that there may be value in driving consistency in assumption and scenario setting between the ISP and distribution network annual planning processes, particularly where separate market modelling is undertaken.

Currently, AEMO assumes that distribution networks will be appropriately augmented to facilitate the level of CER penetration and operation in any given planning scenario. However, whether DNSPs will achieve those levels through their annual plans is not specifically evaluated as part of the ISP. AEMO recognises that the growth of CER creates complex dynamics that need to be well understood and planned for. It has established a working group with DNSPs and Energy Networks Australia to strengthen the links between the ISP and distribution network planning processes (AEMO 2022a, p. 100).

The ISP also contains relatively little information on the assumptions underpinning its CER forecasts, particularly in terms of distribution network development, tariff design or other policies or market incentives. For these reasons, the review considers there may be benefit in pursuing a requirement for the ISP to analyse how distribution investments or programs impact CER development, and so the ODP for transmission.

The review considers that additional analysis would enhance the credibility and transparency of AEMO's CER forecasts and this would best be achieved through the following recommendation.

Recommendation 2: Demand forecasting in the ISP

That AEMO enhance demand forecasting in the 2026 ISP by:

- Undertaking targeted stakeholder engagement (including but not limited to DNSPs) to develop more robust assumptions underpinning CER and distributed resources projections in the ISP. The new assumptions should reflect a comprehensive view of initiatives affecting CER and distributed resources uptake and evaluate the implications for operational demand.
- Analysing how electrification and CER / distributed resources development sensitivities affect operational demand projections and consider these directly in the ISP modelling where relevant.
- Subject to available information, analysing how DNSP investments, programs and annual plans, may impact CER and distributed resources development, and thereby the ODP for transmission, and include these findings in the ISP in order to send clearer signals to inform DNSP planning.
- Developing a framework, methodology and guidance material to support DNSPs and jurisdictions to develop projections and undertake analysis in a consistent manner to support the ISP's development.
- Including a statement in the 2026 ISP, and subsequent ISPs, aimed at informing the market and policy makers about the expected development of CER and distributed resources. The statement should be sufficiently detailed to provide a baseline for the identification of opportunities to promote the uptake of CER and distributed resources within each jurisdiction.

Recommendation 3: Jurisdictions' support for AEMO's demand forecasting

That jurisdictions and AEMO work together to ensure the provision of key inputs for the 2026 ISP that includes information about relevant jurisdictional policy developments and scenarios and projections about industrial and consumer electrification demand in NEM sub regions.

Further opportunities to optimise CER and distributed resources

CER and distributed resources have been key drivers of changes in grid energy demand in recent years. Like other demand-side resources, CER has the capability to reduce operational demand at times of high wholesale prices or in response to system security issues, such as through customer load reductions or generation from customers' embedded generators (e.g. household batteries, community batteries, virtual powerplants and electric vehicles (EVs)). CER and distributed resources involve both consumers and industrial users making customer side of the meter (also known as behind-the-meter) investments in on-site generation and storage.

The review is mindful that AEMO currently considers several other demand-side factors, in addition to CER and distributed resources, in developing its operational demand forecasts, including:

- estimates of business and residential energy efficiency (drawn from analysis by consultants which take into consideration federal and state-based energy efficiency programs, including the National Construction Code and building disclosure schemes)
- expected changes to heating and cooling load due to climate change
- expectations about changes in large industrial loads (formed on the basis of surveys and direct engagement with the owners and operators and including consideration of investments in energy efficiency or electrification).

While the 2022 ISP includes consideration of CER and distributed resources, it does so from the perspective of forecasting the impact of CER and distributed resources on operational demand from the wholesale electricity market.

The economic modelling process used to produce the ISP's ODP incorporates CER and distributed resources as an exogenous variable. Based on stakeholder input and expert advice, the review

considers that this is a limitation of the current ISP. Specifically, the ISP takes a scenario-based approach towards CER investments, which involves:

- adopting CER projections as fixed inputs
- exploring a wide range of assumptions on those CER projections and carrying out additional sensitivity analysis
- identifying the materiality of any resulting impacts on the transmission ODP.

However, modelling future CER investments in this way is unlikely to adequately consider the trade-offs between small-scale investments in CER against investments in renewable generation and storage, the wholesale market, distribution networks, and transmission infrastructure. This is problematic from the perspective of the ISP's ongoing scope as a national transmission plan, but also presents challenges for stakeholders who rely on the ISP to assess energy market conditions. For example:

- policymakers rely extensively on the ISP for jurisdictional planning, such that an analysis of the trade-offs between small-scale CER investments and large-scale energy infrastructure investments may have an impact on the development path for REZs.
- DNSPs and the Australian Energy Regulator (AER) consider the ISP's projections when assessing the efficient distribution network capital expenditure required to support Australia's energy transition.

Accordingly, the ISP should, ideally, include more detailed analysis of:

- the opportunities for demand-side participation
- how network investments affect the availability of CER to the energy market
- the opportunity to avoid large-scale generation/storage and network investments through enhancing CER.

Such analysis would promote least cost delivery of electricity, in the long-term interests of consumers.

Consequently, the review considers that there is scope to build on Recommendation 2 by developing a framework and methodology for the progressive optimisation of CER and distributed resources, beginning in the earliest practicable ISP. The review considers that such an approach should include, but need not be limited to:

- Working with DNSPs to progress the orchestration of CER and determine how outcomes from the ISP can best be integrated into DNSP planning processes to optimise CER and distributed resources.
- Obtaining the required data to meaningfully assess the capacity of distribution networks to connect CER across the NEM, how that capacity will change over time, and the cost to increase that capacity.
- Identifying the appropriate value that the orchestration of CER and distributed resources can deliver for the NEM by determining the 'trade off' cost of unlocking increasing tranches of orchestrated CER and distributed resources.

This approach is expected to provide benefit by supporting consequential investment and planning by DNSPs or by jurisdictions to 'activate' the corresponding level of orchestration of CER investments by consumers, subject to more granular assessments by the DNSPs.

This approach is distinct from a process of co-optimisation through inclusion of CER and distributed resource assets as investment options in the ISP to find the least-cost solution. The review agrees with AEMO's assessment that such an approach may create a false sense of accuracy given the inherent uncertainty about consumer behaviour and the various factors that drive it.

A critical consideration for implementation of the proposed approach is the availability of appropriate data, delivered in a consistent format across the NEM. DNSPs may already have, or be developing, some of this data, however such data is likely currently only available in forms that are tailored to the specific commercial needs of individual DNSPs. The recommendation of the review is designed to allow for consideration of appropriate data availability and identification of any necessary actions to obtain it.

Practically, the recommended optimisation would necessarily be at a high-level initially (e.g. by NEM region initially, or potentially through the identification of CER/distributed resources 'zones' in an equivalent way to REZs). The resultant modelling assumptions would need to be sufficiently representative to test whether there are opportunities to trade-off between incremental CER/distributed resources, given expectations about the baseline development of CER/distributed resource development, and large-scale energy infrastructure investments. The implementation of this reform option would also depend on AEMO refining its modelling methodology, over time, to incorporate, to an appropriate degree, CER and distributed resources, including developing appropriate inputs and assumptions. This can be expected to take some time.

For these reasons, the review considers that an incremental approach represents the most prudent and practical medium- to long-term option for better integrating demand-side participation in the ISP. The review considers that this should necessarily commence with development of a framework and methodology for the progressive optimisation of CER and distributed resources and should be subject to detailed and comprehensive stakeholder engagement, particularly with DNSPs, to help determine how best to deliver the new methodology.

Recommendation 4: Optimising CER and distributed resources
That the System Planning Working Group and AEMO work with the relevant stakeholders, including DNSPs, to develop a suitable approach to trade off the cost of unlocking increasing tranches of orchestrated CER and distributed resources against other investment options for use in the earliest ISP practicable.

Given the urgency of the need for the ISP to better account for demand-side participation, the review considers that it is crucial that the implementation of such a framework becomes a central and ongoing feature of the ISP at the earliest practicable opportunity. Noting that the proposed approach may also be subject to unanticipated barriers, the review further recommends that the System Planning Working Group report back to ECMC on progress made against Recommendation 5 and any additional actions required to support its implementation in full.

Recommendation 5: Review progress in optimising CER and distributed resources
That the System Planning Working Group report to ECMC on progress made in implementing Recommendation 4 following the 2026 ISP.

(c) Supercharging the ISP for generation and storage

This section of the report considers enhancements to the ISP's analysis to address aspects of two themes from the Terms of Reference for the review (1 (d) and 1 (e)): incorporating the supply of

affordable and reliable renewable electricity generation and storage to meet demand and decarbonisation goals, and the planned, orderly transition from coal generation.

Australia's energy generation and storage mix is undergoing a significant transformation, supported by record renewable energy installations, withdrawals of ageing thermal generators, and government interventions aimed at increasing the pace of the transition, including the Commonwealth Government's 82 per cent renewable energy target by 2030.

The balance of renewable energy entry into the NEM and the withdrawal of thermal generators needs to be carefully managed in the interest of maintaining affordable and reliable energy for consumers. Policy interventions and programs will incentivise development of renewable energy at a greater scale and pace, but this is likely to put more pressure on existing, dispatchable thermal generators. This may result in thermal generators exiting the system earlier than expected. Adequate firmed renewable energy needs to be online before thermal generation capacity exits the system.

The review specifically considered whether it was appropriate for the ISP to be more explicit about the location of where and when generation and storage developments are needed, and the technology types required to ensure an orderly transition from coal generation. In response to stakeholder feedback, the review also considered whether the ISP should give greater consideration of system security constraints when modelling the optimal mix of generation, storage, transmission and other infrastructure. This review has identified three areas of enhanced analysis and information that should be included in the ISP to assist market participants in developing generation and storage projects including deeper analysis of thermal generation shutdowns, enhanced analysis of system security constraints, and improved locational information in the ISP.

Deeper analysis of coal-fired generation shutdown scenarios

AEMO estimates that some coal-fired generation would need to close earlier than currently announced to achieve the emissions reduction objectives in the 2022 ISP Step Change scenario. In that scenario, up to 60 per cent of coal-fired generation capacity is estimated to withdraw by 2030 to reduce the emissions intensity of the NEM, with a mixture of renewable generation, storage, transmission capacity and firming gas developments required to replace the retiring generators (and support growing customer loads, including growth due to electrification) (AEMO 2022a, pp. 10-12). Only 20 per cent (5 GW by 2030) of coal generator withdrawals have been announced to date, with the closure dates of seven coal generators having been brought forward in 2022.

In the Step Change scenario, the 2022 ISP forecasted the need for over 125 GW of additional variable renewable energy by 2050 to meet demand as coal-fired generation withdraws. The 2022 ISP forecasts an additional 48 GW required to meet demand by 2030 under the same scenario, which is understood to be consistent with the 82 per cent by 2030 renewable energy target. It has been observed that the growth in intermittent renewable generation has been more rapid compared to the corresponding growth in storage, which risks creating system reliability and security problems as dispatchable thermal generators retire (CSIRO 2023, pp. vii-viii). This emphasises the importance of the role of the ISP in supporting the orderly shutdown of thermal generation and sending the appropriate signals to inform investment in renewable generation and storage to maintain system reliability and security.

Although the review is aware that AEMO undertakes analysis to understand the impact of earlier coal generator closures on the ODP (AEMO 2023d, pp. 35-36), the review considers it is important for AEMO to analyse explicitly the impact of thermal generators retiring earlier than announced so that the risks and uncertainties across the market can be better understood and managed. In so doing, it would be helpful if AEMO could include a more prominent explanation of the wider energy sector implications of earlier coal generator closures (such as implications for additional or earlier investments required for firming capacity), in addition to providing assurance about the implications for the ODP and identified actionable ISP projects. This will allow for direct consideration of how investments in firming capacity might assist with managing the risks of thermal shutdown that might arise over the course of the energy transition.

Recommendation 6: Deeper analysis of coal-fired generation shutdown scenarios

That AEMO analyse the sensitivity of the ODP to alternative coal-fired generation shutdown scenarios, allowing for consideration of facilitating investments in firming capacity, e.g., storage, and including this more prominently as part of the ISP narrative, subject to appropriately managing commercial sensitivities.

Improving the information available in the ISP

The review considered whether there is a need for the ISP to provide more explicit direction as to where renewable generation and storage should be developed, beyond the information that is currently available to NEM participants in the ISP. The review is mindful that renewable generation and storage assets are mostly owned, operated and funded by private investors and that undue market interference in relation to this issue may risk stifling private investment.

The ISP currently includes a projection of the generation and storage capacity needed over the modelling horizon to 2050 to meet estimated demand, with the modelling of each scenario identifying the generation and storage technology needed to deliver the least cost pathway for the development of the NEM under different market conditions. This modelling includes projections of generation and storage by REZs, and so provides some indication of the location of those developments at a sub-NEM region level.

AEMO also publishes information on renewable generation and storage needs across other documents outside the ISP including the ESOO and the Medium Term Projected Assessment of System Adequacy (MTPASA). The annual ESOO is an input to the ISP process and provides a 10-year outlook for the electricity sector, including identifying whether there may be reliability concerns in each NEM region, in specific years over the modelling horizon, and the additional generation and storage build requirements needed to address adequacy concerns. The weekly MTPASA assesses the adequacy of expected electricity supply to meet demand across the two-year horizon through regular assessment of any projected failure to meet the reliability standard. This assists market participants' decisions about supply, demand and transmission network outages over that period.

Transmission Annual Planning Reports also provide NEM participants with information they need to make informed connection decisions and as a consequence, more information on optimal locations for generation and storage developments to be pursued to avoid delays with transmission connections. The information in these reports also assist non-network service providers in offering non-network solutions to identified transmission needs.

There have been a range of recent policy actions relevant to the market for generation, storage and firming infrastructure, reflecting a concern that current market signals are insufficient to deliver the generation and storage needed to support the energy transition. The review also notes that a value of emission reduction once available and applied to the ISP development, is expected to improve the signals provided to NEM participants to drive investment in renewable generation and storage.

In addition to direct actions to accelerate generation and storage projects, in February 2023, Energy Ministers agreed to immediately implement 'enhanced information' reforms to provide east-coast market participants with better information on the optimal location for new generation and storage. Following this decision, the then Energy Security Board in June 2023, recommended AEMO develop an enhanced locational information report that will draw from and consolidate existing sources of locational information in an annual report publication and accompanying data set.

The review considers that the information available in the ISP and other planning documents provides an adequate base to support NEM participants to develop generation and storage projects. For the purpose of consistency, the review considers that there is merit in ensuring the available information to support renewable generation and storage developments is summarised and drawn out in the ISP, including that of the important material from other relevant documents, such as the forthcoming Enhanced Locational Information report (due for release in 2024). At a minimum, there would be merit in cross-referencing relevant information.

Recommendation 7: Improving the information available in the ISP

That AEMO centralise the available information on renewable generation and storage, such as by summarising important material from other relevant documents in the ISP and/or including links to other relevant documents in a manner that facilitates easy access for stakeholders. This may be implemented via reference to the Enhanced Locational Information Report, if appropriate.

Enhanced analysis of system security

In response to stakeholder feedback that AEMO should include greater consideration of system security constraints in identifying the optimal mix of generation and transmission, the review has considered this issue further and recommends some possible enhancements.

The review observes that AEMO already integrates system security constraints into its ISP methodology, particularly in the 'engineering assessment' stage. This stage iteratively and holistically tests and validates the outcomes from the 'capacity outlook' and 'time-sequential' models, including aspects such as synchronous generation retirements and the size and location of new builds, using power system security assessments (AEMO 2018, pp. 34-35). However, the review also notes that the cost benefit analysis does not consider changes in ancillary service costs, which, while challenging to quantify and historically not material compared to project costs, are increasingly important in the context of future system security. These costs may be considered by transmission network service providers in subsequent Regulatory Investment Tests for Transmission (RIT-T) for actionable projects (AEMO 2023, pp. 70).

The review suggests AEMO consider the merit of an expanded analysis of ancillary service costs and their long-term implications, as well as a more nuanced exploration of system security trade-offs in various future scenario models.

This recommendation is in line with the AEMC's recommendation regarding a transitional plan for system security. This plan, as proposed by the AEMC, 'would outline an explicit pathway of the steps AEMO is undertaking to evolve its engineering knowledge and manage security in a low- or zero-

emissions system without needing to rely on type 1 transitional service contracts' (AEMC 2023a, p. 22).

Overall, the review considers AEMO's approach to date to be understandable given computational and data constraints. Nevertheless, the review highlights the growing importance of system security costs and the need to recognise these when considering the optimal mix of generation and transmission investments. The review also points to some uncertainty in the investments required to meet system security obligations. Consequently, it recommends that AEMO explore ways to give greater consideration to system security trade-offs in determining the optimal mix of generation, storage, transmission and other infrastructure.

Recommendation 8: Enhanced analysis of system security

That AEMO give greater consideration of system security trade-offs for assessing the optimal mix of generation, storage, transmission and other infrastructure.

(d) Emissions reduction considerations

The Terms of Reference require the review to consider AEMO's current approach to inclusion of emissions reduction targets in the ISP, including how it responds to legislative requirements such as the recent change to the National Energy Objectives (NEO) and policy objectives announced at Commonwealth, state and territory level (theme 1(a)).

The ISP has historically used carbon budgets to inform its scenario development, with the economic value of emissions reduction implicit in the ISP's modelling (i.e. the value is not allocated to individual projects as they progress through regulatory approval processes).

The *Statutes Amendment (National Energy Laws) (Emissions Reduction Objectives) Act 2023* (assented to on 21 September) amended the NEO to include an emissions reduction component. The change will require market bodies to consider emissions reduction together with the pre-existing limbs of the NEO (i.e. price, quality, safety, reliability and security) when making regulatory decisions.

The inclusion of the new emissions reduction component within the NEO is also expected to change the way in which the emissions reduction targets of the Commonwealth and jurisdictions are considered in future ISPs. The review notes that the inclusion of the emissions reduction component within the NEO will better incentivise projects that support decarbonisation in the ISP due to the explicit requirement that emissions reduction be considered.

As the Australian Energy Market Commission's (AEMC) recent draft rule determination states, a value of emissions reduction is expected to be an important tool for operationalising the new emissions reduction objective in the ISP because it will enable appropriate trade-offs between emissions reduction and the other limbs of the energy objectives. Noting that the effects of these amendments are yet to be fully realised in the ISP, no further recommendations regarding emissions reduction are proposed at this time (AEMC 2023b, p.3).

5. Data and modelling capabilities

As directed by the Terms of Reference, the review has analysed the ISP development framework and considered AEMO's data and modelling capabilities in the context of an expanded and 'supercharged' ISP. To do so, it was necessary for the review to first understand the capabilities of AEMO and commissioned parties (CSIRO & Climateworks) in the context of the current ISP framework, to identify any potential gaps and improvements that might be made within the ISP's current scope. The review then considered the possible modelling and data augmentations needed to implement the review's recommendations for integrating gas and demand-side planning into

future 'supercharged' ISPs. In conducting this assessment, the review has focussed on the ISP's data sources, models, and underlying modelling capabilities. Consultations with AEMO, CSIRO and Climateworks were undertaken to confirm current ISP processes, potential opportunities and limitations of an expanded 'supercharged' ISP scope, and to inform the assessment and findings in this section of the report.

(a) Data and modelling improvements within the current ISP focus

The primary objective of the ISP is to optimise value to end consumers by designing the lowest cost, secure and reliable energy system capable of meeting the emissions trajectory defined by policy makers at an acceptable level of risk. AEMO does this by using a suite of optimisation models, which aim to determine the least cost set of options that deliver the desired outcomes.

Optimisation techniques are well suited to the system planning problem as it can mimic the intention of energy market design by incorporating representations of actual costs in a system, while solving large problems with many variables and constraints, enabling a detailed representation of energy market operations and investment considerations.

ISP data and modelling components

The current ISP model contains a number of major data inputs from the Multi-sector Modelling, GenCost, CER and EV Projection reports produced by CSIRO and Climateworks. The inputs generated from these reports provide crucial information on electrification and hydrogen demand (from the Multi-sector model), generator cost (from the GenCost model) and CER and EV uptake (from the CER/EV models). The data sources are then used as inputs into the ISP Main models, which consist of the capacity outlook modelling, time-sequential modelling, and the engineering assessments. As a final step, AEMO then undertakes a cost-benefit analysis to test the alternative development paths emerging from the capacity outlook (and time-sequential models) to determine the ODP. The cost-benefit analysis and multi-criteria assessment produces the development path that minimise cost over the 'long-term outlook' under different scenarios.

This review has considered both the inputs to the ISP, as well as the ISP modelling itself. The ISP does not include the GSOO and ESOO, although there is shared data (e.g. demand forecasts) between these processes, and some outputs of previous GSOOs and ESOOs are used in the ISP.

A map depicting these key inputs is at Figure 1, although note that this map is purposefully simplified to provide an overview of the ISP process only.

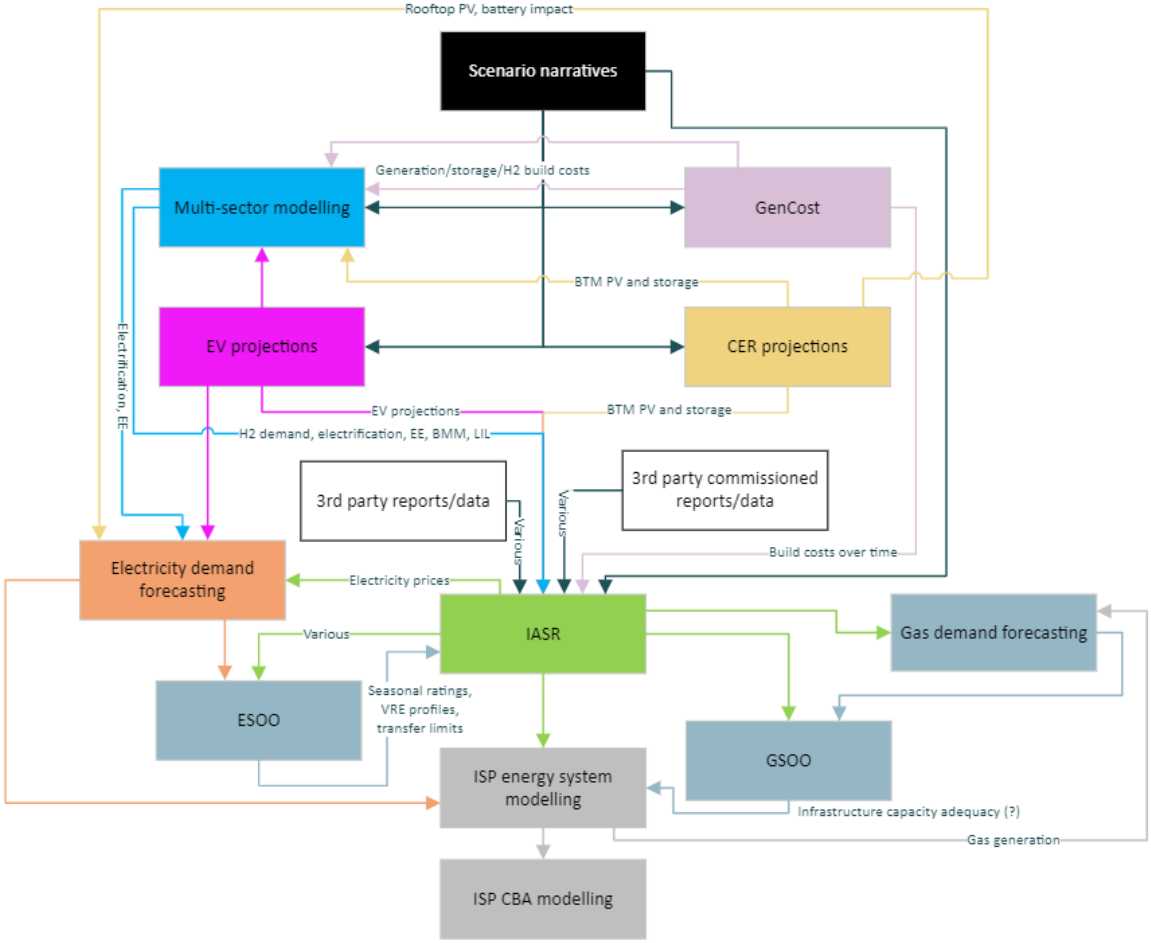


Figure 1. Simplified map of major ISP modelling components (Frontier Economics, 2023)

Limitations of the current approach

While the review considers that there are limitations to the current ISP data and modelling approach, these limitations appear to be intrinsic to the task of modelling modern power systems and the inherent trade-offs and simplifications involved. Optimisation techniques are not unlimited in capacity and the structure of the ISP process reflects these practical limitations. This is due to both the breadth and complexity of the ISP, as well as the limits on the computers and solvers for the modelling process. The ISP process therefore requires considerable expertise, effort and judgement to identify where simplifications should be applied and to determine where the exogenous treatment of components are necessary so that the ISP retains sufficient granular detail while ensuring the model can be solved within a reasonable timeframe.

Additionally, even within the current ISP scope, there are emerging energy trends that mean power system planning has become increasingly complex. There are now more supply side options, with more complex characteristics to be modelled. For example, the increasing penetration of utility scale wind and solar generation has resulted in significant intermittency being introduced to the NEM. The demand-side is also rapidly evolving and will become an increasingly important influence on the least cost development pathway. The increasing penetration of CER and distributed resources changes the level, shape and responsiveness of demand and has implications for distribution systems. The review found that the existing ISP process does incorporate forecasts for many of these emerging trends in energy markets – including CER, EVs, electrification and hydrogen. However, these forecasts are not

currently developed in an integrated fashion. Some stakeholders also noted that the forecasting horizons used in both the ESOO and GSOO (two inputs noted above), are inherently shorter than the medium-term forecasts underpinning the ISP.

Simplifications and trade-offs

To reduce the inherent complexities in the model, the ISP currently employs simplification techniques. AEMO have designed these techniques to reflect their view on the variables of interest and the structural relationships between these variables.

Simplifying representations of time is a common way of reducing the complexity of a linear programming problem so that more can be considered in a given model. Another such technique is to treat elements (such as demand, hydrogen, natural gas and CER) of the energy system as exogenous. Treating these components as exogenous vastly simplifies the modelling but means the outputs of the model may be limited in how they respond to an increasingly volatile energy system. This can cause internal inconsistency between assumptions coming into the model and outputs coming out of the model.

Despite the resulting limitations, the review found that exogenous treatment of inputs was necessary in some instances, such as with customer behaviour. This is because least cost methodologies (Multi-sector modelling, GenCost, ISP Model) and price-based methodologies (DER and EV modelling) cannot be combined into a single model. Price-based methodologies where energy prices (not costs) are used to estimate customer behaviour have an objective (to minimise customer costs) that differs to the system planner's objective (to minimise system costs). Therefore, it makes sense that models to forecast customer behaviour based in part on energy prices are implemented separately from models that optimise system least costs.

Potential improvements within the current ISP scope

Fundamentally, the existing ISP process is primarily focused on the modelling required to inform the transmission plan that is developed. The methodology and approach used for the ISP evolved before changes occurred to electricity markets resulting in utility-scale electricity generation and electricity transmission outcomes being increasingly dependent on, and integrated with, outcomes in other parts of the energy market.

The review found that a more integrated treatment of some key elements of the broader energy market (such as CER, EVs, electrification and hydrogen), which are currently treated as exogenous assumptions, may result in more robust ISP outcomes. Under the current approach, the logical place for this further sectoral integration is CSIRO's Multi-sector model. However, there are questions about whether this model can reasonably capture key drivers of outcomes in energy markets given the level of detail included in the model.

As outlined above, consumer decisions are incorporated in a number of separate models which are not meaningfully integrated with the ISP Main model, although some iterations occur from year to year. Currently, within the development of individual ISPs there is little or no attempt to iterate between outcomes from the different models and from the ISP Main model to ensure that the outcomes are aligned. Such iteration has potential implications for timelines for the ISP development process. However, the review suggests that due consideration should be given to adopting this iterative approach in the future, particularly as computational capabilities expand and new data is made available.

The review has identified a number of potential gaps where further data or modelling capability may improve outcomes under the ISP with respect to its current scope. In particular:

- Customer load data in the public domain remains an area with significant potential for improvement. CSIRO use Smart Grid Smart City data in forecasting distributed resources, because it contains a number of categorical variables (e.g. number of occupants in residence; customer gas data) as well as load traces. However, this data is out of date, patchy and only relates to NSW. Better data on consumer behaviour – including consumption by fuel/appliance over time, in different regions, with tariff information and categorical variables would significantly assist efforts to better forecast demand-side behaviour. There is likely to be similar opportunity to improve data inputs for EVs.
- Network/retail tariff evolution: data on the changing structure of network and/or retail tariffs (including cost-reflectivity, typical structures e.g. time-of-use, and emerging structures e.g. solar soak) have the potential to significantly impact how consumers use energy, and may be more important in determining the outcomes of ISP modelling than the level of future retail prices. There may be opportunity for this data to be consistently and systematically incorporated into the ISP process, within its current scope.

In order for the ISP to continue to meet the needs of the broad range of stakeholders involved in the energy transition, it is important that it is a genuine whole-of-system plan that accounts for the increasing integration that is occurring within broader energy markets. This level will be difficult to achieve under the current scope and therefore further consideration of data and modelling requirements for an ISP with an expanded 'supercharged' scope is required. These considerations are outlined in detail in the following section.

(b) Data and modelling considerations for implementing the 'supercharged' ISP

The review's recommendations to 'supercharge' the ISP through the integration of electricity and gas planning, and greater consideration of demand-side dynamics, will have a number of data and modelling implications.

The review has considered what additional requirements the supercharged scope will place on AEMO, and the opportunities and limitations involved in implementing these changes from a data and modelling perspective, noting the increased complexity that would be involved in integrating the gas, CER and distribution sectors into the ISP modelling. A consistent finding is that the extent to which the recommendations will be able to be implemented will depend on data availability. There remains merit in efforts to expand the range of data sets available in a consistent and useful manner.

The review recognises that there are a range of options available for how best to implement the recommended changes, and that there will be key trade-offs involved in the new modelling, for example between the level of granularity that can be achieved for electricity and transmission planning as a result of integrating other sectors. Recognising AEMO's modelling pre-eminency, the review has avoided taking a determinative approach to how recommendations should be implemented. That being said, advice to the review has indicated that there are no insurmountable barriers to implementing the recommendations, particularly in the context of the review's recommended approach of undertaking further detailed work with AEMO and DNSPs to identify opportunities to optimise CER and distributed resources.

Data and modelling for electricity and gas integration

As outlined in Section 3(a), the review recommends that AEMO improve its consideration of gas market conditions in the ISP, including gas demand and expected infrastructure utilisation, and

publish development projections for the gas sector that outline AEMO's expectations of how the sector will develop. AEMO would then use the development projections in combination with its electricity sector modelling to iteratively identify and analyse cost/benefit trade-offs of projects across the two sectors, to support development of the ISP, with the sole focus on identifying optimal electricity sector investments. This would not involve the development of co-optimised 'development paths', thereby avoiding the need to develop highly robust and detailed project costings. The review's recommended approach is likely to be best implemented via integration of the gas modelling with the outcomes from the ISP Main via iteration ("integration through iteration") and the publication of gas development projections aimed at informing the electricity optimal development path.

Integration through iteration ensures that key outputs from the ISP of relevance to the gas sector (such as GPG demand) are included in gas modelling and key outputs from gas modelling of relevance to the ISP (such as the delivered gas price) are reflected in the ISP Main. The review considers that this approach is practical for implementation for the 2026 ISP (with appropriate resourcing) as AEMO already have the modelling tools and experience to make this approach viable. However, it is recognised there may be need to retain flexibility to further explore the best way to implement this integration.

As discussed previously, some additional data will also be required to support the new gas market modelling proposed by the review, and it is expected that as better quality and more granular data is collated over time, the analysis will be able to become progressively more detailed. AEMO will also need to engage more closely with industry to understand the future direction the industry is going in, including changes in demand and potential future gas projects that it should consider in producing the development projections. This may necessitate further changes to AEMO's information gathering and modelling capability.

All gas market analysis proposed through the recommendations of the review would include consideration of natural gas, as well as hydrogen, biomethane, and other renewable gases. However, supercharging the ISP through the integration of electricity and hydrogen is likely to be more complex and time-consuming than for natural gas. The review considers that in the absence of further certainty around hydrogen policy and the associated development of hydrogen infrastructure, it is possible that the integration of electricity and hydrogen modelling for the 2026 ISP might not result in clear planning outcomes. However, as this sector may develop rapidly, the capacity to investigate the interaction between electricity and hydrogen is expected to become increasingly important in the near future.

If AEMO will be undertaking dedicated efforts to build its modelling capability for gas markets, it will be important that AEMO also consider the increasing future role of hydrogen and build the appropriate level of capability for hydrogen modelling accordingly, and apply this to the earliest feasible ISP. It would be appropriate for AEMO to lean on the DCCEEW-commissioned hydrogen infrastructure and demand modelling to date completed under the National Hydrogen Infrastructure Assessment and Review of the National Hydrogen Strategy, given clear linkages to the energy system and energy system transition.

Data and modelling to integrate electricity supply-side and demand-side

As outlined above, the current ISP modelling treats the demand-side of the NEM as exogenous and focuses on the supply-side of the NEM, with an emphasis on transmission planning as the key output. However, as the energy transition is driving fundamental change in energy demand, there is an

urgent need for the ISP's supply-side planning to be better integrated with demand-side considerations, including CER and distributed resources. The review recognises that driving a full integration of supply- and demand-side factors would represent a significant change in approach and would require new and different data inputs and modelling methodologies. Feedback from stakeholders, including AEMO, suggests that the data environment around orchestration of CER is evolving.

As a result, the initial focus of the review's recommendations is on improving data inputs for AEMO's demand forecasting and providing a more detailed narrative for CER and distributed resources in the ISP. This narrative should include information on key contingencies and risks for the orchestrated uptake of CER and distributed resources in each jurisdiction. The review expects that, as per the process for updating the modelling approach to integrate gas market considerations, AEMO will be required to undertake further work to determine the most suitable path to achieve these objectives. Noting this, the review acknowledges that there may be data limitations in the near term that impact on the extent to which this recommendation can be given full, immediate effect.

The review makes the case that there is a requirement for the ability to optimise investment in orchestration of CER and distributed resources. As the data environment is rapidly evolving, the review considers that the best way to undertake this optimisation is still to some extent unclear. AEMO advise that the ISP model may be able to trade-off the cost of unlocking increasing tranches of orchestrated CER and distributed resources if appropriately summarised inputs can be sourced. Such analysis can inform assessment of transmission infrastructure requirements and support the investment decisions of DNSPs and governments to unlock increasing traches of CER and distributed resources.

There are a range of ways that the ISP modelling might achieve this intent, with the primary consideration being the availability of appropriate and consistent data on the capacity of distribution networks to connect CER and distributed resources across the NEM, how that capacity is scheduled to increase over time and, crucially, the cost to increase that capacity. For this reason, the review does not recommend a particular approach to optimisation, rather further exploration of the available data and appropriate modelling methodology.

Next steps

Increased integration of gas and demand-side modelling is likely to result in improved information and planning outcomes to support the energy transition within desirable timeframes. However, the review considers that it is hard to be determinative about the appropriate modelling approach given the often trial and error approach to modelling and the need to exercise judgement around many aspects. Further detailed work will be conducted with AEMO and other stakeholders to support the additional data and modelling requirements and to narrow down the exact scope of changes to the ISP Methodology, as well as any required guidelines changes, as part of the implementation phase of the review.

6. Recommendations to support delivery of the ISP

In addition to the key recommended changes aimed at 'supercharging' the ISP, in line with the Terms of Reference the review has also considered other potential improvements to the process for a number of themes including barriers to the planning and construction of ISP projects, the relationship between the ISP and jurisdictional planning documents, and other relevant reviews, policy and reform activities being progressed concurrently. This section outlines additional recommendations for AEMO to further improve the outcomes of the ISP across these topics.

(a) Alignment with jurisdictional planning and policies

The Terms of Reference specified that the review would examine the relationship between the ISP and jurisdictional planning documents. Its objectives included aligning development pathways, enhancing system planning complementarity, and synchronising the timing of updates between the ISP and jurisdictional plans. In particular, the review examined whether clause 5.22.3(b) of the NER still provides an appropriate framework for AEMO's consideration of jurisdictional policies in the ISP. This clause stipulates that AEMO may consider the implications of jurisdictional environmental or energy policies on 'power systems needs' if they meet at least one of the following criteria: international agreement commitments, enacted legislation, regulatory obligations, material funding allocation in the relevant jurisdiction's budget, or advice from the Energy and Climate Change Ministerial Council to incorporate the policy. For AEMO, the criteria most relevant for the purposes of the 2023 IASR are enactment of the policy in legislation and a material funding allocation to the policy in a budget of a participating jurisdiction.

Feedback for the review underscored that the majority of stakeholders still believe that clause 5.22.3(b) in the NER provides a suitable framework for considering policies in the ISP.

Nevertheless, commencing with the 2026 ISP, there is an opportunity for AEMO to refine its application of this clause by establishing a clear, structured, and transparent process for consultations with NEM jurisdictions on policy inclusion in ISP modelling. For clarity, this is not intended to extend existing guidance under clause 5.22.3(b), but is intended to provide transparency in regard to its application. Feedback from stakeholders indicated that they were unclear as to the process that AEMO follows when it determines what jurisdictional infrastructure and policy commitments meet its threshold for inclusion in the ISP. The review recommends that AEMO refine and clearly articulate its consultative approach, building upon its ongoing collaborative relationships with NEM jurisdictions to effectively gather and assess information regarding their jurisdictional policies. This refined approach, which will be detailed in ISP publications, aims to enhance transparency, enabling stakeholders to more fully understand the methodology and reasoning behind the inclusion or exclusion of specific policies in scenario modelling.

Recommendations 9: Consultation guidelines for jurisdictional planning and policies

In the interests of transparency, AEMO to develop and publish clear, structured and transparent guidelines for its consultation process with jurisdictions around consideration of policy inclusion in the 2026 ISP modelling.

The review understands that AEMO does conduct analyses of unfunded or uncertain policies relevant to the development of the ISP's ODP. Yet, stakeholder feedback indicates that confusion exists with how the specifics of these analyses have been applied to past ISPs. Greater transparency in how these policies are evaluated and integrated into the 2026 ISP would address this confusion. Clear articulation of the methods and criteria used by AEMO in analysing these policies would facilitate better understanding of the generated outputs of the ISP, thereby improving the overall effectiveness and credibility of the ISP process. The review recommends that, in the interests of transparency, AEMO provide more clarity on how uncertain or unfunded policies are considered in the 2026 ISP, a step that would enhance stakeholder understanding and engagement.

Recommendation 10: Clarifying jurisdictional policy inclusions

In the interests of transparency, that AEMO provide more clarity on how uncertain or unfunded policies are considered in the 2026 ISP to enhance stakeholder understanding and engagement.

(b) Supporting the timely delivery of actionable ISP projects

Timely implementation of the ISP is critical to ensure consumers have access to reliable and affordable energy as the NEM transitions to net zero emissions, and thermal generators retire. Inputs to the 2022 ISP identified that firmed renewable energy continues to be the lowest cost generation to replace retiring coal power stations, however without transmission to connect and deliver generation to where it is needed, the benefits of this investment may not be effectively passed onto consumers.

There are several challenges currently affecting the timely delivery of actionable ISP projects. There are difficulties in energy infrastructure planning and construction due to supply chain delays, a lack of available workforce and most significantly, delays from localised community opposition to new projects. While a lack of community acceptance for new projects can be interpreted as a 'barrier' or 'obstacle' to delivery, the review considers that this discourse should be reframed to instead focus on the significant benefits that can be derived from best practice community engagement. If genuine, this engagement can lead to better and more just outcomes for all participants and present new opportunities for active and meaningful participation in the energy transition communities.

It is important to recognise the significant focus that governments and other stakeholders are giving to addressing community acceptance and other delivery challenges, and that the responsibility for overcoming them does not necessarily sit solely with AEMO and its delivery of the ISP. Feedback from stakeholders emphasised that state and territory governments and infrastructure developers are often ultimately responsible for the actual delivery of ISP projects. Examples of some of the most relevant policy and reform activities that are being progressed concurrently with this review are outlined below. This broader context should be reflected in the ISP to the greatest extent possible, and to allow for stakeholders to perceive that fair processes have been supported by AEMO, within their remit.

Existing initiatives – regulatory reform

Prior to the introduction of actionable ISP rule changes in 2020, the RIT-T process was around a 2-year process (excluding the feedback loop and contingent application processes, which can still be a lengthy process sometimes extending over several years). Actionable ISP rule changes that came into effect on 1 July 2020, sought to accelerate the RIT-T process for Transmission Network Service Providers (TNSP) by removing the requirement for Project Specification Consultation Reports to be developed, with this requirement now being met by the ISP. As the 2020 ISP was released in July 2020, the 2022 ISP was the first publication where this change was visible.

Further to the actionable ISP rule changes, several additional rule changes are being progressed in response to the AEMC's Transmission Planning and Investment Review, which sought to further improve the regulatory frameworks for transmission investment and planning to support delivery of major transmission projects. This includes the 'Enhancing community engagement in transmission building' rule change, which introduces a set of minimum consultation requirements for TNSPs when engaging affected communities, including as part of preparatory activities for future ISP projects. This rule came into effect on 9 November 2023.

The following other rule change requests have been submitted to the AEMC and are anticipated to be finalised in 2024. These include the:

- 'Feedback loop' rule change, which addresses workability issues impacting the feedback loop's ability to safeguard consumers and support timely delivery of transmission projects (AEMC 2023c).

- 'Concessional finance' rule change, which defines the approach to determining how financial benefit from the concessional financing of transmission infrastructure, from policies such as Rewiring the Nation, are shared between consumers and TNSPs (AEMC 2023d).
- 'Accommodating financeability in the regulatory framework' rule change, which introduces greater flexibility into the revenue setting framework by allowing the AER to vary the depreciation profile of actionable ISP projects (AEMC 2023e).
- 'Early works contingent project application' rule change request, which will provide greater cost recovery certainty for early works activities and therefore encourage TNSPs to undertake more planning activities earlier enhancing the likelihood of securing community support (AEMC 2023f).
- 'ISP targeted ex post review' rule change request, which seeks to introduce a targeted ex-post review mechanism for capex incurred on completed ISP projects. This will safeguard consumers from unnecessary infrastructure costs (AEMC 2023g).

The set of enacted and proposed regulatory changes to support the development of transmission projects are substantial. In seeking to assess the need for additional changes, the review is cognisant that the impact of existing and proposed changes may not yet be apparent, and it may be necessary to consider the need for further regulatory reform at a later date, once the impacts of existing and proposed changes are more apparent.

In addition to rule changes, governments are also progressing the development of a 'Nationally Significant Transmission Project (NSTP) framework'. The NSTP framework is considering potential enhancements to environmental approvals and planning to support transmission developments without compromising environmental outcomes (including potential regional planning for renewable energy zones), and economic regulatory approval reforms. A future review of the effectiveness of the Actionable ISP rule changes and subsequent measures aimed at the timely delivery of transmission projects could examine whether they have achieved this objective, and point to potential areas for further improvement.

The NSTP framework is closely related to the Australian government's ongoing reform of the Commonwealth *Environment Protection and Biodiversity Conservation Act* (1999) (the EPBC Act), including the 'Regional Planning Initiative'. The new regional planning approach is a priority of the Government's 'Nature Positive Plan', released in December 2022. The purpose of regional plans is to make sure the natural environment is protected as the infrastructure of the future is built, including transmission lines and renewable energy projects needed for the transition to net zero. Regional plans aim to enable faster decision-making under the reformed EPBC Act. They will consider cumulative impacts and how best to manage threats to environment and heritage values at a regional scale. Regional plans will provide clear information to project proponents and communities and establish regulatory zones to guide what areas are appropriate for development at a landscape and/or seascape scale, as well as identifying areas for protection.

Regional plans, where they are available, are likely to provide clear guidance to assist AEMO, TNSPs and jurisdictions in their planning and development of transmission expansion options as an input to the ISP, and speed up some environmental approval processes for new renewable energy infrastructure development. Other aspects of the EPBC reforms are also likely to provide useful information to AEMO and NEM participants, including the outcomes of strategic assessments, and the creation of Environment Information Australia, which will be developing and publishing country-wide regional environmental values maps. Environmental impacts/constraints are a key factor in

determining both project costs for TNSPs and ultimate value for end consumers, due to their potential to cause project delays and amendments to project design (particularly in circumstances where they have not been properly considered as part of the initial project planning).

Existing initiatives – supply chains and workforce

The 2022 ISP notes the delivery timetable of the ODP partially depends on carefully managing the risk to supply chains from increasing coincident global demand for the same infrastructure expertise, materials and equipment. The 2022 ISP also notes ISP modelling seeks to schedule projects to deliver the greatest benefits to consumers, however the ISP process does not consider the sequencing of project steps to ensure completion within the project delivery date while managing global supply chain risks.

For the 2024 draft ISP, AEMO have introduced a new 'Constrained Supply Chains' sensitivity that will explore the costs and benefits of limiting the level of infrastructure build due to global demand and workforce availability (AEMO 2023d). It will be examined by applying greater constraints on the development capabilities to deliver GPG, renewable generation, storage and transmission investments, as well as investment in new industries such as hydrogen electrolysers and biomethane processing, associated with technical supply chain and workforce considerations. This is in recognition of the significant uncertainties and risks involved from these constraints. AEMO note that this uncertainty is best treated as a sensitivity in the ISP model to allow for adaptation from any anticipated delays (resulting in a proposed electricity sector investment response). In 2023, the ISP Methodology was also updated to include a transmission project lead time uncertainty.

As outlined in the 2022 ISP, AEMO has partnered with Infrastructure Australia and the Institute for Sustainable Futures to assess and understand the labour and material requirements for the transmission and generation projects identified in the ISP. The 'Market Capacity for Electricity Infrastructure' project develops and publishes electricity sector workforce projections by technology, occupation and location to correspond with ISP scenarios. It allows stakeholders to understand the employment implications of alternative scenarios and gives governments and the electricity industry an awareness of the workforce development needs for future development paths.

Through these processes, the review considers that the ISP appropriately considers issues around supply chains and workforce. The 2022 ISP outlines steps that NEM participants and jurisdictions can pursue to address these issues including developing programs to meet those workforce requirements, through domestic training programs and targeted skilled migration, and expanding supply options for plant and materials, including by investing in new onshore manufacturing. However, the review suggests that AEMO should also give consideration (even if qualitatively) as to whether the sequencing of project construction within the ISP would be an appropriate planning response to anticipated delays that become apparent through the new modelling approach (for example through the application of the Constrained Supply Chains sensitivity).

Resolving these barriers is a priority for governments and NEM participants and recent Commonwealth and jurisdiction-level initiatives aimed at addressing the significant workforce and supply chain challenges are a positive step that will assist in reducing delays to the construction of ISP projects. For example, at the December 2022 Energy Ministers' Meeting, Ministers agreed to the development of a 'National Renewable Energy Supply Chain Action Plan' to alleviate supply chain pressures and support the net zero transition. At the November 2023 meeting, Energy Ministers' agreed to further collaborative development of details actions to deliver this action plan.

ECMC is progressing the 'National Renewable Energy Pipeline' project, which is aimed at delivering a consistent nationwide view of large-scale renewable energy and storage projects in development across Australia to better understand and address barriers to completion. There is likely to be useful data on the status of a range of projects 'in the pipeline' derived from this work, which could be incorporated into future ISP modelling, and/or used to ground-truth assumptions about current supply chain and workforce impacts in current ISP modelling.

With a focus on planning for upcoming renewable energy workforce and skills requirements, at the October 2022 Energy Ministers' Meeting, Ministers agreed to the development of a 'National Energy Workforce Strategy', which will be developed by December 2024 and cover the period 2025-2030. In addition, Jobs and Skills Australia recently undertook a capacity study on the workforce needs for Australia's transition to a clean economy and included 50 recommendations for training and education pathways, and opportunities to transform existing sectors through decarbonisation (Jobs and Skills Australia 2023). Government initiatives to support the workforce requirements of the renewable energy transition should also be considered in the context of broader labour market reform and intersections with migration and education policy (The Treasury 2023).

It is important that AEMO continue to keep abreast of both national and jurisdictional initiatives in this space, including when considering supply chain and workforce constraints as part of ISP scenario modelling. This is likely to be most relevant for the development of the 2026 and future ISPs, as the outcomes of these initiatives begin to manifest.

Existing initiatives – enhancing and measuring community engagement

The 2022 ISP acknowledges the need to improve consideration of community acceptance in planning, and recognises it as an issue that affects transmission, generation and storage developments. It notes that AEMO will be working with governments and other stakeholders on progressing coordinated efforts to address this issue. Indeed, since the publication of the last ISP in 2022, AEMO have made changes to the ISP process in recognition of the importance of this issue, including forming an Advisory Council on Social Licence and introducing a new 'social licence' sensitivity in the modelling to explore risks relating to deliverability challenges and costs.

These changes are occurring in the context of government-focus on improving processes for community engagement on new energy infrastructure projects and incorporating more monitoring and measurement of community sentiment indicators. Some examples of these initiatives are described in this section, to provide important context for the following recommendations. In many cases, extensive consultation processes have been undertaken to inform new projects, and the review has considered the feedback obtained through any concurrent processes where appropriate.

In July 2023, the Minister for Climate Change and Energy announced the Community Engagement Review to be conducted by the Australian Energy Infrastructure Commissioner (AEIC). The AEIC review will provide advice on: improving developer engagement with communities, landholders and other stakeholders, throughout the phases of site selection, planning, development and operation of new renewable energy infrastructure projects; ensuring projects engage with communities, landholders and stakeholders, including First Nations peoples; and better aligning project benefits with community interests. The AEIC review has sought insights and feedback from communities and organisations through a comprehensive public consultation process across Australia. A final report is expected to be published in early 2024. The ISP review notes that this is an important body of work for transmission planning processes.

Under the National Energy Transformation Partnership, the Australian Government has committed $5.5 million to develop the 'First Nations Clean Energy Strategy' (FNCES). It aims to identify ways to support First Nations aspirations to: participate in and benefit from the clean energy transformation; ensure access for reliable clean energy for all Australians; and ensure First Nations cultural heritage, knowledge and connection to land and sea Country is respected. Importantly, the FNCES is also aimed at creating opportunities for government and industry to build deeper collaboration, consensus, and new ways of working with First Nations people. Consultation on the development of the FNCES is extensive and currently ongoing, however interim feedback from engagement to date has highlighted the importance of reframing First Nations engagement and respect for Country, culture, and heritage (DCCEEW 2023b). First Nations communities have advocated for earlier and ongoing engagement in clean energy projects, policy and program development and expressed desire for genuine and enduing partnerships based on trust and transparency to be developed. Communities want to step beyond consultation to actively collaborate with government and industry to achieve the associated social, economic, and environmental outcomes of clean energy projects. Communities want certainty that their land, water and cultural heritage rights will be protected as these projects progress, with active engagement on these topics throughout the development lifecycle. The FNCES is aimed at being finalised following the completion of roundtables and consultations.

New 'National Guidelines for Community Engagement and Benefit Sharing for Electricity Transmission' are also currently under development. Applying a behavioural science research approach that takes account of social and cultural factors that underpin community acceptance, the guidelines will improve clarity and consistency for TNSPs across jurisdictions by outlining best practice principles for community engagement and benefit sharing with a focus on place-based application. The guidelines will be supported by an evaluation framework for use by government to baseline and track levels of community acceptance at a national level. The guidelines are expected to be finalised in mid-2024.

Separately, CSIRO, in partnership with DCCEEW, has developed one of the largest national surveys measuring Australian attitudes towards the renewable energy transition. The survey launched in July 2023, collecting over 6,700 responses, and explored themes such as social licence as it relates to renewable energy infrastructure, the energy narrative, measures of trust, cumulative impact, compensation, perceived impacts, and community perception surrounding a range of renewable energy infrastructure (onshore and offshore wind, solar farms, and transmission lines). A qualitative follow-up study will commence in mid-2024 to further explore trends that have emerged in 2023 survey findings. The survey is expected to be re-run in 2025 to enable tracking of social licence for renewable energy infrastructure as projects progress through the project lifecycle (from planning to development to operation) and as new technologies are developed and deployed. Findings may provide additional insights on national community acceptance that could be incorporated into the ISP as a planning input.

The costs and benefits associated with infrastructure projects that can be considered in the development of the ISP's ODP are outlined in the AER's Cost Benefit Analysis Guidelines (CBA Guidelines). In October 2023, the AER released the 'Directions Paper on Social Licence for Electricity Transmission Projects' to gain stakeholder feedback on how best to refine the current approach and update AER guidelines and instruments so as to ensure that community acceptance issues (including the social costs and benefits associated with infrastructure projects) are considered appropriately in the ISP (and RIT-T processes) (AER 2023). The review recognises the relevance of this work and does not seek to duplicate the efforts of the AER in updating the CBA Guidelines to provide more detail on

community engagement activities and how community sentiment is considered by AEMO through the ISP and by the AER in their regulatory decisions.

Timely delivery of actionable ISP projects

The timely delivery of new energy infrastructure is a key focus for stakeholders and governments at all levels. While the outcomes of the new initiatives happening in this space are yet to be fully realised in practice, there are likely to be some early results that provide opportunities for enhancements to the development of the 2026 ISP and beyond. As described above, AEMO does not have primary responsibility for addressing the numerous challenges in delivering projects on the ground, however they are working with governments and other stakeholders on progressing coordinated efforts. This is in recognition of the fact that the timely delivery of new energy infrastructure projects can only succeed with coordinated and pooled efforts by governments and relevant stakeholders. Aside from highlighting supply chains, workforce and community acceptance considerations as key risks, the review considers that there is opportunity to leverage the significant work being undertaken in this space, and for the ISP to help build broader community understanding of the need for new ISP projects.

The review recognises that for current actionable projects that have been identified through previous ISP processes, there are unlikely to be many changes that AEMO could make to future ISPs that would speed up their implementation in practice. The most significant opportunities instead derive from the broader regulatory, community engagement, workforce and supply chain initiatives that are being progressed by governments. Efforts to improve community outcomes, boost the available workforce and speed up regulatory approvals will hopefully improve the delivery timelines for the existing actionable ISP projects. However, the review also considers that there is opportunity to improve the current ISP framework, which identifies projects over a 20-year horizon, to achieve significant benefit for the energy transition into the future.

While the terms of reference for the review are aimed at recommendations to improve the consideration of “barriers to the planning and construction of ISP projects”, feedback from stakeholders through the review process has made it clear that the same constraints around transmission infrastructure construction (supply chains, workforce, and community acceptance) also have strong relevance for other new infrastructure projects across the NEM, including for large-scale generation and storage projects and the development of REZs. Therefore, the recommendations in this section may be considered as being more broadly applicable than transmission infrastructure alone.

Although the ISP is a highly technical document, its audience has become more general over time. As a principal planning document for the energy system, the publication of the ISP can contribute to the efforts of governments and others in building a new national narrative on the importance of the energy transition and the critical need for new infrastructure. Indeed, it is clear that AEMO are progressing efforts in this space and the draft 2024 ISP includes some more accessible commentary about the broad benefits of the ODP. It will be important for governments and other stakeholders to support AEMO to play an appropriate role in delivering this narrative around the release of future ISPs, to help better explain the need for new energy infrastructure and the opportunities it will generate for communities across the board.

The additional communications that would be provided around the broad benefits of the ISP is not intended to expand the current scope of the CBA and introduce additional classes of benefits to inform the development of the ODP itself. However, the review notes that any future updates to the

AER CBA Guidelines that provide more specific detail about the community acceptance costs that should be incorporated into the ISP may also create opportunities for expanded exploration of these issues in the ISP itself.

The main ISP document may not be the most appropriate place to explain the outcomes of the ODP to consumers and community groups, and that AEMO should be supported to deliver targeted communications products and activities alongside the ISP that are more accessible to a broader audience. The use of separate communications products would help maintain the document's primary purpose as an investment informing tool for NEM participants and governments.

Recommendation 11: Improving the accessibility of the ISP

That AEMO develop additional targeted communications products and activities to support community groups and consumers to engage with the 2026 ISP planning process, separate to the ISP document itself, and informed by a communications strategy.

Noting the link between early community engagement in establishing trust, and overall improved outcomes, it is important that the process and timeframes involved in ISP joint planning does not undermine the ability for AEMO or other NEM participants and jurisdictions to conduct appropriately timed community engagement (including to support the principles of free, prior and informed consent[5] for First Nations communities). In addition, where local concerns and sensitive locations are already known to participants such as TNSPs, allowing a process for this information to be incorporated into the identification of the ODP could in some cases improve community acceptance. There may also be new data available from projects that are monitoring and measuring community sentiment towards energy infrastructure that could be considered by TNSPs and AEMO, where appropriate.

The review is also mindful that very early engagement for infrastructure projects that might not eventuate is likely to result in negative community outcomes. It is also important to avoid "consultation fatigue" in communities that might be involved in multiple processes at different levels. Noting the recently enacted 'Enhancing Community Engagement in Transmission Building' rule change has clarified the requirements for early community engagement by TNSPs in conducting preparatory activities, and once enacted, the 'Early Works contingent project application' rule change will allow TNSPs to recover the costs associated with this early engagement, it is possible that no further changes to processes will be required. In this context, the review considers that AEMO should work with jurisdictions and TNSPs to continue to accommodate best practice community engagement processes, as appropriate within the ISP regulatory framework as it continues to evolve. The effectiveness of the new measures in achieving enhanced community engagement outcomes should be revisited as part of a later review of the ISP (refer Recommendation 15).

Recommendation 12: Incorporate community acceptance considerations into transmission expansion options

That AEMO have regard to community concerns or sensitive locations in the identification of the ODP, and consider existing and available data on community sentiment, where available for the 2026 ISP (for example, from CSIRO surveys or as the result of TNSP community engagement as part of preparatory activities).

[5] As outlined in the UN Declaration on the Rights of Indigenous Peoples 2007

As the renewable energy transition gains momentum, governments and NEM participants are undertaking significant efforts to obtain a more granular level of information on factors that impact the timely delivery of ISP projects, and in some cases, undertaking regional planning to identify locations that will be suitable (or less suitable) for new energy infrastructure. The review considers that this presents an important opportunity for AEMO to obtain additional inputs to help inform the development of the ISP, including information about environmental values or constraints, where these are available at an appropriate and useful scale. For example, outcomes of any jurisdictional regional planning initiatives, and the Nature Positive Regional Plans that will be created under the reformed EPBC Act, might result in high-level geographic data that could be considered by AEMO in the future in a similar manner to how National Parks are currently taken into account. The most appropriate avenue for considering these inputs should be determined by AEMO, but may be via TNSPs and jurisdictions through the joint planning process and development of the Transmission Expansion Options Report.

Recommendation 13 also notes the opportunity for AEMO to consider additional information on supply chain limits and workforce constraints as the results of new initiatives in this space begin to manifest. The implication of this is not intended for AEMO to apply a constrained outlook in identifying the ODP, but instead the additional data might be used in determining the costs and timing for delivery of ISP projects.

Recommendation 13: Additional planning inputs to the ISP
That AEMO take advantage of the significant focus being given to environmental and regional planning for energy infrastructure, improving data on supply chain limits, workforce constraints and community sentiment, and consider where the outputs of this work can be incorporated into the 2026 ISP.

It is important to consider all the recommendations around the timely delivery of actionable ISP projects in the context of the other substantial changes proposed by this review. If implemented, these broader recommendations may result in overall improvements to the deliverability of ISP projects, increasing the perceived credibility (and community acceptance) of the ISP itself. For example, the opportunities for the ISP to influence distribution network planning and CER that might better explore the trade-offs of small scale and large-scale infrastructure may help to build community acceptance of the need for particular projects. The recommendations would also, however, increase the scope and complexity of the ISP, and therefore considerations on how to improve the accessibility of the document and communicate its inputs are even more important in this context.

Supporting AEMO to implement these recommendations may require greater investment of dedicated resources, but should be achievable within the current regulatory framework, particularly in the context of the recently proposed and enacted rule changes and the upcoming reforms outlined in this section.

7. Enhancements to the 2024 ISP

The review has focused on an ambitious set of enhancements to ‘supercharge’ the ISP for 2026 and into the future. This focus in part reflects that 2024 ISP processes were well underway prior to the commencement of the review and as a result, significant changes are not feasible for the 2024 ISP. However, AEMO has made significant methodological changes for the 2024 ISP, with many of these relevant to matters raised in the Terms of Reference.

Several ISP process changes that AEMO have made are referenced in the previous sections of this report (for example, the formation of the Advisory Council on Social Licence, and the treatment of

supply chains and 'social licence' constraints as sensitivity analyses). Additional modifications that have been made that are relevant to the matters being considered in this review are included below. These reflect the extent of changes that AEMO is making to meeting the supercharging objectives, within existing legal and policy frameworks and within available timeframes for the implementation of the 2024 ISP.

Gas planning

For the 2024 draft ISP, AEMO has explored the shifting role from mid-merit gas to peaking and then backup supply, and the ability for existing gas infrastructure to support that change. This includes assessing the capability of pipelines and gas storage but does not include an economic assessment of options to increase gas pipeline or storage infrastructure. In conducting this analysis, AEMO has assumed that new gas production (from existing gas fields, or new forms of supply including biomethane or imported LNG) will be available and developed in time, from existing points of production in the gas network. New basin or field developments that would require expanded gas infrastructure will not be considered.

A process change for the 2024 draft ISP also has seen AEMO incorporating all legislated policies in all scenarios and assessing emerging policies using sensitivity analysis. This includes consideration of the safeguard mechanism and its impact on electricity and gas demand through potential acceleration of electrification and energy efficiency investments for industrial loads.

The 2024 draft ISP has also assessed the impact of low-carbon gases (such as hydrogen and biomethane) on electricity infrastructure through scenario-based planning and sensitivities. Particularly, the use of a diverse mix of energy forms for industrial applications may have a material impact on the electricity load profiles that need to be served through electricity infrastructure. Sensitivity analysis explores the impact of this on electricity infrastructure investment needs.

Data on the need for dispatchable capacity to facilitate analysis for the Capacity Investment Scheme is also presented quantitatively in the 2024 draft ISP.

Energy demand

In the 2024 draft ISP, AEMO has updated its demand-side participation assumptions to reflect observed operation of demand-side participation response in practice. Data from actual events has been incorporated to provide a more realistic representation of the demand-side participation response in the modelling process, including limits that assume a maximum of two hours of operation of demand-side participation, based on historical data. This replaces the 2022 ISP methodology assumption that demand-side participation response would be unrestricted at times when most required by the power system.

Thermal generation exits

AEMO has deployed sensitivity analyses in the 2024 draft ISP to test the robustness of the ODP to early thermal generation exits to demonstrate whether network or non-network solutions provide greater benefit.

Consumer risk preferences

The 2022 ISP methodology provides for AEMO to consider consumer risk preferences in the selection of the ODP. For the 2024 ISP, AEMO has engaged a consultant to explore the potential use of consumer risk preference metrics and has amended the ISP Methodology to include some of these

metrics to inform selection of ODP. Stakeholders have suggested that future ISPs should have a greater focus on consumer risk preferences. AEMO agrees and will continue work on understanding and incorporating consumer risk preferences metrics to future ISPs.

Renewable energy

AEMO will include the Australian Government's commitment to an 82 per cent Renewable Energy Target by 2030 and sensitivity analysis for certain scenarios to identify the additional investment to deliver this objective on top of other policies. That is, in some scenarios the target may be exceeded, while others may fall short without this target in place. For those scenarios where results fall short of the target, sensitivity analysis may identify the change in investments that the 82 per cent target itself may require. State and territory renewable energy targets are also considered.

To further enhance the modelling of offshore wind, AEMO has included:

- an additional offshore REZ for the North East Tasmania Coast,
- updated boundaries for Gippsland Coast offshore REZ, Hunter Coast offshore REZ and Portland Coast REZ, to align with the areas identified by the Commonwealth Government for offshore wind development
- specified resource limits for each offshore REZ for both fixed and floating offshore wind turbine structures, considering the ocean depth of the offshore REZ.

8. Examining the ISP development framework

The review examined the ISP's development framework to ensure its efficiency in enhancing the ISP. It focused on the legislative and regulatory requirements for ISP inputs, possibilities for streamlining consultation processes, and the timing for integrating new information throughout the ISP's development.

While some stakeholders recognised the merit in an ISP that dynamically adapts to an evolving energy sector, reflecting its continual changes, there were concerns about the practicality of increasing the frequency of ISP updates. Key challenges identified include the feasibility of meaningful consultation and engagement in shortened ISP cycles, the risk of updates becoming minor and ineffective, potential compromise to investment certainty due to rapid changes in long-term plans, and conflicts with existing NER obligations for actionable ISPs, which are based on a two-year publication schedule. In light of this feedback, the review does not consider significant benefit in adopting a more frequent cycle for the publication of the ISP.

Stakeholder feedback raised observations about the update frequency of AEMO's Inputs, Assumptions and Scenarios Report (IASR) and its accompanying workbook. Stakeholders drew attention to the substantial value they derive from AEMO's inputs and assumptions, noting they use inputs and assumptions for commercial purposes and advocating for the transition to an annual update cycle. Similarly, jurisdictions and researchers draw on the IASR for their modelling needs.

The review acknowledges that AEMO updates a significant portion of its inputs and assumptions used in the ISP through the ESOO process and its Forecasting Assumptions Update (AEMO 2022b), occurring in alternate years to the IASR (AEMO 2023d). However, the review notes there is a lack of awareness about the changes among many stakeholders. Therefore, it is recommended that AEMO take steps to increase the visibility of the latest Forecasting Assumptions Update on its website, to allow stakeholders to access this information more easily.

The review also assessed the AER's transparency and compliance reviews to determine their effectiveness and timeliness. This evaluation concluded that these processes are achieving their intended purpose of ensuring AEMO's actions are transparent and accountable, and no adjustments to the current practices are necessary. The compliance report serves as an essential document that clearly outlines AEMO's adherence to the regulatory obligations set by the RIT instrument and CBA Guidelines, providing a clear and comprehensive account of compliance activities. This documentation not only confirms compliance but also bolsters the transparency integral to the ISP development process.

Recommendation 14: Greater visibility of updated inputs and assumptions
That AEMO take steps to increase the visibility of the latest Forecasting Assumptions Update on its website, linked clearly from material relating to the ISP and in time for the 2026 ISP.

9. Considerations for implementation

This review has assessed the appropriate presentation of the ISP in light of the final report's recommendations and in response to stakeholder feedback about concerns with the potential increasing complexity and size of the publication with an enhanced scope. The current format of the ISP reflects AEMO's analytical focus on supporting decisions for actionable ISP projects along the ODP. This is evident in the report's structure, where about half of the content is dedicated to analysing this path, while the rest provides context, outlines consultation processes, and explores opportunities in renewable energy and dispatchable capacity.

The review's recommendations, particularly those regarding AEMO's 'development projections' for gas and a statement about the expected development of CER and distributed resources, are intended to broaden the ISP's current emphasis on actionable transmission projects. It is anticipated that in developing these paths, AEMO will need to:

- collect additional and new information to support its analysis, from both gas market participants and those directly involved in CER development
- conduct additional analysis to support the development of a narrative about expected developments across all aspects of the energy sector
- provide a more detailed exploration of the risks and uncertainties in the energy sector, focusing on those relevant to the energy transition and separate from any impact on the transmission ODP
- restructure the presentation of information in the ISP report to reflect this broader focus.

The review does not prescribe a specific format for the ISP, considering AEMO is best placed to develop the structure of the report. The review does consider however, that AEMO in the revised structure should distinctly outline the dual functions of the ISP, ensuring its broadened 'whole of energy system plan' and transmission planning aspects are clearly defined and effectively communicated.

The review considers it prudent to be mindful of the enhanced scope of the ISP going forward, and its purpose to deliver a genuine 'whole of energy system plan' which should not come at the expense of the extensive transmission planning requirements of the publication. It is recommended that a further review of the ISP is undertaken following the release of the 2026 ISP to determine if this review's recommendations have been appropriately implemented, and whether the format and

purpose of the ISP report remains fit-for-purpose. This will allow lessons from the implementation of the review's recommendations to be identified, and further refinements to be made if needed.

Recommendation 15: Review of the 2026 ISP

That the System Planning Working Group undertake a further review following the release of the 2026 ISP to determine if this review's recommendations have been appropriately implemented, and whether the format and purpose of the ISP report remains fit-for-purpose.

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Appendix A - Summary of recommendations

Recommendation 1: Integrating gas into the ISP

That AEMO expand its consideration of gas market conditions in the 2026 ISP. This should include but not be limited to:

- carrying out additional analysis of future gas demand and gas pricing,
- developing projections about the future utilisation of gas infrastructure
- collating information about dates of expected gas pipeline or GPG closure or conversion
- updating medium- and long-term projections of gas generator fuel costs to reflect expectations about gas market developments
- providing more information in the ISP about how ISP modelling scenarios are integrated in its gas supply model.

Working closely with stakeholders and drawing on the deeper understanding of future gas market conditions, AEMO should include 'development projections' in the 2026 ISP for the gas sector and:

- use this capability to identify and iteratively analyse the gas sector project trade-offs with electricity development needs, with the sole aim of optimising electricity infrastructure investments in the ISP;
- update the development projections to reflect the outcomes of this analysis; and
- publish the updated development projections in the ISP.

The development projections should set out AEMO's projections on how it expects the gas sector to develop (both in terms of demand, and infrastructure investment to supply expected demand) under prevailing policies and market incentives.

Recommendation 2: Demand forecasting in the ISP

That AEMO enhance demand forecasting in the 2026 ISP by:

- Undertaking targeted stakeholder engagement (including but not limited to Distribution Network Service Providers (DNSPs)) to develop more robust assumptions underpinning CER and distributed resources projections in the ISP. The new assumptions should reflect a comprehensive view of initiatives affecting CER and distributed resources uptake and evaluate the implications for operational demand.
- Analysing how electrification and CER / distributed resources development sensitivities affect operational demand projections and consider these directly in the ISP modelling where relevant.
- Subject to available information, analysing how DNSP investments, programs and annual plans, may impact CER and distributed resources development, and thereby the ODP for transmission, and include these findings in the ISP in order to send clearer signals to inform DNSP planning.
- Developing a framework, methodology and guidance material to support DNSPs and jurisdictions to develop projections and undertake analysis in a consistent manner to support the ISP's development.
- Including a statement in the 2026 ISP, and subsequent ISPs, aimed at informing the market and policy makers about the expected development of CER and distributed resources. The statement should be sufficiently detailed to provide a baseline for the identification of opportunities to promote the uptake of CER and distributed resources within each jurisdiction.

Recommendation 3: Jurisdictions' support for AEMO's demand forecasting

That jurisdictions and AEMO work together to ensure the provision of key inputs for the 2026 ISP that includes information about relevant jurisdictional policy developments and scenarios and projections about industrial and consumer electrification demand in NEM sub regions.

Recommendation 4: Optimising CER and distributed resources

That the System Planning Working Group and AEMO work with the relevant stakeholders, including DNSPs, to develop a suitable approach to trade off the cost of unlocking increasing tranches of orchestrated CER and distributed resources against other investment options for use in the earliest ISP practicable.

Recommendation 5: Review progress in optimising CER and distributed resources

That the System Planning Working Group report to ECMC on progress made in implementing Recommendation 4 following the 2026 ISP.

Recommendation 6: Deeper analysis of coal-fired generation shutdown scenarios

That AEMO analyse the sensitivity of the ODP to alternative coal-fired generation shutdown scenarios in the 2026 ISP, allowing for consideration of facilitating investments in firming capacity and including this more prominently as part of the ISP narrative, subject to appropriately managing commercial sensitivities.

Recommendation 7: Improving the information available in the ISP

That AEMO centralise the available information on renewable generation and storage, such as by summarising important material from other relevant documents in the ISP and/or including links to other relevant documents in a manner that facilitates easy access for stakeholders. This may be implemented via reference to the Enhanced Locational Information Report, if appropriate.

Recommendation 8: Enhanced analysis of system security

That AEMO give greater consideration of system security trade-offs for assessing the optimal mix of generation, storage, transmission and other infrastructure in the 2026 ISP.

Recommendations 9: Consultation guidelines for jurisdictional planning and policies

In the interests of transparency, that AEMO develop and publish clear, structured and transparent guidelines for its consultation process with jurisdictions around consideration of policy inclusion in the 2026 ISP modelling.

Recommendation 10: Clarifying jurisdictional policy inclusions

In the interests of transparency, that AEMO provide more clarity on how uncertain or unfunded policies are considered in the 2026 ISP to enhance stakeholder understanding and engagement.

Recommendation 11: Improving the accessibility of the ISP

That AEMO develop additional targeted communications products and activities to support community groups and consumers to engage with the 2026 ISP planning process, separate to the ISP document itself, and informed by a communications strategy.

Recommendation 12: Incorporate community acceptance considerations into transmission expansion options

That AEMO have regard to community concerns or sensitive locations in the identification of the ODP, and consider existing and available data on community sentiment, where available for the 2026 ISP (for example, from CSIRO surveys or as the result of TNSP community engagement as part of preparatory activities).

Recommendation 13: Additional planning inputs to the ISP

That AEMO take advantage of the significant focus being given to environmental and regional planning for energy infrastructure, improving data on supply chain limits, workforce constraints and community sentiment, and consider where the outputs of this work can be incorporated into the 2026 ISP.

Recommendation 14: Greater visibility of updated inputs and assumptions

That AEMO take steps to increase the visibility of the latest Forecasting Assumptions Update on its website, linked clearly from material relating to the ISP and in time for the 2026 ISP.

Recommendation 15: Review of the 2026 ISP

That the System Planning Working Group undertake a further review following the release of the 2026 ISP to determine if this review's recommendations have been appropriately implemented, and whether the format and purpose of the ISP report remains fit-for-purpose.

Appendix B - Terms of Reference

Aim of the review

A review of the Australian Energy Market Operator's (AEMO) Integrated System Plan (ISP) is being undertaken to determine the ideal scope, function, and form of a 'supercharged' ISP and the extent to which the current regulatory and operational planning frameworks support its development.

The ISP is a whole-of-system plan that provides an integrated roadmap for the efficient development of the National Electricity Market (NEM) over the next 20 years and beyond. Its primary objective is to optimise value to end consumers by designing the lowest cost, secure and reliable energy system capable of meeting any emissions trajectory determined by policy makers at an acceptable level of risk.

As the energy system progresses towards achieving net-zero emissions targets, there is an increasing interrelationship between gas and electricity, both through the electrification of gas demand and through the use of gas-fired power generation to support a NEM with high levels of intermittent renewable energy generation. Although the goal of net-zero emissions is clear, there is considerable uncertainty about potential transition pathways, which can inhibit efficient investment.

Under the National Energy Transformation Partnership, Energy Ministers recognised the importance of addressing cross-sector challenges as part of the electricity transformation, including the deep interaction with gas markets. This review will examine how this could be achieved through a 'Supercharged' ISP.

A 'Supercharged' ISP is expected to be an integrated transition plan for the NEM and the East Coast Gas Market (including hydrogen and renewable gases as the industries develop) that considers the generation, storage, transmission and distribution requirements to maintain affordable and reliable energy for all consumers as Australia transitions to net zero emissions. It's intended that a 'supercharged' ISP be a reliable guide to inform energy related investments that considers jurisdictional specific plans (where in place).

The ISP takes almost two years to develop, and work is well underway to develop the 2024 ISP. To ensure the review process aligns with the ISP development timeframes, it will be undertaken in two stages. The first stage will consider what enhancements or changes can be made for the 2024 ISP within existing regulatory and operational frameworks. The second stage will consider more comprehensive changes needed to support the delivery of a 'supercharged' ISP for 2026, including potential regulatory amendments.

The review will also consider the Western Australian and Northern Territory Governments' system planning arrangements, and issues that are unique to these jurisdictions, to explore how system planning can be more integrated across electricity and gas sectors in these jurisdictions.

Scope

Review of the ISP

1. The review will examine the themes that could be addressed through a 'supercharged' ISP as outlined below, and identify any scope for enhancements to the ISP and other planning documents, including the Electricity Statement of Opportunities and the Gas Statement of Opportunities, to improve consideration of these themes:

   a. Emissions reduction targets including legislative requirements and policy objectives announced at Commonwealth, state and territory level including the Safeguard Mechanism and the proposed amendments to the National Energy Objectives.
   b. The changing nature of energy demand including through electrification, uptake of electric vehicles, modified consumption patterns, and consumer energy resources needed to achieve emissions reduction targets.
   c. The interrelationship between electricity and gas markets, the gas supply and generation needed to maintain secure and affordable energy for consumers, and the gas infrastructure improvements, including deep and shallow storage, that will assist with the orderly decarbonisation of energy markets.
   d. The planned, orderly transition from coal and gas use and the uptake of renewable fuels including hydrogen and biomethane.
   e. The supply of affordable and reliable renewable electricity generation and storage to meet consumer demand and the firming required to support decarbonisation goals.
   f. Barriers to the planning and construction of ISP projects, including social licence considerations, workforce, supply chains, regulatory constraints, and the consequences of delays.
2. The review will assess whether the ISP is the most appropriate planning tool to deliver the objectives of a supercharged ISP, or if changes are best addressed through other existing or new system planning documents or processes, taking into consideration the requirements of the:
   a. National Electricity Law and National Electricity Rules.
   b. National Gas Law and National Gas Rules.
3. The review will examine the ISP Development Framework to ensure it supports AEMO to 'supercharge' the ISP in the most efficient manner. This includes assessment of:
   a. The legislative and regulatory requirements around the ISP development (including the requirements around inputs to the ISP, particularly the threshold at which infrastructure and policy commitments can be considered in the ISP).
   b. Consultation requirements and potential for streamlining.
   c. The timing for consideration of new inputs throughout the development process.
   d. AEMO's internal operational frameworks and procedures.
   e. AEMO's data and modelling capabilities.
4. The review will also consider the relationship between the ISP and jurisdictional planning documents including;
   a. How the ISP takes into account development pathways identified in jurisdictional plans.
   b. How the ISP can better complement jurisdictions' individual system planning activities.
   c. How to maintain currency across ISP and jurisdictional plans, particularly considering and coordinating timing of updates to the ISP and jurisdictional plans.
5. The review will consider other relevant reviews and policy and reform activities and, where they are being progressed concurrently with this review, consider their implications, and propose the exchange of interim findings and data, where appropriate.

WA and NT System Planning Review

6. The review will consider the system planning processes undertaken in Western Australia and the Northern Territory and support these jurisdictions to consider possible enhancements that could be considered to ensure better integration across the electricity and gas sectors.

Governance

The System Planning Working Group established under the National Energy Transformation Partnership governance arrangements will oversee the review. Policy recommendations and advice of the review will be formulated on a consensus basis. The Department of Climate Change, Energy, the Environment and Water will administer the review with guidance from the System Planning Working Group, and working in close consultation with AEMO and other market bodies.

The working group will report to Energy and Climate Senior Officials throughout the review process. The Energy and Climate Ministerial Council will approve the interim and final report and recommendations.

Consultation

Consultation will be undertaken as needed during the review to gather necessary data and information to support the development of sound recommendations.