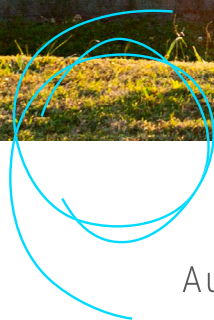


A CONSUMER-FOCUSED NET ZERO ENERGY SYSTEM

The Australian Energy Market Commission's
vision for our shared energy future



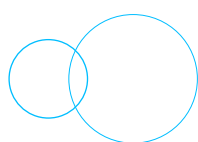
AEMC

Australian Energy Market Commission

September 2024



The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and to the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.





About the AEMC

The Australian Energy Market Commission (AEMC) is an independent statutory body that works for Australia's future productivity and living standards by contributing to a decarbonising, affordable and reliable energy system for consumers.

We listen, make practical rule changes and provide expert advice in a rapidly changing world. We lead, collaborate, adapt and influence in making and amending rules for the National Electricity Market, elements of the natural gas market and related retail markets; and providing strategic and operational advice on energy issues to the Energy and Climate Change Ministerial Council.

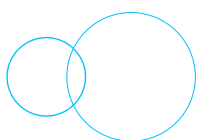
The National Electricity, Gas and Retail Rules made by the AEMC have the force of law and under the National Energy Laws, all of the AEMC's work is guided by the legislated national energy objectives.

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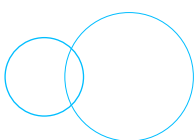
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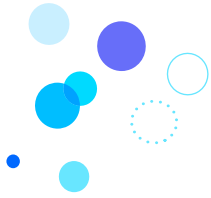


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FOREWORD



Anna Collyer
Chair

Australian Energy
Market Commission

Before we had satellites and GPS, wayfarers navigated by the stars. They identified the bright lights and constellations that could be trusted to point to where they wanted to land. They learned which stars stayed constant and which ones moved with the seasons or their transit of the earth. They created stories about the shapes in the sky that helped memorise the sequences of stars they needed to follow, and these stories made it easier to share directions with others.

The document before you is just one way the AEMC is navigating its path to a future destination. Like modern sailors, we have access to enormous experience and technology to help predict where our efforts are best directed, and like the ancients, we know that a narrative is an excellent way to capture our knowledge and share it over time.

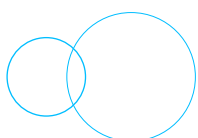
The energy sector in Australia, and around the world is experiencing change at the scale of the Industrial Revolution, only very much faster. With domestic and commercial energy currently one of the world's most significant sources of climate-damaging carbon, the traditional ways we produce and consume power must be replaced as quickly as possible.

We are still early in this journey, and we need to understand much more about what will happen between 2030 and 2050. Our purpose – legally and ethically – is to provide the best possible energy outcomes for Australian consumers of all kinds. The constellations guiding us are shaped by the evolving needs of energy consumers and the framework the market requires to meet those needs. We need to chart our course by the work that most effectively provides a net zero power system with a focus on consumer benefits.

In this report, framed as a narrative, we set ourselves the task of predicting what comes next: beyond 2030 and beyond the immediate demands of reviews and rule changes. Our vision – a consumer-focused net zero energy system – sets a destination towards which we can apply our skills in imagining our path ahead. This allowed us to identify eight crucial challenges and opportunities and agree on four key action areas that demand our early attention if we are to serve the energy sector and wider community well into the future.

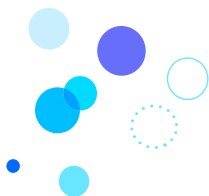
We connected regulatory shifts, market trends, technological innovations, here and overseas, and consulted our staff and stakeholders. We incorporated the extensive research, policy settings and plans established by Australia's governments and our market body colleagues. As a result, we are confident this narrative's intentions and priorities align with the Australian Government's Net Zero Plan, which covers all aspects of the economy. It also supports the Energy and Climate Change Ministers' Electricity and Energy Sector Plan and complements AEMO's Integrated System Plan, AER's work on *Game Changer Reforms* and consumer protections, and jurisdictional roadmaps for energy and related policy areas.

The primary task of this document was to map and capture the longer-term work the AEMC must complete in order to navigate a clear path to our vision. We will be even more pleased with the results of this mapping if others find the narrative illuminating, too.



TWO

Executive Summary



1. Our vision: a consumer-focused net zero energy system

We want to help the people of Australia benefit from a low-cost, low emissions, reliable, secure and safe power system. A successful energy system transition is the critical factor for decarbonising the economy, supporting national prosperity, and giving people confidence in our new approach to energy as we all face climate change.

The full statement of our vision in this narrative sets out three linked characteristics:

- **customer-facing goals**, such as giving consumers access to clear and actionable information as well as ways to benefit without active market engagement,

and

- **grid-scale features**, such as innovations that drive low-cost energy alongside the flexibility to adapt to changing economic circumstances, expanding to support new export opportunities,

leading to

- **energy transition benefits** for households, businesses, communities, and the environment – across an approach covering environmental, social, cultural and economic measures.

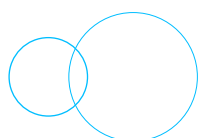
Realising this vision means the AEMC can support Australia's commitment to addressing climate change, empower consumers to easily make informed energy choices, attract investors to support the sector, and foster sustainable economic growth and prosperity.

We considered the challenges and opportunities that would exist regardless of which pathway the sector may follow to achieve its net zero goals. Among the issues we identified are many that Australia has been grappling with for some years. Every indication is that most will continue to require attention as the energy transition evolves in the decades ahead.

2. Our guidance: longer-term challenges and opportunities

We consulted and reflected carefully on the challenges most likely to require ongoing effort from policymakers, regulators and stakeholders. From this work we defined eight challenges or opportunities where, collectively, we can strive to achieve:

- equitable energy outcomes across households
- energy system security and reliability
- cross-portfolio coordination of relevant energy and net zero policies
- levels of social trust that will support change



- delivery of capital, labour and other resources
- meeting community and environmental needs alongside infrastructure requirements
- accessible data that supports the evolving energy system
- transition planning for the role of gas.

We recognise the need to contribute to the energy transition at pace and amid rapid changes, while still taking a far-reaching view of our tasks to support the transition through to 2050 and beyond.

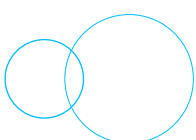
The intent is for these key challenges and opportunities to guide our current work program and identify focus areas for action. They will also guide our longer-term contextual view of what is required to support a successful transition to a consumer-focused net zero energy system.

3. Our actions: focus areas for the AEMC

One way these findings guide us is to help set our work program prioritisation to ensure we apply our resources to the work that matters most. We set annual priorities for rule changes and reviews for this purpose. For example, for the next 12 months our priorities are:

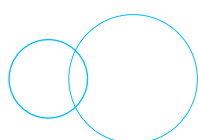
- **Consumers** – progressing work relating to urgent issues for consumer under the regulatory framework, including how we inform, empower and protect consumers individually and collectively.
- **Consumer energy resources (CER)** – we will progress work relating to the technical aspects of CER including the efficient integration of new technologies into the market and system.
- **Long-term market design** – progressing work relating to longer-term market design to ensure our frameworks provide the appropriate reliability settings, efficient provision of system services and investment signals for the net zero future.
- **Transmission** – progressing work relating to the cost-effective and efficient delivery and use of major transmission and network infrastructure.

Our work on this report has helped to identify four broader focus areas that will be nested within our work program. Developing these focus areas will support our priorities as we address opportunities and challenges over time, contributing to achieving our vision of a consumer-focused net zero energy system.



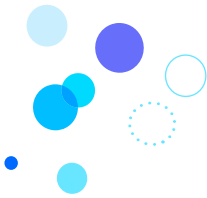
These focus areas are for us to understand or consider:

- 1 consumer behaviours and preferences to empower choice in a way that supports the energy system and benefits consumers individually and as a collective
 - 2 ways to foster the rapid, efficient, effective electrification of the consumer-focused transport sector
 - 3 how the regulatory framework for gas supports consumers and the electricity system as we transition to a net zero system
 - 4 the impact of climate change on the reliability, resilience and security of the energy system.
-

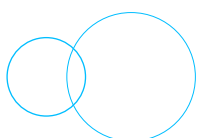


THREE

**Our vision:
a consumer-
focused net
zero energy
system**



To achieve our vision the energy system must: deliver for consumers, foster innovation, and be flexible, adaptable and resilient.



Decarbonisation is the most significant economic, social and environmental challenge of our time. This section sets out the AEMC’s vision for the energy transition, focusing on the energy system characteristics that are needed to deliver desired outcomes for households, businesses, communities, and the environment.

Our vision for the energy transition aligns with the strategic direction set by the Australian Government’s **Net Zero Plan** and the supporting **Electricity and Energy Sector Plan** agreed to by the Energy and Climate Change Ministers. It is also consistent with the development roadmap described by **AEMO in the Integrated System Plan** (ISP) as well as the AER’s work on **Game Changer Reforms** and consumer protections, as well as jurisdictional plans for energy and other policy areas.

In this vision and its narrative, we take a big picture lens, capturing the broad range of benefits that a successful transition to a net zero energy system can deliver for the people of Australia.

Australia is among the forefront of nations answering many of the most pressing questions arising from major power systems being revolutionised by decarbonisation, digitisation and decentralisation. We face unique challenges, including the growing scale, pace, and engagement of CER in a grid that covers vast distances and multiple jurisdictions. We are proactively managing the power system engineering and economic challenges associated with new technologies and the huge influx of inverter-based technologies that can see the generation and technology mix rapidly vary on any single day.

All of this means we are constantly inventing and testing new approaches in policy, regulation and market operation. Our learnings provide an opportunity to contribute beyond our borders by sharing our knowledge with the rest of the world.

This section describes our vision in more detail and sets out the wider context in which it needs to be considered. We recognise that the transitioning energy system is intersecting with a growing number of other sectors and policy areas, and we will continue to respond to this expansion.

3.1 Providing for Australian consumers

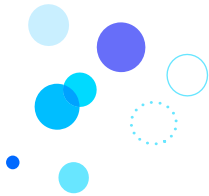
We want to help the people of Australia benefit from a low cost, low emissions, reliable, secure and safe power system. A successful energy system transition is the critical factor for decarbonising the economy, supporting national prosperity, and providing confidence as we all face climate change.

Consumers of all kinds are pivotal to the transition – whether through their investment in CER or simply their decisions about when and how to use energy. Their choices about energy contribute to the optimal functioning of the system. Consumers in rural, regional and remote communities often play an additional, integral role by hosting transmission, storage and generation infrastructure.

Our vision reflects our ambition to deliver a once-in-a-generation transformation of Australia’s energy system. Commonwealth, state and territory governments have set a series of targets for emissions reduction and renewable generation and the nation is making progress towards this goal.

3.2 The essential characteristics for transition

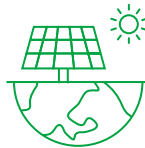
This vision informs our core functions as rule maker and adviser to governments, in line with the national energy objectives (comprising the National Electricity Objective, National Gas Objective, and National Energy Retail Objective). The energy objectives are our guiding light in how we assess our decisions for the long-term interests of consumers. They have recently been updated to include an emissions reduction focus. The summary below sets out the characteristics of the energy system the AEMC sees as essential to deliver desired outcomes.



A consumer-focused net zero energy system

Our decisions will support an energy transition that delivers wide-ranging benefits for consumers.

ENVIRONMENTAL



Australia’s emissions targets will be met, contributing to lowering global emissions. Biodiversity impacts will be minimised.

SOCIAL



All types of households with varying levels of participation will benefit. Vulnerable consumers will be supported.

CULTURAL

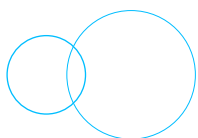


Communities that host energy infrastructure will be empowered. First Nations people will benefit.

ECONOMIC



Australia’s economic prosperity will be boosted. There will be new job and investment opportunities.



We consider the future energy system should have the following customer-facing characteristics:

- consumers can benefit without having to actively engage in the market
- consumers who want to participate in the system have easy options to do so and can opt out at any time
- all customers are covered by appropriate consumer protections
- clear information supports consumer choices on price, quality, and protection
- interoperability and innovation in regulatory frameworks to incentivise CER technology owners to share their resources in ways that promote reliability, security and low costs.

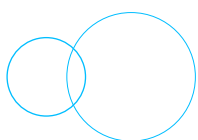
At grid-scale, the future energy system should feature:

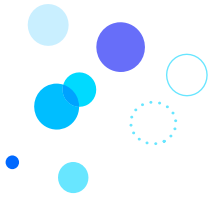
- energy efficient homes and businesses help to manage demand, lower costs, and make best use of existing resources
- coordinated and collaborative planning with communities of all kinds, including First Nations, resulting in significant energy infrastructure
- the right incentives for the uptake of renewable generation and storage at the right place and time
- market operators, regulators and participants equipped with information and tools to quickly adapt to changing technologies
- technologies and tools that keep the power system secure and reliable as weather patterns alter due to climate change
- sophisticated, accessible data use supporting competitive markets, efficient investment decisions, effective planning, and consumer choices.

An energy system that has these characteristics will:

- meet targets for renewable energy and emissions reduction that reduce the impacts of climate change and reduce pollution
- deliver reliable, secure, safe and low cost power to all
- earn high levels of trust among different consumer groups
- achieve and maintain social licence for the infrastructure to be built on land and sea
- underpin Australia's economic prosperity and our standard of living.

The move to an energy system based around renewables and storage will drive significant development, creating jobs, infrastructure, and wealth in our communities. Collaboration with communities will be essential to make decisions that balance the benefits of reducing carbon emissions and low-cost energy alongside potential impacts on human and natural environments.





Our vision emphasises the importance of ensuring that communities, including rural and remote communities and traditional owners, receive meaningful benefits from the transition when they host infrastructure on their land.

First Nations Clean Energy Strategy

We recognise First Nations people as important partners in Australia's transition to net zero. Extreme weather events and other effects of climate change affect many First Nations communities, as do issues relating to access to reliable and affordable energy for homes, businesses and important infrastructure.

Our vision supports the aspirations of the ***First Nations Clean Energy Strategy***, which are ¹:

- *participate in and benefit from the clean energy transformation*
- *ensure access to reliable clean energy for all Australians*
- *ensure First Nations cultural heritage, knowledge and connection to land and sea Country is respected*
- *government and industry create opportunities to build deeper collaboration, consensus and new ways of work with First Nations people.*

3.3 The broad context for the energy transition

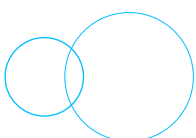
Our vision for a customer-focused net zero transition has been informed by the scale of the challenges as well as the future consequences for Australia.

Decarbonising the energy system will have far-reaching benefits, enabling other industries, such as transportation, to achieve their emissions reduction objectives. The transition presents a significant opportunity for Australia to expand its energy exports, transforming the sector from one primarily focused on domestic supply to one that is intrinsically international.

Australia's net zero fuel and resource exports, including from green industries, will support substantial economic growth and job creation. Moreover, by sharing the knowledge and expertise gained during our own transition to net zero, Australia can make a valuable contribution to global efforts to reduce emissions and combat climate change.

Immense changes are required to make the net zero power system secure and reliable. The transition is urgent and faces significant risks if market and policy settings, social licence, and supply chain issues are not promptly addressed.

¹ First Nations Clean Energy Strategy, 2024, <https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/first-nations-engagement-working-group/first-nations-clean-energy-strategy>



Net Zero Australia's modeling goes beyond the scope of the ISP to show the massive challenge for getting Australia to net zero. When considering a fully national (rather than NEM) scope, and covering a green energy export scenario out to 2060, the plan estimates that:²

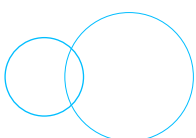
- the capital requirements are \$1.2–1.5 trillion of commitments by 2030, and \$7–9 trillion by 2060
- there needs to be an expansion of the skilled workforce from about 100,000 today to 7-800,000 by 2060
- renewables need to grow 40 times beyond the current National Electricity Market capacity for direct use and clean fuel production.

Our vision was developed with an awareness of the increasingly dispersed, disaggregated, and decentralised nature of the energy system. In the past, when reforms were more incremental, the policy enablers and stakeholders crucial to supporting desired outcomes were mostly confined to the energy sector.

Now, however, the combination of increasing electrification, the associated build-out of significant energy infrastructure, green energy export ambitions and other factors have expanded the range of what influences, and is influenced by, the energy system. As a result, the number of relevant stakeholder groups, policy areas, and decision-makers crucial to delivering desired outcomes has increased both within and outside the energy sector.

The increasingly complex context in which the energy sector operates means there is value in taking a holistic approach to achieving our vision. Successful outcomes will require change and coordination widely across energy and other policy areas. The broad approach applied in our vision was important, and helped us consider the challenges and opportunities of the transition. These are explored in the next section.

² Net Zero Australia, final modelling results, 19 April 2023; <https://www.netzeroaustralia.net.au/final-modelling-results/>



FOUR

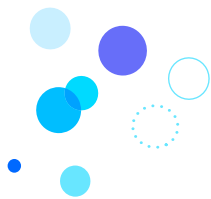
Our guidance: longer-term challenges and opportunities

The previous section emphasised the magnitude of Australia’s energy transition. The AEMC reflected closely on the factors that will require the ongoing attention of policy makers, regulators and stakeholders to achieve our vision. We recognised that there may be a number of drivers that result in different pathways to net zero and identified many challenges and opportunities that would feature regardless of the pathway.³

Among the issues we identified are many that Australia has been grappling with for years. We consider that most will continue to require attention as the energy transition evolves in the decades ahead.

We identified eight challenges and opportunities where, collectively, we can strive to achieve:

- 1 equitable energy outcomes across households
- 2 energy system security and reliability
- 3 coordination of energy policy and other policy areas
- 4 levels of social trust that will support change
- 5 delivery of capital, labour and other resources
- 6 meeting community and environmental needs alongside infrastructure requirements
- 7 accessible data that supports the evolving energy system
- 8 transition planning for the role of gas.



The AEMC has identified eight challenges and opportunities that are critical to achieving a consumer-focused net zero energy system

Energy system security and reliability needs to be maintained through unprecedented change



Equitable outcomes need to be achieved across households

Energy policy and other policy areas need to be coordinated to enable desired outcomes



EIGHT

The transition of gas needs to meet consumer, industry and net zero objectives



THREE



SEVEN

Data needs to be accessible and used to support the evolving energy system



FOUR



SIX

Community and environmental needs must be met alongside the need for new infrastructure

ONE

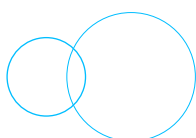
Trust is necessary to facilitate required change

FIVE

Capital, labour and other resources need to be attracted and distributed to deliver the energy transition



3 For more information on the methodology the AEMC undertook, see the Appendix.



The sub-sections that follow explore these themes. To develop our thinking for each of the eight themes, we asked the same questions.

- Why is the challenge and opportunity emerging?
- Why is it increasingly important to address?
- What are the benefits of addressing it?

4.1 Equitable energy outcomes across households

Energy participation across households continues to diverge

In recent years, household investment in energy assets has increased markedly, driven particularly by the growing adoption of rooftop solar, electric vehicles (EVs), and household batteries. The proportion of households with rooftop solar has more than doubled, rising from 15% in 2015 to more than 30% in 2023,⁴ and is expected to reach up to 80% by 2050.⁵

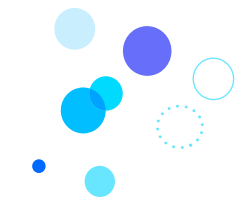
Demand management tools have also empowered households to make active choices about their energy consumption. These innovations have been fueled by consumer preferences, in response to rising energy costs and environmental considerations, and ongoing technological advancements.

As a result, there is a growing divergence across households. On one hand, a rising number of households are exercising control over their energy consumption and able to make choices to minimise their energy costs, including selling excess energy back to the grid. On the other hand, a majority of households currently cannot, or choose not to, invest in CER or change the way they use energy. This distinction will grow as new opportunities arise in energy-efficient solutions and electrification, including the shift away from natural gas.

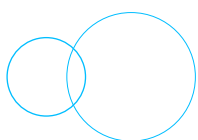
In its 2024 *PowerUp*⁶ report, Energy Consumers Australia (ECA) presented similar and additional insights into consumers regarding CER. Their findings included that consumers 'expect fairness' and that governments will distribute the benefits and burdens of the transition 'fairly – not equally'.

The disparity in household energy participation creates the risk of growing inequities for households unable to, or not wanting to, invest in CER or change the way they interact with the energy system. This risk will be exacerbated by two key factors:

- **Households with a preference for gas or unable to electrify will face a higher share of gas network costs.** Without regulatory changes, as more households electrify, the declining number of households that use gas for cooking and heating will each bear a larger proportion of gas network charges.



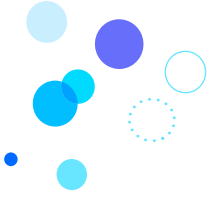
Promoting equity will benefit households and the energy system



⁴ Clean Energy Regulator, Small-scale installation postcode data, 2024. Accessible at: <https://cer.gov.au/markets/reports-and-data/small-scale-installation-postcode-data>

⁵ Australian Energy Market Operator, Integrated System Plan, 2024.

⁶ Energy Consumers Australia, PowerUp: Consumer Voices in the Energy Transition, 2024



Achieving energy system security and reliability will require a greater focus on new and emerging challenges

- **Households with access to consumer or community energy resources will be better positioned to exercise choice in the future as new technologies and energy services emerge.** Those households are likely to be more adaptable and willing to adopt innovations, alongside a deeper understanding of their personal energy use and suitable services.

While difficulties increase, an energy system that supports equitable outcomes across households regardless of their energy choices will empower households to choose if, how, and when to participate in energy markets. It will also enable households to choose from a broad range of cost-effective energy products and mean that those investing in CER receive a fair and appropriate return. For the energy sector, promoting equity will lead to more effective CER integration with the broader energy system and reduce the need for investment in generation capacity. This will reduce the costs to all customers.

4.2 Energy system security and reliability

New factors are affecting system security and reliability

The shift from a fossil fuel-based, synchronous, power system to a renewables-dominated power system introduces new economic and technical challenges to ensuring secure and reliable operation at all times.

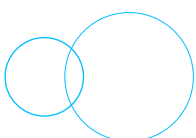
The main reasons for this are:

- **More active and diverse participants.** New participants in the energy system vary in size, technical and operating characteristics, and behaviour. This increases the uncertainty and decreases the predictability of energy supply and demand.
- **Greater dependence on, and vulnerability to, weather.** While renewable energy generation is essential to reach net zero objectives, it is dependent on weather conditions. Like much of our traditional infrastructure, new infrastructure is vulnerable to the risk of natural disasters associated with climate change.
- **Technologies need to evolve.** Shifting from large synchronous power units to inverter-based systems such as batteries, wind and solar relies on the development of new technologies and operational practices to ensure system security.

The ongoing evolution to a net zero energy system, and the emergence of new technologies, will necessitate an even greater focus on new security and reliability challenges, while also providing new opportunities to address these.

This includes the need to:

- **Enable sufficient firming capacity in a system dominated by renewables.** The future system will include a broader mix of energy generation sources, and a range of firming technologies, including demand flexibility, to support the overwhelming generation by renewables. This is likely to include reliance on gas-peaking plants until other solutions are developed.



- **Incorporate new technologies to meet future energy needs.** A range of early-stage technologies, including grid-forming inverters and hydrogen and other renewable gases, have the potential to support a system dominated by renewables, particularly in terms of security. Incorporating such technologies will impose new requirements on the energy system.
- **Manage the changing mix of assets and actors.** The potential proliferation of virtual power plants (VPPs) and community preference for energy self-sufficiency will create energy 'islands' or smaller grids. Greater ability to predict the requirements they will place on the energy system, for example, due to unplanned outages or generation shortfalls, will reduce the potential for disruption to overall operations.

A stable, reliable and secure power system is fundamental to delivering a dependable source of energy for homes and businesses required for the economy. It provides households with confidence to invest in and integrate their rooftop solar and stored power into the energy system, driving individual benefits and contributing to broader power system needs.

It will also build confidence and trust in the economics of the energy sector and support for the investment needed to decarbonise. Effective sequencing of energy infrastructure delivery will reduce price volatility and minimise costs to consumers. It will also help to minimise ongoing dependence on conventional fossil-fuel based technologies, in turn benefitting the environment.



Coordinating energy and other policy areas is critical in the face of change

4.3 Coordination of energy policy and other policy areas

The energy sector's transformation has a growing impact on other areas

The relatively slow pace of change to energy systems in Australia's past meant that these arrangements were developed and sustained over a relatively long time, and the impact on other sectors was limited.

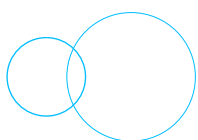
The rapid transition we are in now demands faster reviews of regulatory frameworks as changes to our system result in increasingly greater impacts on the community, the environment and the broader economy than has previously been the case.

Two of the most significant impacts are:

- **Planning for environmental and social implications.** The expanding footprint of the energy system is changing how land is used and evolving the role of regional and rural areas. More renewable generation is being placed in regional and remote areas and must be connected to the grid to reach metropolitan areas, too. The NEM alone requires a six-fold increase in grid-scale wind and solar generation, and up to 10,000km more transmission built by 2050,⁷ which is close to 25% more than the current transmission infrastructure.⁸ The material impacts of this expansion on rural areas hosting the new infrastructure go beyond energy sector policy and will place strain on social services such as housing, transport and healthcare.

⁷ AEMO, Integrated System Plan, 2024.

⁸ Department of Climate Change, Energy, the Environment and Water, National Electricity Market, 2024. Accessed at: <https://www.dceew.gov.au/energy/markets/national-electricity-market>



- **Greater coordination across energy and transport.** Additional energy network capacity will be required to enable more extensive provision of EV charging infrastructure across Australia. Enhancements to the road network will need to enable EV charging requirements. The transport sector can also play a key role to further drive EV uptake. The greater connection between the energy and transport sectors will also require greater coordination to best support natural disaster preparedness and response and drive emissions reductions.

Navigating these impacts will require increased coordination between energy and non-energy policy and closer attention to the role of non-energy policy to complement energy policy.

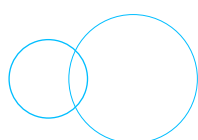
Policy questions raised by the increasing impacts of the energy sector include:

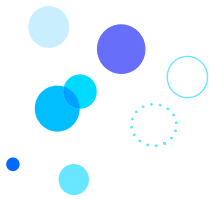
<i>Impact</i>	<i>Policy questions</i>
Land use planning	<ul style="list-style-type: none"> • How can we make thoughtful decisions on land use without introducing hurdles that slow the pace of Australia's transition? • How do we enable stakeholder participation in decisions on trade-offs?
Transport	<ul style="list-style-type: none"> • How can policy initiatives support EV adoption and sustainable fuels? • How can we best manage the rollout of EV charging infrastructure which will require changes to both road and energy infrastructure?
Regional communities	<ul style="list-style-type: none"> • How can policy settings meet the need of diverse regional communities, each with unique needs? • How can we best facilitate rural, regional and remote residents' engagement in the energy transition? • How can transient and long-term infrastructure workers and their families be housed and serviced in or adjacent to regional communities?
First Nations	<ul style="list-style-type: none"> • How can energy sector participants engage most effectively with First Nations communities with diverse needs in remote areas as well as in regional and metropolitan centres? • How can policy settings help ensure First Nations people's needs and perspectives are considered across energy and related decision-making?

Effective coordination builds trust

Coordination between energy policy and other policy areas will build trust in the transition and support the desired objectives in our vision for households, businesses, communities, and the environment.

Effective policy coordination has many benefits. Industry will be able to decarbonise with the confidence that policy settings are stable and coordinated. Governments will be well-placed to take timely and cost-effective action to address issues that arise, as they can build from a clear overarching policy framework.





*Need,
preference and
innovation will
continue to
drive change*

4.4 Levels of social trust that support change

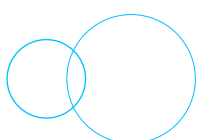
In recent decades there has been a dramatic expansion in the availability and use of new technologies in the energy sector. Among other factors, this has been driven by:

- **Consumer preference to control their own energy supply and demand to reduce their bills and decarbonise.** In late 2023, it was reported more than half of Australian households perceived affordable energy prices for all Australians as the most important challenge ahead for the energy system.⁹
- **New innovative technologies at the household and grid levels.** For households, there are new opportunities to participate in the energy system through CER innovation. At the grid level, change is already being driven by innovations in long-duration battery storage. Further substantial change may come from the potential for hydrogen and other renewable energy carriers.
- **Business customers need confidence.** Businesses of all sizes need access to information about the energy system of the future and throughout the transition. This means they can be confident the system will support their operations and make informed decisions about their energy supply.

With Australia only partway through the transition to a net zero energy system and economy, rapid change is set to continue. Confidence and trust have now become enablers of the energy transition. However, in December 2023 energy consumer confidence was at a five-year low.¹⁰

Without due care, public confidence and trust will be affected by:

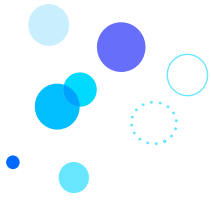
- **Uncertainty about the future affordability of reliable energy services.** Research shows that more than half of Australians are worried they won't be able to afford energy in the next three years. An equal number believe affordable prices are the most important issue for the future energy system¹¹.
- **Burdens on consumers from rapidly evolving and increasingly complex technologies.** As noted in section 4.1, CER offers substantial benefits for consumers, but consumer confidence to invest in technologies can be undermined if contracts are too difficult to understand. Consumers may prefer not to, or find it difficult to, process multiple decision variables around tariffs or thresholds for exporting energy to the grid.
- **Changes in energy sources.** A move away from gas as a household energy source will undermine the confidence of people who cannot afford or prefer not to switch away from natural gas for cooking and heating. The unknown factors associated with new renewable gases, such as hydrogen, may undermine confidence in new energy sources.



⁹ Energy Consumers Australia, Energy Consumer Sentiment Survey – December 2023.

¹⁰ Ibid.

¹¹ Ibid.



Trust has become an enabler of change

- **The impacts of renewable projects in regional communities.**¹² Where new projects do not adequately consider community needs and preferences, anxiety and distrust are likely. This is exacerbated by the cumulative impacts of projects.

Building and maintaining trust is a necessary step to empowering households to make informed decisions, such as shifting to new technologies. Done well, communities across Australia, including First Nations people, will access opportunities enabled by the transition.

We can also expect environmental benefits from a faster uptake of new technologies and new investment through CER integration. Businesses will have an affordable platform to decarbonise through electrification and will be more willing to trial new products and services. The energy sector will gain certainty about investing in new technologies and building new forms of clean energy and infrastructure delivery.

4.5 Delivering capital, labour and other resources

Capital and labour demands have grown beyond the energy sector's current ability to meet them

The energy sector's resource requirements have increased markedly. This is set to continue.

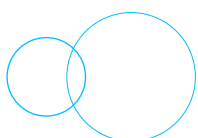
Key drivers behind the growing need for more capital and labour include:

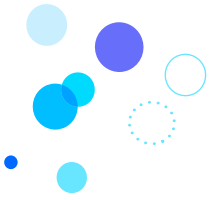
- **Increased energy sector construction.** The value of electricity generation, transmission and distribution construction increased by 77% between 2019 and 2023, from \$11.7b to \$20.7b.¹³ Capital and labour demand will continue to grow. As one indication, skilled electricity sector labour must double (as discussed in section 4.3) to deliver AEMO's Step Change scenario ODP.¹⁴
- **Distribution outside of established industrial centres.** As mentioned in section 4.3, energy infrastructure is increasingly moving outside of established industrial centres towards new areas such as renewable energy zones (REZs) and offshore wind areas. This shift will require vast quantities of capital and construction inputs to be transported to new locations.

12 Australian Government, Department of Climate Change, Energy, the Environment and Water, Community Engagement Review, 2023.

13 Australian Bureau of Statistics, Engineering Construction activity – tables 8 and 10, 2024.3. Note: this is not a comprehensive account of economy-wide investment in renewable energy as it excludes rooftop photovoltaic system. The value of work completed is based on the actual value of work carried out, which includes labour costs, plant hire, materials, project overheads.

14 Institute for Sustainable Futures for RACE for 2030, The Australian Electricity Workforce for the 2022 Integrated System Plan: Projections to 2050, 2023.





*It will become
harder to
attract
resources*

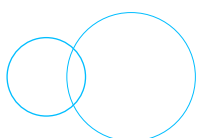
- **Expansion of renewable exports.** The development of renewable exports, including green hydrogen and its derivatives, presents new opportunities for Australia to expand its export industries. Comparing AEMO's Green Energy Export and Step Change scenarios suggests that developing new export industries will have a significant input on Australia's labour and capital requirements. This includes nearly twice as much installed generation capacity, more than twice as much transmission and an electricity sector workforce nearly three times larger.¹⁵

Some key contextual factors serve to emphasise the challenges of attracting the required resources, including:

- **International competition for capital and skilled labour.** Australia's energy transition is happening alongside similar transitions across the globe. We will increasingly need to compete for capital and labour globally, and alongside incentives provided through such mechanisms as the United States' Inflation Reduction Act and Japan's Green Development Strategy.
- **New education and training requirements to build the energy transition workforce.** It is predicted the energy transition will require almost doubling the size of electricity sector jobs (from 44,000 to 80,000) by 2050.¹⁶ Higher education and VET courses will have to keep pace, offering skills specific to renewable technologies, including the design, operation and maintenance of solar, wind, hydrogen and storage facilities. An important aspect of this challenge is to reskill workers in fossil fuel-dominated communities to transition to clean energy jobs.
- **Supply chain constraints.** Global supply chains are still grappling with the after-effects of COVID-19. Australia, as a smaller player in the global market, faces challenges in attracting the required resources for the energy transition.
- **Demands on transport infrastructure.** The logistics involved in developing new generation in regional areas, especially in the areas of substantial build, will pose substantial requirements on transport infrastructure. Many regional and rural roads may require significant upgrades to manage higher volumes of transport, and impacts on local communities from increased traffic will need careful management. The availability of ports and sea vessels will be stretched as the development of new offshore wind areas overlap with offshore oil and gas decommissioning.
- **Housing and service needs in regional areas.** The additional workforce required to support construction in REZs is too large to be accommodated in existing dwellings in regional areas, alongside the ongoing housing shortage in many parts of the country. Additional social services such as early childhood education and healthcare will be required to support the growing population base across many parts of regional Australia.

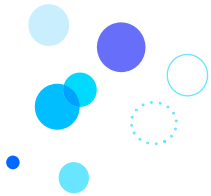
¹⁵ Institute for Sustainable Futures for RACE for 2030, The Australian Electricity Workforce for the 2022 Integrated System Plan: Projections to 2050, 2023.

¹⁶ Ibid.



Attracting sufficient capital and labour to the energy sector will enable Australia to meet its net zero targets faster, minimising the cost of the transition and improving affordability of energy.

Businesses will benefit from increased global competitiveness due to cheaper clean energy and green credentials. The energy sector will be able to participate competitively in the global energy market, given a lower cost of capital and resources. Governments will benefit as Australia meets its legislated net zero targets and international agreements and through our ability to support other economies to decarbonise.



Addressing the resource need will help achieve net zero targets and create economic opportunities

4.6 Meeting community, environmental and infrastructure needs

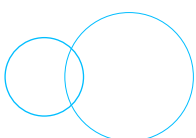
The interplay of diverse factors has placed greater weight on community and environmental considerations in the energy transition. In addition to energy's growing geographic footprint across Australia (noted in section 4.3), such factors include:

- **Heightened environmental and social standards.** Australians are placing greater importance and interest on environmental and social matters, including pressing expectations for ESG initiatives.
- **Value in partnering with First Nations communities.** Greater awareness and respect of First Nations people's connection to and expertise of Country has highlighted the importance of partnering with their communities to create an inclusive energy transition that delivers enduring community benefits towards better social and environmental outcomes.

Complex, interrelated trade-offs

Managing social and environmental concerns, amidst an evolving system, is increasingly complex as:

- **Community expectations will continue to increase.** As the energy transition progresses, community and environmental stakeholders will have more reference points to inform their advocacy. This includes more precedents on benefits that have been achieved for communities and environments, which can then, in turn, inform their representations to energy developers and governments.
- **Cumulative impacts will grow.** Some decisions may have low levels of impact when considered in isolation. However, when considered over time, there might be significant impacts on particular stakeholders or environments. Likewise, stakeholder sentiment and willingness to make trade-offs will evolve as cumulative effects from the transition are experienced. For example, communities in REZs may seek greater social and environmental considerations after seeing the impact of earlier renewable projects.

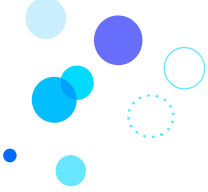


- **The energy transition will affect more communities.** As the energy transition progresses, more geographical areas will be affected by generation or transmission infrastructure. Each area will have its own community and environmental needs. For example, once the optimal sites for REZs have been developed, there may be a need to consider more contested sites to meet Australia's growing clean energy requirements.

Clearly addressing community and environmental objectives will best enable the transition

Clarity on how community and environmental objectives will be met will build support for Australia's energy transition and reduce sources of uncertainty or friction. It will help meet the needs of First Nations communities throughout the transition, through partnerships and engagement. Appropriate focus on environmental objectives will also help to avoid unnecessary environmental harm and biodiversity loss from infrastructure development.

The energy sector will benefit from greater confidence and certainty to underpin their investment decisions. Governments will have greater ability to focus on broader aspects of the energy transition, such as maximising consumer outcomes, as less time is required to address issues with specific developments.



Energy's physical footprint has expanded along with an increase in community expectations

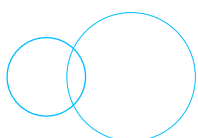
4.7 Accessible data that supports the evolving energy system

The energy system can benefit from unlocking the value of existing and new data

Improving data flows is essential for the transformation of our energy system into one that is smarter, more flexible, responsive to consumer needs and is more affordable. To support the increasingly decentralised system we need to establish the data sources and flows. This is a critical enabler of reliability and security of the system, the efficiency of markets and consumer choice.

The deployment of new technologies across the grid makes Australia's energy system increasingly rich in data. A growing number and variety of devices are creating and potentially sharing data as they connect to the system, such as smart meters, grid sensors, and the Internet of Things (IoT).

However, the system faces challenges in accessing and coordinating disaggregated pieces of information to draw meaningful insights and make effective decisions. Australia requires new ways to leverage the full benefits of data to support the move to a more efficient, cost-effective, secure and resource-optimised energy system.



Gathering data and establishing flows is challenging

New challenges continue to surface, impacting the ability of the energy system to leverage data. These include:

- **Interoperability of new technologies, devices and systems.** The energy system comprises a wide range of technologies, devices, and systems with different data formats, protocols, and communication standards. Without standardisation across these domains, it will be difficult to exchange information and generate valuable insights from a rich database.
- **Accessibility and distribution of high volumes of data.** The energy system is collecting vast volumes of data from new sources every day. To be useful to the system, data must readily be accessible to share with relevant decision-makers, such as operators, retailers and policymakers, while maintaining the privacy of personal and sensitive information. Converting raw information into insights will require sophisticated analytical tools and capabilities across the energy sector.
- **Risks and opportunities associated with artificial intelligence (AI).** AI has the potential to significantly improve processing and analytical capability in an increasingly complex energy system. It offers promising new ways to manage power grids and predict demand patterns through sophisticated algorithms. Along with such promise come risks, such as algorithms posing possible anti-competitive effects, known as ‘algorithmic collusion’, that will require further investigation and attention.

Effective coordination of data and technology will facilitate an energy system that is cost-effective, resilient, secure and flexible. Household and business consumers will benefit from cheaper energy bills if they use insights from their real-time energy data to optimise their usage.

For the energy sector more broadly, system failures can be anticipated in advance through sophisticated monitoring systems and algorithms that reduce maintenance time and costs. Used innovatively, data promises to connect energy system stakeholders in new and extraordinary ways, reinforcing a whole-of-system approach to Australia’s energy transition.

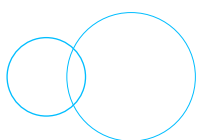
4.8 Transition planning for the role of gas

The future of gas raises a complex set of factors

The Australian Government’s *Future Gas Strategy* and other works, including the ISP, emphasise the critical role of gas in the current energy system. Natural gas makes up 27% of Australia’s energy consumption: from generating electricity, to mining and industrial processes, to household cooking and heating.



An energy system enabled by data will benefit all stakeholders



The future role of gas in the energy system involves a complex range of factors. These include:

- the role of gas peaking plants as part of the quadrupling of firming capacity that the ISP predicts will be necessary to support new, variable, renewable energy
- the continued role of gas as an energy source for homes and businesses, where some consumers will prefer gas and some will find it difficult or unaffordable to electrify
- consideration of alternatives being developed to replace gas in industrial processes that are hard to electrify, such as manufacturing cement and steel
- uncertainty on the role of renewable gases such as hydrogen
- the desire to exit natural gas and other fossil fuels to reduce the carbon emissions of the energy sector.



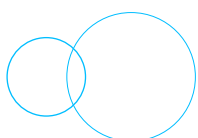
Clarity about the role of natural gas will also encourage timely and economic investment in renewable gases

The challenges of the gas transition will grow

The transition planning for gas in Australia's energy system must account for consumers, networks, exports and wholesale market impacts both in electricity and gas.

Some challenges to be addressed are:

- **Increased costs for remaining users as use declines.** The declining use of gas infrastructure will raise the costs for those who continue to use gas. Unless transition plans continue to be developed and refined, households, businesses and industries that choose not to or are unable to electrify will bear a greater portion of costs to meet changes in gas usage (section 4.1).
- **Certainty for investors, households and industry.** Certainty allows organisations and individuals to make plans – important for industries that are reliant on gas, as well as households that face difficulties in electrifying. Greater certainty around the role of gas will support continued investment, including investment in electricity generation required for security and reliability.
- **Future of gas distribution assets.** This includes whether existing infrastructure can be used or modified to cater for renewable gases, including hydrogen and biomethane. There is also an important question of whether existing assets that will not be required in the future can recoup the value of investing in these assets when they were required.



Clarity on the role of gas in the transition will benefit consumers, business and the energy system

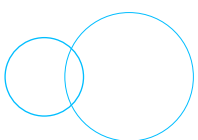
The AEMC supports the six guiding principles, and associated actions, set out in the Future Gas Strategy. We also welcome the government's emphasis on the need for further policy development to provide greater clarity on the transition plans for gas.

Greater clarity will minimise the risk that assets that become underutilised or unnecessary will leave vulnerable and other consumers to pay an increasing share of the remaining value of those assets if they are unable to transition away from gas.

For the Australian economy, additional policy development will assist in the development of replacement export industries such as green gases and other green exports, such as green steel. Some of which may be able to utilise the spare capacity of existing assets.

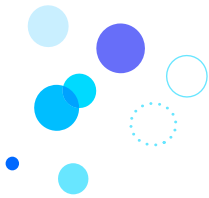
Clear transition planning and policies for gas will benefit the energy sector as a whole. This includes:

- greater certainty for investment in both gas and other energy assets
 - support for the development of alternatives to natural gas, such as renewable gases
 - certainty to investors providing gas peaking generation that the value of that investment will be recovered
 - the sector's ability to repurpose assets for renewable gases.
-



FIVE

*Our actions:
focus areas
for the
AEMC*



We recognise the need to contribute to the energy transition at pace and amid rapid changes, while still taking a longer-term view of our role in delivering the transition through to 2050 and beyond.

The challenges and opportunities will guide our longer-term contextual view of what is required to support a successful transition to a consumer-focused net zero energy system.

Our work from this report will be used to guide our work program prioritisation in the coming years to ensure we use our resources to do the work that matters most.

We have used the challenges and opportunities to guide our rule change and review priorities over the next 12 months. We will continue to use these challenges over the coming years to guide our work.

In this final chapter we will describe the shorter-term actions ahead of us. We will cover the rule change and review prioritisation for the next 12 months, our four new focus areas based on the work of this report, and, at the end of this chapter, describe the aspects of the AEMC's 'toolbox' most relevant to this work.

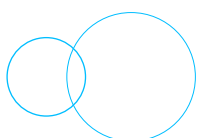
Our rule change and review priorities for the next 12 months are:

- 1 Consumers** – progressing work relating to urgent issues for consumers under the regulatory framework, including how we inform, empower and protect consumers individually and collectively.
- 2 Consumer energy resources** – we will progress work relating to the technical aspects of CER including the efficient integration of new technologies into the market and system.
- 3 Long-term market design** – progressing work relating to longer-term market design to ensure our frameworks provide the appropriate reliability settings, efficient provision of system services and investment signals for the net zero future.
- 4 Transmission** – progressing work relating to the cost-effective and efficient delivery of major transmission and network infrastructure.

Key areas of work under these areas include:

Consumers

- **Pricing for a consumer driven future review.** We are conducting a review to look at opportunities for retailers, networks, and third parties to offer products, services, and tariffs that are meaningful and understandable to customers. As covered elsewhere in this narrative, changes in energy usage behaviours, often driven by pricing, can minimise system costs and lower bills for households and businesses both directly and indirectly.
- **Rule changes relating to smart meter deployment** and consumer access to real-time data.



Consumer energy resources

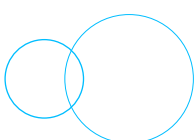
- **CER implementation roadmap.** We are actively participating in the CER taskforce established by Australia's energy ministers to advance key elements of the CER roadmap. This includes:
 - developing a framework of protections for consumers as they use an expanded range of energy products and services
 - defining the system and market functions and interfaces, and clarifying the roles and responsibilities of networks, industry participants and AEMO
 - developing a map of data requirements and flows for the future system
 - determining how industry standards are best developed for performance, communication and interoperability
 - making technical governance arrangements fit for high levels of CER
 - understanding how EVs can be integrated into the energy system.
- **Rule changes** including unlocking CER benefits and integrating price-responsive resources.

Long-term market design

- **The future of the wholesale market.** Working closely with governments and industry stakeholders, we are examining how the market will need to change to attract the scale of investment required in the system both up to and beyond 2030. We are exploring market designs that deliver reliability, security, emissions reduction and affordable energy in the next five years and further ahead.
- **Essential system security reforms.** We will continue to focus on our essential system services work program, which will evolve as we explore how best to operate a future power system with more inverter-based resources. This will build on the significant amendments we have already made to address the challenges of emerging technologies and the retirement of synchronous plant.
- **Rule changes** including cyber security roles and responsibilities and technical access standards.

Transmission

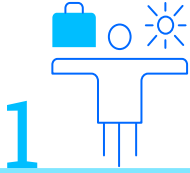
- **Transmission review and rule changes.** We need more transmission infrastructure and a more interconnected grid to achieve net zero. It is important to ensure regulatory frameworks are fit for purpose to support the timely and efficient delivery of major transmission projects and better signals are in place to coordinate new storage, generation and network builds. We will continue to focus on our transmission work program to achieve these outcomes.



New focus areas

Our work on this report has helped to identify four broader focus areas that will be nested within our work program. The development of our understanding across these focus areas will support our priorities as we address opportunities and challenges over time. This will contribute to achieving our vision of a consumer-focused net zero energy system.

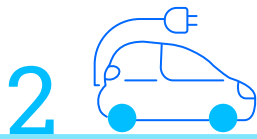
These focus areas are for us to understand or consider:



1

Consumer behaviours

Consumer behaviours and preferences to empower choice in a way that supports the energy system and benefits consumers individually and as a collective.



2

Electrification of vehicles

Ways to foster the rapid, efficient, effective electrification of vehicles.



3

The gas transition

How the regulatory framework for gas supports consumers and the electricity system as we transition to a net zero system.



4

Climate impacts

The impact of climate change on the reliability, resilience and security of the energy system.

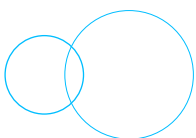
5.1 Understand consumer behaviours and preferences

This area of action seeks to further broaden our knowledge about consumer behaviours and preferences to identify:

- how trends in consumers' choices are affecting the operation of the energy system and the costs borne by different groups
- how existing consumer protections may inhibit choice while also not providing appropriate safeguards
- how to better inform and empower people in their decision-making in a way that benefits consumers generally, as well as individually.

This work will complement and support AER's actions on consumer protections for future energy services, and any future work Australia's energy ministers might prioritise. Bringing a social science lens to our work will provide greater insights than relying on our collective intuition about what we think consumers will do.

It is an important area of focus that will contribute to our vision for delivering a consumer-focused net zero energy system. Such a system needs to deliver for consumers by facilitating choice, fostering innovation and maintaining power systems that are efficient, adaptable and resilient.



Understanding this area will only become more important as an increasing proportion of households exercise control over their own energy production, storage, and consumption. This will come about through greater access to solar panels, household batteries, flexible load, smart meters and other energy management technologies and services.

As we have more CER in the system, consumer behaviours and preferences become increasingly impactful on energy system security and reliability in a period of unprecedented change (section 4.2). This goes beyond identifying the ideal set of behaviours that will benefit the energy system as a whole. It is about understanding how different types of consumers will behave under different pricing incentives, market frameworks, climatic conditions and consumer protections, and what this means for reliability and security.

The ECA's 2024 *PowerUp*¹⁷ report also found that different segments of consumers will require different 'interventions' to participate in the changes the system may require.

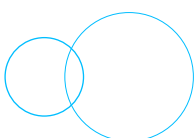
The uptake of CER also increases the need for a fit-for-purpose consumer protection framework that balances innovation and system operation with safeguards and access to services. The more consumers who are using CER advances – such as home batteries or third-party management services – the greater the need for effective protections. Just as important, effective consumer protections are integral to building up confidence for households and businesses to adopt new hardware or engage new services.

Appropriate consumer protections are an important aspect of building confidence to engage in new services

Understanding consumer choices and preferences is critical to addressing the opportunities and challenges of achieving equitable outcomes across households (section 4.1). The success of CER integration in a way that benefits all households, not only those owning CER kit, is dependent on when and how consumers use their CER and energy. Our vision is for a future where CER delivers considerable benefits to all rather than contributing to a worsening energy divide.

We will actively examine these issues in our current work program through our review on Pricing for a Consumer-Driven Future.

17 Energy Consumers Australia, *PowerUp: Consumer Voices in the Energy Transition*, 2024



5.2 Consider how to foster rapid electrification of vehicles

This focus area examines changes that may be required to support government objectives to increase the uptake of electric vehicles and related infrastructure. We will consider the cost, price, emissions reduction potential and other implications, including equity.

Electrification of consumer transport is a fundamental part of achieving our vision, due to the ubiquitous nature of motor vehicles and the scale of impacts that EVs will bring. This directly relates to several of the challenges and opportunities we outlined in Chapter 4, including that energy system security and reliability needs to be maintained through unprecedented change and energy policy and other policy areas need to be coordinated to enable desired outcomes (sections 4.2 and 4.3).

The increased uptake of electric vehicles has substantial implications for the amount of electricity that needs to be available, the time it needs to be available and where it needs to be available. This increased uptake – and potential storage and export capacity via EV batteries – will also create opportunities that broadly fall under the CER banner.

These implications and opportunities will occur across the production, transport, sale and use of electricity, and at a scale where barriers or inefficiencies could result in negative outcomes for consumers, participants, and the broader economy. This relates to charging infrastructure, home charging behaviour, and the intersection of transport-related policy and electrification. EVs at the consumer level will be the starting point for consideration of these issues.

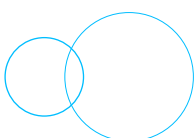
Similar to the preceding focus area on consumer behaviours, an important aspect of this work will be considering the ideal combination of incentives and regulatory requirements to achieve the desired outcomes. For example, understanding whether pricing can create home-charging behaviours for EVs that benefit consumers and the energy system as a whole. If not, we can consider to what extent incentives may need to be supplemented with regulatory requirements about when EV charging can occur.

This focus area will also be considered through the existing work program through our review on Pricing for a Consumer Driven Future.

5.3 Consider the regulatory framework for gas

This focus area involves the future regulatory framework for gas, including costs and impacts on households, industry and the electricity system of the future.

While natural gas is likely to continue to play an important role in Australia's energy mix, there is currently uncertainty about the extent of that role in the future and the opportunity for net zero substitutes. A continuing lack of clarity is likely to result in poor outcomes for consumers of both gas and electricity in terms of increasing costs, poor reliability, lack of availability and security of the system.



Attention to this area aligns with our vision for consumer choice and a low-cost energy system during the transition to net zero. Consideration of gas will address multiple challenges and opportunities identified in chapter 4, especially section 4.8, which emphasises the transition of gas must meet objectives for consumers, industry and decarbonisation.

The gas transition will be an important consideration across the AEMC work program for the coming years. It relates to questions of reliability, security, affordability and enabling the achievement of emissions targets. We will be a key contributor to the national conversation about the gas transition. The intention is to coordinate with the Commonwealth's future gas strategy, to provide a pathway to energy security while transitioning to net zero.

5.4 Understand the impact of a changing climate

To improve our understanding of the impact of climate change on the reliability, resilience and security of the energy system, we will:

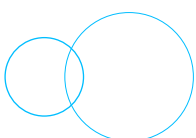
- build on our work in the Form of the Standard review to develop a better understanding of the changing nature of reliability risks in a weather-dependent system
- develop our understanding of the risks of extreme events and options to support the resilience of the system
- investigate challenges to system security from an increasingly weather-dependent system.

We will consider and incorporate these findings in our work so that energy market frameworks are robust, manage the transition and protect the interests of consumers.

This action area supports our vision for a low cost, low emissions, reliable, secure and safe power system through the transition, giving people confidence and trust as we face climate change.

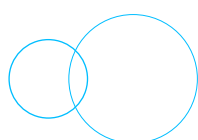
As discussed in chapter 4, our future energy system will be heavily exposed to weather (section 4.2). Understanding how climate change will alter future weather patterns that affect the power system – via combined wind and solar droughts, for example, or long-term trends in wind speeds – is critical for maintaining reliability. This involves understanding the climatic impacts on supply and demand. AEMO has done work on this in the ISP but there is more to understand, especially how consumer preferences and behaviours might change demand patterns. The ECA has also researched consumer attitudes towards trade-offs to contribute to reliability in the grid – for example, how different segments of consumers would respond to requests to reduce power usage during a heatwave¹⁸.

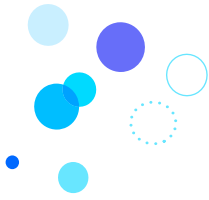
18 Energy Consumers Australia, PowerUp: Consumer Voices in the Energy Transition, 2024



The power system risk and resilience profile is changing as it becomes more weather-dependent and more exposed to extreme weather. Considering how the system can be more resilient by becoming stronger, more interconnected, or smarter, can help us avoid, survive, recover and learn from the events that will affect it.

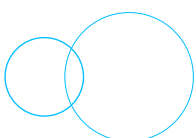
We will seek to apply insights and learnings from climate change adaptation into our work evolving the regulatory frameworks. Our remit, skills and experience place the AEMC in a strong position to understand these considerations and how the frameworks may need to adapt, as do our close collaborations with other market bodies, government agencies, and the broader sector and community.

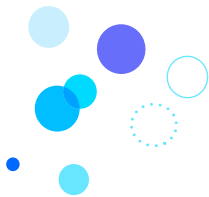




5.5 Our toolbox

- **Self-initiating reviews.** *These reviews thoroughly investigate a priority issue to work out what needs to be done. This can result in recommendations for rule change proposals.*
- **Progressing rule changes in priority areas.** *We make and amend the National Energy Rules under the National Energy Laws. These rules affect how functions of the AER and AEMO are undertaken and how participants operate in the competitive wholesale and retail sectors. They provide specific protections for consumers, and govern the economic regulation of electricity transmission, distribution and gas. Rule change requests can be submitted by anybody and are progressed on a priority basis.*
- **Trial rules.** *Stakeholders may also request the AEMC make a trial rule, which enables regulatory sandboxing, which is a temporary rule that supports market innovation.*
- **Undertaking forward-thinking projects to inform others.** *These include research projects that fill a gap in knowledge for emerging issues.*
- **Providing advice to governments.** *This occurs on an ongoing basis and may range from conducting a formal review in accordance with terms of reference provided by Australia's energy ministers, through to ad hoc advice to governments on a particular issue.*
- **Develop a Reconciliation Action Plan.** *Our RAP is underway and will build AEMC staff cultural competencies and to help us work towards reconciliation with First Nations people and build greater understanding.*
- **Broadening our stakeholder connections.** *As the sector increasingly expands and interconnects with other policy areas, we are connecting and working with more stakeholders coming into the sector, innovators, and those outside the energy sphere, such as planning, skills and environmental policy. This will enhance our understanding of industry and consumer issues and improve our decision-making capability.*
- **Advocating through submissions to external parties.** *This may include written submissions or participating in forums and discussions that relate to policy initiatives run by other organisations.*
- **Identifying opportunities for research collaborations.** *This includes partnerships with researchers, academia and other organisations.*
- **Highlighting important context for our work.** *Calling out particular issues or important context when we make decisions, recommendations or provide advice.*





We look forward to engaging with stakeholders to progress current and new reforms

The AEMC will continue to work with market bodies, governments, industries, consumers, First Nations people and communities of all kinds, to achieve our vision.

We will use our existing tools to progress this work, including our work on reviews, rule changes, forward-thinking projects, collaborating with others, providing expert advice to governments and advocating for change.

Importantly, we will continue to test and adopt new and innovative ways of working that increase the pace, quality and impact of our work and decisions. We recognise that to do this we need to consider trade-offs between precision and better outcomes and find ways to keep up with contemporaneous information in a fast moving technology and market environment.

Our objective remains to deliver effective outcomes for consumers through practical rule changes and expert advice; and improve the energy market through more forward-thinking action and decisions.

We recognise that to progress our vision we must evolve with the energy system.

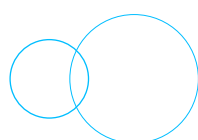
We will continue to improve how we work, including proactively embarking on initiatives outside of our traditional rule-change processes to better collaborate, engage, lead and influence.

The successful transition of the energy sector will be a catalyst for the transition of the broader economy to net zero. We look forward to working with the broad range of stakeholders involved in Australia's energy transition with cross-disciplinary coordination, innovation and iterative development.

TOGETHER,

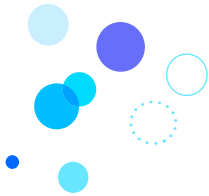


we can achieve our vision for a consumer-focused net zero energy system for Australia.

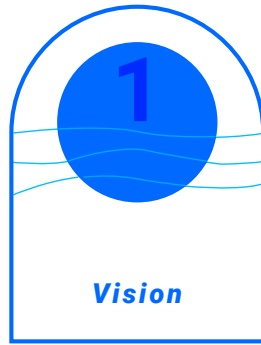


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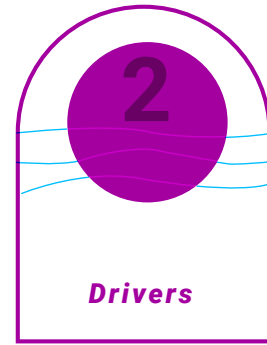
*Appendix:
A structured
method
underpins
AEMC's
perspective*



The AEMC developed this report to guide its own future rule-making and market reviews, and to share its perspective with other stakeholders across the energy system. We undertook a broad strategic exercise to develop the findings in this report, as outlined in this diagram. The key steps are further detailed below.



AEMC reflected on its ambitions for the energy system over coming decades and distilled this into an overarching vision.



AEMC identified six overriding 'drivers' that it believes will influence Australia's energy transition in the future. Transition drivers offer a way of thinking about the many ways the energy system may evolve.

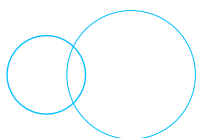


AEMC analysed each driver against the vision to distil eight challenges and opportunities for ongoing attention to achieve the vision as Australia undergoes its transition.



AEMC identified four focus areas for the AEMC that will guide our future work program and address the challenges and opportunities to achieve the vision.

Figure 1 The AEMC took four steps to develop the report



1. AEMC's vision

We reflected on our ambitions for the energy system over coming decades and distilled this into an overarching vision. The vision succinctly captures AEMC's aspiration and is the bedrock for this report.

2. Drivers

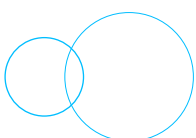
AEMC identified six overriding 'drivers' that we believe will influence Australia's energy transition in the coming years and decades. These drivers offer different ways of thinking about how the energy system may evolve. The drivers were formed through analysis of public reports that have examined Australia's energy transition, such as AEMO's 2024 Draft ISP and the Net Zero Australia study, and AEMC's own reflections.

The drivers represent a range of possibilities, including:

- a narrow focus on household objectives (**Household**) versus a broader focus on community and environmental objectives (Just)
- a focus on the energy system specifically (**Efficient**) versus a wider focus on the opportunities for the overall economy (Economic development)
- a slower pace and scale of change (**Contested**) versus rapid and substantive change (**Revolutionary**).

Each driver has a distinct 'focus':

- **Household** – focuses on outcomes for households, driven by innovative technology and services.
- **Revolutionary** – rapid and substantive change, driven by big data and CER in a modular system.
- **Just** – fairness and equity, driven by distributed benefits across communities and the environment.
- **Economic development** – economic prosperity, driven by abundant and cheap energy sources.
- **Efficient** – market competition and industry-led innovation, driven by policy and market design.
- **Contested** – slower pace and scale of change, driven by low public confidence and coordination.



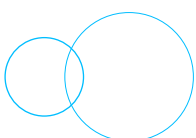
The transition drivers were analysed against AEMC's vision to identify unique challenges and opportunities about the future.

3. Key challenges and opportunities

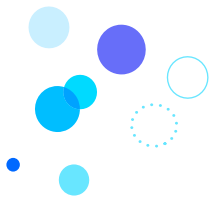
Consideration of each driver raised a range of questions alongside our vision, surfacing a longlist of considerations for the AEMC and broader energy system. Eight key challenges and opportunities for ongoing attention emerge, given their relevance across different drivers, their criticality to achieve AEMC's vision and gaps in current policy and regulation. Chapter 4 articulates each of these eight key challenges and opportunities for ongoing attention. We asked: Why is the challenge and opportunity emerging, why is it increasingly important to address, and what are the benefits of addressing it?

4. Future focus areas

In reviewing the eight key challenges and opportunities, we identified four future focus areas to guide our work. They are intended to guide the AEMC's future work program, and address the challenges and opportunities surfaced in the previous section.



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