



Australian Government

# Electricity and Energy Sector Plan 2025



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#### Acknowledgements

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#### Acknowledgement of Country

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

# Minister's foreword

I am pleased to present the Electricity and Energy Sector Plan. The plan sets out an ambitious and achievable pathway to reduce emissions while ensuring the affordable, reliable, secure and equitable supply of energy.

Energy underpins the Australian economy and our energy system is at a pivotal moment. Australia's ageing coal fired power stations are reaching their end of life. They are increasingly unreliable and expensive to maintain. The natural gas fields that powered Australian industry from the 1960s are depleting. Over 90% of our liquid fuel comes from imports so consumers have significant exposure to global oil prices. Energy also accounts for around 90% of our net emissions.

Australia's rich renewable energy resources provide a once-in-a-generation opportunity to capitalise on the global transition to net zero. We can use our abundant renewable energy to modernise our energy system and develop the new clean energy industries that will support our future prosperity. The energy transformation represents an opportunity to develop new industries, grow our regions, create new jobs and reduce energy bills for consumers.

The electricity system of 2050 will be delivered by wind and solar, backed by hydro, storage and gas. Today, two thirds of Australia's energy comes from gas and liquid fuels. Electricity generation will increase dramatically to support new demand as users switch from fossil fuels to electric alternatives, with domestic electricity demand projected to double by 2050. Firmed renewables provide the cheapest form of new generation available to support this demand.

The Australian Government has set an ambitious target of 82% renewable electricity by 2030. We are making good progress towards this target. Already, over 40% of the electricity in Australia's 2 largest grids is renewable. The Capacity Investment Scheme and Rewiring the Nation program will supercharge progress to 2030. And while there's a long way to go, sales of electric vehicles hit record levels in June 2025 – making up over 10% of the overall new car market. Around the nation, more and more households and businesses are providing their own energy with rooftop solar. The Cheaper Home Battery has delivered over 55,000 batteries – with total storage capacity of over 1 GWh – in just over 2 months since the program commenced on 1 July 2025.

But there is still so much more to do.

We also need to fuel-switch to lower emissions alternatives, which is why we are investing \$1.4 billion to kickstart Australia's low carbon liquid fuel supply chain, including \$1.1 billion for the new Cleaner Fuel Program. Electrification should be implemented wherever possible. Where electrification is not currently feasible – for example, some high-heat industrial processes – switching to low-carbon gases and liquid fuels should be prioritised.

Decarbonising our energy system includes energy performance improvements to make the most of Australia's energy resources. This means using energy more efficiently, and changing how and when we use energy to best take advantage of Australia's abundant renewables.

Governments, the energy sector, households, communities, businesses and industry, all have a role to play in the energy transformation. This plan shows how we can maximise the benefits of the energy transformation by ensuring the right incentives are in place to support industry and households to participate.

I thank industry, investors, community groups, unions, academics and others for their feedback in developing this plan. The energy transformation is a huge opportunity for our nation. Together we must keep working to seize that opportunity.



**The Hon Chris Bowen MP**  
**Minister for Climate Change and Energy**

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# Executive summary

The Electricity and Energy Sector Plan is one of 6 sector plans developed alongside the Net Zero Plan. It supports the Government's 2035 emissions reduction target of 62-70% and charts an ambitious and achievable course for transforming our energy system to support net zero by 2050.

Clean energy is essential to decarbonising the domestic and global economies. The world is already shifting away from fossil fuels like coal, gas and oil, towards cleaner and cheaper energy sources. New investments are needed to modernise our energy system as global energy markets change, technology continues to develop, and our existing infrastructure reaches its end of life.

Our rich renewable resources are a powerful advantage in the changing global economy. We can target the new investment our energy system needs to support economy-wide decarbonisation and power economic growth in a way that benefits all Australians – while also supporting global emissions reduction through the export of products made with clean energy. These investments will drive productivity growth in our energy sector and across the economy.

Australia is already in the midst of this significant transformation. Households are actively investing in solar panels, batteries and electric vehicles. Private investment and government policies are driving a rapid transformation of our electricity and energy sector.

The Electricity and Energy Sector Plan sets out a roadmap for the next stages of our energy transformation. Long-term policy settings that are credible and stable will support higher levels of investment and growth. A clear pathway will help households, industry and governments successfully navigate and prosper through the transformation.

An orderly transition is in the interest of all Australians. Early and coordinated action will support economic growth, living standards and energy affordability. In contrast, a delayed and disorderly net zero transition would push up wholesale electricity prices through a greater reliance on ageing coal-fired power stations and more expensive gas-fired generation.

## Setting a pathway to 2050

The plan sets out a pathway to 2050 characterised by 3 major shifts in our energy system.

- 1) **Using energy more efficiently:** We will use energy more wisely to reduce emissions, lower energy bills and minimise the infrastructure we need to build to support a growing economy.
- 2) **Electrifying and fuel-switching:** Where possible, energy users will switch from gas and liquid fuels to electricity. Over time, most remaining gas and liquid fuel users will transition to renewable gases and low carbon liquid fuels (LCLF).
- 3) **Scaling clean energy supply:** We will increase renewable generation like solar and wind, supported by batteries and other firming technologies. At the same time, we need to grow domestic production of renewable gases and liquid fuels to decarbonise hard-to-abate gas and liquid fuel uses.

These shifts will enable Australia's energy system to support a net zero economy, while continuing to deliver affordable, reliable and secure energy.

## The energy transformation will occur in phases

Australia's energy system will undergo significant structural change on our pathway to 2050. These changes will occur in phases as technology, markets and energy demand evolves.

The Electricity and Energy Sector Plan describes this complex transformation through 3 broad phases.

- **Now to 2030.** Renewable generation increases to reach 82%, delivering significant emissions reductions in the electricity sector and setting Australia up to decarbonise other sectors through wide-spread electrification. Domestic markets for and production of renewable gases and LCLF are established.
- **2030 to 2035.** Electrification and energy efficiency drive decarbonisation across the transport, built environment and industry sectors, backed by continued growth in firming renewable generation. Renewable gases and LCLF increasingly support decarbonisation in hard-to-abate sectors like high-heat industrial processes and aviation.
- **2035 to 2050.** A high-performance renewable electricity system supports economy-wide electrification. Fuel-switching accelerates as production of renewable gases and LCLF scales. By 2050, Australia's economy is underpinned by abundant clean energy.

These phases are consistent with the findings of Treasury's report, *Australia's Net Zero Transformation: Treasury Modelling and Analysis*, which highlights the need for a well-sequenced transition starting with the most efficient abatement options.

Actions in the plan focus on now to 2035, with a view to putting Australia on a firm path for the decades ahead. We can't know all our options to 2050 as technologies and the global economy evolve – but we can understand the best path forward given what we know today.

## Australian households can benefit from this once-in-a-lifetime transformation

A typical household that installs solar and batteries and electrifies their home and vehicles could reduce their energy costs by as much as \$4,300 per year on average, after accounting for upfront and financing costs. Governments, industry and communities will need to work together to ensure all Australians benefit fairly. Monitoring and evaluation mechanisms will track progress and guide adaptive policy responses as the energy transformation progresses.

## This plan sets out 5 key actions to put us on the pathway to 2050

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### **Transform energy demand, electrify where possible and use energy more efficiently and flexibly, by:**

- expanding and reforming existing mechanisms to drive energy performance
  - identifying, incentivising and increasing visibility of demand-side opportunities across the economy
  - incentivising energy performance improvements where there are large opportunities.
- 



### **Expand and decarbonise electricity supply by:**

- incentivising private market investment in firmed renewables
  - incentivising efficient network investment and use
  - getting the most out of consumer energy resources (CER) like rooftop solar and batteries.
- 



### **Develop renewable gases while maintaining supply security by:**

- securing an adequate natural gas supply
  - supporting natural gas users to electrify or switch to low carbon alternatives like renewable hydrogen
  - establishing and scaling production of renewable gases.
- 



### **Decarbonise the liquid fuel market while maintaining supply security by:**

- electrifying light passenger and light commercial vehicles
  - establishing and scaling Australia's domestic low carbon liquid fuel (LCLF) market and industry
  - strengthening Australia's fuel security through the transformation.
- 



### **Enable the transformation by:**

- supporting investment and faster project approvals
  - building a strong clean energy workforce
  - developing supply chain security
  - improving community engagement
  - promoting a sustainable energy future
  - ensuring a secure and resilient energy transformation.
-

## New actions – a foundation for the next stage of the energy transformation

The Australian Government is committed to providing a stable and predictable framework for emissions reduction, backed by concrete policies and measures. Significant actions have been taken to date to decarbonise the energy sector.

This plan includes new policy actions that lay the foundations for the next stage of Australia's energy transformation. This includes actions that:

- improve energy performance, including:
  - expanding successful existing programs for energy ratings and standards in the built environment sector
  - establishing a Demand-side Statement of Opportunities (DSOO) as a critical step to unlocking further opportunities for energy consumers to benefit from the energy transformation
  - accelerating the rollout of kerbside and fast charging infrastructure for electric vehicles
- build a supply chain for LCLF, including a new \$1.1 billion investment in the Cleaner Fuels Program
- continue to invest in the Clean Energy Finance Corporation (CEFC) by updating the CEFC's investment mandate to include a new focus on the rapid roll out of renewable projects to drive down electricity prices, and commit up to \$2 billion more to the CEFC General Account, to be drawn down in line with these changes
- engage communities in the benefits of the energy transformation through a \$50 million investment to upgrade community sports clubs by installing solar and batteries, energy efficiency upgrades and lighting, and climate adaptation improvements.



# Electricity and Energy Sector Plan at a glance



## Vision for 2050

Affordable, clean, equitable, reliable and secure energy supply that unlocks new economic opportunities in a net zero world



## Strategic objectives

Enable decarbonisation across the economy

Deliver affordable, reliable and secure energy to Australians

Capture new economic opportunities



## Pathway to 2050

Accelerate **energy performance** and optimise system impacts

Expand existing energy performance mechanisms

Increase visibility of demand-side opportunities and incentives

Incentivise energy performance improvements

Expand and decarbonise the **electricity system**

Incentivise private investment in firmed renewables

Optimise use of network infrastructure

Get the most out of consumer energy resources

Develop **renewable gases** while maintaining supply security

Secure an adequate natural gas supply

Support natural gas users to electrify

Establish and scale renewable gases

Decarbonise the **liquid fuel market** while maintaining supply security

Electrify light passenger and light commercial vehicles

Establish and scale up Australia's low carbon liquid fuel market

Strengthen Australia's fuel security through the transition

## Phases of the energy transformation

2030

Renewable electricity generation increases to reach 82%



2035

Electrification of homes, businesses, low-heat industrial use and light vehicles continues



2050

Renewable gases and low carbon liquid fuels support decarbonisation

## Enabled by

- Supporting investment and faster project approvals
- Building a strong clean energy workforce
- Developing supply chain security
- Improving community engagement
- Promoting a sustainable energy future
- Ensuring a secure and resilient transformation

## Delivering benefits to households

- Financial savings
- Health benefits
- Energy reliability and resilience

# 1. Introduction

## 1.1 About the Electricity and Energy Sector Plan

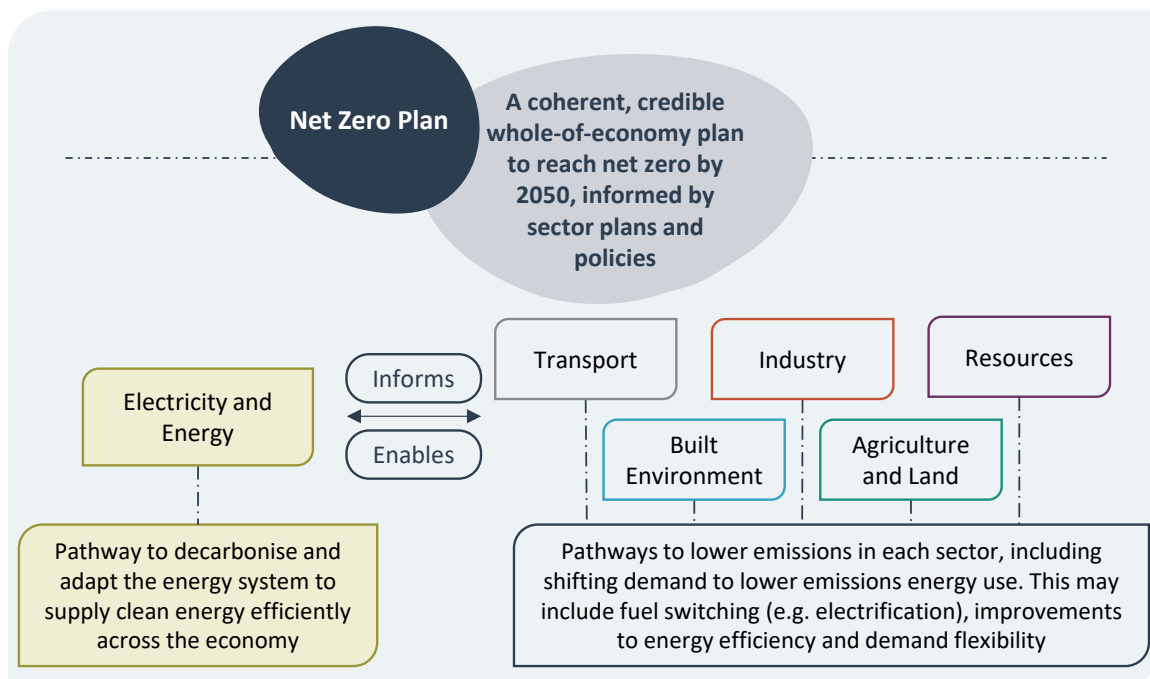
Energy underpins Australia’s economy and is a major source of emissions. The sector must transition to cleaner sources of fuel to achieve the Government’s 2035 emissions reduction target of 62-70%, reach net zero and support global decarbonisation efforts.

Right now, Australia is in the midst of this significant and complex energy transformation. We have a once-in-a-generation chance to seize the moment, modernise our energy system and power Australia’s economic growth in a way that benefits all Australians.

The Electricity and Energy Sector Plan is one of 6 sector plans that supports the Net Zero Plan (Figure 1.1). It sets out a pathway for an ambitious and orderly transformation of the energy sector. It shows how we can establish reliable sources of clean energy that:

- unlock decarbonisation opportunities across all sectors of the economy
- capitalise on the clean energy export opportunities of a Future Made in Australia
- deliver affordable energy to all Australians.

**Figure 1.1: The Net Zero Plan is underpinned by 6 sector plans**



The plan has been informed by input from stakeholders, independent expert advice from the Climate Change Authority (CCA) and in-house analysis from across government. This includes insights from the Department of the Treasury (Treasury) modelling and supplementary energy market modelling conducted by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). Insights from other government strategies (including the [First Nations Clean Energy Strategy](#), [National Hydrogen Strategy](#), [Future Gas Strategy](#), and [National Energy Performance Strategy](#)) also informed its development.

## Why we need a plan

Australia's electricity and energy sector is key to a prosperous net zero economy. The sector is at a pivotal moment and already experiencing rapid change. New investments and infrastructure are needed to modernise and secure our energy system, while global trends in technology and investment are driving changes in energy markets and lowering emissions around the world.

We can harness these changes to transform our energy system, reduce emissions and capture new economic opportunities. This will require early action and a coordinated transition.

Treasury's report *Australia's Net Zero Transformation: Treasury Modelling and Analysis* highlights that credible long-term policy frameworks will support investment and growth. Households benefit from an efficient and well-signalled transition to net zero. In contrast, a delayed or disorderly transition is costly for households, businesses and our economy, resulting in higher wholesale electricity prices, slower economic growth, less investment, fewer jobs and forgoing the export opportunities of a net zero global economy.



### **Australia's Net Zero Transformation: Treasury Modelling and Analysis**

*'Australia's ambitious and achievable plan to reduce emissions will support continued economic growth, higher living standards and employment.'*

The Australian Government is committed to providing a stable and predictable framework for emissions reduction. This means setting clear ambition backed by concrete policies, like the Capacity Investment Scheme and other policies that are supporting our target of 82% renewable electricity by 2030.

The Electricity and Energy Sector Plan builds on this commitment. It sets a clear vision for a future where abundant clean energy underpins our economy and identifies the actions that are needed now to set Australia on a firm path to 2035 and beyond.

Realising this vision means transforming our energy system to be more affordable, reliable and secure as well as low emissions. Our path to 2050 will not always be easy – but the potential rewards are great (Figure 1.2).

The plan provides a framework not only for government policy, but also for private investment in the transformation. A clear pathway will help households, industry and governments successfully navigate and prosper through the transformation. It provides the certainty that businesses need to invest, transition their operations and grow.

Figure 1.2: Opportunities of the energy transformation

## Seizing the opportunity

### A productive net zero economy underpinned by abundant clean energy

Australia's abundant energy resources have underpinned our economic development over most of the past century. As global fossil fuel use declines, Australia has an opportunity to leverage our rich renewable resources to drive our future economic development.

#### A modern reliable energy system



Australia's energy infrastructure is ageing. We have an opportunity to modernise our system by investing in new and flexible technologies as we replace these ageing assets.

This includes investing in new technologies like artificial intelligence (AI), smart grids and energy intelligence systems that can improve the reliability and resilience of our system.

*See 3.2 Energy performance and 3.3 Electricity*

#### Greater consumer choice and lower energy costs for households



Australia's energy transformation is giving consumers more choice about how to meet their energy needs as new technologies and market offers emerge.

Already, consumer investment in solar, batteries and electric vehicles is pushing forward the transformation. The potential energy cost benefits are significant – with a fully electrified household that installs solar and a battery saving \$4,300 a year, after accounting for upfront and financing costs.

*See 5 What the plan means for Australians*

#### Greater energy security in an increasingly uncertain world



Australia has the resources to produce abundant clean energy – not only renewable electricity, but also renewable gases and liquid fuels.

We can leverage these resources to meet more of our energy needs with domestic supply, reducing our exposure to global shocks and ultimately supporting our national security.

*See 4.6 Ensuring a secure and resilient transformation*



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## **A healthier, more productive economy**

The energy sector sits at the heart of any modern economy with improvements to energy productivity flowing on to other sectors of the economy. A cleaner, more efficient energy system can also improve air quality and public health.

*See Box 1.2 Energy and productivity and 5 Household benefits*

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## **Competitive energy costs to underpin our industrial sector**

Australia has some of the best wind and solar availability in the world. These resources give us a comparative advantage in the renewable electricity and renewable hydrogen needed to power our industrial sector as it decarbonises.

With efficient market and investment signals, we can translate this advantage into internationally competitive energy costs for Australian industries.

*See Box 1.1 Future Made in Australia and the Electricity and Energy Sector Plan*

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## **The opportunity to be a world-leading clean energy exporter**

Australia is uniquely positioned to establish competitive export industries to meet growing international demand for green commodities.

By doing so, we can support global decarbonisation and secure our place in the changing global economy – all while creating new jobs and opportunities across Australia.

*See Box 1.1 Future Made in Australia and the Electricity and Energy Sector Plan*

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## 1.2 Understanding our strategic context

### Australia cannot decarbonise without clean energy

Energy is an essential input across all sectors of the economy: industry, resources, transport, the built environment, and agriculture and land. These sectors cannot decarbonise unless our energy system provides enough clean, affordable energy to meet their needs.

Australia has made substantial progress growing renewable generation in recent years, with renewables now making up over 40% of generation in our two largest grids. Despite this, fossil fuels (coal, natural gas and petroleum) remain the largest source of energy in our economy.

Fossil fuels release emissions:

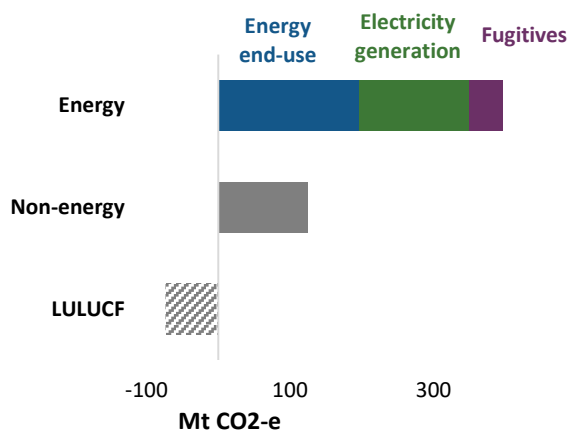
- during processing, transport and storage (*fugitive emissions*)
- when they are burned to generate electricity (*electricity emissions*)
- when they are used as a direct energy source in other sectors (*end-use emissions*).

This means that most of Australia’s emissions come from producing and using energy – with energy accounting for the bulk of emissions in almost all sectors of the economy (Figure 1.3 and Figure 1.4).

To support the decarbonisation of the Australian economy, our energy system needs to deliver clean energy in a way that is smarter and more efficient. This energy must be affordable, reliable, secure and delivered fairly. Achieving these objectives will require a whole-of-system transformation in how we supply, use and manage energy.

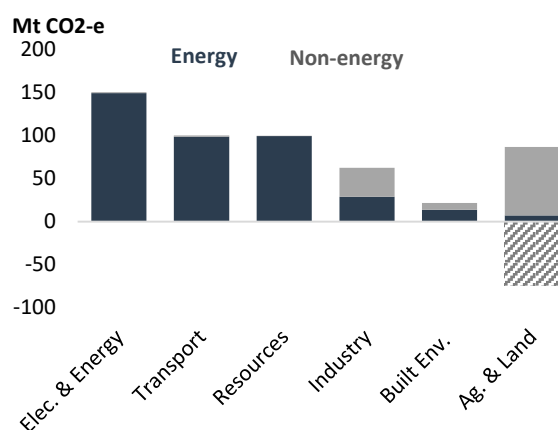
**Figure 1.3: Most of Australia’s emissions come from energy production and use**

Australian emissions by source, 2023-24, Mt CO<sub>2</sub>-e



**Figure 1.4: Energy accounts for the bulk of emissions across most sectors**

Emissions by sector, energy vs non-energy, 2023-24, Mt CO<sub>2</sub>-e



Source: DCCEEW analysis based on Quarterly Update of Australia’s National Greenhouse Gas Inventory December 2024.

Note: Energy emissions are emissions from the United Nations Framework Convention on Climate Change (UNFCCC) energy sector, including electricity generation, stationary energy, transport, and fugitive emissions. Non-energy emissions are emissions from the UNFCCC agriculture, industrial processes and product use, waste and land use, land use change and forestry sectors.

These charts show total energy emissions across the economy. The Net Zero Plan and Treasury modelling allocates the end-use of energy to the relevant sector plan (i.e. emissions from energy are split across sectoral plans) and only emissions from electricity generation, petroleum products manufacturing, gas supply, pipelines, and a small proportion of services are allocated to the Electricity and Energy Sector Plan.

## Australia’s energy transformation will lay the foundations for our economic future

Australia is an energy-rich nation and the energy sector has been a major source of growth and productivity for our economy. Australia’s energy sector will continue to support our economy in coming decades, but in new ways.

Abundant coal and gas resources have supported our development as a strong export economy. We are now one of the world’s largest energy exporters and Australia’s energy industries – including exports – have accounted for around 6% of our annual national income on average over the last decade.<sup>1</sup>

Australia is also rich in renewable energy resources. This includes our abundant wind and solar and the potential to produce the feedstocks needed for renewable gases and LCLF.

The world economy is changing as it moves towards net zero, and a structural shift away from fossil fuels is already happening in global energy markets. Demand for fossil fuels will fall and demand for low emissions products will grow as our trading partners decarbonise.

Australia is well-placed to capture new opportunities in the changing global economy. Our renewable resources offer a powerful source of competitive advantage, and we are uniquely positioned to produce clean energy at volumes exceeding our domestic needs.<sup>2</sup> We can make a meaningful contribution to global emissions reduction by exporting products with embedded clean energy.

Australia can leverage these resources to drive long-term growth and prosperity. We have an opportunity to develop new, export-oriented clean energy industries – strengthening priority supply chains and becoming an indispensable part of the net zero global economy.

To realise this opportunity, which underpins the Government’s **Future Made in Australia** agenda, we must capitalise on our natural advantages to build a world-leading clean-energy sector (Box 1.1).



<sup>1</sup> [ABS \(2024a\)](#)

<sup>2</sup> See, for example, [Graham P \(2023\)](#) and [Finighan \(2024\)](#)

### **Box 1.1: Future Made in Australia and the Electricity and Energy Sector Plan**

The [Future Made in Australia](#) agenda is a plan to maximise the economic benefits of net zero and secure our place in a changing global economy. It focuses on attracting investment to make Australia a leader in renewable energy, allowing us to build competitive new export industries and creating more jobs and opportunities across the country.

The Electricity and Energy Sector Plan supports a Future Made in Australia. It sets out a pathway to transform our energy sector to deliver affordable clean energy across the economy. This includes cost-competitive renewable electricity that will support priority industries like green metals.

The Electricity and Energy Sector Plan also sets out a pathway to scale new forms of clean energy like renewable hydrogen and LCLF – both identified as priority industries under the National Interest Framework.

- **Renewable hydrogen** is a zero-emissions gas produced using renewable electricity.
- **LCLF** can be produced sustainably from waste materials and biomass or by combining hydrogen from low or zero carbon feedstocks with captured carbon dioxide (e-fuels). Some examples include sustainable aviation fuels and renewable diesel.

Renewable hydrogen and LCLF have been identified as priority sectors because they can leverage Australia's abundant renewable resources to support decarbonisation domestically and among our trade partners. For LCLF, Australia also has the competitive advantages of abundant renewable feedstocks and advanced farming practices.

Under Future Made in Australia, the Government is helping kick-start development of low-carbon alternative fuel industries by incentivising innovation and supporting production. This includes support for **renewable hydrogen** through the Hydrogen Production Tax Incentive and Hydrogen Headstart program, and for **LCLF** through the FMA Innovation Fund and the Sustainable Aviation Fuel Funding Initiative.

**Clean energy manufacturing** another priority industry under the Future Made in Australia agenda. This industry is critical because the energy transformation is contingent on having a reliable supply of clean-energy technologies and equipment.

The Government released Australia's [National Battery Strategy](#) to outline how Australia will build a diverse and competitive Australian battery industry and is investing in domestic battery manufacturing capabilities through the Battery Breakthrough Initiative, delivered by the Australian Renewable Energy Agency (ARENA). ARENA is also delivering the \$1 billion [Solar Sunshot program](#) to support commercialisation of Australian innovations and scale-up domestic solar PV manufacturing.

## Global trends are changing energy markets around the world

Global energy markets are changing as the world transitions to new forms of energy. Investment, technology and policy developments are all driving a shift from fossil fuels to cleaner, cheaper sources of energy.



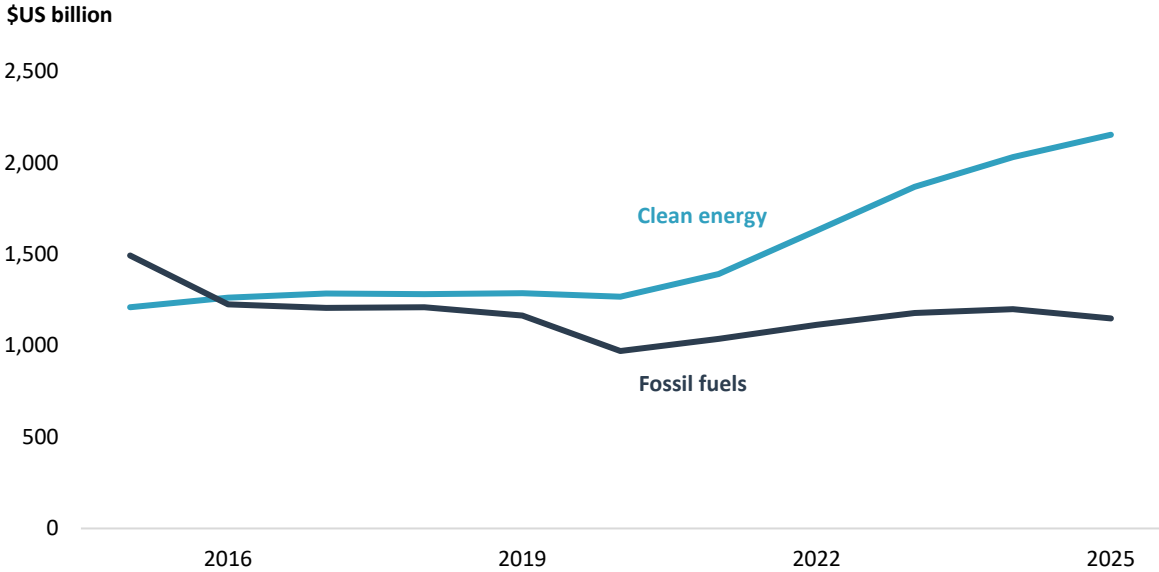
### International Energy Agency – World Energy Investment 2025

*‘Rapid growth in spending on energy transitions over the past 5 years was kicked off by post-pandemic recovery packages and then sustained by a variety of economic, technology, industrial and energy security considerations, not only by climate policies....Emissions reductions provide a powerful reason to invest, but are often not the primary driver for investment in technologies that are increasingly mature and cost-competitive.’*

Global investment in clean energy is around double the level of investment in fossil fuels (Figure 1.5). The International Energy Agency (IEA) now expects global fossil fuel use to peak before 2030.<sup>3</sup> Renewable electricity generation is set to overtake coal in 2025, providing more than one-third of global electricity generation.<sup>4</sup>

**Figure 1.5: Global investment in clean energy has overtaken investment in fossil fuels**

Global clean energy and fossil fuel investment, \$US billion



Source: IEA 2025, World Energy Investment 2025.  
 Note: Data is expressed in constant 2023 \$US, market exchange rates.

<sup>3</sup> [IEA \(2024a\)](#)  
<sup>4</sup> [IEA \(2025b\)](#)



## Climate Change Authority – 2035 Targets Advice

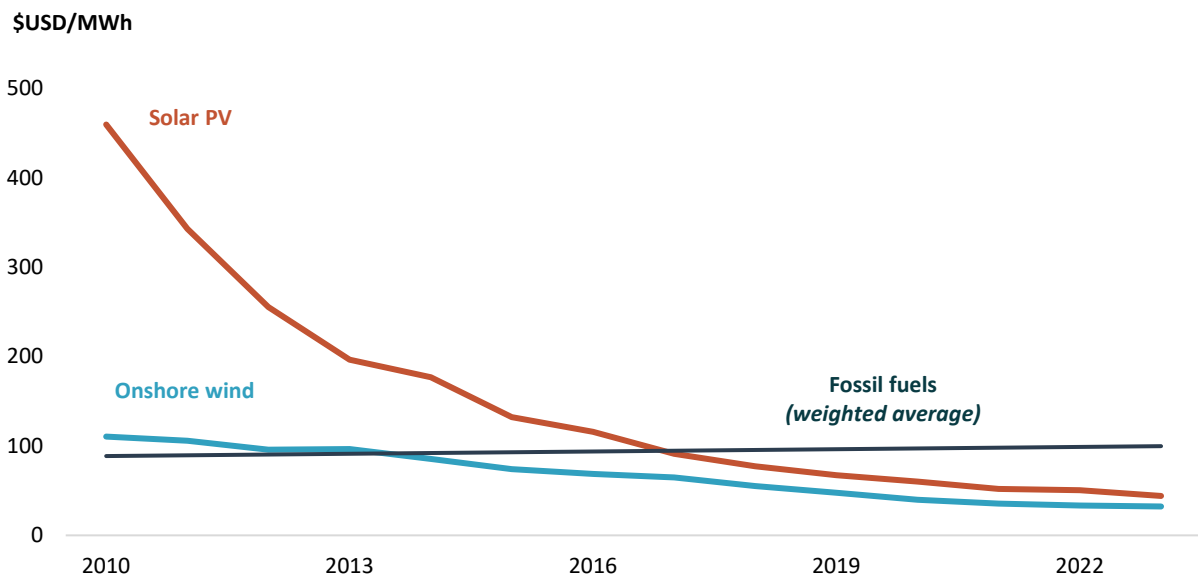
*‘Recent actions of the US Government are unlikely to materially hinder Australia’s decarbonisation efforts. With many clean energy projects in the US stalled, and the expertise and innovation capacity sidelined, Australia now has a strategic opportunity to attract displaced capital, capability and innovation to accelerate its own transition and secure a competitive edge.’*

Recent geopolitical developments have increased uncertainty about the outlook for climate action from some countries. This near-term uncertainty is unlikely to slow the pace of clean energy investment, although it may affect the location and nature of that investment. Australia is well placed to attract investment to support its energy transformation.

The economics of renewable electricity have improved dramatically over the past decade as these technologies have become cheaper and more effective. Globally, the cost of clean energy technologies more than halved between 2010 and 2023.<sup>5</sup> The cost of both solar photovoltaic (PV) and lithium batteries has fallen around 90% since 2010, while costs for onshore and offshore wind have fallen by more than 60% (Figure 1.6). This means that renewables are not only cost-competitive with fossil fuel generation – they are the least-cost option for new build generation.<sup>6</sup>

**Figure 1.6: Renewable generation technologies outcompete fossil fuel alternatives on cost globally**

Global average levelised cost of electricity, \$USD/MWh, 2010-2023



Source: IRENA 2024, *Renewable Power Generation Costs in 2023*.

Note: Fossil fuel data only provided for 2010 and 2023.

<sup>5</sup> [IRENA \(2024\)](#)

<sup>6</sup> [Ibid](#)

## New investment is needed to modernise our energy system

The coal-fired power stations that formed the backbone of our electricity system are ageing and increasingly unreliable. Most of our coal-fired power capacity is over 40 years old and due to close in the next decade, which will extend their operational life beyond the historic retirement age of 42 years.<sup>7</sup> Firmed renewables provide the cheapest form of new generation available to replace these assets as they retire.<sup>8</sup>

At the same time, electricity demand is expected to grow dramatically as Australians electrify their cars, homes and businesses, clean energy industries emerge, and the digital economy grows. Significant investment in our electricity system is needed to support growing demand and replace coal-powered capacity.

This investment has the potential to drive significant improvements in energy sector productivity – with implications across the economy (Box 1.2). Because energy sits at the heart of any modern economy, productivity improvements in the energy sector can flow on to improved competitiveness, efficiency and growth across sectors.

Investment in new forms of energy can also help improve Australia’s energy security. We import over 90% of our liquid fuel needs, so petrol and diesel users are exposed to global oil prices. The natural gas fields that powered Australian industry from the 1960s are depleting. Global oil and gas prices also impact our domestic gas price, with flow-on impacts in electricity markets given the role of gas-powered generation in setting prices. Increasing domestic production of clean energy, gases and liquid fuels will increase supply security and reduce our exposure to these volatile global markets.



<sup>7</sup> DCCEEW analysis of [Bowyer and Edis \(2025\)](#)

<sup>8</sup> [Graham P, Hayward J and Foster J \(2025\)](#)

## Box 1.2: Energy and productivity

Productivity is a measure of how effectively we use the finite resources in our economy. Productivity growth occurs when we make better use of these resources – the physical capital, people and ideas that make up our economy – to create more value from the same inputs.

Australia's energy transition will involve a transformational level of investment in our economy. This goes beyond investment in physical assets like solar panels or transmission lines. We will also need to invest in our people, to build the skilled workforce we need, and to invest in innovation across the energy sector.

These investments will modernise our energy system and deliver direct improvements in energy sector productivity. Opportunities to improve energy sector productivity include:

- **Improving energy performance** – that is, improving the way we manage energy demand by using energy more efficiently and optimising the energy system to deliver reliable and secure low-emissions energy. Improving performance reduces energy demand and avoids overbuilding infrastructure, resulting in sustained savings across the economy.
- **Electrification** is a key component of energy performance that can deliver immediate productivity benefits to Australia's economy. Electric technologies are generally more energy efficient, and often more cost-effective, than fossil fuel alternatives.
- **New technologies** like AI, smart grids and energy intelligence systems can unlock the full capacity of existing transmission and distribution networks, increasing the use of existing assets. Utilising these assets more efficiently will lower costs and enable Australia to better allocate finite capital and labour resources to other high-value uses across the energy sector.

This scale of investment will also drive economy-wide productivity improvement and growth in the decades ahead. The increasing appetite for investment is already testing regulatory and approval processes, and there is competition for the skilled labour needed to complete projects. Streamlining these processes, expanding the energy workforce and supporting project delivery were key themes of the [August 2025 Energy Roundtable](#) and will be critical to getting the full productivity benefits of Australia's energy transformation.

## 1.3 Working together to deliver the energy transformation

### Governments are working collaboratively to support the transformation

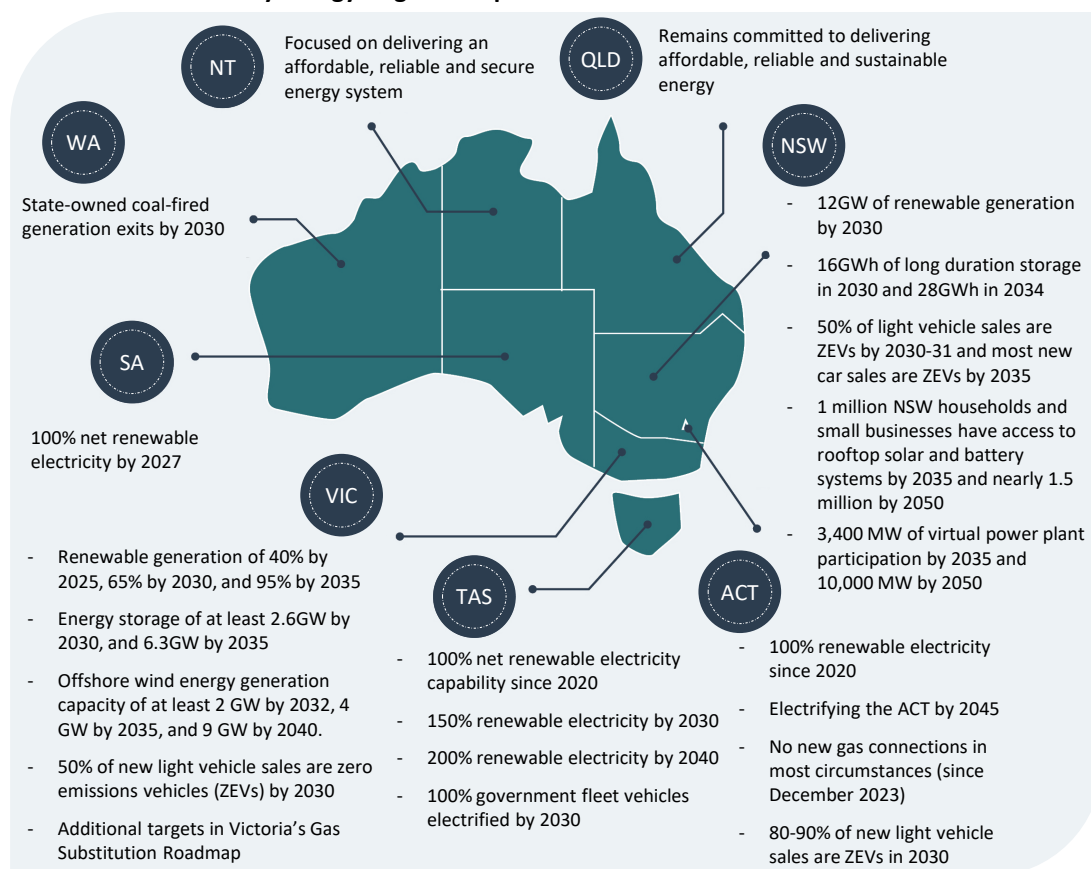
Driving the clean-energy transformation is a joint responsibility of all governments. The Australian Government is working closely with governments of all levels to support a smooth transition.

The Government has played an active role in the energy transformation in recent years. As technologies and markets mature, the focus of government will shift to enabling private industry to deliver the transformation. Clear market signals, such as those provided by existing policies like the Safeguard Mechanism, are the most efficient and effective means of driving decarbonisation across the economy.

Many of the policies required to decarbonise the electricity and energy sector are at least partly the responsibility of the states and territories to implement. Electricity supply, for example, is regulated under state and territory cooperative and jurisdiction-specific legislation. Local governments also play a key role with planning approvals, supporting the needs of their communities, and deploying renewables and storage on local government-owned real estate.

Like the Australian Government, the states and territories have set a target of net zero emissions by 2050 or earlier, alongside supporting energy targets and priorities (Figure 1.7).

**Figure 1.7: State and territory energy targets and priorities**



*Note: State and territory energy targets and priorities are accurate as of 16 September 2025. Queensland is currently reviewing its energy targets.*

The diverse energy systems across jurisdictions means each state and territory faces its own challenges and priorities. Recognising this, the Energy and Climate Change Ministerial Council (ECMC) provides a forum for Ministers from the Australian Government and each state and territory government to collaborate towards a net zero future.

The ECMC is underpinned by the National Energy Transformation Partnership (NETP), which provides a framework for the Australian Government, and state and territory governments to collaborate on the transformation of Australia's energy systems to net zero by 2050. Through the NETP, governments work together to identify issues of focus to guide actions taken by governments to help achieve the [ECMC's strategic priorities](#) and ensure Australian households, businesses and communities experience the benefit of the transition.

Building on the NETP, the Australian Government has also negotiated bilateral Renewable Energy Transformation Agreements (RETAs) with South Australia, Western Australia, the Australian Capital Territory, Tasmania, Victoria and New South Wales (NSW) to support additional ambition on top of existing commitments and help deliver new renewable generation and storage. Agreements about priorities for Rewiring the Nation support have also been entered into with NSW, the Northern Territory, Tasmania, Victoria and Western Australia. The Government will continue working closely with jurisdictions to deliver an orderly transition.

## **The role of the private sector and the community**

Government action alone is not enough. We need the private sector and the community engaged, investing, thinking, innovating and employing. The energy transformation will be driven by private investment at a scale not seen since the mining investment boom. The Australian Government's [Sustainable Finance Roadmap](#) outlines priority measures to help mobilise the significant private capital needed to reach net zero, modernise Australia's financial markets, and maximise the economic opportunities associated with energy, climate and sustainability goals.

This plan builds on the input and insights of stakeholders across the energy sector (Box 1.3). Investors and industry stakeholders have been clear that policy and market signals are needed to provide certainty to enable investment decisions and encourage innovation that supports a high-performing energy system. These enabling frameworks and market settings will support industry's increasing role to mobilise private capital towards net zero-aligned investments and innovation to drive the energy transformation.

Ensuring community support and social licence is essential to the success of the energy transformation. While governments play a key role in supporting this, industry needs to meaningfully engage with communities, First Nations people and landholders on renewable-energy projects. Gaining community acceptance and trust, and delivering local benefits, will support smooth project delivery. The Government is helping to inform this process through its [Developer Rating Scheme](#).

There is also an increasing role for individuals and businesses. Household and business investment is already driving changes in our energy system as Australians adopt technologies such as rooftop solar and batteries, and invest in energy efficient appliances, heating solutions and insulation. Sustaining this investment is key to reducing emissions and lowering energy costs for Australian households.

### Box 1.3: What we heard

The Electricity and Energy Sector Plan is informed by extensive stakeholder consultation, including:

- 176 submissions to a public consultation paper from members of the public; community and consumer advocacy groups; state, territory and local governments; investors; the energy industry and peak bodies; large energy users; unions; think tanks and academia
- targeted roundtables with key stakeholders, including consumer and community groups, investors and engineering professionals
- ongoing discussions with industry experts, market bodies, state and territory governments.

Five broad themes emerged which were critical in shaping the plan:

- 1) **Provide a clear vision and long-term policy direction** for industry, investors and communities, including setting targets or milestones, establishing clear policy frameworks, and designing energy markets and systems that are fit-for-purpose for the future energy mix.
- 2) **Improve coordination and planning** across all levels of government, including across regulation and workforce policy.
- 3) **Manage an orderly transition**, including addressing price impacts and ensuring adequate energy supply.
- 4) **Drive adoption of new technologies and innovation** to decarbonise, including providing targeted support to build new low carbon fuel and clean energy industries, and providing incentives to shift behaviour.
- 5) **Provide support for households, businesses and communities** to participate and benefit from the energy transformation.

Stakeholders also emphasised the importance of addressing energy affordability, security and reliability; the need to plan for a range of technology outcomes; the role for government in addressing barriers to household and community participation in the energy transformation; and the importance of driving environmental outcomes.

## 2. Electricity and energy in Australia

### 2.1 The electricity and energy sector sits at the heart of Australia's economy

Australians rely on a combination of electricity, gas and liquid fuels to meet our energy needs. The bulk of this energy still comes from fossil fuels like coal, natural gas and oil (Figure 2.1).

As a result, a significant share of Australia's emissions come from the production and use of fossil fuel energy. Electricity generation accounts for 34% of current emissions.<sup>9</sup> Energy end-use accounts for a further 43% of current emissions.<sup>10</sup>

The energy system is complex. Each of the energy sub-sectors is interlinked, but they have distinct market structures and dynamics. This is partly because each energy type has unique characteristics that shape how they are supplied, transported and used across the economy.



**Electricity** is produced by transforming a primary energy source – like coal or wind – into electric energy. This energy is delivered across the country through a network of power lines. Electricity is used in every sector of the economy – for heating, cooling and cooking and to power devices, appliances and industrial equipment.



**Gaseous fuels** can be used as a direct energy source by households and businesses for cooking and heating, and for industrial processes like steelmaking. It is also used for electricity generation and as an input ('feedstock') to produce chemicals like ammonia. Almost all the gas used in Australia is natural gas, a fossil fuel which is transported across the economy through a network of pipelines.



**Liquid fuels** are used as a direct energy source for transport and to power machinery, including in the mining and agricultural sectors. Australia uses a variety of liquid fuels across the economy, including petrol, diesel and aviation fuels. A small proportion of diesel is also used for electricity generation. These fuels are mostly derived from crude (fossil) oil.

Energy needs also vary significantly by economic sector. Some sectors are more energy-intensive, and some activities require specific fuel types - for example, aircraft need a high-density liquid fuel. The cost and availability of decarbonisation options vary across fuel types and user requirements.

Our past energy choices reflect historical costs and availability of technology to power different activities. But technology options and costs are changing rapidly. In recent years, Australia's abundant renewable resources and significant cost declines in deploying solar and wind generation have driven much of Australia's decarbonisation progress. Further cost declines and technological availability will continue to drive decarbonisation and transform our energy mix.

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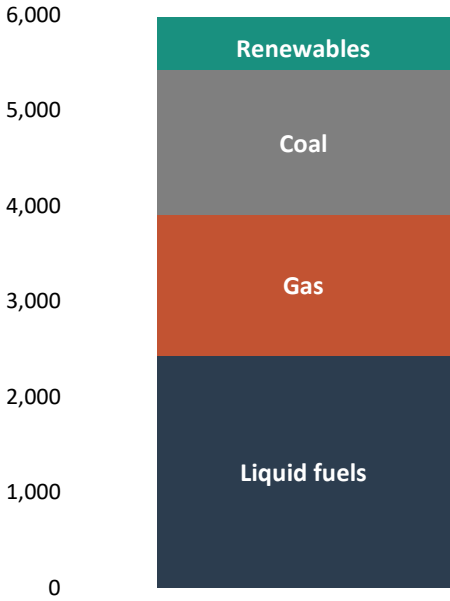
<sup>9</sup> [DCCEEW \(2025b\)](#)

<sup>10</sup> [Ibid.](#) End-use emissions are calculated as the sum of Transport and Stationary energy emissions. Fugitive emissions account for a further 11% of current emissions. Most fugitives occur in the coal, oil and natural gas industries and are addressed in the Resource Sector Plan.

**Figure 2.1: Australian energy supply and consumption, 2023-24**

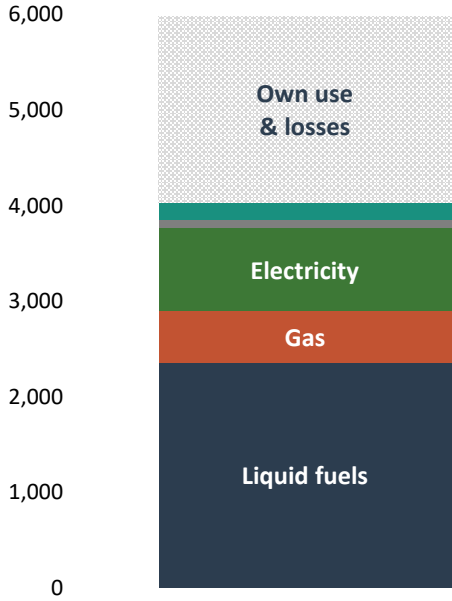
**Around 90% of Australia's energy supply comes from fossil fuels**

Primary energy supply, PJ



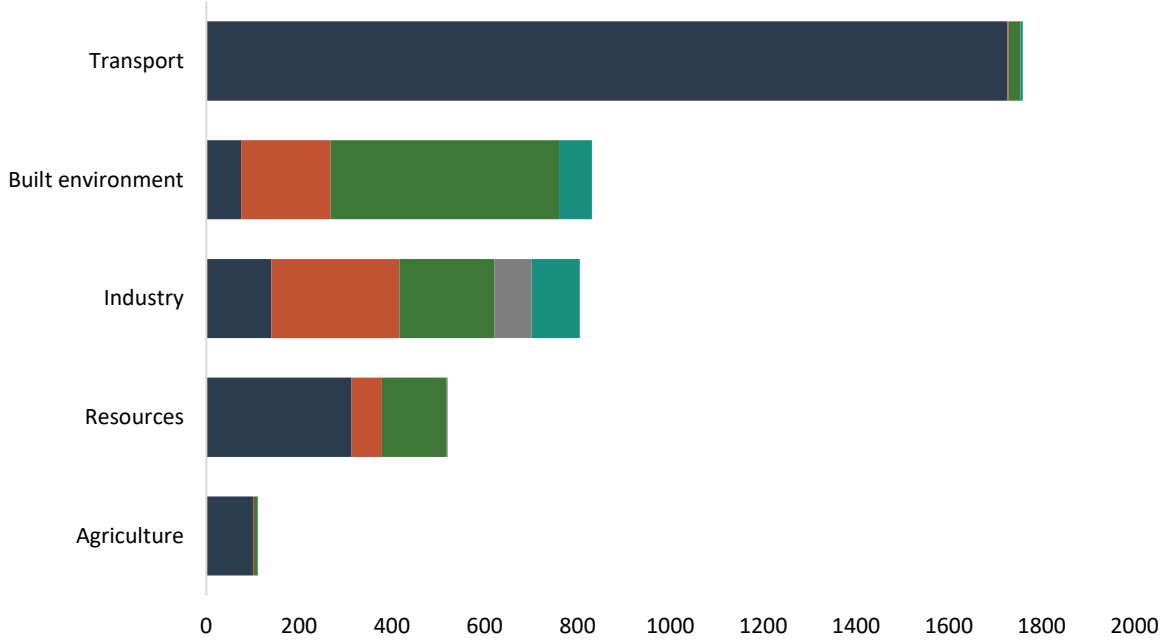
**This energy is either used directly or transformed into electricity for use across the economy**

Total energy consumption, PJ



**Energy use varies significantly by sector**

Total final energy consumption by sector, PJ



Source: DCCEEW 2025, Australian Energy Update 2025.

## 2.2 Emissions outlook for the electricity and energy sector



### Australia's Net Zero Transformation: Treasury Modelling and Analysis

*'The modelling finds that expanding the supply of renewable energy continues to be the most cost-efficient abatement opportunity, reducing emissions in the electricity sector directly and enabling broad-based decarbonisation through electrification. Fuel switching and efficient use of energy will become increasingly important over time, enabled by improving abatement technologies, and scaling up carbon removals will be required to offset residual emissions later in the transition.'*

Australia's abundant renewable resources mean the electricity and energy sector is a key pillar for decarbonisation. The sector has already contributed substantially to emissions reduction to date – with annual electricity emissions peaking in 2009, and falling 22% since 2005.<sup>11</sup> Expanding renewable generation directly reduces emissions from electricity generation and unlocks decarbonisation opportunities across all sectors of the economy.

Treasury modelled 3 scenarios to explore how the Australian economy could evolve under different net zero transition pathways. Two of these scenarios broadly reflect the Government's Net Zero Plan: the *Baseline Scenario* where Australia builds on existing climate policies, and the *Renewable Exports Upside Scenario* where Australia captures a larger share of global green commodity markets. A third scenario, the downside *Disorderly Transition Scenario*, assumes Australia does not set a credible 2035 emissions reduction target, but resumes a trajectory towards net zero in 2050 from 2040 onwards.

The Treasury modelling provides useful insights on the potential cost-effective timing, sequencing and size of sectoral contributions to the economy-wide emissions reduction task. Supplementary energy modelling by DCCEEW provides further insight into the impacts, opportunities and risks of these changes in the electricity and energy sector.

Energy-related emissions decline steadily to 2050 under the Baseline and Renewable Exports Upside scenarios. Electricity and energy sector emissions decline rapidly over the next decade, while emissions from energy end-use across other sectors fall more slowly as it takes time for users to electrify or switch to low carbon alternatives. In contrast, emissions decline more slowly under the Disorderly Transition Scenario (Figure 2.2).

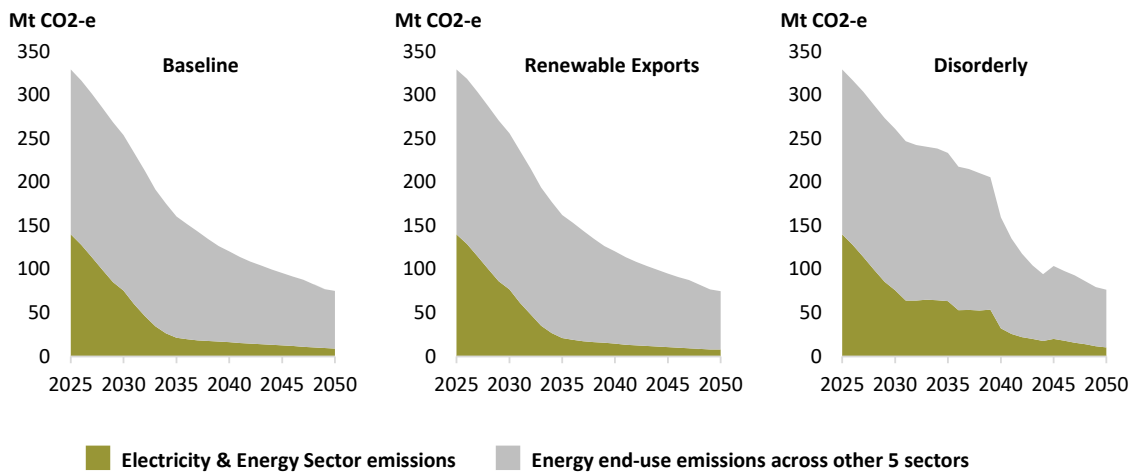
The Disorderly Scenario is projected to increase wholesale electricity prices by 17 per cent on average during the 2030s and up to 54 per cent in the 2040s, relative to the Baseline Scenario. In contrast, investing in Australia's renewable exports potential could unlock broader competitiveness and help reduce cost-of-living pressures on households by reducing wholesale electricity prices by around 20 per cent by 2050, relative to the Baseline Scenario.

Under Treasury's modelling, the electricity sector drives substantial emissions reductions, particularly to 2035 – both through and beyond achievement of the 82% renewable electricity target. Decarbonisation of the electricity grid continues under all 3 modelling scenarios, showing that the most cost-efficient abatement opportunity for Australia is to expand the supply of renewable energy.

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<sup>11</sup> [DCCEEW \(2025b\)](#)

**Figure 2.2: Energy related emissions to 2050, by sector and scenario, Mt CO2-e**



Source: Treasury modelling. Note: Energy end use covers emissions from the UNFCCC categories 'Stationary Energy' and 'Transport' across the 5 other sector plans.

Under the Baseline Scenario, emissions in the electricity sector fall from 140 Mt CO2-e in 2025 to 9 Mt CO2-e in 2050. Consistent with the Australian Energy Market Operator’s (AEMO) 2024 Integrated System Plan, reductions in electricity emissions are primarily driven by decisions of coal-fired power generators to exit. In Treasury’s modelling the east-coast National Electricity Market (NEM) has only 2 GW of coal capacity remaining by 2035. The Wholesale Electricity Market (WEM) in south-west Western Australia follows a similar decarbonisation trajectory.

Understanding the most prospective abatement technologies and pathways across sectors ensures that this plan will meet the evolving needs of Australia’s diverse energy users. The other 5 sector plans provide detailed pathways to reduce end-use emissions in their sector. This plan adopts a whole-of-system view and focuses on decarbonising energy supply and improving energy performance to support these sector-specific decarbonisation pathways.

End-use emissions across the other 5 sectors fall substantially over the period to 2050 as gas and liquid fuel users either electrify or transition to low carbon alternatives. All sectors of the economy contribute to emissions reductions to achieve net zero by 2050, but the pace of decarbonisation varies across sectors given underlying differences in technology and the availability, feasibility and relative cost of abatement opportunities.

The Treasury modelling finds that electrification is a key source of low-cost emissions reductions, particularly for transport, the built environment, and some processes in the industry and resources sectors. Under both the Baseline and Renewable Export Upside Scenarios, renewable generation continues to expand beyond 2030 to support economy-wide electrification. Improvements in energy efficiency also support emissions reduction in the near term.

Over the longer-term, emerging technologies are anticipated to support decarbonisation in hard-to-abate sectors including some industrial sectors and heavy transport. Some industries – such as steel and alumina – are expected to transition to natural gas as a lower-emissions alternative to coal before making the transition to renewable electricity and hydrogen by 2050. LCLF are expected to offer an increasingly cost-effective decarbonisation pathway over time, supporting a reduction in diesel- and aviation fuel-related emissions by 32 Mt CO2-e and 5 Mt CO2-e respectively between 2035 and 2050 in the Baseline Scenario.

## 3. Setting a pathway to 2050

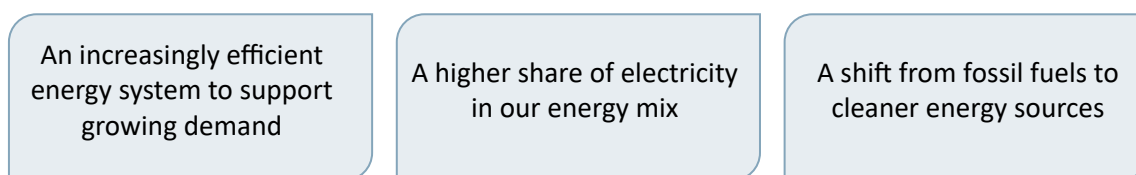
### 3.1 Australia's energy transformation: A whole-of-system view

Australia's energy sector will require significant structural change as our economy moves to net zero. This change will not be linear or uniform across the energy sub-sectors. Differences in technology and market readiness mean each sub-sector will transition and decarbonise at its own rate.

Setting a pathway to 2050 requires a whole-of-system view rather than considering each sub-sector (e.g. electricity, gas, liquid fuels) in isolation. This is because changes in one part of the system have flow-on effects across the system.

The Electricity and Energy Sector Plan describes a decarbonisation pathway between now and 2050 for the energy system as a whole. This pathway is characterised by 3 major shifts in our energy system (Figure 3.1).

**Figure 3.1: The 3 major shifts driving Australia's energy transformation**



Emissions will decline as our energy system becomes more efficient, more electrified and transitions to cleaner sources of energy.

These system-wide shifts are described over the page in Figure 3.2 to Figure 3.5. The remainder of this chapter sets out more detailed pathways to improve energy performance and transform the electricity, gas and liquid fuel sub-sectors.

Setting out a pathway over distinct time periods to 2050 helps us to understand the key phases Australia's energy transformation and monitor progress over time. It provides a structure for action now that will unlock opportunities in future decades. Clear 'no-regrets' actions will ensure we achieve our strategic objectives. Longer-term directions maintain flexibility so we can harness opportunities as they become available.

We know that certain actions are needed now to set us on the path to 2050. As we look further into the future, we have less certainty about how the energy system will develop. We can't know all of our options to 2050 as technology and the global economy evolve – but we can understand the best pathway forward given what we collectively know today.

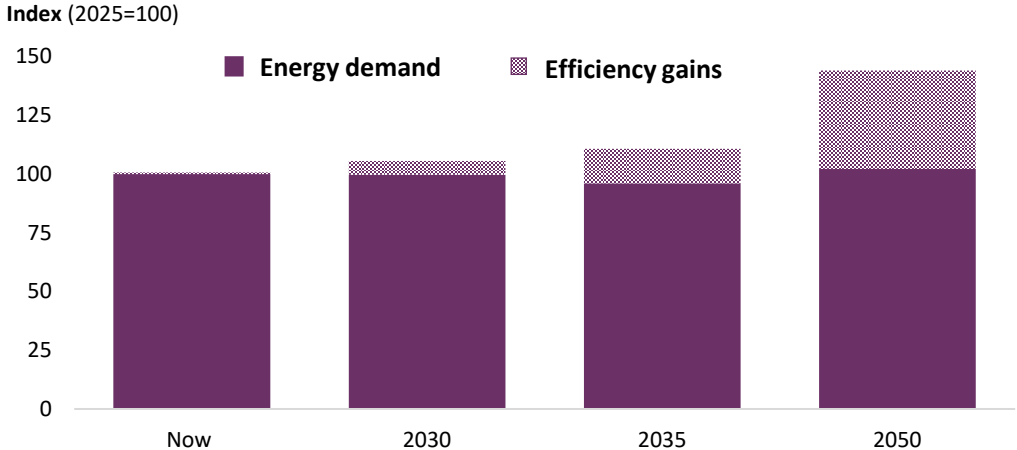
The plan therefore predominantly focusses on actions needed on the path to 2035, but with an eye to the years and decades beyond that.

# The 3 major shifts driving Australia’s energy transformation

## 1. An increasingly efficient energy system to support growing demand.

Improving energy performance will allow Australia to get more out of our energy inputs and existing energy infrastructure – with energy consumption broadly flat to 2050 even as the economy grows strongly. Our energy system becomes more efficient and the amount of useful energy in the economy grows as we move away from fossil fuels. DCCEEW analysis shows that efficiency gains can deliver energy savings at the point of use of around 30% by 2050.

**Figure 3.2: Domestic energy consumption to 2050, Baseline Scenario, indexed against 2025 demand**

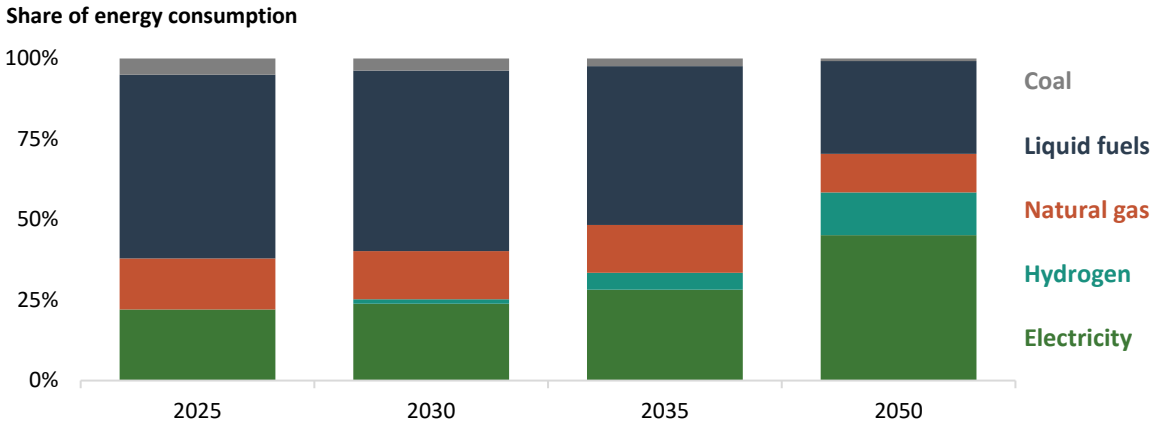


Source: DCCEEW analysis.  
 Note: Energy demand estimated by DCCEEW based on Treasury’s Baseline Scenario. Efficiency gains estimated by DCCEEW.

## 2. A higher share of electricity in our energy mix.

Electricity makes up an increasing share of our energy mix as energy users electrify and new industries grow – with electricity demand doubling by 2050 under the Baseline Scenario. Gases and liquid fuels will play a continued but more specialised role in the economy, powering high-value sectors like ironmaking and aviation in the long term.

**Figure 3.3: Energy consumption mix to 2050, Baseline Scenario, %**

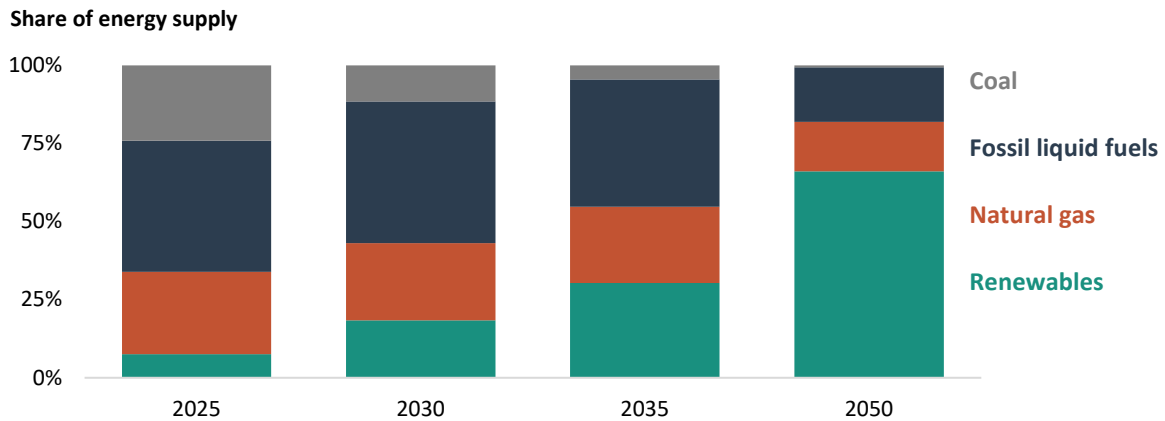


Source: DCCEEW and Treasury modelling.  
 Note: Energy consumption is fossil fuels energy and electricity consumed by end-use sectors. It excludes fossil fuels used in conversion sectors such as electricity generation, LNG plants, and electricity used in renewable hydrogen production. While gas used as a chemical feedstock and coal used in iron and steelmaking are sometimes excluded from final energy consumption, they are included here as significant standalone domestic economic activities.

### 3. A shift from fossil fuels to cleaner energy sources.

Electricity generation is already shifting from coal to renewables. Growing domestic production of renewable gases and LCLF will support the gradual decarbonisation of our gas and liquid fuel markets to support ongoing, high-value energy needs. Under the Baseline Scenario, renewable energy supply expands almost 8-fold. Renewables increase their share of total primary energy supply from less than 10% in 2025 to two-thirds in 2050.

**Figure 3.4: Energy supply mix to 2050, Baseline Scenario, %**



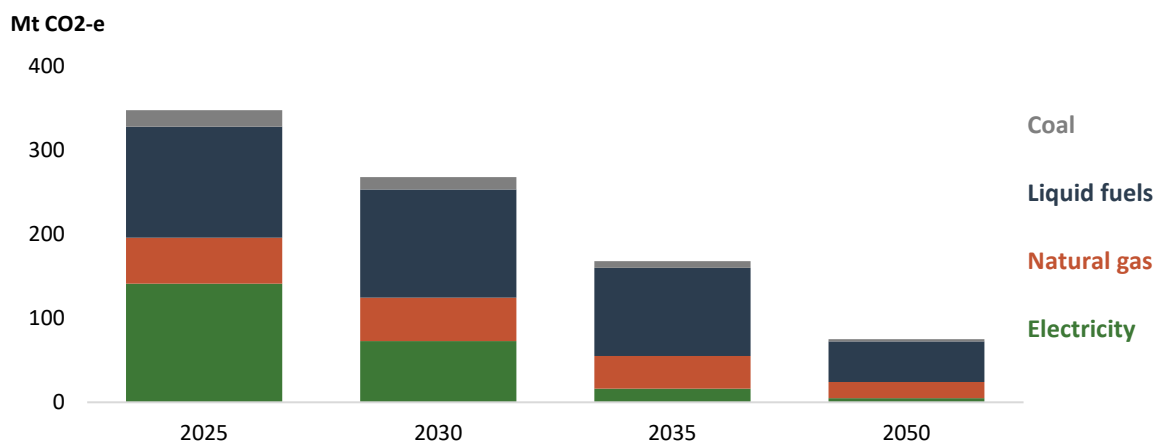
Source: DCCEEW and Treasury modelling.

Note: Renewable energy supply includes renewables used to generate electricity or to produce renewable gases and low carbon liquid fuels.

### Overall, Australia’s energy system becomes more efficient, more electrified and more renewable through the energy transformation.

Emissions decline across all fuel types as energy performance improves and our energy supply shifts from fossil fuels to renewable electricity, gases and liquid fuels.

**Figure 3.5: Emissions by fuel type to 2050, Baseline Scenario, Mt CO2-e**



Source: DCCEEW and Treasury modelling.

## 3.2 Energy performance

Decarbonising Australia’s energy system starts with making the best use of our energy resources. That means using energy more efficiently, and changing how we use energy to take advantage of Australia’s abundant renewable resources. Improving energy performance will help every sector decarbonise at lowest cost, supporting the Australian Government’s productivity agenda while keeping energy reliable and affordable.



### A pathway to 2050

2030	2035	2050
Coordinated policy is driving improvements across the economy	Energy performance improvements have supported achievement of the 2035 Target	Australia’s energy system is high performance

### Policy directions to put Australia on the pathway to 2050

Expand existing energy performance mechanisms	Increase visibility of demand-side opportunities and incentives	Incentivise energy performance improvements
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### New actions

The Australian Government has provided \$85 million to accelerate energy performance by:

- expanding successful energy performance ratings and standards programs: Greenhouse and Energy Minimum Standards Program; Commercial Buildings Disclosure Program; National Australian Built Environment Rating System and Nationwide House Energy Rating Scheme
- establishing a Demand-side Statement of Opportunities to complement existing system planning by AEMO, highlight opportunities to improve productivity within the energy system, and lower the cost of the transition for all consumers.

The Government is also building on existing investments in EV charging infrastructure with a further \$40 million to accelerate rollout of kerbside and fast charging for electric vehicles.

## Overview

Energy is a critical input to every sector and an important part of the household budget for all Australians. Improving energy performance helps ensure the best use of Australia's energy resources and is directly linked to higher productivity across the economy.

Energy performance is a broad concept that refers to how well we manage energy demand. A high-performance energy system is one which uses energy efficiently and is optimised to deliver reliable and secure low-emissions energy. Actions that improve energy performance include:

- **Increasing energy efficiency** – using less energy for the same task or result. This can be done by adopting more efficient appliances and materials, or retrofitting buildings to waste less energy.
- **Electrification and fuel-switching** – replacing the use of fossil fuels with less costly and/or less emissions-intensive fuels, including renewable electricity, renewable hydrogen, biofuels and e-fuels.
- **Increasing demand flexibility** – increasing the capability to shift electricity demand to times when renewable electricity is more abundant or cheaper. This can include heating water when solar generation is high, or storing solar energy in batteries for evening use.

Driving demand-side action through these energy performance levers, whether it be electricity, gas or liquid fuel demand, can deliver benefits across the energy system (Figure 3.6).

More broadly, improving how energy is produced, transported, and consumed will support system-wide efficiency. Greater access to CER like rooftop solar, batteries and virtual power plants reduces reliance on large-scale generators and electricity networks. This helps reduce infrastructure build and energy losses.

Our energy system is becoming more efficient as we move away from fossil fuels. Much of the energy stored in fossil fuels is lost as heat during production or use, while clean energy technologies tend to be more efficient. For example:

- around 66% of the energy stored in coal is lost during the electricity generation process – while losses during renewable generation are close to zero.<sup>12</sup>
- conventional vehicles experience energy losses of 70-90%, with most of this energy lost as heat. In comparison, electric cars have energy losses of less than 20%.<sup>13</sup>

Overall, up to half of all global primary energy is currently lost and never provides users with any services or benefits. A clean energy system has 33% less loss and 31% more useful energy.<sup>14</sup>

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<sup>12</sup> [DCCEEW \(2025a\)](#)

<sup>13</sup> [US Department of Energy and the US Environmental Protection Agency \(2025b\)](#)

<sup>14</sup> [Rystad Energy \(2024\)](#)

**Figure 3.6: Summary of key levers for improving energy performance**



## Accelerating energy performance is critical to decarbonisation

### **T** Net Zero Plan – Treasury Modelling and Analysis

*'The modelling finds that electrification is a key source of low-cost emissions reductions, particularly for transport, the built environment, and some industrial manufacturing processes. Improvements in energy efficiency are also a significant contributor to reducing emissions and energy bills as electricity demand increases.'*

#### *Improving energy performance is the fastest and cheapest way to decarbonise the economy*

Improving how energy is produced, transported, and consumed will support economy-wide energy efficiency (Box 3.1). Using energy more efficiently and optimising our use of renewable electricity reduces how much fossil energy we need to power our economy. It also reduces the amount of electricity generation and network infrastructure needed, minimising the risk of costly over-build.

Actions that improve energy efficiency reduce the effort and investment required to get to net zero through more costly supply side measures.

- They provide the quickest and cheapest emissions mitigation options.

*For example, the NSW Energy Savings Scheme reduced emissions by 8.6 Mt CO<sub>2</sub>-e between 2019 and 2023, at an average abatement cost 31 to 36% lower than for renewable projects with equivalent emissions reductions.<sup>15</sup>*

- Greater energy efficiency increases economic productivity and makes businesses more competitive.

*For example, reducing manufacturing energy use by 100PJ over the next decade could deliver a sustained increase (improvement) in industry productivity by around +0.09%, compared to the fall in the decade to 2022-23 of -0.08%.<sup>16</sup>*

- Reducing gas and liquid fuel demand minimises the low-carbon fuel and offsets needed to decarbonise hard-to-abate sectors.

### **Box 3.1: Measuring economy-wide energy efficiency**

We measure **economy-wide energy efficiency** using **final energy intensity**.

**Final energy intensity** measures the amount of energy used by consumers, like households and industry, per unit of economic output. It is calculated as total final domestic energy consumption, divided by gross domestic product (GDP).

While this metric can be impacted by changes in the composition of the economy, it is useful for comparing Australia's progress on demand-side action to other countries. The effects of energy efficiency improvements need to be considered for households, industry sectors and the economy as a whole.

<sup>15</sup> [NSW Government Department of Climate Change, Energy, the Environment and Water \(2025\)](#)

<sup>16</sup> DCCEE analysis of [ABS \(2015\)](#)

The private market, supported by government, has led to changes in how we use energy. Australia's final energy intensity improved by around 13% over the pre-COVID decade. This was driven in part by businesses and households investing in upgrades to reduce energy bills, as well as government regulations, standards and programs. A macroeconomic shift towards less energy-intensive industries, such as services, has also contributed.

More recent policy and private action has improved Australia's energy performance outlook. Under current policies, final energy intensity is now expected to improve almost 20% over the decade to 2035 – an acceleration compared to the pre-COVID decade.

### *Improving energy performance enables a reliable and affordable energy transformation*

A high-performance system meets demand more efficiently. Improved energy performance and CER uptake directly reduces the amount of electricity that consumers draw from the grid. Demand flexibility can reduce the need for new generation and network infrastructure while also supporting system security (Box 3.2).

This helps to avoid overbuilding infrastructure, resulting in sustained savings across the economy and lower energy bills – not only for the consumer investing in the upgrades, but for all households and businesses.<sup>17</sup>

- Switching to more efficient electric technologies can deliver significant savings for energy users. A household that electrifies and installs solar panels and a battery could save around \$4,300 per year, after accounting for upfront and financing costs (see 5.1 Household benefits).
- Minimising peak demand reduces wholesale electricity prices by lowering the amount of expensive gas-fired generation required to firm renewables, particularly over winter (see 3.3 Electricity). More efficient and flexible electricity demand also makes it easier to achieve higher levels of renewable penetration in the grid and delivers more efficient utilisation of the grid, lowering costs for all users.
- Reducing the amount of new network infrastructure investment reduces network tariffs on energy bills. Network investment costs are passed onto consumers and accounted for almost 40% of the average energy bill in 2023-24.<sup>18</sup> The NSW Energy Savings Scheme, which deferred an estimated \$168 million of network investment, saved households an estimated \$98 per year and businesses \$277 per year on electricity bills over 2019 to 2023.<sup>19</sup>

Households and businesses make significant investments in assets like cars, appliances and industrial equipment, which often have multi-decade lives. Replacing these assets when they reach their end-of-life with energy efficient and 'flexible' electric options also avoids locking in more costly infrastructure.

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<sup>17</sup> [Graham, Meher-Homji, Havas and Foster \(2023\)](#)

<sup>18</sup> [ACCC \(2024\)](#)

<sup>19</sup> [NSW Government Department of Climate Change, Energy, the Environment and Water \(2025\)](#)

### Box 3.2: Demand flexibility can support Australia’s energy transformation

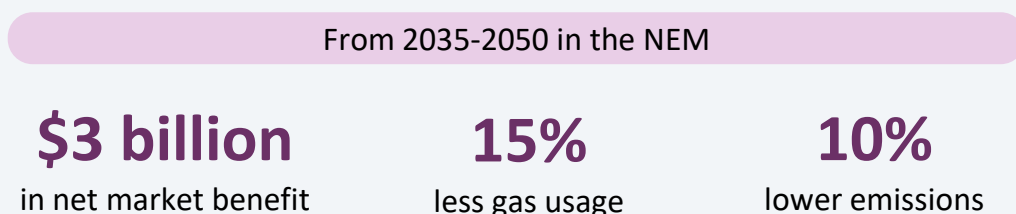
Households, businesses and industry can help to shift when energy is used to better match when renewable electricity is available. This has benefits for improving grid stability, reducing peak demand and managing supply shortfalls – which reduces the firming and infrastructure investment required to meet electricity demand through the transformation (see 3.3 [Electricity](#)). This includes:

- Matching daily demand to periods of high renewable output, for example by shifting evening energy use to the middle of the day
- Adjusting energy use over longer periods of lower energy availability, such as through winter
- Temporarily adjusting energy demand from the grid to support the system during emergency events. This can prevent blackouts during extreme weather events.

‘Smart’ electric appliances, timers and batteries can help households use energy more flexibly. Business and industry can support grid stability by adopting on-site energy storage to support participation in grid demand management schemes. Research and development (R&D) for technologies that enable this for more energy users can increase this potential.

Analysis by DCCEEW illustrates some of the potential benefits of flexible demand in the NEM (Figure 3.7). This analysis compares the Baseline Scenario with a sensitivity that assumes greater flexibility for on-grid hydrogen production and some industrial load. The additional flexibility results in reduced generation investment, lower system costs, and lower reliance on gas powered generation to support the grid and associated emissions.

**Figure 3.7: Potential benefits of flexible demand in the NEM**



New market incentives may be needed to deliver efficient levels of demand flexibility. This will need to be supported by appropriate regulation and standards (e.g. the National CER Roadmap).

*Source: DCCEEW and Treasury modelling.*

## The energy performance pathway to 2050

Energy performance will need to improve through the transformation to 2050. More can be done to accelerate progress on energy performance. Along the pathway to 2050:

- Energy efficiency improves across sectors
- Electrification and fuel-switching reduce emissions and support economy-wide energy efficiency
- Demand flexibility is increasingly integrated into our electricity system.

Figure 3.8 sets out the key milestones on this pathway to 2050.

The Australian Government has committed to accelerating energy performance improvements. At the 2023 United Nations Framework Convention on Climate Change Conference (COP28), Australia committed to working with member countries to achieve the Energy Efficiency Pledge of doubling the average rate of global energy efficiency improvements from 2% to 4% every year until 2030.<sup>20</sup>

Energy performance improvements are particularly important to support the 2035 Target. DCCEEW analysis suggests a 25% improvement in economy-wide energy efficiency by 2035 would be an ambitious and achievable contribution to meeting our 2035 emissions reduction target.

Relative to a current policies trajectory,<sup>21</sup> this level of improvement could:

- **abate substantial CO<sub>2</sub>-e emissions, with cumulative savings of 33 Mt CO<sub>2</sub>-e between 2025 and 2035**, or around 9% of the estimated emissions gap between the Baseline Scenario and a current policies trajectory.
- **reduce total final energy consumption by 187 PJ in 2035**, or almost 50% more energy savings due to energy performance to 2035 compared to the current policies trajectory.
- **increase productivity** across industries.

To coordinate longer-term action, the Australian Government has set out a National Energy Performance Strategy (NEPS), developed in close collaboration with state and territory governments. In the near-term, it prioritises improving access to information, reducing upfront costs of energy performance improvements, and addressing split incentives such as between landlords and tenants.

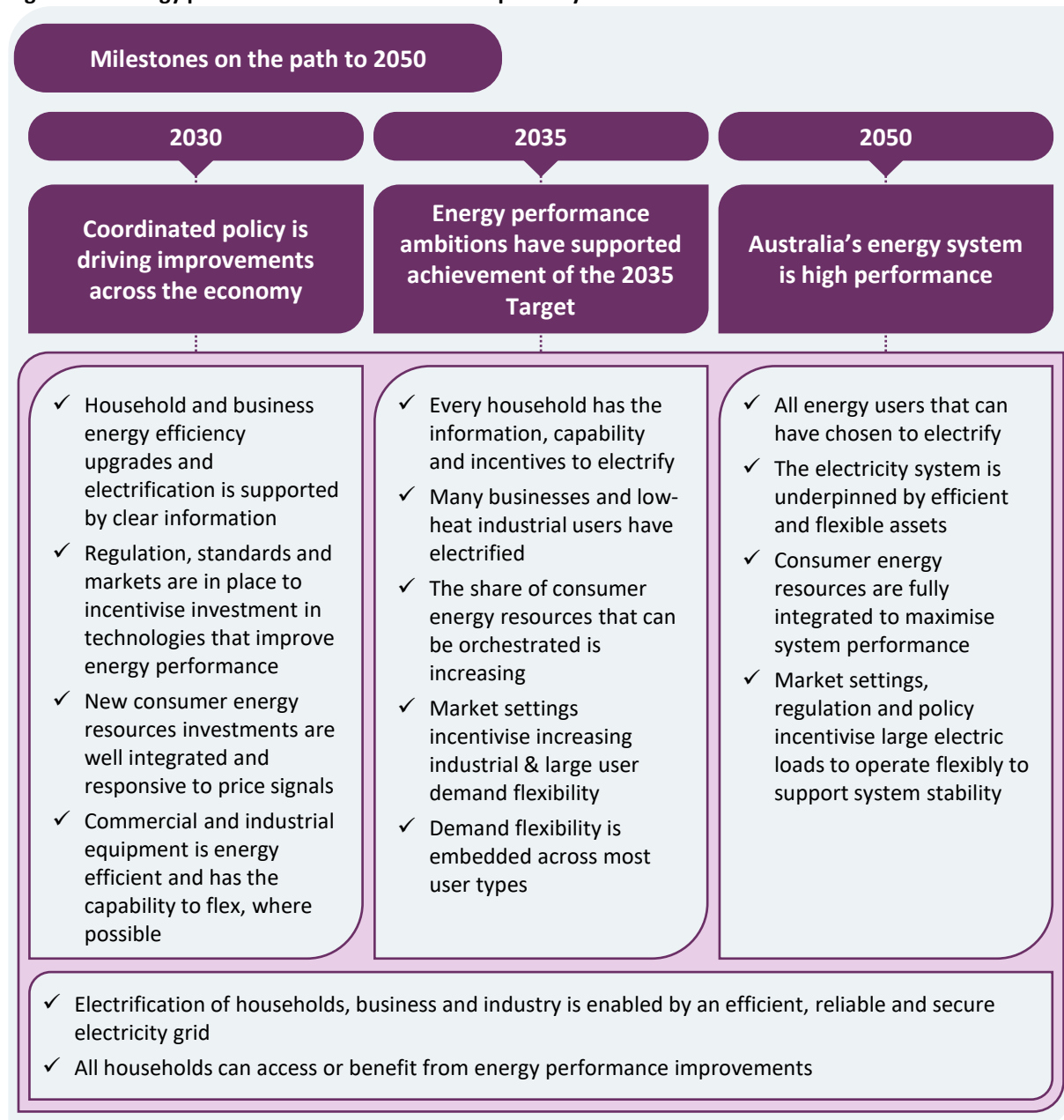
Existing initiatives supporting residential energy performance include the Household Energy Upgrades Fund and the Social Housing Energy Performance Initiative to support upgrades in Australian homes. The 2024 amendment to the Australian Renewable Agency (ARENA) Act also permanently expanded ARENA's mandate to support electrification and energy efficiency, with programs like the Industrial Transformation Stream of the Powering the Regions fund supporting key industrial efficiency improvements. Innovation and technological progress, including on AI can also help optimise and manage energy demand.

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<sup>20</sup> Note: the COP28 Energy Efficiency Pledge measures energy efficiency using primary energy intensity, that is primary energy consumption divided by GDP. Primary energy consumption includes both final energy consumption and energy own use and losses, such as energy lost while transforming fossil fuels into electricity. Our definition of energy efficiency is narrower; see [IEA \(2024d\)](#).

<sup>21</sup> Based on Australia's emissions projections 2023 'with additional measures' scenario; [DCCEEW \(2023\)](#).

**Figure 3.8: Energy performance milestones on the pathway to net zero**



*Energy efficiency improves across sectors*

Government measures across the Commonwealth and states and territories are supporting progress on energy efficiency. Further sector-specific opportunities are identified in other sector plans, including expanding access to energy ratings for homes, commercial buildings and appliances and implementing key elements of the updated Trajectory for Low Energy Buildings, which are addressed in more detail in the Built Environment Sector Plan. There are also opportunities to address incentive gaps, such as for some commercial and industrial facilities to perform efficiency upgrades beyond state and territory white certificate schemes, grant programs and the Safeguard Mechanism.

Improvements in energy efficiency are particularly important to support broad-based electrification. For example, under the Baseline Scenario, NEM demand would be over 20% higher by 2050 without energy efficiency improvements. Reduced demand from energy efficiency helps relieve supply pressures to build renewables and firming capacity, and augment electricity networks.

### *Electrification and fuel-switching reduce emissions and support economy-wide energy efficiency*

Electrification can be an effective way to decarbonise key sectors including buildings, transport, and some industry and resources sub-sectors. Electrification is also a key lever for improving whole-of-economy energy efficiency, because electric technologies tend to be more efficient than their fossil fuel alternatives.

State and territory governments are supporting **residential electrification**. Electric options are already cost-competitive for many uses, like household heating or passenger cars – with 125,000 gas hot water systems replaced with electric systems annually.<sup>22</sup> The cost of electric technologies is expected to fall further as adoption and innovation grow.

There are significant opportunities to accelerate **industrial electrification**. Electric technologies like industrial heat pumps are currently available to electrify some industrial processes. New technologies will make electrification more viable for a wider range of processes. Despite this, electricity consumption in the manufacturing sector has changed minimally over the last 10 years, increasing as a share of total energy consumption by less than 2 percentage points from 23.6% to 25.5%.<sup>23</sup> Where electrification of fossil fuel activities is not viable, fuel switching to low emissions gas and liquid fuels can support an alternative decarbonisation pathway.

As households and businesses electrify, there will be a need to manage system impacts and ensure no one is left behind.

- Electrification increases electricity demand and may place greater pressure on electricity networks, particularly as large industrial users electrify. ‘High quality’ electrification is vital. This means improving appliance and equipment efficiency and flexibility to reduce the impact of electrification on the grid. Choosing the right combination of ‘smart’ appliances and equipment to support demand flexibility while electrifying will maximise benefits.
- Accelerating electrification has implications for disconnections from gas networks and the viability of continuing to use gas for remaining users. The cost of staying connected to the gas network will grow in the absence of targeted action as network costs are spread across a smaller group of consumers, which could have equity implications if lower income households are least able to switch.

These considerations are discussed in more detail in 3.3 **Electricity** and 3.4 **Gaseous fuels**.

### *Demand flexibility is increasingly integrated into our electricity system*

Households and smaller businesses can participate in demand response programs, particularly when their electricity demand and production is aggregated through virtual power plants. On the other hand, many large users participate on an individual basis including by:

- scheduling their load profiles to align with high and low price periods, or dynamically shifting loads in response to market signals
- enrolling in market mechanisms to respond to periods of high demand or critical events affecting the grid through the Reliability and Emergency Reserve Trader Scheme
- responding to grid management requirements such as frequency control ancillary services.

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<sup>22</sup> [CCA \(2024b\)](#)

<sup>23</sup> [DCCEEW \(2025a\)](#)

Market operators currently lack visibility of energy users' capacity to operate flexibly, even when that capacity is being actively deployed through agreements with suppliers or networks. This can lead to sub-optimal market interventions, such as unnecessary peak electricity generation or deployment of frequency control ancillary services to stabilise the grid.

There is significant scope to further unlock industrial potential, but this will require greater market operator visibility of industrial loads and supporting large energy users to build capability. The potential for industry to participate in demand flexibility programs will depend on operational imperatives, as well as having the right market arrangements, signals and incentives. To support this, energy market bodies have been developing reforms including the recently established Wholesale Demand Response Mechanism.

Providing the right incentives to shift energy use in the design of the NEM can also unlock demand flexibility. This is being considered by the Government-commissioned independent expert review of the NEM's wholesale market settings, as part of their examination of how to promote investment in firmed renewable energy generation and storage capacity beyond 2030 more broadly.

### Accelerating energy performance to 2035

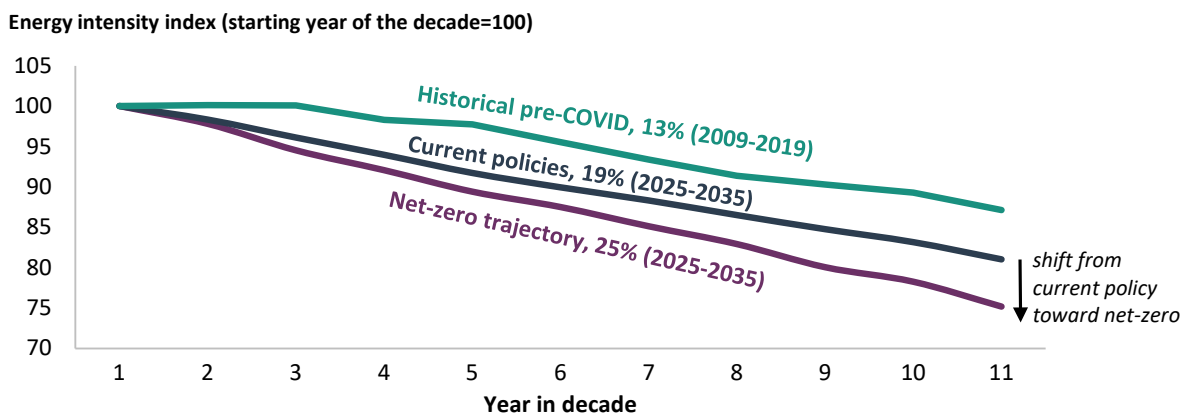
DCCEEW analysis suggests a 25% improvement in economy-wide energy efficiency by 2035 would be an ambitious and achievable contribution to meeting our 2035 emissions reduction target. This is based on achieving levels of improvement in energy efficiency and electrification consistent with Treasury's Baseline Scenario.

The benefits of achieving this level of economy-wide energy efficiency improvement depend on the specific pathway taken. For example, quicker adoption of electric vehicles that saves the transport sector 10 PJ per year could increase industry multi-factor productivity by 0.15%.

Enhanced policy settings can help put Australia on this pathway. Existing policy settings have substantially improved the outlook for economy-wide energy efficiency over the coming decade. Nonetheless, there remains a gap between what current policy achieves, and the level of improvement in economy-wide energy efficiency that is consistent with a least-cost net-zero aligned pathway (Figure 3.9).

**Figure 3.9: Current policies have already improved Australia's energy performance— but there is more to do**

Economy-wide energy efficiency improvement over the past and next decade, index

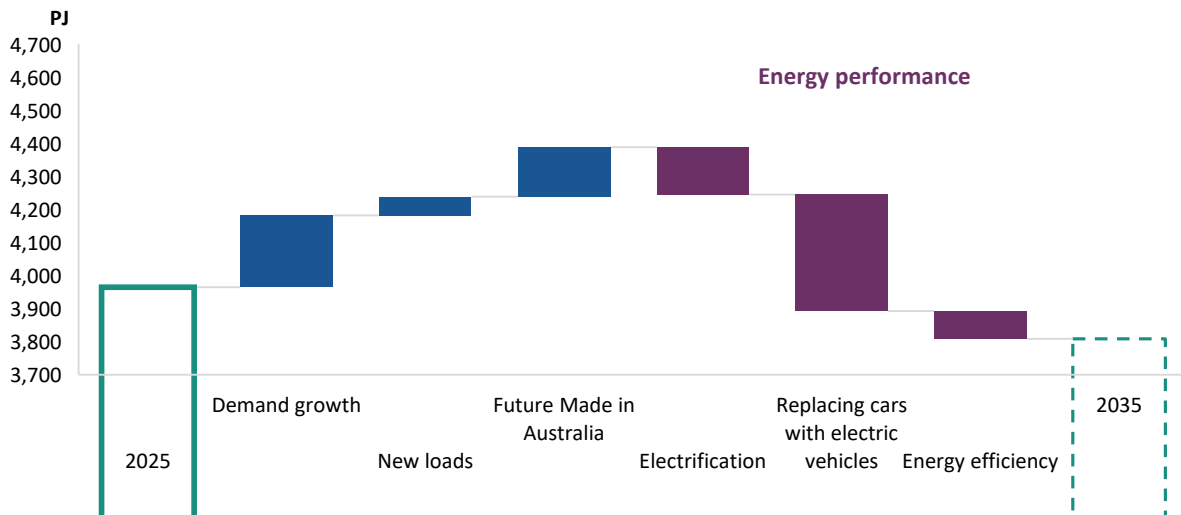


Source: DCCEEW analysis using DCCEEW 2023, Emissions Projections 2023.

DCCEE analysis explores one possible path to accelerating improvements in economy-wide energy efficiency. Under this path, EV adoption accelerates to reach over a third of the vehicle fleet by 2035. Electrification and technical energy efficiency improvements also deliver significant energy savings. Achieving this level of improvement would offset expected increases in energy demand from electrification, economic growth and new industries to 2035 – allowing other sectors to grow (Figure 3.10).

**Figure 3.10: Energy performance improvements can offset expected increases in energy demand to 2035**

Key drivers of changes in energy demand to 2035, PJ



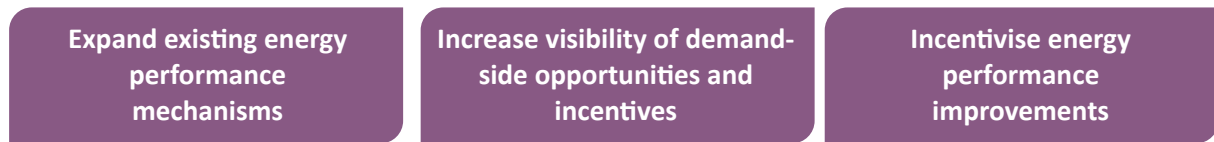
Source: DCCEE analysis using DCCEE 2023, Emissions Projections 2023; consistent with Treasury’s Baseline Scenario.



## Policy directions to put Australia on the pathway to 2050

This plan sets out economy-wide policies that complement policies in other sector plans to improve energy performance in their sector. There are 3 key areas where government action can accelerate progress in the near-term.

**Figure 3.11: Energy performance policy directions**



### *Expanding existing energy performance mechanisms.*

The Australian Government is expanding proven energy rating and standards programs in the residential and commercial built environment to give Australian households and businesses better information and signals to improve their energy performance and reduce costs. This includes:

- modernising the Greenhouse and Energy Minimum Standards (GEMS) Act to account for demand flexibility in appliance and equipment standards and expanding the application of GEMS requirements to commercial and industrial sectors
- investing in the National Australian Built Environment Rating System for non-residential buildings
- expanding the Commercial Building Disclosure (CBD) program to more commercial building types beyond office buildings, and expanding the Nationwide House Energy Rating Scheme (NatHERS) to cover existing homes.

The Government is also building on existing investments in EV charging infrastructure with a further \$40 million to accelerate rollout of kerbside and fast charging for electric vehicles.

### *Increasing visibility of demand-side opportunities and incentives.*

The Australian Government is establishing a Demand-side Statement of Opportunity (DSOO), to be developed in collaboration with AEMO and states and territories via the ECMC. This will help to ensure the energy system is ready for new electricity loads, and identify opportunities to reward consumers for providing demand services and avoid costly system build out where flexible demand can achieve an equivalent system outcome. The DSOO would complement AEMO's existing supply-side Gas and Electricity Statements of Opportunities and integrated system planning.

Additional actions include:

- working with the ECMC to address recommendations by the National Electricity Market Review Panel that support more flexible demand in the NEM
- continuing policy and analytical work to help manage economy-wide electrification, including through enhanced analysis and understanding of incentives and barriers to electrify, and monitoring the pace of electrification to consider unintended outcomes
- updating the National Energy Performance Strategy to coordinate further action.

### *Incentivising further energy performance improvements.*

There are large opportunities to incentivise more efficient network investment and operation for commercial and industrial energy users that are not captured under the Safeguard Mechanism.

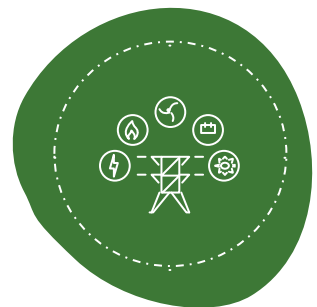
### 3.3 Electricity

#### Electricity in Australia today

<b>22%</b>	of Australian total final energy consumption	<b>Over 40%</b>	renewable generation share in our 2 largest grids
<b>34%</b>	of Australia's emissions	<b>8%</b>	of electricity generation is off-grid

#### Electricity in Australia's energy transformation

Electricity is central to Australia's decarbonisation as firmed renewables can drive emissions reduction and enable economy-wide electrification. The sector will significantly expand and transform to meet demand from electrification and new industries. A system dominated by variable renewable electricity will be more distributed, bidirectional and will require sufficient long-duration firming.



#### A pathway to 2050

2030	2035	2050
<b>82% renewable electricity</b>	<b>Orderly exit of coal through the 2030s</b>	<b>Transition to a net zero system</b>

#### Policy directions to put Australia on the pathway to 2050

<b>Incentivise private investment in firmed renewables</b>	<b>Optimise the use of our network infrastructure</b>	<b>Get the most out of consumer energy resources</b>
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#### New actions

At the start of 2025 the Government added \$2 billion to the Clean Energy Finance Corporation (CEFC) general funding, allowing it to sustain its crucial investments in clean energy technologies.

The Government will update the CEFC's investment mandate to include a new focus on the rapid roll out of renewable projects to drive down electricity prices, and commit up to \$2 billion more to the CEFC General Account, to be drawn down in line with these changes.

The Australian Government has commissioned a Review of the NEM wholesale market settings and will work with states and territories to consider the recommendations.



## Overview

Electricity is crucial for modern life, powering essential aspects of our daily activities, businesses and infrastructure.

Australia's electricity systems were originally powered by coal-fired generators, which have long underpinned both supply and system security. Many of today's coal plants are now nearing the end of their operational life and are increasingly unreliable.

As these plants are retired, they are progressively being replaced by renewable sources like solar, wind, and firmed by battery storage. Renewables now supply over 40% of electricity in the NEM and the South West Interconnected System (SWIS) – Australia's 2 largest grids.<sup>24</sup> This shift is being driven by government support for climate action and the falling costs of mature renewable technologies.

The renewable rollout is being complemented by enhanced peaking, firming and system security measures to ensure system reliability and security. This includes pumped hydro and natural gas-fired generation, which plays an important role in managing periods of low renewable generation, particularly in winter. Renewables provide the cheapest form of new generation even when accounting for these additional firming costs.

At the same time, our electricity system is becoming more dispersed and bidirectional. Households are playing a more active role in energy markets by generating, storing and flexibly using electricity. With solar panels installed on more than a third of Australian homes, there is more rooftop solar capacity than all of the remaining coal fired generators, providing around 11% of Australia's electricity generation.

The expansion of renewable generation has already driven substantial emissions reductions since 2005. Continued growth in renewables will further reduce electricity sector emissions and enable economy-wide decarbonisation through electrification.

Reaching 82% renewable electricity by 2030 is a major milestone on the path to net zero, supporting Australia's target of reducing emissions to 43% below 2005 levels by 2030. To meet this goal, the pace of utility-scale renewable and storage deployment has accelerated and will need to continue to grow. Beyond 2030, maintaining a strong build rate will be essential to support our 2035 Target and meet a doubling of current electricity demand by 2050.

This comes with challenges – there is a need for private market investment to maintain a high renewable build rate, alongside ensuring sufficient long-duration firming and better use of existing network infrastructure and CER.

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<sup>24</sup> DCCEEW analysis of [Open Electricity \(2025\)](#)

## The electricity pathway to 2050

Australia’s energy system will expand and transform to support our transition to a net zero economy.

Continued momentum in the rollout of firmed renewable generation will be key to decarbonising Australia’s electricity system. Australia’s on-grid electricity system is decarbonising rapidly, with the 2 largest grids now supplied by over 40% renewable energy. These grids together supply nearly 90% of the electricity used across Australia.



### Australia’s Net Zero Transformation: Treasury Modelling and Analysis

*‘Strong investment in renewable energy remains foundational to Australia’s efficient transition, and emission reduction will be required across all sectors. The modelling finds that expanding the supply of renewable energy continues to be the most cost-efficient abatement opportunity, reducing emissions in the electricity sector directly and enabling broad-based decarbonisation through electrification.’*

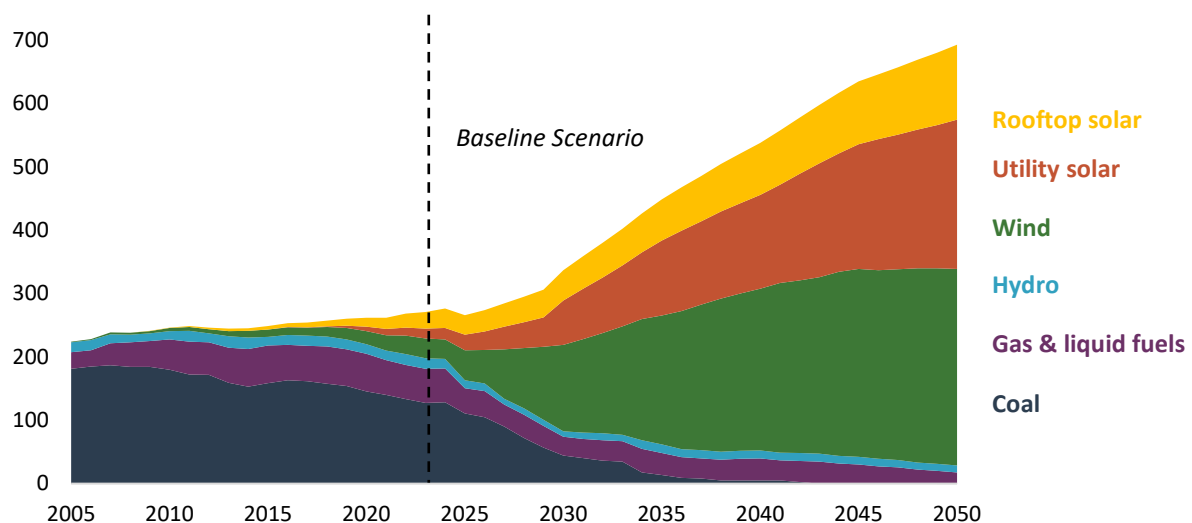
Renewables will also be key to decarbonising Australia’s off-grid electricity systems, which provide around 8% of total generation and are essential for our remote communities and industries. Gas-powered generation currently provides 80% of total off-grid generation, and most of Australia’s oil-fired generation occurs off-grid. When both on and off-grid generation is included, electricity is supplied mostly by coal (46%), renewables (35%), and gas (17%).

By 2050, our electricity system will be dominated by renewable sources (Figure 3.12). Variable generation will comprise a mix of utility-scale and rooftop solar, alongside both onshore and offshore wind. Dispatchable generation will primarily rely on hydro and gas-powered sources. Batteries will also play a crucial role in energy storage, particularly in managing daily demand fluctuations, and will assist in providing reliable energy supply for regional and remote communities. Network infrastructure is expected to be optimised and delivered cost-effectively, with the grid underpinned by efficient and flexible assets.

Figure 3.13 sets out the key milestones on this pathway to 2050.

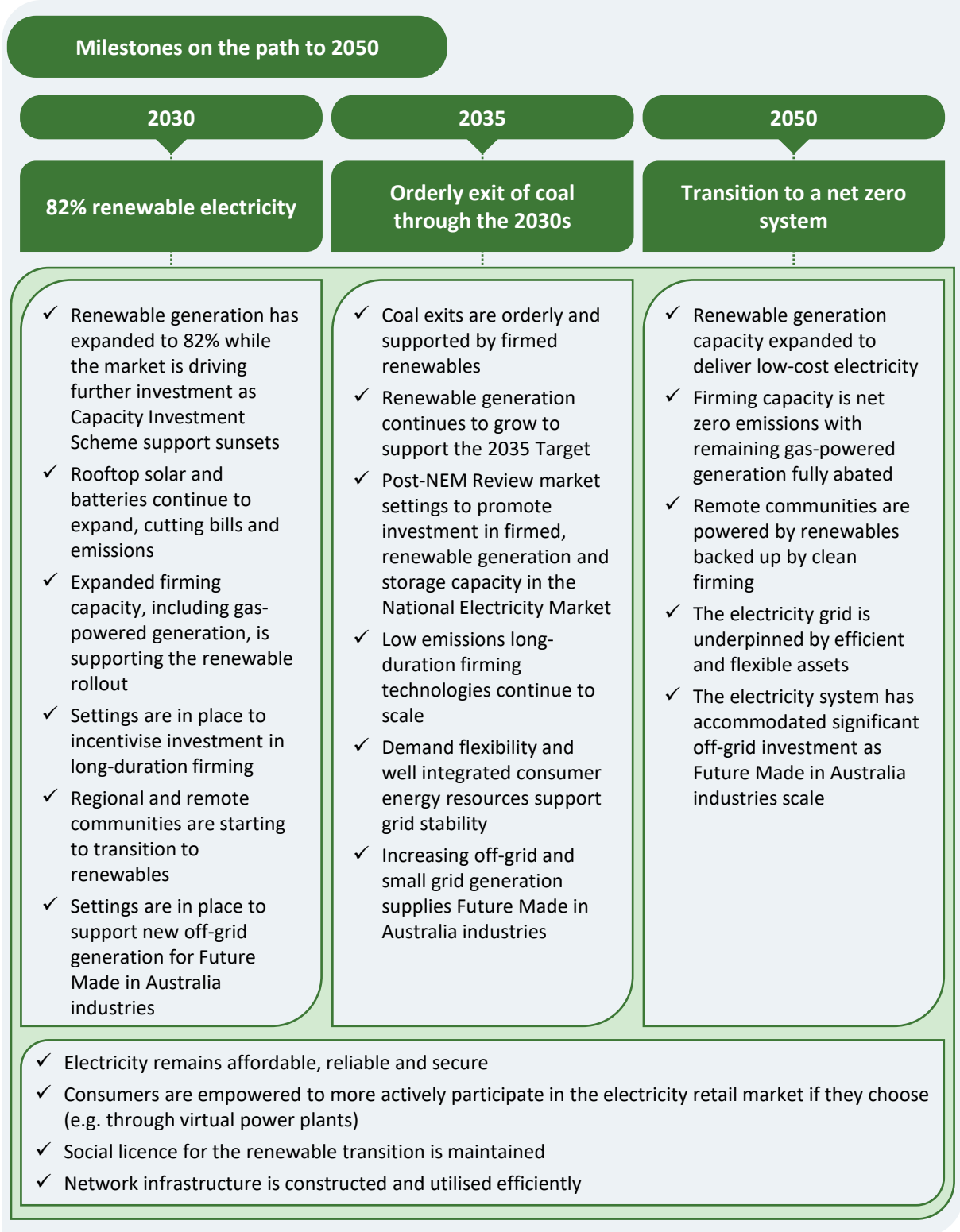
**Figure 3.12: Australia’s electricity generation mix will increasingly shift to renewables**

Electricity generation mix in Australia, Baseline Scenario, TWh



Source: DCCEEW and Treasury modelling. Note: Excludes storage discharge.

Figure 3.13: Electricity milestones on the pathway to net zero



Our electricity system will need to expand to meet demand from electrification and new industry growth, including from data centres (Box 3.3). Energy efficiency improvements will offset some of this growth – as detailed in *3.2 Energy performance*. The profile of electricity demand will also change, with greater variability in generation, changing peak demand and new large loads.

By shifting from coal to renewables, scaling renewable supply, and improving performance of our networks and how we use electricity, Australia can decarbonise the sector and service new demand. Whilst there is a clear technological pathway for the decarbonisation of electricity supply, challenges remain in rolling out the required generation and network infrastructure (see *4 Enabling the transformation*).

It will be critical to manage electricity system security – the system’s capability to withstand and recover from disturbances and contingencies – as Australia’s energy transformation gathers pace and synchronous power plants like coal exit the system. Through the ECMC, governments are working collaboratively with energy market bodies and networks to ensure we have appropriate regulatory frameworks, technological innovation and policy settings in place to maintain a stable, reliable and safe power system through the energy transformation.

### **Box 3.3: Artificial intelligence and data centres**

Digitalisation is a key driver of productivity in the Australian economy and underpins significant growth opportunities. The rapid growth of data centres is a market response to these opportunities, which will grow further with the expected expansion in AI-driven demand. AI can help optimise energy management, enhance grid stability, and mitigate cybersecurity risks.

While data centres deliver significant benefits, they are increasing electricity demand and present challenges for the grid. Data centres require a continuous energy supply, and generally prefer to draw a consistent load from the grid, which needs to be balanced with the variable nature of renewable energy.

AEMO estimates the electricity consumed in the NEM by data centres is currently around 4 TWh (2% of grid demand). AEMO forecasts consumption to grow to around 12 TWh by 2029-30 (equivalent to 6% of the NEM’s grid-supplied electricity), reaching around 34 TWh (or 12% of the grid supplied electricity) by 2049-50.<sup>25</sup>

A crucial tool for managing the integration of data centre loads into the energy system will be the deployment of flexible demand. In the US, Google has reached agreements with 2 energy providers to reduce its electricity consumption for AI on request during periods of high demand.<sup>26</sup>

The Australian Government is working with states and territories, energy market bodies, network service providers and the data centre industry to harness the opportunities from the growth in data centres, while managing the implications for Australia’s electricity systems.

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<sup>25</sup> [AEMO \(2025\)](#)

<sup>26</sup> [Kearney \(2025\)](#)

*Long duration firming will be critical in a system dominated by variable renewable electricity*

As we shift to renewables and coal exits the electricity system, long-duration firming options, including gas-powered generation, will act as a backup in periods of low renewable generation and high demand.

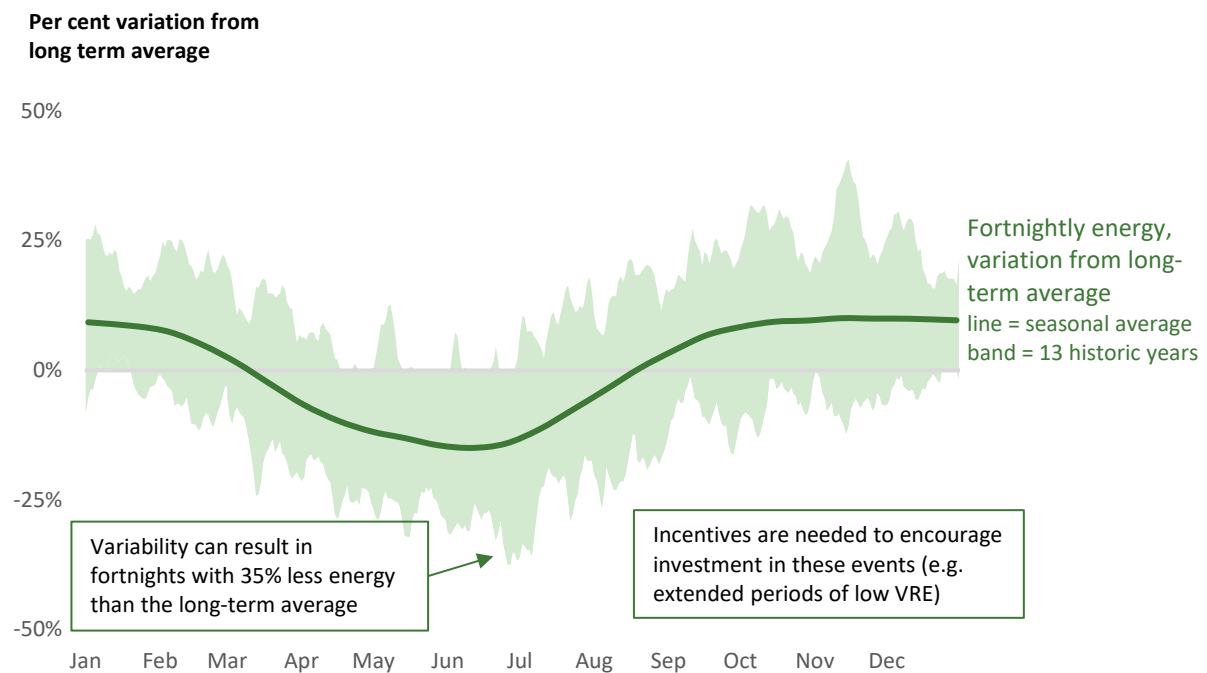
A diversified mix of renewable generation sources like solar, onshore and offshore wind will, on average, reduce seasonal variability since solar output alone is consistently lower in winter (Figure 3.14).

Clean long-duration energy storage technologies like batteries and pumped-hydro can also be used to manage predictable, daily and seasonal fluctuations in generation. However, these technologies may become depleted during periods of low solar and wind generation.

During these challenging periods, gas-powered generation is currently the most affordable solution for long duration firming, offering the cheapest insurance against periods of extended low generation. Under the Baseline Scenario, gas-powered generation in the NEM represents around 5% of total capacity, but just 3% of total generation in 2050.

**Figure 3.14: Australia’s electricity system will need to be resilient to fluctuations in renewable output**

Variable renewable energy (VRE) variation from long term average, across 13 years of historic weather patterns



Source: DCCEE analysis of AEMO 2024, Integrated System Plan.

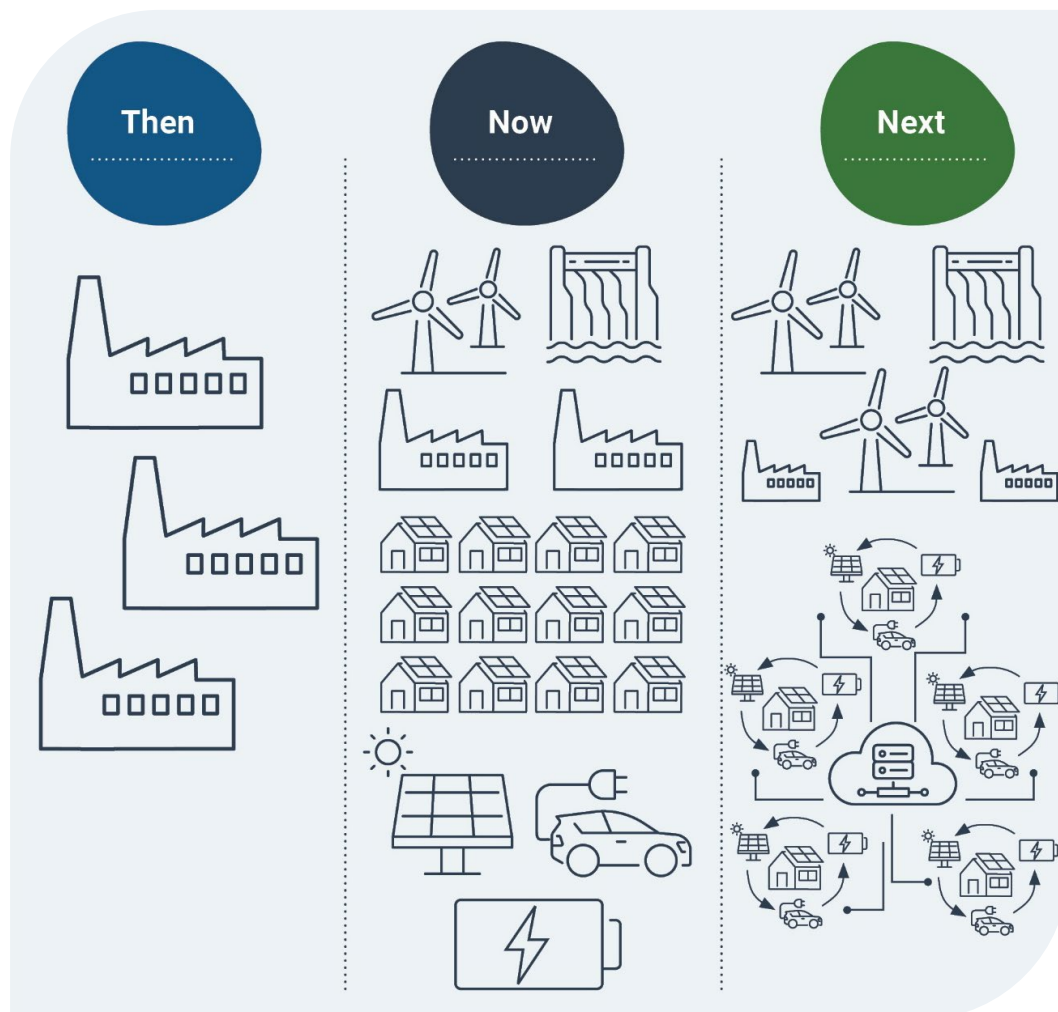
### *An increasingly bidirectional and decentralised electricity system unlocks opportunities*

Households and businesses will also play a more active role in generating and storing electricity. What was once a relatively straightforward, one-directional market where large generators like coal-fired generators supplied electricity to consumers, is now evolving into a decentralised model that supports 2-way power flows (Figure 3.15).

This transformation is being led by the uptake of CER – such as rooftop solar panels, electric vehicles and home battery storage – which enables households, industries and businesses to generate, store and manage their own electricity. Complementary services like virtual power plants, aggregation services, bidirectional charging and home energy management systems can further empower consumers to optimise their energy use. The CCA has highlighted the significant potential of solar and batteries on commercial and industrial properties, as well as rural properties, as an important opportunity for Australia.<sup>27</sup>

As CER deployment accelerates and innovative technologies are developed, the electricity system is becoming more dynamic, with a greater number of participants and increasingly blurred lines between supply and demand. While this creates a more complex system, it also unlocks opportunities to reduce overall system costs and deliver better value to consumers.

**Figure 3.15: Australia's evolving electricity system**



<sup>27</sup> [CCA \(2025b\)](#)

*An expanded electricity grid will support new demand*

Electricity generation more than doubles by 2050 in the Baseline Scenario to meet new demand from electrification and new emerging industries.

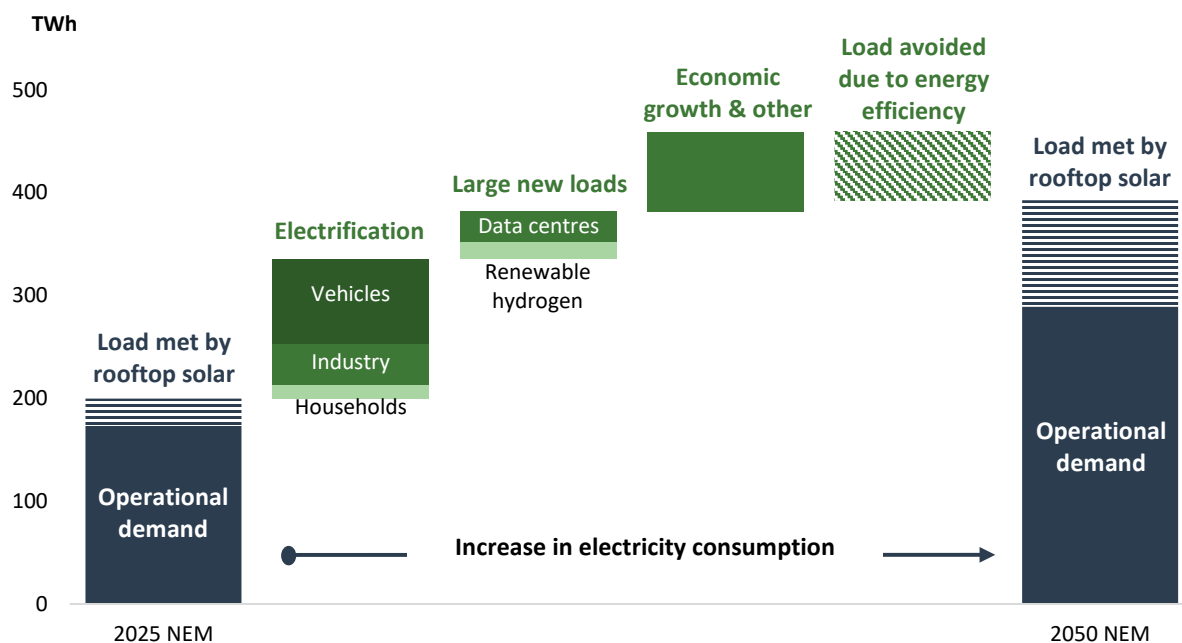
For some sectors currently reliant on gas and liquid fuels, switching to electricity may be a cost-effective decarbonisation strategy, as electric technologies are generally more energy efficient, and firmed renewables are now the most affordable form of new generation. New industrial loads will also contribute to an increase in on-grid demand. Data centres in particular are anticipated to be a major driver of electricity demand in coming decades.

For our major grids, electrification and economic growth will be a major driver of demand growth under the Baseline Scenario (Figure 3.16).

Energy efficiency improvements can partly offset the impact of demand growth, reducing the need for new generation capacity. The impact on operational demand – that is, the amount of electricity that needs to be supplied by utility-scale generators – is also offset by rooftop and other distributed solar generation.

**Figure 3.16: Underlying demand in the NEM will increase significantly to 2050 – with energy efficiency and rooftop solar playing an important role to limit the increase in operational demand.**

Electricity consumption in the NEM, TWh, Baseline Scenario



Source: DCCEEW and Treasury modelling. Note: Rooftop solar includes other distributed solar.

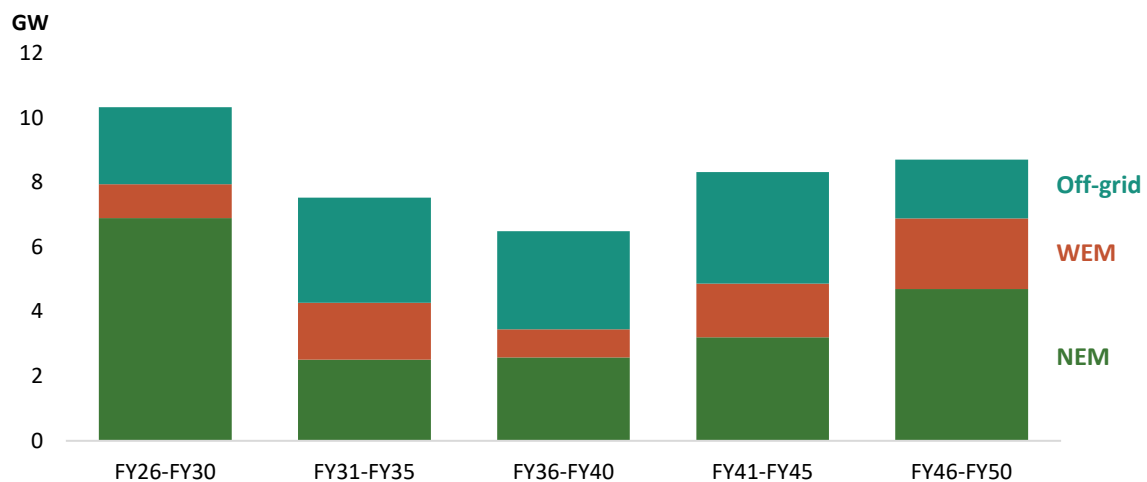
### A growing off-grid system will support new industries

Some emerging industries – like renewable hydrogen, green metals, and critical minerals processing – will be established in off-grid locations that best leverage Australia’s comparative advantage in low-cost renewables. As a result, off-grid generation increases under the Baseline Scenario. The sustained buildout of renewables includes significant off-grid investment, particularly between 2030 and 2045 (Figure 3.17).

Small and off-grid electricity consumption depends on the scale of new clean energy embedded export sectors. For example, small and off-grid electricity consumption for renewable hydrogen production is projected to increase from zero in 2025 to 110 TWh and 481 TWh in 2050 under the Baseline Scenario and Renewable Exports Upside Scenario, respectively.

**Figure 3.17: A high renewable build rate will be sustained to 2050, including significant off-grid investment**

Average annual VRE capacity build, GW, Baseline Scenario



Source: DCCEE and Treasury modelling.

Enabling these industries to develop outside of our major grids can help to reduce their operating costs by taking advantage of lower cost renewable generation, optimising their facility energy loads with production, and minimising transmission infrastructure costs. However, this investment will come at a time of heightened competition for workforce, equipment and capital.



## Policy directions to put Australia on the pathway to 2050

The Government's 82% renewable electricity target, alongside ambitious state and territory targets, is driving a national transformation towards a more affordable, cleaner and reliable electricity system. To date, government support has focused on catalysing investment to scale clean electricity supply.

### Key government initiatives

- The Capacity Investment Scheme is accelerating investment in renewable electricity and clean dispatchable capacity to meet future demand.
- Rewiring the Nation is investing in new and upgraded grid infrastructure to connect renewables and storage more efficiently, enabling timely project delivery and lowering costs for consumers. Projects like Marinus Link will further enhance grid resilience.
- The Australian Government, together with states and territories, energy market bodies and industry, is working to prioritise reforms to boost grid productivity, allowing more renewable power to flow to households and businesses and lowering energy bills. Pathways include the Grid Enhancing Technology grants program, and by addressing barriers to deployment via support for AEMO to accelerate grid connection of renewable generation and storage assets.
- The NETP fosters collaboration across the Australian Government and state and territory governments to coordinate planning, enhance energy security, and implement nationally significant transmission projects.
- The National CER Roadmap, the Small-scale Renewable Energy Scheme (SRES) and the Cheaper Home Batteries program (Box 3.4) are enabling consumers to participate in the energy transformation.

Australia's electricity system is evolving rapidly. Sustaining this momentum is essential to ensure an orderly transformation that delivers lasting benefits for all Australians. Further action is needed to incentivise private investment in firmed renewables and efficient network investment. Continued innovation and productivity will also be important. AI has the potential to deliver significant benefits for our electricity systems by optimising energy usage, supporting grid stability through predictive maintenance, and better integrating renewable energy by improving supply and demand predictions.

### Box 3.4: Cheaper Home Batteries Program

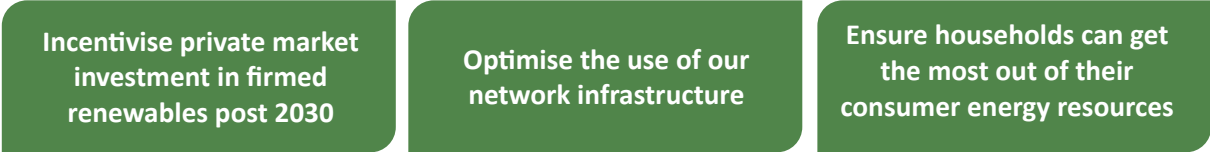
The Government is rolling out the Cheaper Home Batteries Program to help more people install batteries.

Australian households, businesses and community organisations can get a discount of around 30% on the upfront cost of installing small-scale battery systems (5 kWh to 100 kWh, with the discount available up to 50 kWh). Over 55,000 batteries – with total storage capacity of over 1 GWh – have been installed in just over 2 months since the program commenced on 1 July 2025.

This program is helping consumers reduce electricity bills at the same time as reducing broader system costs. This will support Australians to make the most of cheap and clean solar power, storing it for later use, while reducing peak demand and creating a more stable electricity grid.

There are 3 key areas for government action in the near-term (Figure 3.18).

**Figure 3.18: Electricity policy directions**



*Incentivising private market investment in firmed renewables post 2030*

Beyond 2030, economy-wide electrification and new industry growth will continue to drive demand for renewable electricity, clean dispatchable capacity and other firming technologies.

As shown above in Figure 3.17, a high renewable build rate will need to be maintained to 2050. In recent years, significant government action has supported the build out of renewables and strong private investment. Sustaining this level of investment will require electricity markets and policies to provide investment certainty for clean electricity, as we transition away from a model driven by government support. Several critical enablers must also be in place to achieve the required infrastructure build out - such as social licence, planning and approvals, supply chains and workforce, discussed in 4 *Enabling the transformation*.

Sufficient firming services will be needed to complement a system dominated by variable renewable electricity. On average, a more diversified generation mix will reduce seasonal variability and the associated need for firming. The development of an offshore wind industry will enhance energy security and resilience by providing power when solar and onshore wind are unavailable. Improvements in energy performance, in particular demand flexibility, will also reduce the scale of firming required.



### Box 3.5: The NEM Review

In November 2024, the Australian Government announced a review of NEM wholesale market settings by an independent expert panel, chaired by Associate Professor Tim Nelson.

The purpose of the review is to recommend wholesale market settings to promote investment in firmed, renewable generation and storage capacity in the NEM following the conclusion of Capacity Investment Scheme tenders in 2027. The Panel will make actionable recommendations to support reforms to the NEM wholesale market to support the achievement of Australia's National Electricity Objectives to deliver reliable, competitively priced, safe and secure electricity services, supporting the long-term interests of consumers and prosperity of Australia's economy. The Panel is expected to deliver final recommendations to Government and the ECMC in late 2025.

The NEM Review Panel is considering several measures to ensure wholesale market settings in the NEM are fit-for purpose to promote investment in generation capacity, and short- and long- duration firming beyond 2030 (**Box 3.5**). As part of this, the NEM Review Panel's [draft report](#) recommends establishing an entry mechanism that addresses misalignment between the long-term revenue certainty investors need and the short-term focus of electricity buyers. The Panel notes that establishing this mechanism would provide an enduring framework and clear price signals for the electricity investments our future electricity system requires.

ECMC has agreed to high-level principles to inform the detailed design of the new mechanism to support continued investment through the energy transformation. Following receipt of the NEM Review Panel's final report, the Australian Government will work with states and territories through ECMC to consider the recommendations made.

At the start of 2025 the Government added \$2 billion to the Clean Energy Finance Corporation (CEFC) general funding, allowing it to sustain its crucial investments in clean energy technologies. The Government will update the CEFC's investment mandate to include a new focus on the rapid roll out of renewable projects to drive down electricity prices, and commit up to \$2 billion more to the CEFC General Account, to be drawn down in line with these changes. This will enable the CEFC to continue to crowd-in private capital for initiatives to modernise our electricity system and reduce emissions across the economy.

### *Incentivising efficient network investment and use*

Making the best use of expanded network infrastructure will enable the delivery of affordable, reliable and secure electricity. AEMO has estimated that around 5,000 km of transmission lines are needed in the next decade on the east coast. At the same time, using existing infrastructure more efficiently can minimise the need for expensive new projects and support delivery of the 82% target.

Delivering network projects efficiently and cost-effectively will minimise overbuild and associated costs to consumers. There is also scope to use our existing transmission and distribution network infrastructure more efficiently. This includes:

- improving network productivity, such as addressing congestion and network black spots
- non-network solutions including adopting increasingly available and cost-competitive battery storage, flexibility services and grid enhancing technology.

Governments play an important role by ensuring Australia's system planning processes and network regulation are fit for purpose. This can make the grid more stable, reliable, affordable and safe.

The Grid Enhancing Technologies program will drive innovation by supporting development and utilisation of new grid technologies. The Accelerated Connections Fund will trial faster, more efficient connections for critical renewable generation and clean storage projects. These initiatives will unlock more renewable energy, enhancing reliability, reducing costs and delivering benefits to developers and consumers.

At the request of the Australian Government, the Australian Energy Market Commission (AEMC) has made several rule changes to improve how transmission networks are developed to benefit consumers. The Government will continue to monitor this to address inequalities in the cost burden of paying for network infrastructure, to avoid excessive costs passing through to electricity consumers and to encourage increased utilisation and innovation.

Enhancing the use of distribution networks could deliver projects faster at lower cost, and improve the reliability of supply for regional communities. For example, distribution network renewable energy zones could unlock more utility-scale renewable generation. Distribution network batteries could be well positioned to reduce pressure on the grid. Better utilising distribution networks can also help to increase the rate of deployment and coverage of kerbside EV charging.

### *Getting the most out of consumer energy resources*

ECMC agreed to the National CER Roadmap in July 2024. The Roadmap sets out national reform priorities to harness CER's full potential and deliver benefits and equitable outcomes to all Australian consumers.

By 2050, under the Baseline Scenario there is 86 GW of distributed solar connected to the NEM, up from 23.7 GW in 2025. Households install 44 GW of CER storage by 2050, up from 1.4 GW in 2025.

Consumers can benefit from highly integrated CER as it can help manage minimum demand and reduce peak demand, provide essential system services, and reduce the need for costly network upgrades, grid scale generation and storage investments. Balanced regulation of new energy technologies and services can facilitate this engagement by ensuring adequate consumer protections are in place. Consumer protections can help build trust that the control of CER by third parties – necessary to coordinate technologies and realise possible benefits – is safe, in their interest, and does not require them to become energy experts. Evolving consumer protections are discussed in *5.2 A fair and equitable transformation*.

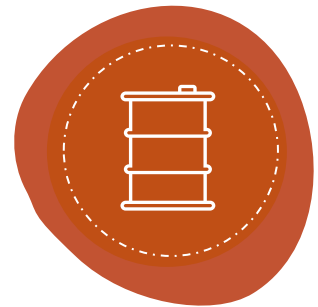
### 3.4 Gaseous fuels

#### Gaseous fuels in Australia today

<b>13%</b>	of Australian total final energy consumption is from natural gas	<b>74%</b>	of Australia’s natural gas is exported
<b>21%</b>	of Australia’s emissions come from natural gas supply and use	<b>18PJ</b>	of renewable gases produced in 2024 – 1% of domestic gas consumption

#### Gaseous fuels in Australia’s energy transformation

Natural gas will remain an important contributor to Australia’s economy and energy security, but its role will need to change to support the net zero transition. Overall gas demand is expected to decline over time as households, businesses and some industrial users electrify. For some uses – particularly electricity generation, high-heat processes or as a chemical feedstock – natural gas will continue to play a role. In the short term, new sources of gas supply are needed to support the transformation. By 2050, gas users have transitioned to renewable gases like hydrogen or biomethane where possible, with remaining natural gas use abated.



#### A pathway to 2050

2030	2035	2050
Natural gas is supporting an orderly transition	Renewable gases and natural gas are supporting strategic sectors	Remaining gas use is decarbonised with strong renewable gas uptake

#### Policy directions to put Australia on the pathway to 2050

Secure an adequate natural gas supply	Support natural gas users to electrify	Establish and scale renewable gases
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#### New actions

The Australian Government is undertaking a Gas Market Review that will examine existing regulatory settings and consider long-term policy settings for Australia’s gas markets with a focus on ensuring efficient investment, availability of gas and meeting emissions reduction targets.

## Overview

Natural gas has been integral to Australia's economy for more than half a century – heating homes and businesses, providing peaking power via gas-powered electricity generation (GPG) and powering industry.

Natural gas supply and use accounts for 21% of Australia's emissions.<sup>28</sup> In the short term, new supply is needed to avoid shortfalls and support the transformation. However, we will need to reduce natural gas use and transition towards lower emissions alternatives over time to reach net zero.

Some uses of gas, such as residential use and low-temperature industrial heat, can be phased down over time with the uptake of available alternatives. Even without the benefit of solar and batteries, switching to electric appliances can reduce energy costs for households by more than \$1,000 per year on average compared to a non-electrified household. When solar and batteries are installed as well, the savings rise to over \$2,200 (see 5.1 Household benefits).

Other uses, such as in industries reliant on high-heat processes or gas as a feedstock, will persist for longer as they currently have limited technical or commercially viable alternatives. Natural gas will also be important to support emerging strategic industries, such as green metals production, and GPG will remain an important source of long-duration firming for variable renewable generation.

As set out in the Future Gas Strategy, natural gas supply will shift to support these higher-value and non-substitutable uses. This will allow an overall gas demand declining alongside a transitional increase in gas use for electricity firming and some industrial applications. A secure and adequate domestic gas supply is critical to support these sectors, and to support energy affordability while households and businesses electrify.

The gas decarbonisation pathway will vary across sectors and over time. Electrification and energy efficiency should be prioritised wherever possible to reduce emissions and take some pressure off tightening supply. Scaling and the commercialisation of renewable gases will be key to the longer-term decarbonisation of those sectors that will continue to rely on gaseous fuels.

Australia is also a major exporter of liquefied natural gas (LNG) and will remain a trusted and reliable trade and investment destination to help trading partners on their own paths to net zero. The Resources Sector Plan describes the decarbonisation pathway for Australia's gas extraction and processing sector.

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<sup>28</sup> [DISR \(2024\)](#)

## The gaseous fuel pathway to 2050

### **T** Net Zero Plan – Treasury Modelling and Analysis

*'The modelling projects that emissions from gas use decline by 70 per cent to 2050 under the Baseline Scenario. Natural gas use is projected to shift towards higher-value and non-substitutable use cases*

*'Energy efficiency, electrification and fuel switching technologies are expected to enable reduced gas demand by industrial users and households over time, as capital stock turns over and electric appliances become more cost efficient.'*

Natural gas provides 13% of Australia's final energy consumption. Around 5 million households use it for cooking, hot water and space heating. Natural gas is the largest source of energy for industry, with the vast majority of gas consumption used for heating purposes. It is also an important feedstock in a wide range of products such as fertilisers, plastics, explosives and medicines.

Gas is also an important source of electricity generation, accounting for 17% of electricity generation overall (including 6% in the NEM). GPG supports the electricity grid in peak demand periods, and over time, will shift to provide firming for renewable generation, while also acting as a strategic backup in 'still and dark' periods in the NEM and WEM. GPG also supplies many remote mine sites in WA and provides 84% of electricity generation in the Northern Territory.

Gaseous fuel demand will vary across sectors and over time on the path to net zero. To ensure an orderly transition, we must balance the ongoing need for natural gas where alternatives are not available or commercial with the need to steadily reduce its use (Figure 3.19).

**Figure 3.19: Decarbonisation pathways differ between natural gas users**



**Residential, small commercial users and low-heat industrial users** will need to be encouraged and supported to electrify wherever possible and improve energy performance. This will reduce emissions and enable supply to be directed to non-substitutable uses.



**Existing industrial and commercial users** that rely on natural gas for high-heat processes (such as alumina refining) or as a chemical feedstock currently have no viable alternatives. This means that there will be an ongoing need for natural gas to support industry until renewable alternatives are commercially viable and available at scale.



**Coal-to-gas switching** in some industries, like ironmaking and alumina refining, can support decarbonisation, with some industries like cement also co-firing alternative fuels from waste streams to replace coal. This delivers direct emissions reductions and ensures the ongoing viability of these industries while Australia's renewable gas industry is established, or alternative production methods are commercialised at scale.

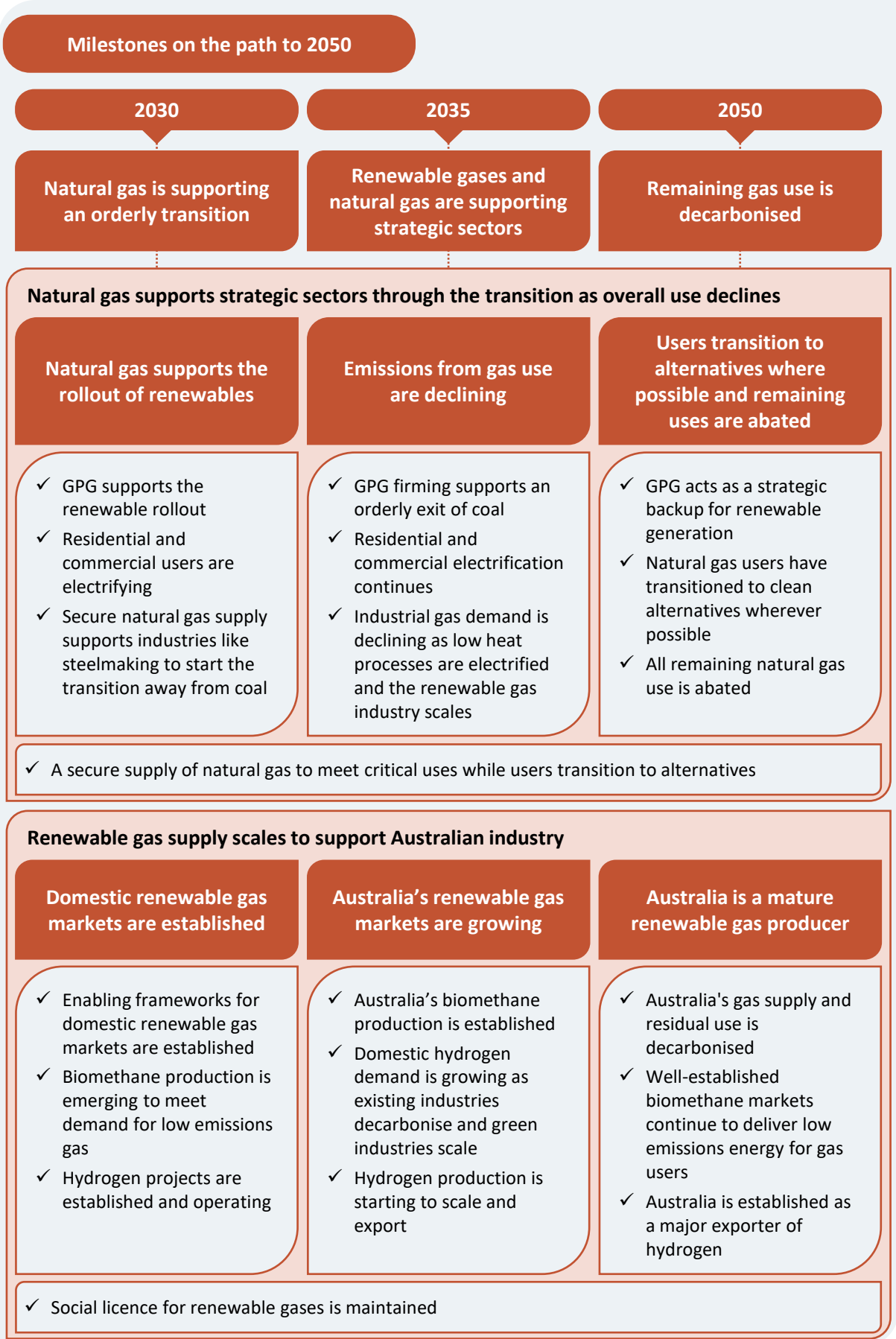


**Emerging industries**, such as green metals and ammonia production, may require natural gas for a period of time while Australia's renewable gas industry is established or alternative production methods are commercialised at scale.



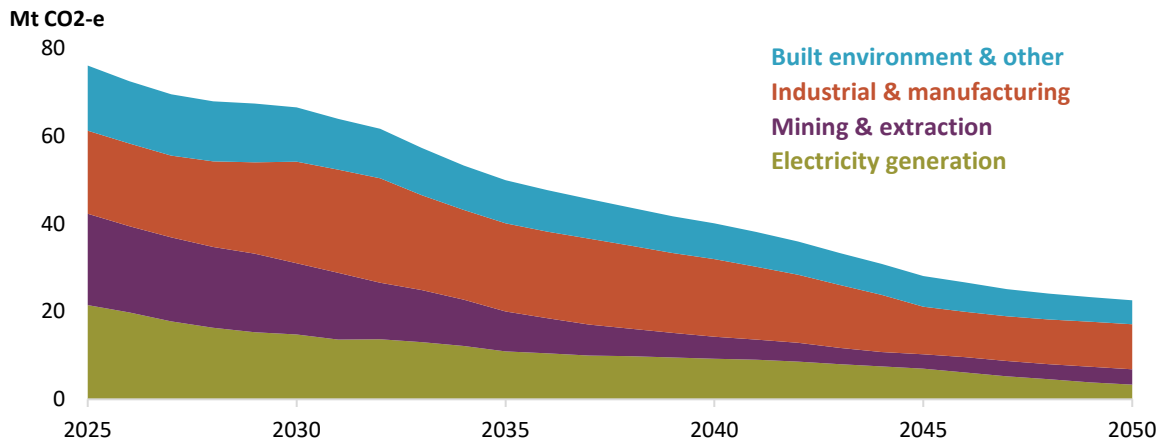
**Gas-powered generation** will be critical to maintain grid reliability and support the integration of variable renewable generation as coal retires. Batteries have proven commercially viable to balance renewable energy over the course of a day, but gas is currently the best technical option to 'back up' variable renewable generation for longer periods. This will be critical during extended renewable droughts.

Figure 3.20: Gaseous fuel milestones on the pathway to net zero



Natural gas use will shift towards higher-value and non-substitutable use cases over time. Emissions from gas use decline substantially to 2050. The emissions trajectory varies across sectors, reflecting the different needs and decarbonisation options available to Australia’s diverse gas users (Figure 3.21).

**Figure 3.21: Emissions from domestic gas use by industry grouping, Baseline Scenario, Mt CO<sub>2</sub>-e**



Source: Treasury modelling. Note: ‘Other’ includes built environment, agriculture and transport industries.

Electrification should be expedited wherever possible to ensure gas is available for non-substitutable uses.

- The pace of electrification will depend, in part, on the rate of asset turnover in different sectors and the relative fuel costs of electricity and gas. The share of natural gas demand that can be electrified will increase over time as technology improves; for example, if electric furnaces are developed for higher-heat processes.
- Even where technically feasible, electrification may not currently be commercially viable, or users may face other barriers to electrification – including upfront costs, grid capacity constraints, long lifespan of existing gas appliances, difficulties in integrating electric technology within existing processes and lack of familiarity with new technologies.

Renewable gases like hydrogen and biomethane will need to be scaled to support the non-substitutable uses of natural gas. For example, biomethane can be injected directly into existing gas networks and has been operating at scale in Europe and North America. Biomethane met over 40% of Denmark’s overall gas demand in 2024.<sup>29</sup> Jemena’s Malabar Wastewater Demonstration Plant is the only biomethane production facility in operation in Australia. The biomethane produced at the facility is injected into the shared gas network.

Emissions from gas will start to decline as policies are put in place to drive the uptake of alternatives. This trend should continue as new alternatives such as renewable hydrogen emerge as a commercially viable option. By 2050, it is anticipated that Australia will be a mature renewable gas producer and many remaining gas users will have transitioned to clean electricity and renewable gases. Remaining residual fossil gas used for GPG and hard-to-abate industrial processes could be abated with carbon capture and storage technology.

<sup>29</sup> [IEA \(2024c\)](#)

## Policy directions to put Australia on the pathway to 2050

The Australian Government has already taken steps to decarbonise gas use, including significant support for development of a renewable hydrogen industry. There are 3 key areas for government action in the near-term (Figure 3.22).

**Figure 3.22: Gaseous fuels policy directions**



### *Secure an adequate natural gas supply*

A secure and affordable supply of natural gas is key to an orderly transition. AEMO is forecasting peak day gas shortfalls for southern states from 2028 under certain conditions and an annual structural gas supply shortfall from 2029.

New sources of supply, gas transport capacity and storage are needed to mitigate forecast shortfalls. Investment in natural gas will be needed in the short to medium term to meet demand. Over the longer term, actions to reduce gas use and scale renewable gas supply will support energy security by taking pressure off natural gas supply. But the next few years are a critical period in which investments in natural gas supply and associated infrastructure will be needed.

The Australian Government has also established a range of mechanisms to support gas supply adequacy, including the Australian Domestic Gas Security Mechanism (ADGSM), the Gas Market Code and the Heads of Agreement with East Coast LNG exporters. The Government is undertaking a Gas Market Review to examine these mechanisms and consider long-term policy settings for Australia's gas markets with a focus on ensuring efficient investment, availability of gas and meeting emissions reduction commitments (**Box 3.6**). The review is expected to report to the Government by the end of 2025.

The Australian Government is also working with the states and territories to consider whether to expand AEMO's powers to allow it to address infrastructure constraints contributing to forecast gas supply shortfalls, if needed. A draft regulatory package (Bill, Rules and Regulations) will be provided to Ministers for consideration by the end of 2025, followed by public consultation, and then final consideration no later than mid-February 2026. The Australian Government and jurisdictions are also exploring policy options to address gas supply and cost issues in the medium term, committing to further work to reduce gas demand and identify barriers to gas supply and storage projects.

### **Box 3.6: Gas Market Review**

[The Gas Market Review](#) (the Review) is examining the effectiveness of existing regulatory instruments (ADGSM, Gas Market Code and Heads of Agreement). A best practice regulatory framework is critical to support investment and ensure Australia's energy security, including in the transition to net zero emissions and for the energy security of Australia's trading partners. The focus of the Review is consistent with the objectives of the Future Gas Strategy, including supporting decarbonisation of the Australian economy, safeguarding energy security and affordability, entrenching Australia's reputation as an attractive trade and investment destination and helping our trade partners on their own paths to net zero.

The Review will also consider options to consolidate and streamline regulations to create a long-term stable regulatory environment to support investment certainty. Any reforms will be mindful of existing commercial contracts (including export contracts) and trade law, including under current regulations. Key areas of focus are: ensuring sufficient domestic gas supply, reasonable gas prices, market transparency, conduct and good faith rules, competition in gas supplier and user markets, impacts on the competitiveness of Australia's LNG industry, and the roles of the energy market bodies (the Australian Competition and Consumer Commission (ACCC), AEMO and the Australian Energy Regulator (AER)).

#### *Support natural gas users to electrify*

Electrification of homes and businesses is possible as there are widely available electric alternatives to household gas appliances. Some users, including low-income households, renters and those in community housing, face barriers to electrification because of up-front cost challenges, or housing tenure/type. Other consumers may face barriers in accessing information.

Where possible, commercial and industrial users should also be encouraged to switch to low-emissions alternatives (for example, industrial heat pumps may be suitable for some low temperature applications in food production). ARENA and CEFC are investing in accelerating development and deployment of clean technologies to support this transition.

Over time, as some users electrify and disconnect from the gas network, it is possible that network costs for remaining natural gas customers will increase. This is because the costs of maintaining the gas network will be shared by a shrinking pool of customers. All levels of government will need to work together, alongside energy regulators, to ensure the impacts from electrification and demand reduction on the gas network are managed in an equitable manner.

The Government is continuing policy and analytical work to help to manage economy-wide electrification including through enhanced analysis and understanding of incentives and barriers to electrify and monitoring the pace of electrification to consider unintended outcomes.

The Government will also work with states and territories through ECMC on opportunities for households and businesses that are seeking to transition away from gas to other forms of energy as part of the energy transformation.

### Establish and scale renewable gases to support decarbonisation over time

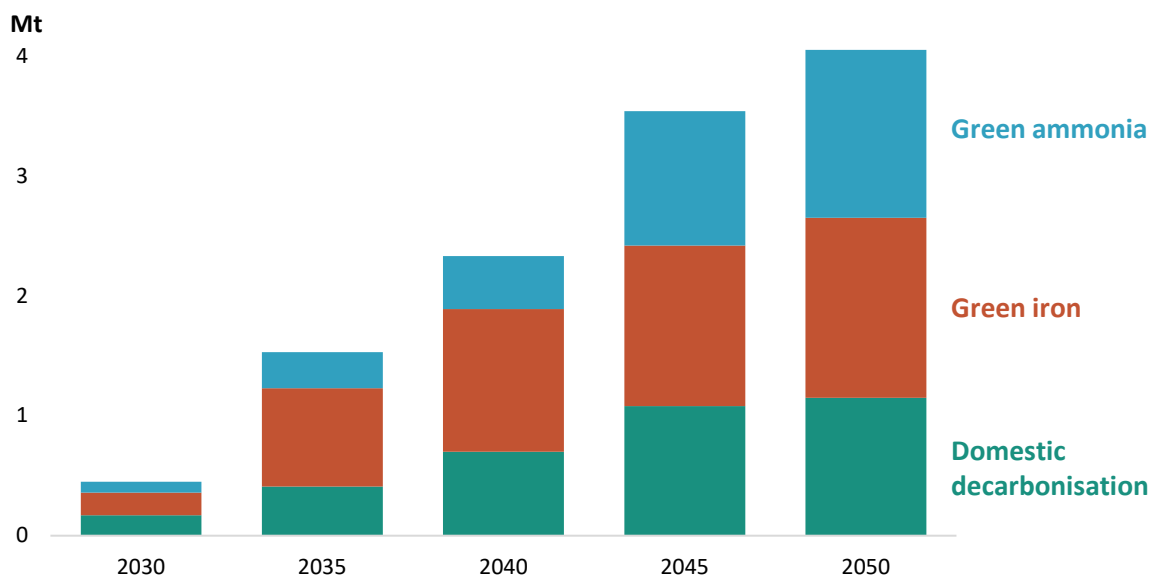
Over time, where electrification is not feasible, Australia will need to substitute natural gas with renewable alternatives (such as biomethane and hydrogen). Natural gas will remain a primary fuel source for many large industrial users until renewable gases are commercially available, or alternative technologies are developed and commercialised at scale. This means that developing renewable gases is critical to deliver long-term emissions reduction.

- Biomethane is a renewable and low-emissions gas that can be injected directly into the existing gas network. Internationally, biomethane production is a mature process that has been operating at scale.
- Hydrogen is a longer-term proposition as it will require new infrastructure to be built, and the industry will take time to scale (Figure 3.23). Australia can leverage our abundant renewable electricity generation to produce globally competitive hydrogen at scale.

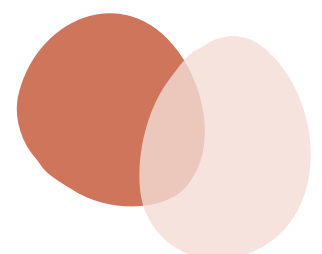
The uptake of low emissions fuel will depend on the relative costs and availability compared to natural gas, the capital costs required to retrofit existing facilities in the case of gas-to-hydrogen switching, and action under the Safeguard Mechanism. The most likely on-going gaseous fuel users will be large-scale industrial users and GPG. Over time, these users may have to make capital investments in upgrades or replacement of their machinery or processing technologies to ensure they are compatible with low emissions gases. Where this is not feasible, offsets or carbon capture and storage will be needed to ensure ongoing natural gas use is fully abated.

The Australian Government is taking steps to support a domestic renewable gas industry. Enabling frameworks for renewable gases are underway – such as through the Guarantee of Origin Scheme and National Greenhouse and Energy Reporting Scheme. The Government is also working with the states and territories through ECMC to develop potential national approaches to a renewable gas policy.

**Figure 3.23: Hydrogen supply and demand to 2050, Mt, by end use sector, Baseline Scenario**



Source: Treasury modelling.



Australia has significant biomethane potential, but scaling production will require secure feedstock supply chains. The Australian Government has committed to strategically examine the potential to grow the bioenergy feedstock industry. A [National Bioenergy Feedstocks Strategy](#) will support a coordinated approach to developing the feedstock industry, in a way that maximises opportunities for agriculture and forestry producers but does not create concern around food security.

Significant support to grow Australia's hydrogen industry has been provided through the [2024 National Hydrogen Strategy](#), which builds on existing announcements like the expansion of the Hydrogen Headstart program, the Hydrogen Production Tax Incentive, funding for developing hydrogen hubs and the establishment of the Guarantee of Origin scheme to provide certification of renewable hydrogen.

The National Hydrogen Strategy includes a range of actions focused on unlocking cost-competitive hydrogen production, prioritising the most prospective sectors for hydrogen-based decarbonisation, ensuring community benefits from growing the industry, and working with international partners. Driving international hydrogen partnerships and markets will create spillover benefits for domestic users. For example, Australia and Germany have signed an agreement to cooperate on new renewable hydrogen supply chains through a \$660 million H2Global funding window to open European markets for Australia's renewable hydrogen producers. Supporting investment in production, storage and distribution infrastructure will be important as the hydrogen industry scales.

Since the release of the National Hydrogen Strategy, hydrogen projects in Australia and globally have faced headwinds. This highlights the importance of targeted government support, and regular monitoring and evaluation processes to ensure policy adjusts appropriately to changing circumstances.

### 3.5 Liquid fuels

Liquid fuels in Australia today			
<b>Over 50%</b>	of Australian final energy consumption is a liquid fuel	<b>Over 90%</b>	of the liquid fuel we use is imported as refined products or indirectly as crude oil
<b>30%</b>	of Australia’s emissions come from the end-use of liquid fuels	<b>Less than 1%</b>	of Australia’s liquid fuel needs are met by low carbon liquid fuels (LCLF)

**Liquid fuels in Australia’s energy transformation**

Liquid fuels are critical for our economy, providing more than half of our final energy demand. Decarbonising our liquid fuel use will require electrification where possible, and development of a low carbon liquid fuel market for remaining users. This will improve energy affordability for households and businesses while strengthening Australia’s fuel security.



A pathway to 2050		
2030	2035	2050
LCLF markets are established	Emissions intensity of liquid fuels is declining	Fuel market consists primarily of LCLF

Policy directions to put Australia on the pathway to 2050		
Continue to electrify light passenger and commercial vehicles	Establish and scale Australia’s LCLF market	Strengthen Australia’s fuel security

**New actions**

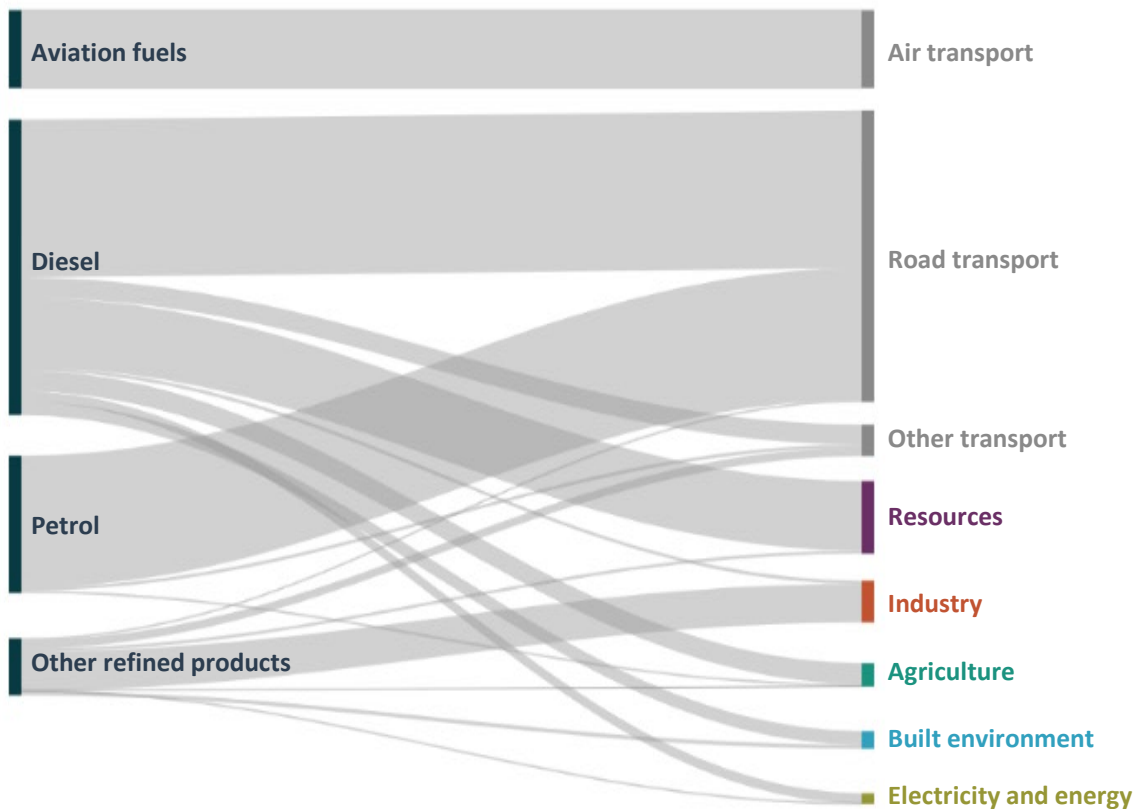
The Government will build on existing investments in electric vehicle charging infrastructure with a further \$40 million to accelerate rollout of kerbside and fast charging. The government will leverage the complementary strengths of distribution networks and electric vehicle charge point operators to deliver up to 10,000 public chargers.

To build a supply chain for Australian low carbon liquid fuels, the Australian Government will invest \$1.1 billion in a new Cleaner Fuels Program. This will help stimulate private investment in Australia’s first onshore low carbon liquid fuel refineries, backing local innovators, making fuel supply more resilient and bridging the price gap for early adopters. The Government will engage with industry on how to make sure Australian liquid fuel users have a fair chance to capture the emissions reduction potential unlocked by low emission Australian fuels.

## Overview

Liquid fuels (including petrol, diesel and aviation fuel) are integral to our economy (Figure 3.24). The energy density of liquid fuels, ease of distribution and storage and relative safety of use mean they provide over half of Australia's final energy consumption, with diesel alone providing more energy across the economy than electricity.

**Figure 3.24: Liquid fuel use across the Australian economy, PJ**



Source: DCCEEW 2025, Australian Energy Update 2025.

Fuel affects the lives of all Australians. The transport sector relies significantly on liquid fuels. Mining and agriculture rely on liquid fuels to power machinery. Remote parts of Australia use liquid fuels to generate power. Fuel prices are a significant contribution to household energy costs, and impact the price of goods and services through freight costs.

Australia relies on global markets for our liquid fuel supply, with over 90% of the fuel we use coming from imports (as refined products or indirectly as crude oil). Our fuel prices are linked to international markets, so Australian consumers have significant exposure to global oil prices.

Liquid fuels are a major source of emissions as most are derived from crude oil. LCLF currently account for less than 1% of Australia's fuel use. Renewable fuels will be key to reducing emissions from existing assets, and from activities that are hard to electrify, as they provide a drop-in replacement for fossil fuels without compromising engine performance. We have an opportunity to establish a domestic LCLF industry and reduce emissions, improve fuel security and create new sources of employment in regional areas.

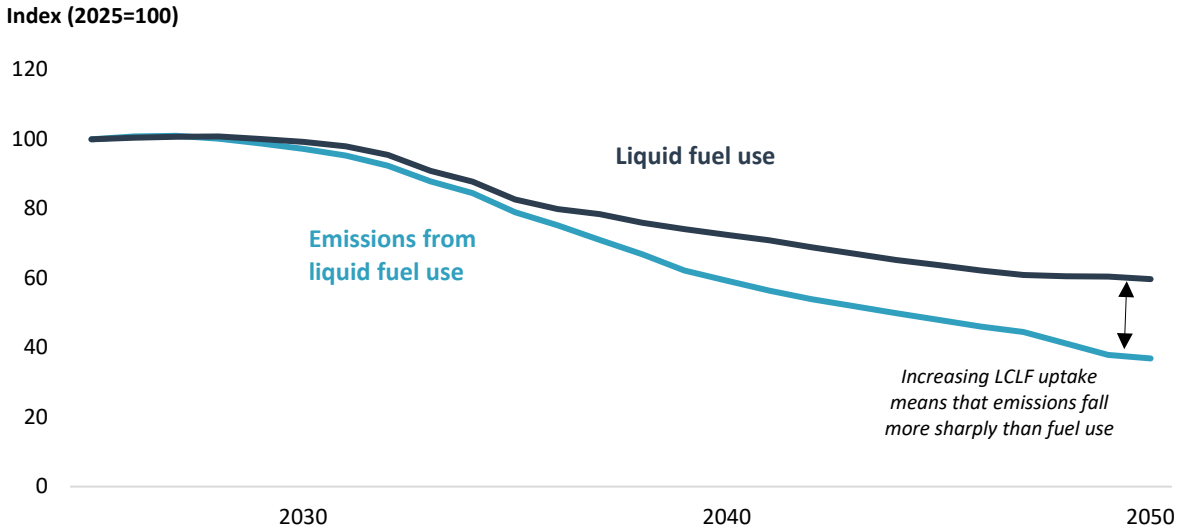
### Liquid fuel demand on the path to net zero

Liquid fuels will play a declining but still significant role in Australia’s energy mix as we move towards net zero.

Under Treasury’s Baseline Scenario, liquid fuel demand peaks around 2030 and falls by around 40% by 2050. This reflects a structural shift in energy demand as many liquid fuel users move to electric or hydrogen alternatives. The emissions intensity of our liquid fuel mix also falls as demand for LCLF increases (Figure 3.25).

The outlook varies by fuel type. While petrol demand declines to 2050, diesel and aviation fuel will continue to play a significant role in the Australian economy given the current lack of cost effective low carbon alternatives for some users (Figure 3.26 and Figure 3.27).

**Figure 3.25: Liquid fuel use and emissions to 2050, Baseline Scenario, indexed against 2025 levels**



Source: DCCEEW and Treasury modelling.



**Figure 3.26: Liquid fuel demand out to 2050 will vary by fuel type**



**Petrol** is predominantly used for passenger transport. As a result, petrol demand is expected to decline rapidly through the 2030s as vehicle efficiency improves and electric vehicle uptake accelerates.

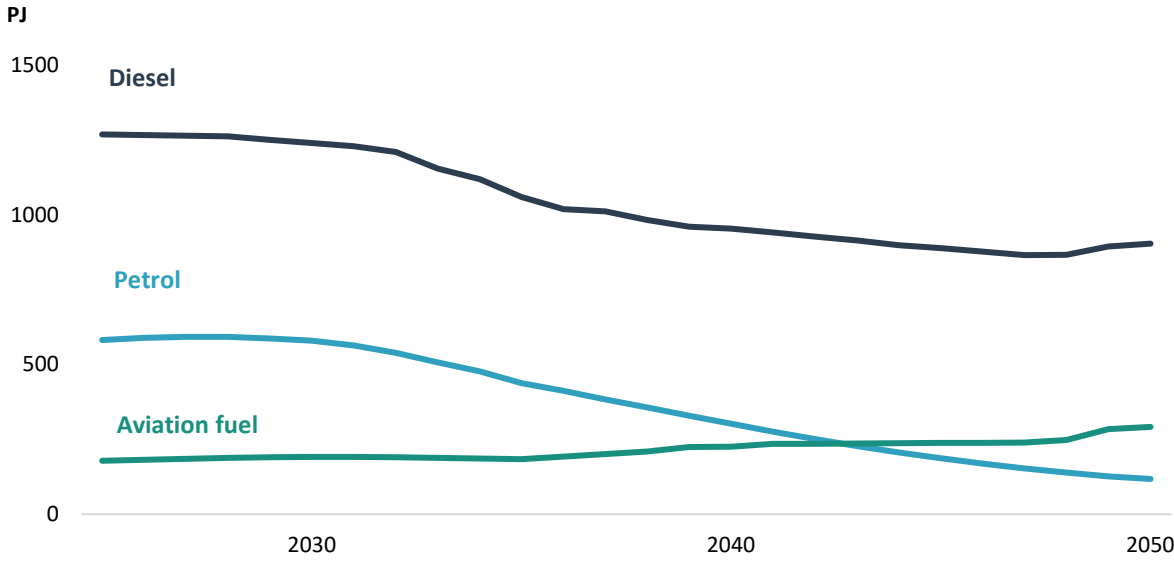


**Diesel** is used for high-performance needs like road, rail and maritime freight, mining equipment, and machinery. Under the Baseline Scenario, demand declines from around 2030, as fuel-switching options increase and older assets are replaced with electric or hydrogen-based alternatives. Nonetheless, diesel will remain part of Australia’s energy mix as fuel-switching may not be viable for all users.



**Aviation fuel** is the primary energy source for air transport. The net zero pathway will rely heavily on sustainable aviation fuel for medium and long-haul flights to 2050 due to range and payload constraints of other technologies. Some short haul and regional flights may decarbonise through battery and hydrogen powered aircraft as these technologies mature. Aviation is expected to increase its reliance on liquid fuels beyond 2050, as demand for air transport increases.

**Figure 3.27: Emissions from liquid fuel types to 2050, Baseline Scenario, PJ**



Source: DCCEEW and Treasury modelling.

## The liquid fuels pathway to 2050

### **T** Australia's Net Zero Transformation: Treasury Modelling and Analysis

*'Low-carbon liquid fuels are expected to offer an increasingly cost-effective decarbonisation pathway over time. Studies by CSIRO and others have found that while low-carbon liquid fuels are currently more expensive than their unabated fossil fuel counterparts, costs are expected to decrease over the medium-term as technology and scale improves.'*

Australia needs to reduce fossil fuel use and increase the supply of LCLF. To do this, our liquid fuels market will need to evolve significantly. The plan sets out a credible pathway to transition the liquid fuels sector to 2050, with an emphasis on fuel-switching and scaling LCLF supply. The milestones along this pathway are outlined in Figure 3.28. The Transport Sector Plan outlines detailed decarbonisation pathways for each transport mode and transport infrastructure.

By 2030, electrification should be well underway for light vehicles. Electrification is also feasible and already used for some buses, vans and trucks. Other significant fuel uses, including in heavy vehicles, maritime, rail, aviation, mining and manufacturing, cannot be readily electrified in the near-term due to long distances and high load demands.

The timeframe for electrification is influenced by the vehicle and equipment turnover rate, market availability of electric alternatives, and progress on developing adequate ancillary infrastructure like charging infrastructure. Fuel-switching technologies for these sectors will need to be developed and commercialised. In the short to medium-term LCLF will be needed to support decarbonisation efforts of these industries.

By 2030, industry invests in projects to establish Australia's LCLF market, supported by enabling frameworks set by government. We expect the LCLF supply chain will be a mix of local production and imported fuels.

By 2035, the emissions intensity of the liquid fuels market will be declining. Petrol demand will continue to decline with electric vehicle uptake and diesel's decline will start as electrification and hydrogen technologies become available. The LCLF share of the market will grow to support fuel-reliant sectors that have limited options to decarbonise. Over time our LCLF industry will need to innovate in feedstock practices and expand production pathways to support decarbonisation efforts across the economy and manage fuel security needs.

By 2050, Australia's liquid fuel market is decarbonising as demand for liquid fuels continues to decline as sectors transition off liquid fuels (including petrol, diesel and LCLF) to electrification and hydrogen technologies. Users with high performance requirements, such as aviation, maritime and heavy transport, will continue to rely on LCLF and blended fuels for energy. Australia should be a major advanced LCLF producer, with partnerships and export arrangements in place to provide fuel security to the region.

Through the transition it is expected that fuels will remain secure, accessible and affordable. LCLF can support this by increasing fuel options and reducing our reliance on imports; however, this is only one element. The Australian Government's broader fuel security policy settings will also help the market move towards net zero in an orderly and cost-effective manner.

Figure 3.28: Liquid fuel milestones on the pathway to net zero



## Policy directions to put Australia on the liquid fuels pathway to 2050

The Australian Government has already undertaken significant steps to put the liquid fuels sector on the pathway to 2050. There are 3 key areas for government action in the near-term (Figure 3.29).

**Figure 3.29: Liquid fuels policy directions**



### *Electrifying light passenger and light commercial vehicles*

The technology to fuel-switch for light vehicles is already available. The National Electric Vehicle Strategy supports the uptake of electric vehicles. The New Vehicle Efficiency Standard is encouraging car manufacturers to supply more electric vehicles to Australia, improving consumer choice and making it easier and cheaper to access popular models. Over time, it will make all vehicles more efficient.

The Driving the Nation Fund is also enabling the shift to electric vehicles by expanding the national rollout of EV charging and hydrogen refuelling infrastructure, as well as supporting investment in fleets. The government will build on existing investments in EV charging infrastructure with a further \$40 million to accelerate rollout of kerbside and fast charging – supporting vehicle choice for more Australians – especially those without access to home charging.

### *Establishing and scaling up Australia's LCLF market*

Australia has significant LCLF potential (Box 3.7). Acting now to establish this industry, identified as a priority under the Future Made in Australia agenda, will set Australia up to meet near term emissions reduction targets, provide certainty for LCLF investments, and enable onshore production before 2030, supporting fuel security.

The Australian Government is working on the enabling framework for LCLF supply, including expanding the Guarantee of Origin to include LCLF products. A market-based accounting framework and renewable diesel fuel quality standard are already in place.

To help establish the LCLF industry, the Australian Government has provided \$250 million to support pre-commercial innovation, demonstration and deployment of LCLF as part of the Future Made in Australia Innovation Fund. This builds on the momentum of the Sustainable Aviation Fuel Funding Initiative, which has provided \$33.5 million across 5 projects to date. Project support is also available through low-cost project finance from the Clean Energy Finance Corporation.

To build a supply chain for Australian LCLF, the Australian Government will invest \$1.1 billion in a new Cleaner Fuels Program. This will help stimulate private investment in onshore LCLF refineries, backing local innovators, making fuel supply more resilient and bridging the price gap for early adopters. The Government will engage with industry on how to make sure Australian liquid fuel users have a fair chance to capture the emissions reduction potential unlocked by low emission Australian fuels.

### **Box 3.7: Australia's LCLF opportunity**

The global LCLF industry has undergone fundamental changes over the past decade driven by national commitments to decarbonise and improve fuel security, and the declining cost of LCLF technologies.

Australia currently exports feedstocks for LCLF refining offshore. We have an opportunity to expand our domestic LCLF industry, combining our abundant biomass resources and renewable energy potential. The CSIRO projects a LCLF industry could contribute between \$6 billion to \$12 billion annually in direct benefits, with greater gains for regional communities, including diversified income streams for farmers.

The CSIRO report finds that by 2050, Australia could have sufficient biomass production capacity to produce over 12 GL of LCLF per year – roughly equivalent to our current domestic fuel industry and around a quarter of total fuel demand. LCLF will not only help to decarbonise hard-to-abate sectors of the economy but provide Australia with sovereign capability and resilience.

The National Bioenergy Feedstocks Strategy will support a coordinated approach to developing a feedstock industry in a way that creates opportunities for agriculture and forestry producers to complement their ongoing contribution to domestic and global food supply. As the demand for LCLF grows, innovation in feedstock pathways could bolster Australia's ability to become a major and diversified LCLF producer. To help maintain Australia's clean energy industry output in the longer-term, it will be important for government to continue to promote LCLF through international partnerships and forums and support industry to seek out export opportunities in the region.



### *Strengthening Australia's fuel security through the transformation*

Australia's fuel security has historically relied on a combination of domestic fuel production and fuel diversity in terms of sources and supply chains. The Australian Government is committed to maintaining fuel security through the transformation to net zero. There are a range of government programs, policies, and initiatives in place to help regulate the liquid fuels market, reduce fuel emissions and maintain fuel security. For example, the *Fuel Security Act 2021* supports Australia's sovereign capability to maintain fuel supplies.

The Government will review, consolidate and build on these efforts to ensure our approach to fuel security remains fit for purpose as the fuel market and broader economy transitions. This includes ensuring the Act, and other complementary market policies, support and incentivise the LCLF that will play an increasingly important role to 2050. That includes building supply of LCLF and integrating output from these production facilities into Australia's fuel market.

The energy transformation will also strengthen our fuel security. Switching to electric vehicles and establishing domestic production and refining of LCLF using domestic feedstocks will bolster fuel security by cushioning Australia from the impact of international supply chain disruptions. Domestic production will enhance Australia's national defence capability through increased operational independence and resilience.

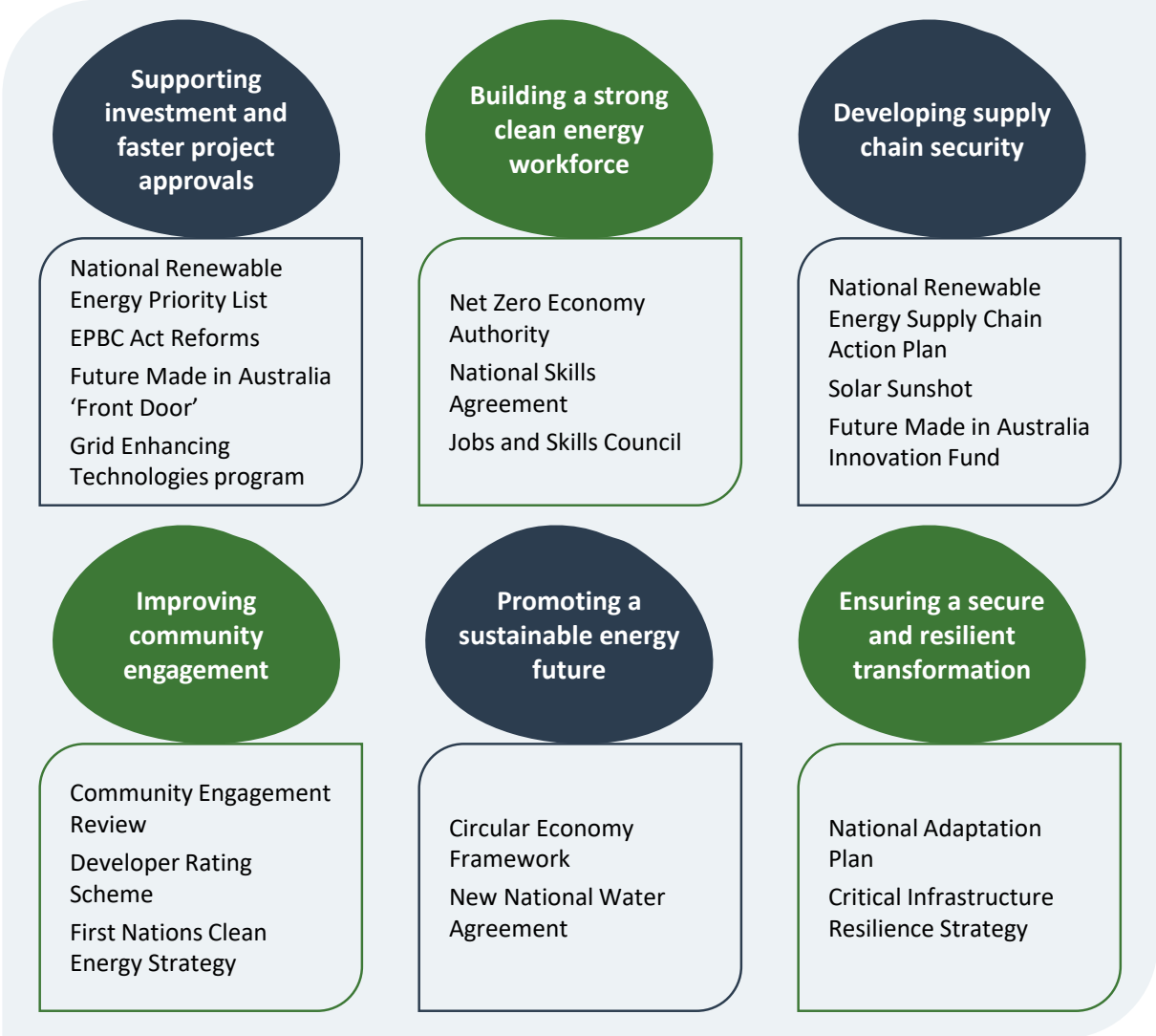
# 4. Enabling the transformation

Achieving action on the electricity and energy sector pathway will require sustained effort by governments and industry in underlying areas that are critical to enabling the energy transformation (Figure 4.1). The Australian Government has made significant progress to deliver these enablers – including working with states and territories to improve coordination and oversight.

The Government has also established the Net Zero Economy Authority (NZEA) to support regions, communities and workers significantly affected by the transformation to manage the impacts, and share in the benefits, of the net zero economy. This includes helping workers in closing coal and gas-fired power stations, and affected businesses in their supply chain to prepare for and find new well-paid, safe and secure jobs.

Government-led efforts have been important to accelerate investment. This will need to be complemented by policies to support the private sector’s role in driving the transformation.

**Figure 4.1: Priorities to enable and support the energy transformation**



## 4.1 Supporting investment and faster project approvals

Decarbonising energy supply to 2050 will require significant investment across the energy sector. While investment in renewables has picked up in recent years, even higher levels of private capital will need to be mobilised.

The Clean Energy Investor Group's 2025 member survey indicates systemic barriers, including planning assessments, grid connection processes and environmental approvals, are slowing investment and causing delays, which can undermine project financial viability.<sup>30</sup> These issues were also raised by stakeholders during consultation on the plan.

Through RETAs, governments are working together to deliver new reliable renewable generation and storage to Australia's electricity grids to support achieving 82% renewable electricity nationally by 2030. RETAs set out roles and responsibilities to help address market and non-market barriers to renewable energy investment, drive better social and economic outcomes for all Australians, and support an affordable, reliable and resilient energy system.

The Australian Government is committed to strengthening and streamlining our national environmental law, the *Environment Protection and Biodiversity Conservation Act 1999*, and establishing a national environment protection agency. Shortening approval times can have a meaningful impact on the rate of return, increasing the economic value of projects.

The Government, in collaboration with the states and territories, created the [National Renewable Energy Priority List](#) to coordinate support for regulatory planning and environmental approval processes for priority energy projects. All levels of government must continue efforts to accelerate planning and approvals processes to keep pace with the speed of transition, while also protecting our environment.

Government and industry stakeholders will also need to provide the right signals to foreign capital, and governments will need to streamline processes for inward investment. Action on this has commenced, with the Future Made in Australia agenda delivering a new 'Front Door' for investors with major, transformational investment proposals to make it simpler to invest in Australia and attract more global and domestic capital.

Continued innovation will also be critical to drive the energy transformation, given uncertainty around the viability, long-term costs and scalability of some emerging technologies. Technological change in generative AI also has the potential to transform energy systems and improve how we manage significant increases in energy demand through the transformation.

Sustained investment in R&D across a portfolio of technologies, by governments and the private sector, is necessary to drive this innovation. The CSIRO has launched the [National Energy Analysis Centre](#) which is vital new research infrastructure to support, accelerate and de-risk Australia's complex energy transformation. ARENA and the CEFC also support investments in the latest technologies to generate, store, manage and transmit clean energy.

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<sup>30</sup> [CEIG \(2025\)](#)

## 4.2 Building a strong clean energy workforce

A highly skilled clean energy workforce is critical to the energy transformation. A new generation of workers is required, both from existing energy sectors and through new pathways into clean energy. Australia is currently experiencing relatively low ongoing unemployment rates, which is contributing to skilled worker shortages across the economy – including in sectors key to the clean energy transformation.

Jobs and Skills Australia's report titled *The Clean Energy Generation*, estimates that the biggest worker shortage will be for electricians. Around 85,000 more electricians are expected to be needed by 2050, 27% more than the projected supply.<sup>31</sup>

To meet this increased demand, the sector will need to attract and retain more workers and upskill and retrain workers for new and emerging industries. The sector would also benefit from increasing participation of diverse cohorts in energy sector roles, including women, First Nations people and people with disability. Building a skilled workforce will take coordinated and sustained effort across governments and the private sector.

The National Skills Agreement is a 5-year funding agreement through which the Australian Government invests in strengthening the vocational education and training (VET) sector, in partnership with the states and territories. Supporting the net zero transformation is an agreed priority under this agreement.

A national network of 10 Jobs and Skills Councils (JSCs) provides industry with a strong, strategic voice to ensure Australia's VET sector delivers better outcomes for learners and employers. The JSC for the energy, gas and renewables sectors, Powering Skills Organisation (PSO), is helping to inform and shape the clean energy transformation, collaborating with industry to build the required clean energy workforce.

Apprenticeships will play a key role in delivering the skilled workforce needed to build Australia's future. The Government has several financial and non-financial programs in place that are available to support apprentices and employers training in high-priority occupations, such as clean energy. This includes the New Energy Apprenticeship stream of the Key Apprenticeship Program, which provides targeted support to skills development and creates a pipeline of skills to deliver Australia's clean energy future.

NZEA's [Energy Industry Jobs Plan](#) provides support to workers impacted by the closure of coal-fired and gas-fired power stations, to prepare and transition to new employment. Professor Roy Green is leading a statutory review of the Energy Industry Jobs Plan to consider its effectiveness and whether it is achieving what the Parliament intended.

ECMC is also collaborating on workforce issues to build the skills and capability we need to reach net zero and provide opportunities for Australians to build meaningful careers in the energy sector.

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<sup>31</sup> [Jobs and Skills Australia \(2023\)](#)

## 4.3 Developing supply chain security

There is increasing pressure to secure the technologies, infrastructure, components and raw materials required to deliver the energy transformation. This is occurring against the backdrop of increasing global economic uncertainty, risks to established supply chains, and global competition for resources.

The Australian Government is addressing renewable energy supply chain constraints. This includes:

- domestic initiatives like the [National Renewable Energy Supply Chain Action Plan](#), [Solar Sunshot](#) program, [National Battery Strategy](#) including the [Battery Breakthrough program](#), and the [Future Made in Australia Innovation Fund](#)
- international initiatives like the [Quad Clean Energy Supply Chain Diversification Program](#).

These efforts will be strengthened by ongoing engagement with industry, to proactively notify government of early warning signs of disruptions to critical supply chains.

The national circular economy transition will also support supply chain security through more efficient material use (see *4.5 Promoting a sustainable energy future*). Circular supply chains encourage resilience by maintaining a circular flow of materials – recovering, retaining or adding to their value.

## 4.4 Improving community engagement

Australia's energy transformation will rely on the contributions and support of communities across Australia. Key among these are Australia's First Nations peoples (Box 4.1) and regional communities that will host new energy infrastructure.

Community acceptance is crucial for the success and speed of the energy transformation. The [2023 Community Engagement Review](#) highlighted several challenges to building community acceptance.

Engagement on new infrastructure is critical to building trust and delivering local benefits to affected regions. The Australian Government is working with developers to proactively engage with communities, First Nations peoples and landholders to ensure benefits are shared and tailored to local priorities, in line with the guiding principles of the Government's [Regional Investment Framework](#). This includes through the Capacity Investment Scheme, which considers a developer's approach to delivering social outcomes when assessing projects, resulting in significant community benefits over the lifetime of the scheme.

The recommendations of the Community Engagement Review span both Australian Government and state and territory responsibilities. Through the ECOM all governments have agreed to implement a broad range of activities in response to the Review. The majority of activities forming the ECOM's response are now substantially progressed or completed.

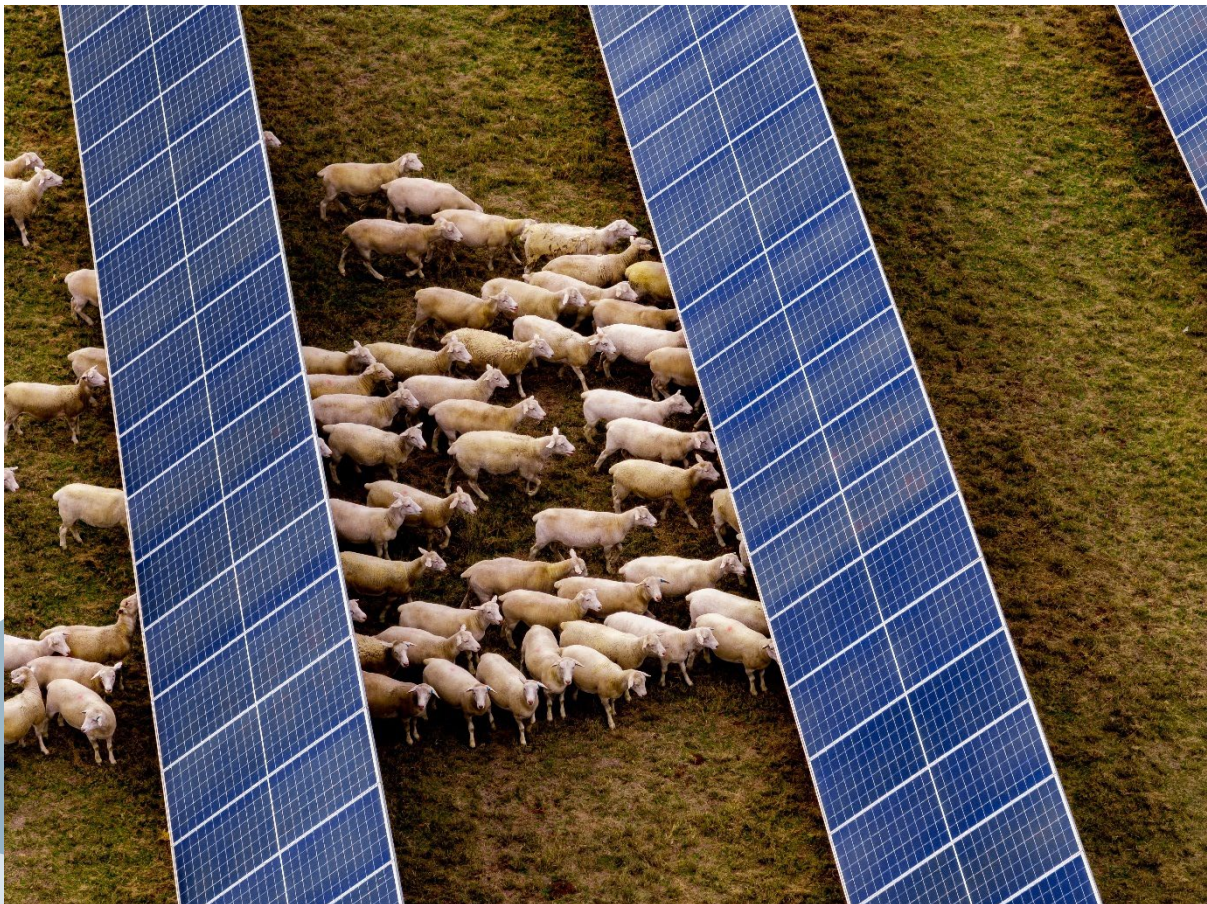
The Government is encouraging renewable energy developers to strengthen engagement practices. This includes the commencement of the [Developer Rating Scheme](#) pilot to foster trust and transparency in developers' practices, and publishing guidelines to set a nationally consistent approach to community engagement for transmission projects. A final report on the response to the Community Engagement Review will be provided to ECOM by the end of 2025.

#### Box 4.1: First Nations Clean Energy Strategy

Government and industry play an important role in partnering with First Nations people to realise their rights and interests, and empower them to benefit from, and drive, the clean energy transformation.

The [First Nations Clean Energy Strategy 2024-2030](#) is the national framework to enable First Nations people to lead, participate in and benefit from the energy transformation. The Australian Government has provided \$74.6 million to support the participation of First Nations organisations and communities in the development of clean energy projects. The funding will accelerate development of First Nations-led projects and support research to address barriers First Nations people and communities face when participating in clean energy projects and programs.

ARENA is additionally funding projects to deliver cleaner, more reliable and affordable electricity to remote First Nations communities through the First Nations Community Microgrids Stream of its Regional Microgrids Program. In August 2025, ARENA announced it would be providing \$18 million to fund 3 projects in South Australia, Western Australia and the Northern Territory. The Net Zero Plan outlines initiatives to support First Nations participation in the net zero transition more broadly, including participation in land use abatement programs.



## 4.5 Promoting a sustainable energy future

The energy transformation will present future environmental challenges, as decommissioned renewable energy equipment enters the waste stream, and energy sources (such as hydrogen and biomass energy production) require water as a critical input.

Addressing renewable waste challenges requires a comprehensive policy framework through government-led regulations, industry-led initiatives and public-private partnerships. [Australia's Circular Economy Framework](#) sets the national direction with clear priorities and targets to reduce waste and keep products and materials circulating at their highest value for as long as possible.

Embedding circular economy principles within the energy sector presents a significant opportunity to build new economic value across the energy supply chain while reducing waste, emissions and environmental impacts. With Australia's circularity rate estimated to be 4.6% (compared to the global average of 7.2%), achieving a more sustainable energy future will require effort across all sectors – including the private sector prioritising investments that adopt circular practices.<sup>32</sup>

The Australian Government is continuing to work with jurisdictions on options for a national stewardship scheme to manage the waste challenge as solar panels reach their end-of-life and considering how this could support a domestic re-manufacturing industry. NSW will work with other states to develop a regulatory impact statement while the Australian Government will work with states to proof a national stewardship scheme, reporting back to the ECMC in early 2026.

The Government has developed various initiatives to improve the efficiency of water use in energy production and ensure the long-term sustainability of Australia's water resources. This will include the [new National Water Agreement](#) and National Hydrogen Strategy 2024. An ongoing focus on water sustainability across government and non-government stakeholders will be important to a lasting and efficient transition. The Australian Government will continue to explore further opportunities for sustainable water management, including by promoting greater circularity and considering more recycling and reuse of water.

## 4.6 Ensuring a secure and resilient transformation

Energy security and resilience are critical to the transformation. The [National Climate Risk Assessment](#) shows that critical infrastructure, including our energy systems, is vulnerable to most climate hazards – which are projected to increase in frequency and/or severity with increasing global warming.

It will be critical for developers and system operators to draw on relevant frameworks – such as the [National Adaptation Plan](#) and the [Critical Infrastructure Resilience Strategy](#) and Plan – to strengthen our energy systems. Regulators will also play an important role by ensuring energy market participants uphold their legislated responsibilities to maintain a resilient energy system.

The energy sector faces diverse threats in the face of a complex geopolitical and economic environment, extreme weather events driven by a changing climate and a continued prevalence of cybercrime. The Australian Government is committed to working with industry to uplift the security and resilience of our critical infrastructure, recognising the serious impact natural hazards, malicious

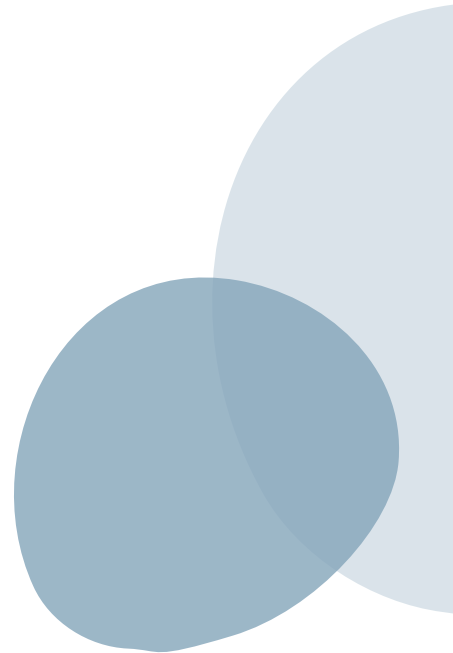
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<sup>32</sup> [ABS \(2024b\)](#)

cyber activity and other threats could have on the operation of these systems and dependent infrastructure. Equally, market participants also have obligations under the *Security of Critical Infrastructure Act 2018*, the National Electricity Law and other legislation to take action to protect infrastructure and work with government to prepare for and respond to disruptions.

The increasing digitisation of energy infrastructure contributes to its efficient operation and ensures Australians have access to affordable, secure and reliable energy. However, this digitisation can – if not carefully managed – increase exposure to supply chain and cybersecurity threats. The Australian Government is responding through a range of measures such as investment into the supply chain for essential technology and ensuring regulation keeps paces with these changes in technology, such as through the *Cybersecurity Act 2024* and introduction of standards to improve the security of consumer energy devices.

The Australian Government continues to work closely with the sector, including through the [Trusted Information Sharing Network](#), to ensure regulatory settings and voluntary action deliver targeted, effective and proportionate investment in security and resilience. These settings are carefully managed alongside the need to encourage a reliable pipeline of investment (including foreign capital), keep costs as low as possible and maximise productivity in the sector.



## 5. What the plan means for Australians

### **T** Net Zero Plan – Treasury Modelling and Analysis

*'The ongoing rollout of cost-effective, clean energy will deliver substantial benefits to households and industry.'*

People are at the centre of the energy transformation. Ensuring all Australians are the beneficiaries of these changes is essential to achieving an ambitious and orderly energy transformation. This means prioritising fairness and equity and designing the energy system to operate in people's interests.

Consumers can benefit from greater cost savings, health and energy resilience through energy efficiency upgrades, electrification, flexible consumption and rooftop solar and battery installations. Where the technology exists at sufficiently low cost, businesses and industry can also increase their productivity and competitiveness through improved energy performance, with examples of opportunities discussed in the Industry Sector Plan and other sector plans.

To ensure no one is left behind, clear and trusted information, fit-for-purpose consumer protections and removing barriers to participation can enable consumers to benefit from a cleaner, more affordable, reliable and resilient energy system.



## 5.1 Household benefits

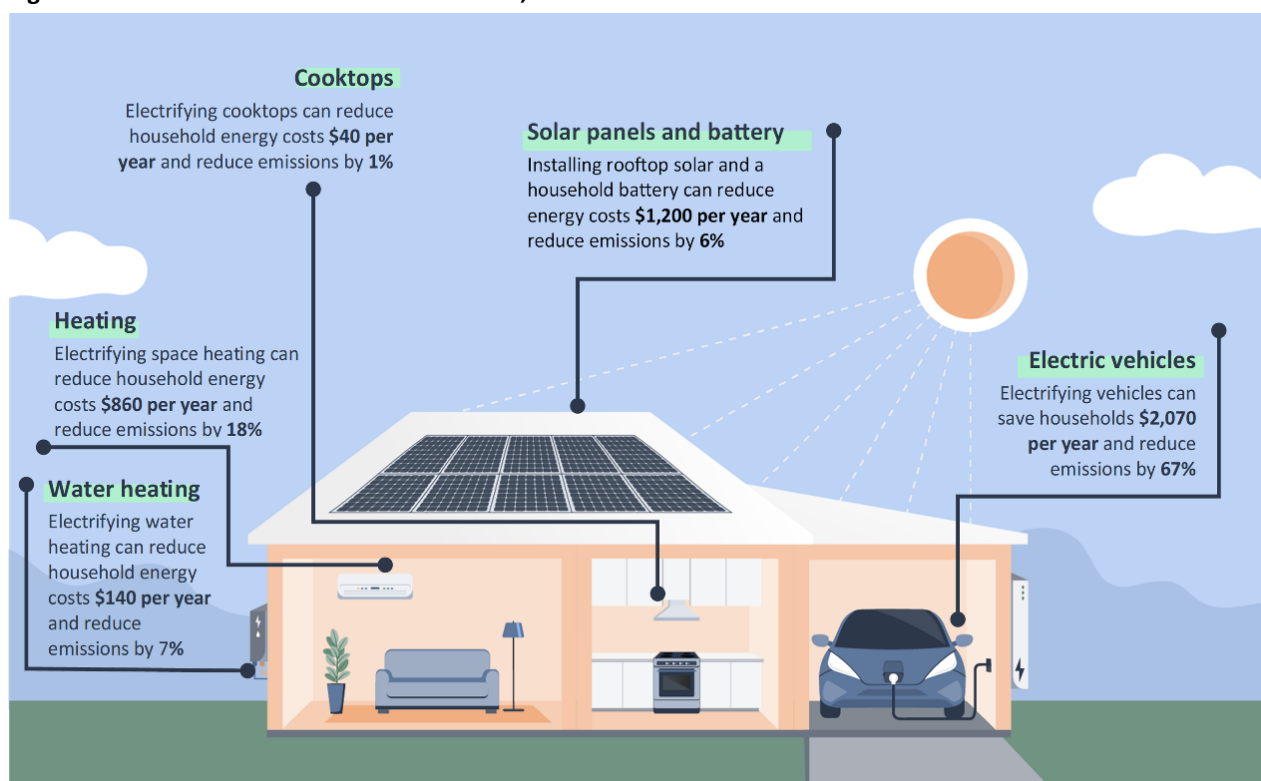
### Financial savings

Electric appliances are significantly more efficient and cheaper to run than combustion-based alternatives. Households which can electrify, choose more efficient appliances and install solar panels and batteries, can significantly reduce their grid electricity consumption and energy bills.

Treasury modelling indicates a typical Australian household that electrifies key appliances, purchases electric vehicles and installs solar panels and a battery, can reduce their energy costs by as much as \$4,300 per year, after accounting for upfront and financing costs (compared to a household that purchases gas appliances and internal combustion engine cars).

Some households face significant barriers to electrification, including one-third of households who rent their home or are living in apartments. Households that cannot make all these upgrades can still benefit from an orderly transition to net zero.

Figure 5.1: Modelled benefits of electrification, under the Baseline Scenario



Note: Annualised real costs from 2030 to 2050, including upfront, financing and ongoing costs. Assumes a typical two-to-three-person household with two vehicles, average consumption for home heating, cooking and hot water, and purchases a 10.6kW solar system and 10kWh battery. For more detail, see 'Australia's Net Zero Transformation: Treasury Modelling and Analysis'. Financing can be reduced by Australian Government, state or territory supports and loans, such as the Household Energy Upgrades Fund. Direct capital support for social housing upgrades is also provided through the Social Housing Energy Performance Initiative.

Source: Treasury modelling.

## Health benefits

Electrification can significantly improve air quality and health. Indoor gas appliances have been linked to lung and cardiovascular damage especially in children, increasing the chance of developing asthma. About 12% of asthma cases across Australia can be directly attributed to gas stovetops.<sup>33</sup> Outdoors, fossil fuel combustion is the leading source of particulate matter, costing our economy around \$13.9 billion annually in health impacts from air pollution.<sup>34</sup> Reducing light diesel vehicle emissions by 55% could save \$3.8 billion in health costs from 2026 to 2040.<sup>35</sup> Adopting EVs also reduces noise pollution – around 70% of which comes from road traffic in Australia.<sup>36</sup> Increasing thermal efficiency of homes also improves liveability of homes. Actions that improve energy performance more broadly can support achievement of Australia's [National Health and Climate Strategy](#).

## Energy reliability and resilience

A more distributed energy system boosts self-sufficiency, reliability, and resilience, particularly where disaster events or volatile weather can disrupt electricity supply. Access to rooftop solar and battery storage can mitigate the impact of extended outages and network damage.

Rural and remote communities can benefit from cheaper and more resilient energy supply through greater access to community solar and batteries. Many small communities rely on diesel generators, either in individual buildings or as part of a micro-grid. These make communities vulnerable to volatile diesel prices linked with global markets or adverse weather events that disrupt supply.

### Box 5.1: Coober Pedy Microgrid

Coober Pedy, a remote mining town in South Australia, has traditionally relied on off-grid electricity generation supplied by diesel generators. Supported by ARENA, the Coober Pedy Hybrid Renewable Power Station combines 4MW wind generation, 1 MW solar generation, a 1 MW/500 kWh battery and other integration technologies with a back-up diesel power station.

It has delivered lower cost and more stable electricity, at world-leading renewable energy penetration rates. Over the first 5 years of operation, the project saved 2,189kL of diesel and achieved an average renewable energy penetration of 75.3% (with the project operating on 100% renewables for its longest continuous period to date in December 2019 for 97 hours).

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<sup>33</sup> [Knibbs et al \(2018\)](#)

<sup>34</sup> Economic cost of lives lost and burden of disease from PM<sub>2.5</sub> (fine particulate matter); DCCEE analysis applying economic value to lives lost and burden of disease from [AIHW \(2021\)](#)

<sup>35</sup> [DCCEE and DITRDCA \(2023\)](#)

<sup>36</sup> [Department of Health \(2018\)](#)

## Outer suburb and regional households are benefitting from access to rooftop solar

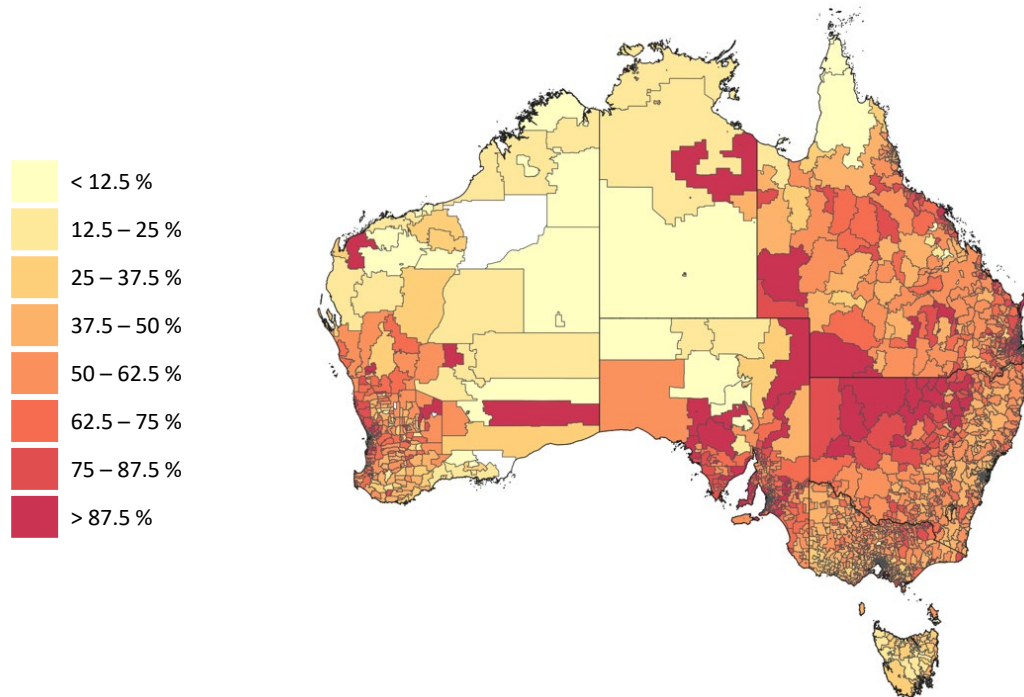
Around 35% of households in Australia have rooftop solar. However, adoption of rooftop solar varies across postcodes, particularly in urban centres where high-density buildings reduce opportunities for rooftop installation (Figure 5.2).

In general, installed rooftop solar capacity increases the further away postcodes are from the CBD. Conversely, postcodes closer to the CBD generally report higher average incomes. While upfront costs can be a barrier to rooftop solar uptake, this analysis indicates households from a range of income levels are sharing in the benefits of the energy transformation. This trend is less prominent in Brisbane, which has significantly higher levels of rooftop solar across a broader range of postcodes, reflecting Queensland's abundant solar resources (Figure 5.3).



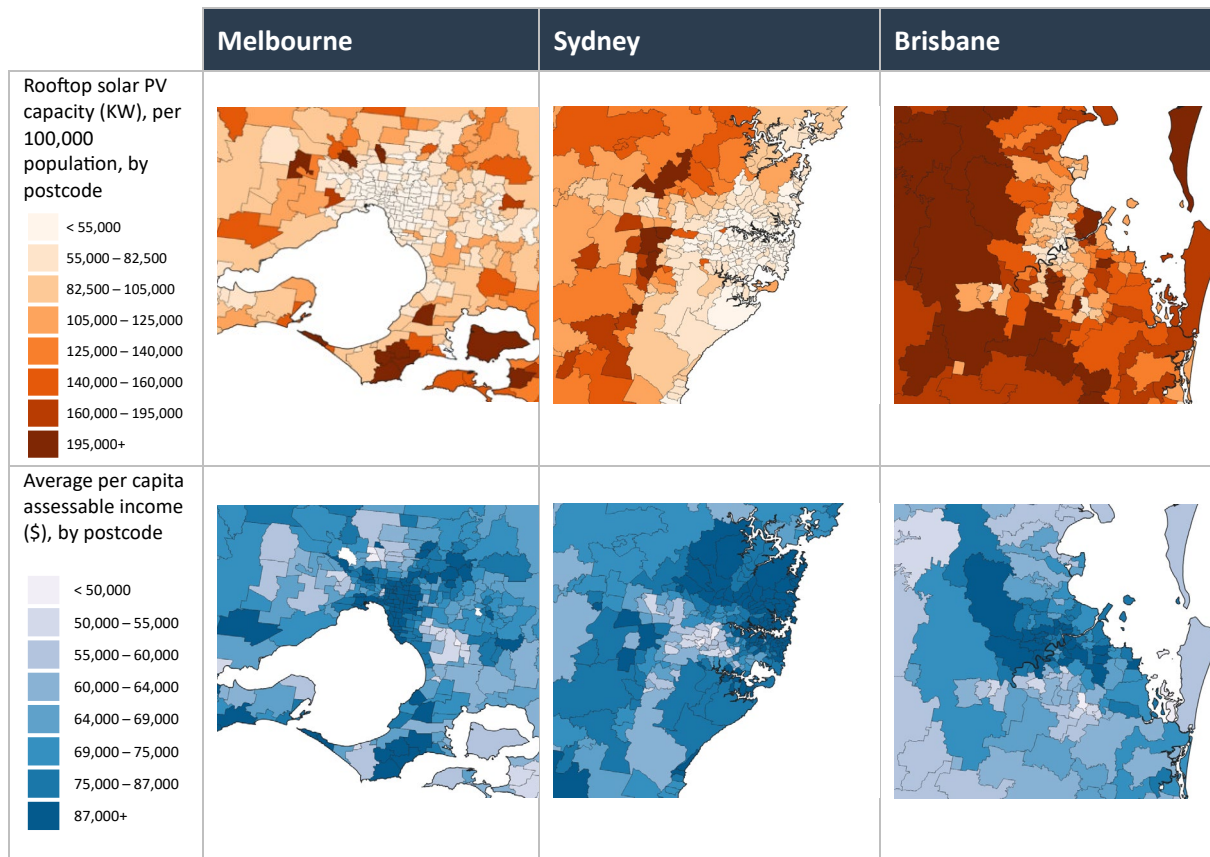
**Figure 5.2: Uptake of rooftop solar, by postcode, %**

Key: Light yellow – Low % of households have rooftop solar in this postcode  
 Dark red – High % of households have rooftop solar in this postcode



Source: DCCEEW analysis based on small-scale installation postcode data, Clean Energy Regulator 2025.

**Figure 5.3: Uptake of rooftop solar and average income per capita, by postcode**



Source: DCCEEW analysis of small-scale installation postcode data and digital boundary files; CER (2025) and ABS (2021).

## 5.2 A fair and equitable energy transformation

Collaborative efforts across all levels of government and industry are critical to maximise the benefits of the energy transformation for all Australians, including removing barriers and avoiding negative consequences for vulnerable groups. Barriers and opportunities include:

- **Information barriers:** Energy service offerings can be complex to navigate. Clear, easily accessible and trusted sources of information that meet diverse linguistic needs are necessary to increase information access.
- **Upfront capital:** Not all households have access to finances for upfront capital costs required for household upgrades, adopting electric vehicles and installing rooftop solar and batteries.
- **Split incentives:** Tenants who benefit from home upgrades may have little control over upgrade decisions, and landlords have limited incentives for upgrading leased homes.
- **Apartment dwellers:** Apartment dwellers may lack control over installation of rooftop solar and household batteries. Households in more densely populated areas may also have less access to electric vehicle charging.
- **Regional and remote communities:** Consumers in remote and regional communities often rely on off-grid electricity generation and could benefit from greater access to shared community microgrids and batteries.
- **First Nations communities:** The energy transformation brings opportunities to address high energy insecurity and a need to implement fit-for-purpose consumer protections for First Nations communities.

The Australian Government is taking action to support all Australians access clean energy and the benefits of higher performance homes and vehicles. Information platforms like [energy.gov.au](https://energy.gov.au) provide advice to consumers to assist with energy upgrades. Assistance is also offered through CEFC energy performance upgrade loan programs, ARENA microgrid grant programs, and ongoing implementation of strategies like the First Nations Clean Energy Strategy, the [National CER Roadmap](#) and the National Energy Performance Strategy.

The Government is also delivering \$50 million over 4 years from 2025-26 to deliver energy performance upgrades for community sports clubs to climate-proof community sports facilities, promote inclusive climate action and harness the potential of sport as a vehicle to engage everyday Australians in the energy transition.

The energy transformation is also creating significant opportunities for regional revitalisation and economic diversification. Regional communities have grown around where much of the country's energy infrastructure is located and industrial activity takes place, and some of these communities are facing a considerably uncertain future due to energy transformation challenges. NZEA is helping to ensure regions, communities and workers are supported to manage the impacts, and share in the benefits, of the net zero economy.

## Evolving consumer protections

The existing regulations and frameworks that support energy customers – including the National Energy Customer Framework – recognise that access to essential energy services needs to be protected.

The Australian Government is reviewing regulatory protections including price protections to ensure market settings continue to enable and incentivise competition and deliver for consumers in the electricity retail market.

- The Government will reform the Default Market Offer (DMO) to better protect standing offer customers and ensure those customers can access a fair price for electricity.
- In response to a review of the *Prohibiting Energy Market Misconduct (PEMM) Act 2019*, the Government will consult on expanding the current protections around retail pricing to ensure companies do not over inflate prices in response to cost increases, as well as introduce measures to ensure companies are not engaging in cross-market manipulation between wholesale and financial markets.
- The Government will also extend the sunset date of the PEMM to 1 January 2031 to maintain current consumer protections.

At the same time, our energy market is changing. Energy customer regulations and frameworks were designed for a time where households and businesses were primarily purchasers of energy. These are no longer fit-for-purpose for a modern energy system, where electricity flows both from the grid to consumers and from consumers to the grid. Encouraging new arrangements between customers and the market needs to be balanced with managing potential risks for consumers, including those who do not engage with new products and services.

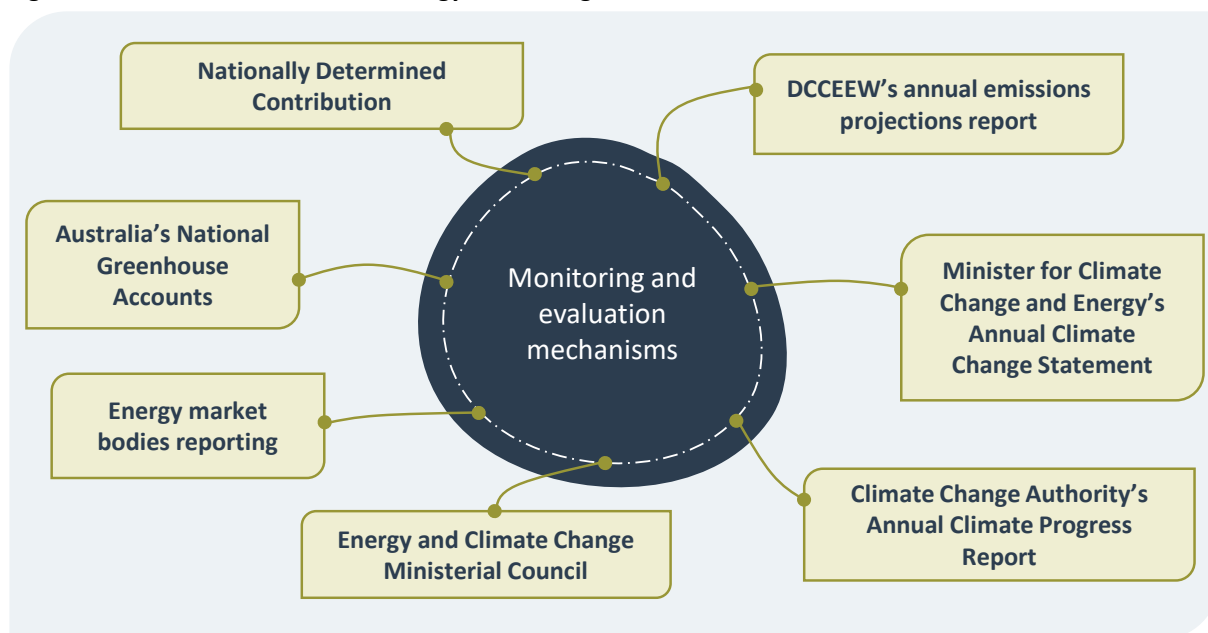
To reflect these shifting circumstances, the Australian Government is also working with states and territories through ECMC to modernise and strengthen Australia's energy consumer protection regimes, including establishing the [Better Energy Customer Experience](#) (BECE) program. The BECE program, endorsed by Energy Ministers at the March 2025 ECMC, will take a holistic approach to reviewing the consumer protection frameworks that underpin the relationship between consumers and the energy market to assess whether reforms are needed to support consumers through the energy transformation and beyond.

Alongside the BECE program, the National CER Roadmap will progress reforms to ensure consumers will benefit from CER and new energy services by extending consumer protections to new service offerings where they are not already covered by existing electricity consumer protection laws.

## 6. Monitoring and evaluation

Monitoring and evaluation throughout the energy transformation will be critical to ensure Australia is on track to meet our emissions reduction targets and the milestones outlined in this plan. Australia has robust mechanisms in place to monitor and evaluate progress on climate and energy commitments (Figure 6.1). These mechanisms will provide the evidence base to track progress under this plan and form advice on policy interventions where required.

**Figure 6.1: Australia's climate and energy monitoring and evaluation mechanisms**



The Paris Agreement requires countries to update their emissions reduction commitments, or Nationally Determined Contributions (NDC), every 5 years. This allows Australia to review and ratchet our national targets in light of the progress of Australia's energy transformation and broader decarbonisation efforts.

The Australian Government produces the annual emissions projections report. These projections provide estimates of Australia's greenhouse gas emissions and provide a transparent assessment of historical and projected emissions in the electricity and energy sector to guide government and industry decarbonisation efforts.

The *Climate Change Act 2022* (the Act) embeds important accountability and transparency mechanisms for assessing and communicating Australia's progress on climate action. Under the Act, the Minister for Climate Change is required to table an Annual Climate Change Statement in Parliament, setting out progress towards achieving Australia's emissions reduction targets. The statement must also report on the effectiveness of policies that contribute to achieving Australia's targets, including energy policies.

To inform the Statement, the Act requires the CCA to provide independent advice on Australia’s progress. The CCA’s Annual Progress Report monitors emissions reductions and evaluates policy progress using a set of leading indicators for each sector, including energy.

Meeting Australia’s emissions reduction targets requires joined-up effort across all levels of government. ECMC provides a forum for sharing of jurisdictions’ progress towards their emissions targets, and to monitor the implementation of key reforms. The ECMC reports to the National Cabinet annually on work to achieve its strategic priorities.

Australia’s energy market bodies – AEMO, AEMC and the AER – regularly undertake reviews and provide advice on the electricity and gas markets. DCCEEW oversees administration of Australia’s liquid fuel security framework. These arrangements ensure comprehensive evidence-based information and analysis is available to support strategic decision-making and guide the energy transformation.

Australia’s existing monitoring and evaluation mechanisms position us well to track progress on the Plan and review and refine policy settings over time to respond to changing circumstances and needs.



# Abbreviations and acronyms

ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
CCA	Climate Change Authority
CEFC	Clean Energy Finance Corporation
CER	Consumer energy resources
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEEW	Department of Climate Change, Energy, the Environment and Water
ECMC	Energy and Climate Change Ministerial Council
EV	Electric vehicle
GDP	Gross Domestic Product
GPG	Gas-fired power generation
GWh	Gigawatt hour
IEA	International Energy Agency
ISP	Integrated System Plan
LCLF	Low carbon liquid fuels
LCOE	Levelised cost of electricity
LNG	Liquefied natural gas
Mt CO <sub>2</sub> -e	Million tonnes of carbon dioxide equivalent
NABERS	National Australian Built Environment Rating Scheme
NDC	Nationally Determined Contribution
NEM	National Electricity Market
NETP	National Energy Transformation Partnership
NZEA	Net Zero Economy Agency
PV	Photovoltaic (solar)
The plan	Electricity and Energy Sector Plan
R&D	Research and development
RETA	Renewable Energy Transformation Agreement
SWIS	South West Interconnected System
TWh	Terawatt hour
UNFCCC	United Nations Framework Convention on Climate Change
VRE	Variable renewable energy
WEM	Wholesale Electricity Market
ZEV	Zero emissions vehicle

# Glossary

Abatement	A reduction in atmospheric greenhouse gases through emissions avoidance or removal and sequestration of carbon from the atmosphere.
Carbon capture and storage	A process in which carbon dioxide from industrial or energy related sources is separated (captured), conditioned, compressed and transported to a (usually geological) storage location for long-term isolation from the atmosphere.
Circular economy	An economic system focused on reducing waste, reusing resources and designing products for longer life, recyclability and minimal environmental impacts.
Critical minerals	Critical minerals are metallic or non-metallic materials that are essential to our modern technologies, economies, and national security, and whose supply chains are vulnerable to disruption.
Decarbonise	To stop or reduce carbon gases, especially carbon dioxide, being released into the atmosphere as the result of a process, like the burning of fossil fuels.
Demand flexibility	Increasing the capability to shift electricity demand to times when renewable electricity is more abundant or cheaper. This can include heating water when solar generation is high, or storing solar energy in batteries for evening use.
E-fuels	Synthetic fuels produced from renewable electricity, hydrogen and captured CO <sub>2</sub> that can be used as direct fuel substitutes in existing engines and infrastructure.
Electrification	Switching from energy sources, such as liquid fuels or gas, to electricity.
Energy efficiency	The amount of energy required to perform given task or produce a given result. Increasing energy efficiency means using less energy for the same result.
Energy performance	Covers the broad management of energy demand, including energy efficiency; demand flexibility (or load shifting); and electrification or fuel switching.
Firming/firmed renewables	Ensuring reliability of electricity supply by supplementing variable renewable energy with dispatchable generation sources such as energy storage (i.e. batteries).
Fossil fuels	Fossil fuels include coal, petroleum, natural gas, oil shales, bitumens, tar sands, and heavy oils. All contain carbon and were formed as a result of geologic processes acting on the remains of organic matter produced by photosynthesis, a process that began in the Archean Eon (4.0 billion to 2.5 billion years ago).
Green metal	Iron, steel, alumina and aluminium produced with low or zero greenhouse gas emissions.
Greenhouse gases	Any gas (natural or produced by human activities) that absorbs infrared radiation in the atmosphere, leading to warming effects. Greenhouse gases include carbon dioxide, methane and nitrous oxide.
Gigawatt hour (GWh)	A measure of electrical energy in terms of the use of one gigawatt of power for one hour, equal to 1,000 MWh.
Hard-to-abate emissions	Emissions from essential processes and products with no near-term decarbonisation options.
Low carbon liquid fuels (LCLF)	Liquid fuels with lower lifecycle emissions than conventional fossil fuels. LCLFs can be sustainably produced from biomass, waste materials and/or green hydrogen.
Microgrid	A set of distributed energy resources that provides energy generation and storage at a local level and can be controlled independently, either within a wider grid or as a standalone grid.
Mitigation	Reducing greenhouse gas emissions in order to stop climate change getting worse.
Mt CO <sub>2</sub> -e	Million tonnes of carbon dioxide equivalent. Is used to standardise different greenhouse gas emissions impacts on climate change to be reported as a single value. Usually shown in tonnes (t CO <sub>2</sub> -e) or million tonnes (Mt CO <sub>2</sub> -e).

Net emissions	The sum of anthropogenic greenhouse gas emissions to the atmosphere and anthropogenic removals of greenhouse gases from the atmosphere.
Net zero emissions	An overall balance between greenhouse gas emissions and removals.
Renewable energy	Energy from a source that is not depleted when used, such as wind or solar power.
Renewable hydrogen	Hydrogen produced through electrolysis using renewable electricity.
Residual emissions	The volume of gross anthropogenic greenhouse gas emissions (see Gross emissions) that remain after emissions reduction activities, but not including emissions removal. Also referred to as residual gross emissions.
Gigawatt hour (GWh)	The volume of electrical energy provided by one gigawatt of power for one hour, equal to 1,000 MWh.
Sustainable Aviation Fuel	Renewable or waste-derived aviation fuels that meet sustainability criteria.
Terawatt hour (TWh)	The volume of electrical energy provided by one terawatt of power for one hour, equal to 1,000 GWh.

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