CLIMATE ANALYTICS

# A blueprint for climate leadership

## 1.5°C aligned climate targets for Australia

*September 2025*

### Authors

Thomas Houlie, Bill Hare

### Contributors or reviewers

Cindy Baxter, Nandini Das, James Bowen


### About Climate Analytics

Climate Analytics is a global climate science and policy institute. Our mission is to deliver cutting-edge science, analysis and support to accelerate climate action and keep warming below 1.5°C.


### Acknowledgments

Climate Analytics Australia Ltd acknowledges the Traditional Custodians of the lands where we work and live, the Whadjuk people of the Noongar nation. We celebrate the diversity of Aboriginal and Torres Strait Islander peoples and their ongoing cultures and connections to land sea and community.

### Cover picture

Kewal Wadibhasme





How to cite: Climate Analytics (2024): A blueprint for climate leadership, September 2025

# Executive summary

The Paris Agreement's first Global Stocktake calls on governments to submit 1.5°C aligned targets. In July 2025, the International Court of Justice Advisory Opinion on climate change further reinforced the centrality of the 1.5°C limit in the Paris Agreement.

The Paris Agreement's 1.5°C limit is critical for protecting the world from the extreme dangers of climate change. The July 2025 report from Australia's Climate Change Authority on the Great Barrier Reef, for instance, found the 1.5°C limit was key to its survival, whereas tropical reefs face near-complete loss if global warming reaches 2°C.

The science is clear: in order to keep warming as close as possible to 1.5°C, it is critical that countries aim to get to net zero $CO_2$ emissions, at the latest by 2050. The solutions are also clear: it is both technologically and economically feasible to make the rapid changes needed. The main barriers to this are political, not scientific.

This applies to all countries and perhaps even more so for a developed country bidding to host COP31 in 2026: Australia. This report outlines a science-based analysis of what Australia needs to include in its new NDC to align with global efforts to meet the Paris Agreement's 1.5°C limit.

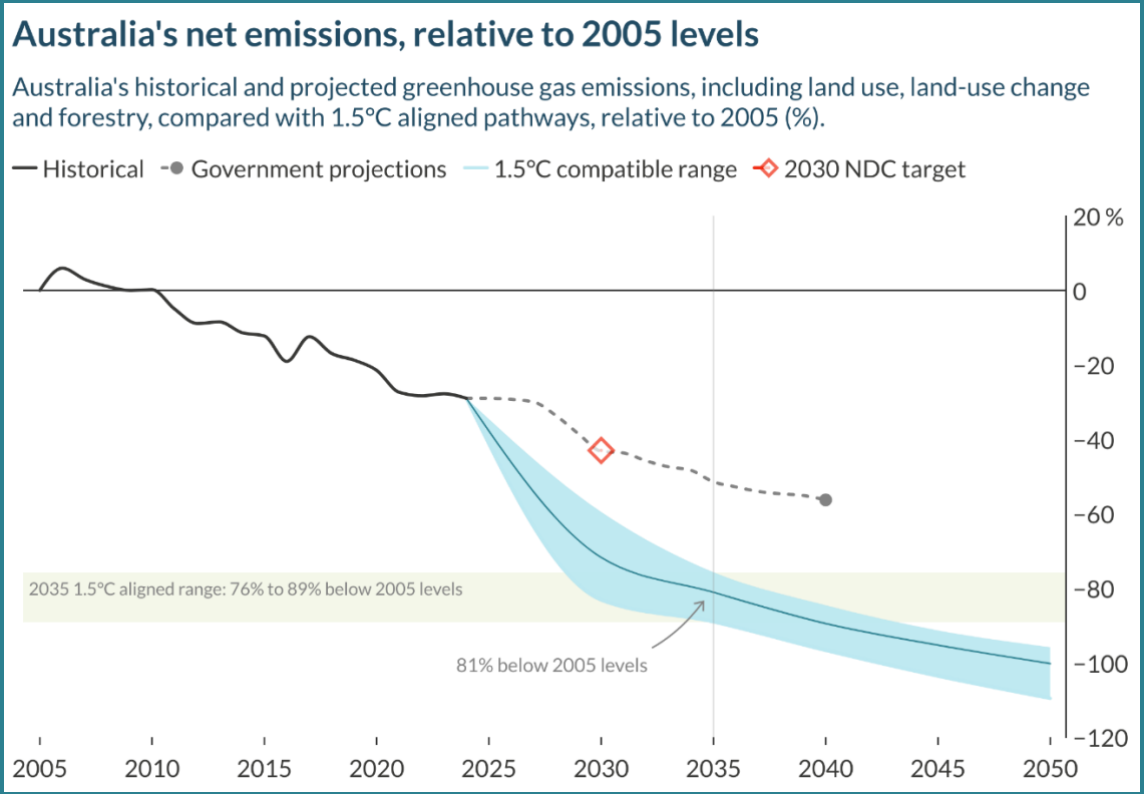
## 1.5°C aligned 2030 and 2035 targets for Australia

**Net emission reduction targets**
Under the Paris Agreement, all countries must submit whole of economy targets, which includes all sources of greenhouse gas emissions, and emissions sequestered by the land sector (LULUCF, see below). These are "net emissions".

In submitting its new, 2035 NDC, Australia needs to both bring its current 2030 net target of a 43% reduction below 2005 levels in line with the 1.5°C limit and put forward an adequate 2035 target.

**Recommended net emissions targets for Australia:**

2030: around 72% below 2005 levels
2035: around 81% below 2005 levels



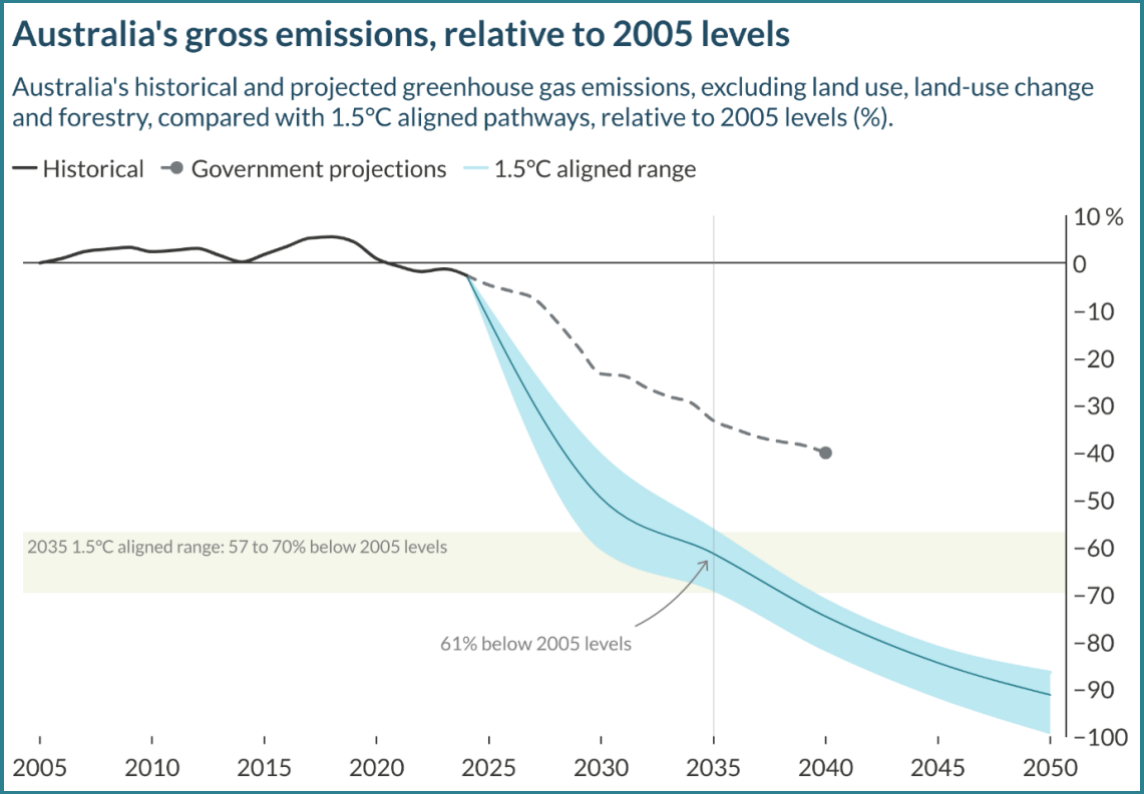

In comparison, Australia's net emissions were 29% below 2005 levels in 2024. Projected emissions through 2040 are far above a 1.5°C aligned range, and long-term policies are not aligned with achieving net zero greenhouse gas emissions by 2050.

## Gross emission reduction targets

The net NDC target range presented above takes into account carbon sequestration in the land sector. However, gross emissions from fossil fuels, industry and agriculture are the main driver of climate change. Domestic targets need to focus on reducing emissions outside of the land use, land-use change and forestry sector, also called *gross* emissions, rather than rely on land sector sequestration.

**Recommended gross emission reduction targets for Australia:**

2030: around 50% below 2005 levels
2035: around 61% below 2005 levels




Under current policies, gross emissions are projected to be only 23% below 2005 levels in 2030 and 33% in 2035, well above the 1.5°C compatible range.

## Reliance on land sector sinks has obscured lack of action

**To clarify the level of abatement required from the economy, Australia's new NDC needs to include a commitment to reduce reliance on land sequestration and provide full transparency on the land sector sequestration it plans to use to meet its commitments**.

Not only has land sector sequestration obscured the sluggish emission reductions across the economy, successive increases in estimated sequestration for 2030 have substantially reduced the action needed across the economy to reach the current 43% 2030 target.

## Fossil CO2 emissions reductions needed

**Australia's new NDC needs to include a commitment to policies that will reduce fossil $CO_2$ emissions by about 54% by 2030 and 71% by 2035, through the phase-out of fossil fuels from power, industry, transport and other sectors of the economy.**

Government policies must be laser-focused on reducing fossil carbon dioxide emissions as fast as possible, as warming will halt once net zero $CO_2$ emissions are achieved globally. This needs to happen by mid-century to limit peak global warming to 1.5°C or close to that level.

## Methane emissions reductions are critical

**Australia's NDC needs to include methane targets, with policies to back this, to provide the basis for much-needed emissions cuts, particularly from the fossil fuel industry**. Australia has failed to cut its methane ($CH_4$) emissions. The government projects them to be only 2% below 2020 levels by 2025, compared with the 30% target from the Global Methane Pledge Australia has signed onto.

**Australia's total methane emissions need to be about 40% below 2020 levels by 2030, and about 48% below 2020 levels by 2035**.

Methane abatement potential differs by sector. The IEA notes that "tackling methane emissions from fossil fuel operations represents one of the fastest and lowest-cost opportunities to reduce greenhouse emissions globally". In global 1.5°C compatible pathways, cuts from energy-related methane emissions are much steeper than in the rest of the economy.

To align with 1.5°C aligned pathways, **Australian energy-related methane emissions would need to drop by about 73% below 2020 levels by 2030, and about 80% by 2035.**

## International aviation and maritime emissions

Australia does not include international aviation and maritime emissions in its whole of economy NDC target: these emissions are effectively excluded from action. **The new Australian NDC needs to commit to including international aviation and marine emissions inside its whole-of-economy 1.5°C aligned targets for 2030 and 2035.**

In 2005, the NDC's reference year, international aviation and maritime emissions were equivalent to close to 2% of Australia's net emissions. In 2023, they were equivalent to 3% of its net emissions. By 2030, if pre-COVID trends resume, this figure will reach 7%, rising to over 9% by 2035. If these emissions are not addressed, the 43% target (excluding international aviation and maritime) would translate into only a 39% reduction in total 2005 emissions when these sectors are included.

Including international aviation and marine emissions in national targets would prevent the unchecked growth of sectoral emissions and bolster confidence in meeting the Paris Agreement's temperature limit.

An ambitious Australian sectoral plan for international transport, for example as part of the Maritime Emissions Reduction National Action Plan it is preparing, would position Australia as a global leader. The European Union and its member states include

international aviation in their NDCs, and the expansion of the EU ETS covers maritime emissions.

## 1.5°C aligned action will require major reductions in fossil fuel production and exports

Fossil fuel exports do not currently fall within the scope of Australia's NDC, as Paris Agreement targets focus on emissions within a country's borders. Australia still has a responsibility to plan for a phase out of fossil fuels. The Paris Agreement's first Global Stocktake in 2023 called for a *transition away from fossil fuels in energy systems*, which Australia prominently supported.

The recent International Court of Justice Advisory Opinion on climate change further states that "*failure of a State to take appropriate action to protect the climate system from greenhouse gas emissions — including through fossil fuel production [...], may constitute an internationally wrongful act which is attributable to that State*".

In 2022, emissions embedded in Australia's fossil fuel exports were 234% higher than its domestic emissions, a 40% increase from 2010 levels. Under the IEA's Net Zero Emissions scenario, global fossil fuel combustion $CO_2$ emissions fall a third between 2024 and 2030, and by two thirds by 2035.

**Australia's new NDC must recognise the need for a fossil fuel phase-out and undertake planning for a transition away from fossil fuels. It needs to immediately stop the development of new fossil fuel production projects, as well as the lifetime extension or expansion of existing ones, so that an orderly phase-down of fossil fuel production can occur in line with the Paris Agreement's 1.5°C limit.**

As the Climate Change Authority argues, in a world trying to limit warming to 1.5°C, Australian economic interest would be to shield itself from the inevitable decline in fossil fuel exports by taking early policy action to avoid it being imposed on the economy.

# Table of Contents

# Introduction

The 2025 Australian Federal Election delivered a landslide victory for the incumbent Labor Party. The result appeared in part to be an endorsement of the government's climate agenda, and certainly a rejection of the Coalition opposition's questioning of Australia's renewables rollout, unrealistic and distracting nuclear programme, and ambiguity on withdrawal from the Paris Agreement. But as the dust settles, the returning Albanese government faces renewed tests of its climate ambition.

The Federal Government now has three immediate climate priorities. First, it must draft Australia's new short-term climate target, its 2035 Nationally Determined Contribution (NDC) – a task it postponed until after the US and national elections.

Second, in line with the Paris Agreement requirement for Parties to periodically revisit their NDCs, the federal government must overhaul and strengthen its 2030 NDC, published in 2022. This document contains the target of reducing net emissions by 43% below 2005 levels. As with most nations, Australia will aim to submit its new NDC before COP30 in Belém, Brazil, in November 2025.

Since the publication of Australia's latest 2030 NDC, new international texts and developments have only strengthened the case for Australia to set ambitious, Paris Agreement-aligned targets.

The 2023 Global Stocktake (GST) requests Australia's 2030 and 2035 domestic emission reduction targets to be aligned with the Paris Agreement's 1.5°C limit (UNFCCC, 2024).[1] In its 28th paragraph, the GST recognises the need for 'deep, rapid and sustained reductions in greenhouse gas emissions in line with 1.5°C pathways', and calls on Parties like Australia to align with those.

The text sets out the steps needed and calls on all Parties to implement a range of actions in the energy sector, including tripling renewables, doubling energy efficiency, transitioning away from fossil fuels in energy systems (which includes both consumption of fossil fuels on Australia's territory and its exports) in a just and fair manner. It also calls for substantial non-$CO_2$ emission reductions, particularly methane by 2030, through the operationalisation of the Global Methane Pledge, and going beyond it to align with 1.5°C compatible pathways.

The July 2025 International Court of Justice's Advisory Opinion (ICJ AO) on climate change further reinforced the obligations of states to align their policies and actions with the Paris Agreement's 1.5°C limit (International Court of Justice, 2025).

[1] The Global Stocktake Text requests Parties to "strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2024, taking into account different national circumstances" (UNFCCC, 2024).

The Advisory Opinion finds that all governments have an obligation to put forward the highest possible ambition in their climate targets, and it is not acceptable to submit a weak NDC that does not align with the Paris Agreement 1.5°C limit. Failure to take action aligned with a 1.5°C limit, not only on emission reduction targets but also in support for the fossil fuel industry, "*may constitute an internationally wrongful act with damages attributable to the state*."

In contrast, as of June 2025, Australia's current 2030 NDC is rated as "Insufficient" by the Climate Action Tracker, meaning that if all countries were to limit their level of action to match Australia's 2030 target temperatures would reach up to 3°C above preindustrial levels by 2100, well above the Paris Agreement's 1.5°C limit (Climate Action Tracker, 2025).

Third, the Federal government must deliver its new net zero plan, which it also pledged to produce during its first term in office. The ICJ AO has reiterated the requirement under the Agreement's Article 4.1, for global greenhouse gas emissions to reach net zero in the second half of this century (International Court of Justice, 2025).

The new net zero plan will replace a previous policy document outlining Australia's climate strategy to 2050, delivered by the previous Coalition government in 2021. This plan relies heavily on "further technology breakthroughs" and offsets (Department of Industry, Science, Energy and Resources, 2021). It does not provide a credible pathway to get Australia to net zero, with large residual emissions remaining by 2050.

The Climate Action Tracker rated the strategy as "poor" (Climate Action Tracker, 2025). The current Labor government seemed to share this assessment, never explicitly endorsing its predecessor's effort; Prime Minister Anthony Albanese even called the net zero strategy a "scam" when in opposition (The Guardian, 2021).

Formulation of a 2035 NDC and net zero plan offers the second Albanese government an ideal opportunity to leverage its decisive victory in the Federal elections and make use of its now considerable political capital. Higher ambition from Australia would be more than timely in light of its bid to host COP31. The government's post-election agenda on climate remains largely unwritten, the only significant commitment it brought to the election campaign being a rebate for home batteries.

Both Australia's 2035 NDC and net zero plan must be ambitious, fair, credible, and transparent. They must be ambitious enough to align with the action required to stay within the 1.5°C limit, in accordance with the Global Stocktake, and supported by consistent policy. They must be fair, reflecting Australia's responsibility as a developed country and historical emitter. They must be credible, built on detailed, robust, sector-based planning free of internal contradictions. Finally, they must be transparent, with clear assumptions, economy-wide and sector-specific targets, including through separate statements specifying the role of land use, land-use change, and forestry, engineered and novel types of carbon dioxide removal (CDR) or carbon markets under Article 6 (Climate Action Tracker, 2024b).

**This report answers the question: what would science-based, 1.5°C-compatible 2030 and 2035 targets, and a net zero roadmap, look like for Australia?**

To get these national-level insights, we downscale IPCC scenarios with regional results to Australia, translating these into more detailed and locally relevant projections by harmonising them with national data. The range formed by this set of downscaled 1.5°C compatible pathways provide the analysis's headline figures for the Australian economy.

Since in the conceptual framework outlined above, a climate target needs to go beyond whole-of-economy emissions figures, we also investigate the sectoral implications of such pathways by examining three illustrative pathways from the set, each with their own narratives. They show what a 1.5°C aligned transition means for the Australian power, transport, industry and buildings sectors.

# Background on 1.5°C aligned emission pathways, energy transformation and net zero

The 1.5°C limit, the temperature goal of the Paris Agreement, is a legal, political, ethical and moral boundary. Established in Article 2.1, it is designed to avoid the most dangerous impacts of climate change, particularly for the most vulnerable countries. The science underpinning the significance of the 1.5°C limit has only grown more conclusive since 2015 (IPCC, 2022).

Together with the requirement to achieve net zero greenhouse gas emissions in the second half of the century, the long-term temperature limit sets the legal framework for understanding the level of ambition Parties have committed to under the Agreement. The Paris Agreement Article 4.1 puts the temperature goal from Article 2.1 into effect by requiring global peaking of greenhouse gas emissions as soon as possible and reaching net zero emissions in the second half of the century. Only the combination of these two articles provides concrete guidance to Parties on the rate and scale of emission reductions needed globally, which can then be downscaled to national and sectoral levels.

In 2024, the global observed annual average temperature exceeded 1.5°C above pre-industrial levels due to rising anthropogenic greenhouse gas emissions, reduced air pollution, and short-term natural variability, including El Niño. Still, the Paris Agreement 1.5°C limit refers to long-term *human-induced* warming assessed over 20 to 30-year periods above pre-industrial levels. The italicised term refers to warming attributed to human activities, in contrast to observed warming, which includes both anthropogenic and natural influences. In 2024, 1.36°C of the warming can be attributed to human activities (Forster et al., 2024).

We are, though, rapidly nearing this limit, with a possibility of breaching it as early as 2030 unless emissions are reduced rapidly (Carbon Brief, 2024). The extreme warming observed in 2023, 2024 and now 2025 with annual average warming close to 1.5°C above pre-industrial levels is a serious signal requiring urgent political response from governments everywhere, including Australia.

Without substantial reductions in global emissions by 2030, a sustained overshoot of the 1.5°C limit by more than 0.1°C for many decades will become inevitable. In this context, an overshoot means temporarily exceeding the 1.5°C limit before returning below that level as quickly as possible.

The impact of this overshoot depends on both its extent and duration. Each increment of warming brings rapidly increasing, irreversible, and harmful impacts and risks, and increases the likelihood of crossing critical thresholds. Exceeding the limit on a sustained basis would significantly increase the likelihood of severe, widespread, and irreversible impacts, globally and in Australia.

One of the most serious and imminent national risks is the survival of Australia's coral reefs. Catastrophic damages are already occurring in tropical coral reefs at around 1.5°C of warming, with projected near-total loss if warming reaches 2°C (IPCC, 2022). The only long-term chance for reef recovery is to reduce warming as rapidly as possible after peak levels as close as possible to 1.5°C, as emphasised by Australia's Climate Change Authority in its 2025 report on the climate impact on the Great Barrier Reef (Climate Change Authority, 2025).

The coming years will decide whether we avoid the most damaging impacts of climate change or face a future with escalating risks, such as irreversible ice loss, shifts in ocean circulation, and ecosystem collapse. The growing risk of reaching and overshooting the Paris Agreement 1.5°C limit increases the legal, political and moral pressure on governments to introduce policies that rapidly reduce emissions and before COP30 in Brazil to substantially improve their 2030 NDC targets and align their 2035 targets with the 1.5°C limit. It is technologically and economically feasible to align with this goal; the main barriers are political, not scientific.

In the event of overshoot, the Paris Agreement gives strong operational guidance on the level and rate of mitigation needed to reduce the breach and stay compliant with all elements of the Agreement, including reaching net zero greenhouse gas emissions in the second half of the century. IPCC AR6 pathways that recognise Articles 2.1 and 4.1 of the Paris Agreement, both central components of the legally binding Agreement, fall under the C1a group.

Pathways consistent with the Agreement allow for only a limited 0.1°C of overshoot (Schleussner et al., 2022). Unless emissions are reduced quickly, higher overshoot (>0.1°C) becomes inevitable. If emissions are not halved by 2030 but still aggressive action is taken, peak warming could be limited to 1.6-1.7°C, and the most adverse impacts and loss and damage can be limited. If net zero greenhouse gas emissions are reached by around 2070, then 2100 temperatures could drop to <1.3°C.

The timing of net zero $CO_2$ and net zero GHG emissions is therefore fundamental for limiting overshoot. The only way to stabilise temperature increase and limit overshoot is to get $CO_2$ emissions to net zero globally as soon as possible with net zero greenhouse gases following a decade or two later to achieve a long-term temperature decline. Achieving net zero $CO_2$ emissions would likely lead to global temperature increase halting (IPCC, 2021). A major focus must be on reducing fossil fuel $CO_2$ emissions, and therefore, gross emissions, as fast as possible through a fossil fuel phase-out. Net zero $CO_2$ needs to be achieved by around mid-

century to keep peak warming close to 1.5°C, and hence is a common feature of 1.5°C aligned pathways.

Net zero greenhouse gas emissions are then needed for temperatures to start declining. The remaining residual greenhouse gas emissions will require negative $CO_2$ emissions, through carbon dioxide removal (CDR), to counteract their warming effect and bring global greenhouse gas emissions to net zero in the second half of this century as required under Article 4.1 of the Paris Agreement.

Carbon dioxide removal technologies carry inherent limitations and sustainability risks across many dimensions. Yet substantial CDR deployment will be needed to meet global climate goals (IPCC, 2023). Negative CO2 emissions through CDR should only be used to counterbalance the “truly unavoidable" residual GHG emissions to achieve net zero greenhouse gas emissions, globally. Residual emissions in any sector must be as low as possible (if not eliminated) to keep global CDR deployment within limits, since the lower the residual emissions, the less reliance on CDR will be needed to reach net zero.

All sectors are not equal in their decarbonisation challenges nor in their capacity to deliver a just and fair transition. This has given rise to the so-called hard to abate narrative, a label often more reflective of an industry’s branding skills than of the full range of technically and financially feasible decarbonisation options. CDR should not be relied on to counterbalance residual fossil fuel emissions that could otherwise be eliminated, especially given falling clean energy costs.

The potential of enhanced LULUCF sinks (often called “conventional CDR”) is limited, and uncertain. Many countries, including Australia, are over-relying on the potential growth of their land sector sinks. An increasing body of research shows the potential for substantially increased land carbon sequestration is lower than previously thought. Global warming itself is impacting on the ability of forests and soils to hold and sustain carbon, due to the increased pressure from extreme heat, drought and wildfires (Climate Analytics, 2025).

Given these concerns, as part of the transparency criterion detailed above, Parties like Australia should indicate separate, distinct targets for land-based net sequestration, permanent carbon removals, and the quantum of residual emissions as part of their NDCs and net zero plans. Comprehensive sectoral planning can, in turn, inform both policy action to limit residual emissions and implement carbon dioxide removal solutions, where and when needed, in a sustainable manner (Climate Analytics, 2025).

The extreme warming levels observed in the last several years - and the prospect that the 1.5°C limit could be reached within just five years unless urgent action is taken - increases the obligation on all Parties to act with the highest possible ambition to comply with both Articles 2.1 and 4.1 of the Paris Agreement to bring CO2 emissions to net zero by mid-century and greenhouse gas emissions to net zero by the 2070s at the latest. For these reasons, short-term targets for 2030 and 2035 must be connected to longer-term outcomes for 2050 and 2100.

# Planning for a fossil fuel export phase-out

Australian fossil fuel exports are outside the scope of Paris Agreement NDC targets, which focus only on emissions within a country's borders. Their climate impact is reported in the importing countries' inventory, in accordance with IPCC guidelines.

This does not diminish their significance, nor Australia's responsibility to begin phasing them out. The legal and moral case for urgent action has been made even stronger by both the Global Stocktake and the recent International Court of Justice Advisory Opinion (Climate Change Authority, 2024; International Court of Justice, 2025; UNFCCC, 2023).

The GST calls on Parties to transition away from fossil fuels in energy systems, in a just, orderly and equitable manner (UNFCCC, 2023). The term 'energy systems' refers to both fossil fuel consumption and production, and, as per Article 14.3 of the Paris Agreement, the GST outcomes should inform the enhancement of NDCs.

The ICJ AO states: "*failure of a State to take appropriate action to protect the climate system from greenhouse gas emissions – including through fossil fuel production, fossil fuel consumption, the granting of fossil fuel exploration licences or the provision of fossil fuel subsidies – may constitute an internationally wrongful act which is attributable to that State*" (International Court of Justice, 2025).

It is also in Australia's economic interest to take action in order to shield itself from the "inevitable decline" in fossil fuel exports, as described by the CCA.

These are directly relevant to Australia's role as the fourth largest exporter of fossil fuel emissions, ahead of other high-profile producers like Canada, the United Arab Emirates, Qatar, or Norway (Climate Action Tracker, 2024c). Australia is the largest exporter of metallurgical coal in the world; the second largest exporter of thermal coal; the third largest LNG exporter globally. For each of these products, more than 80% of production is sent overseas (DISR, 2025).

Because of this exported production, in 2022, Australia's exported emissions were 234% higher than its domestic emissions (Climate Action Tracker, 2024c). While domestic emissions have remained broadly stable since 2010, exported emissions have increased by 40% over the same period (Climate Action Tracker, 2024c).

Export-oriented fossil fuel production also contributes significantly to Australia's emissions. Fugitive emissions - unintended releases of greenhouse gases, mostly methane, during the production, processing, and transport of fossil fuels - made up 11% of Australia's emissions in 2024 (DCCEEW, 2024c). As discussed in the methane section, these numbers are understated.

Combining these fugitive emissions with on-site fuel combustion and power generation, the LNG sector alone is projected to emit 8% of Australia's 2025 emissions, coming from just ten

facilities spread across Western Australia, the Northern Territory, and Queensland (DCCEEW, 2024c). Research has found that fossil fuel production was responsible for 18% of Australia's total greenhouse gas emissions, excluding LULUCF (Climate Analytics, 2024a).

For both coal and fossil gas, the government does not expect export volumes to fall in the near future. It produces two forecasts for fossil fuel production: the Department of Industry, Science and Resources' Resources and Energy Quarterly gives short-term production and export forecasts to 2030 based on global market conditions, and the 2024 Emissions Projections, edited by the Department of Climate Change, Energy, the Environment and Water (referred to across this report as government projections), provide production estimates in five-year increments to 2040 (DCCEEW, 2024c; DISR, 2025).

In the short-term, DISR projects thermal coal exports will fall by just 1% from 2025 to 2030, following a record high in 2024. Australia appears to assume it is insulated from global trends, as the ministry expects world thermal coal trade to drop 10% in the same timeframe, and imports from its main partners (China, Japan, and South Korea) are projected to decline at compound annual rates ranging from 7.9% to 1.9% per year over this period (DISR, 2025).

Metallurgical coal exports are forecast to rise from a projected 159 Mt in 2025 to a peak of 174 Mt by 2028, with multiple mines reaching full capacity. Ironically, the DISR notes that extreme weather events, to which coal production and consumption contribute such as heavy rainfall, can threaten future exports by disrupting production, as it did in Queensland in February 2025 (DISR, 2025).

Post-2030, as per the government's projections, run-of-mine[2] output for thermal, metallurgical and brown coal is expected to fall from 561 million tonnes in 2030 to 427 in 2035, further dropping to 400 Mt by 2040, with this decline attributed to the phase-down of coal power generation across the world. Metallurgical run-of-mine coal production decreases more progressively, dropping only by 7% between 2030 and 2040, from 255 to 237 million tonnes. The government notes that "unspecified" new mines would be required to maintain these levels of production (DCCEEW, 2024c). The Australian government has already approved 10 coal projects since May 2022 (Australia Institute, 2025a).

LNG production is also projected to remain steady this decade, at 80 Mt in 2025, increasing to 82 Mt by 2027, and decreasing to 78 Mt by 2030, in spite of the looming global oversupply identified, for instance, by the International Energy Agency: under current policies, LNG export capacity is anticipated to increase close to twice as much as actual demand globally between 2023 and 2030 (DCCEEW, 2024c). In the DISR's forecasts, LNG export revenues decrease by 37% between 2025 and 2030 (DISR, 2025).

Turning to the government projections, the decline after 2030 is slower for LNG than for coal, with output at 77 million tonnes in 2035, falling sharply to 60 million tonnes by 2040 (DCCEEW, 2024c). The government's 2024 Future Gas Strategy suggests that, at least for this

[2] Run-of-mine coal is coal extracted from the mine before any processing. The Emissions Projections provides volume of run-of-mine coal, unlike the Resources and Energy Quarterly, which provide numbers for saleable coal production and exports.

specific fuel, Canberra expects new sources of demand to replace Australia's current partners, for instance in developing Southeast Asia (DISR, 2024).

The climate consequences of these projections are clear when quantifying emissions from future fossil fuel exports (see graph below), estimated based on the methodology from (Climate Analytics, 2024a).[3]

In comparison, to align with the International Energy Agency's net zero scenario, $CO_2$ emissions from fossil fuel use must fall sharply, worldwide, dropping by a third between 2024 and 2030, and by nearly two-thirds by 2035. Even under the optimistic fossil fuel export decrease projected by the government post-2030, diverging from this decade's trend, their decline rate never comes close to aligning with the IEA scenario (IEA, 2024e).

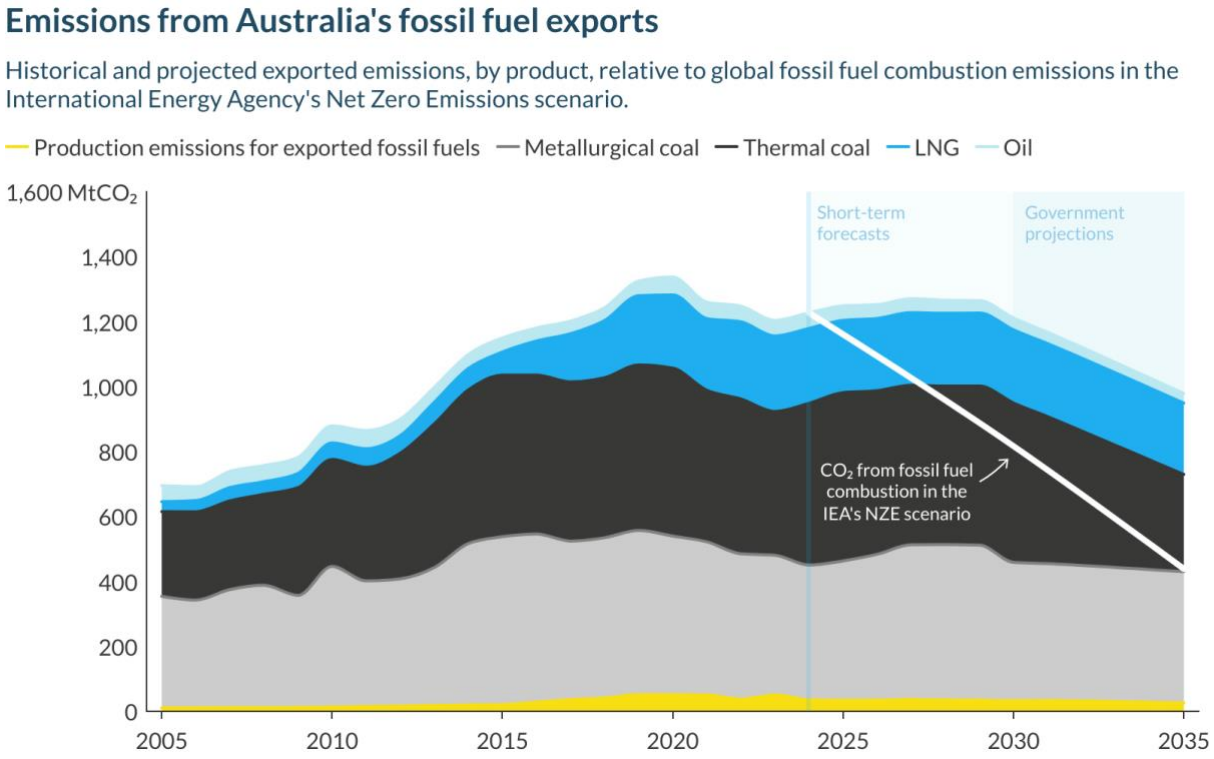



*Figure 1*

Forecasts show little change by 2030 and sharper but still inadequate declines later. The government's approach effectively maintains business as usual, despite the Global Stocktake call to transition away from fossil fuels and the green energy superpower narrative the Prime Minister and government members have rhetorically embraced in recent years.

Continuation of fossil fuel production is hardly compatible with a transition to a Paris-compatible economy, even less so if that economy were export-oriented. The green light given

[3] Forecasts use updated data from the March 2025 Resources and Energy Quarterly and 2024 Emissions Projections, with historical values consistent with the 2024 Energy Statistics and the emissions inventories used in the present report (DCCEEW, 2024a, 2024c; DISR, 2025, 2025). The methodology remains unchanged (Climate Analytics, 2024a).

to numerous coal mine expansions, the North West Shelf LNG project set to operate until 2070, and greenfield gas projects like the development of the Beetaloo Basin all undermine the potential for alignment with 1.5°C pathways by locking in fossil fuel production and exports for decades (Climate Action Tracker, 2025).

CCS for fossil fuel production, supported by the government but which has significantly underperformed as a technology (including in Australia), remains an expensive, unscalable distraction from meaningful climate progress (IEEFA, 2024a).

Political and financial support for the fossil fuels export industry will not flow towards the economy's decarbonisation. The coal industry, concentrated on the East Coast, benefited from AUD 1 billion in 2025 from the Fuel Tax Credits Scheme. In the Northern Territory, the gas-heavy Middle Arm development received AUD 1.9 billion in federal support. Overall, in the last fiscal year, fossil fuel producers and major users received nearly AUD 15 billion in subsidies and tax breaks, with forward estimates increasing by AUD 2 billion, reaching AUD 67 billion (Australia Institute, 2025b).

Political support for the fossil fuel industry has downstream effects on the wider economy. In Western Australia, letting the Northwest Shelf plant source some of its supply from the domestic market has led to a tripling of gas prices, ultimately borne by businesses and consumers (RenewEconomy, 2024).

The Climate Change Authority, legally mandated to provide recommendations to the government in preparing Australia's next NDC, notes that:

> "[…] As part of its broader considerations, the authority will consider how Australia can develop and supply clean energy, critical minerals and low and zero emissions products to our trading partners, potentially making a further significant contribution to the global effort to reduce emissions. This can provide substantial economic opportunities for Australia and insulate us from the inevitable decline in fossil fuel demand […]
>
> Customers of Australia's fossil fuel imports will decide when they phase them out and there is a risk that as Australia reduces its fossil fuel exports, other countries may increase their exports to 'fill the gap'. Hence, the authority considers that phasing out fossil fuels will need to be a planned and organised process, involving the development of new technologies, production processes, and engagement with industries, communities, trading partners and competitors" (CCA, 2025).

The phase-out of fossil fuel exports must be planned to avoid it being imposed on the economy, and such comprehensive planning belongs in the NDCs and the net zero plan. As of June 2025, 10 of the 16 fossil fuel-producing countries that have lodged their 2035 NDC mention fossil fuel production (IISD, 2025).

In contrast, global decarbonisation offers new, future-proof opportunities for Australia to leverage its abundant renewables potential, provided it gives itself the means to fully exploit them. The Future Made in Australia agenda, coincidentally published the same week as the

Future Gas Strategy, lays the first brick of this transition by planning to provide nearly AUD 23 billion to support the scaling up of hydrogen, critical minerals, and green metals through tax incentives (Australian Government, 2024). The AEMO power sector modelling, for instance includes a green industry-heavy scenario for the National Electricity Market that is 1.5°C compatible and includes ambitious pathways for export transition, showing that aligning with such pathway is feasible (AEMO, 2024).

If the Australian government is serious about the leadership role it aspires to in the lead-up to COP31, and in accordance with the Global Stocktake text and ICJ AO, it must break free from its current inertia justified by the so-called drug dealer defence, the argument that if Australia does not supply fossil fuels, other countries will, so it might as well continue exporting them.

While displacing coal and LNG production for new exports will require both incentives and regulatory measures, doing otherwise, by failing to "take appropriate action to protect the climate system from greenhouse gas emissions — including through fossil fuel production [...] may constitute an internationally wrongful act which is attributable to that State" (International Court of Justice, 2025).

# 1.5°C aligned NDC targets for 2030 and 2035

## Present emissions trends

Gross emissions refer to emissions excluding the land use, land-use change and forestry (LULUCF) sector. They represent emissions from the Australian economy, the vast majority of which arise from the production and consumption of fossil fuels across all sectors.

Australia's gross greenhouse gas emissions were 523 $MtCO_2e$ in 2024, according to the September 2024 Quarterly Inventory Report released in March 2025 (DCCEEW, 2025c). In comparison, they were at 537 $MtCO_2e$ in 2005, Australia's 2030 NDC base year. Although national gross emissions have remained broadly flat, individual sectors have followed diverging trajectories.

In 2024, electricity sector emissions were 22% below 2005 levels, after peaking in 2009. Stationary energy emissions, mostly from on-site fuel combustion at industrial facilities, have risen by 20 percent since 2005, driven by the expansion of the LNG industry. Fugitive emissions and transport emissions have increased by 10% and 20% respectively, reflecting continuing coal mining and LNG growth, and transport emissions have almost returned to their pre-Covid trend. Agricultural emissions are 6% lower than in 2005, but have increased since 2021, largely due to drought conditions (DCCEEW, 2025c).

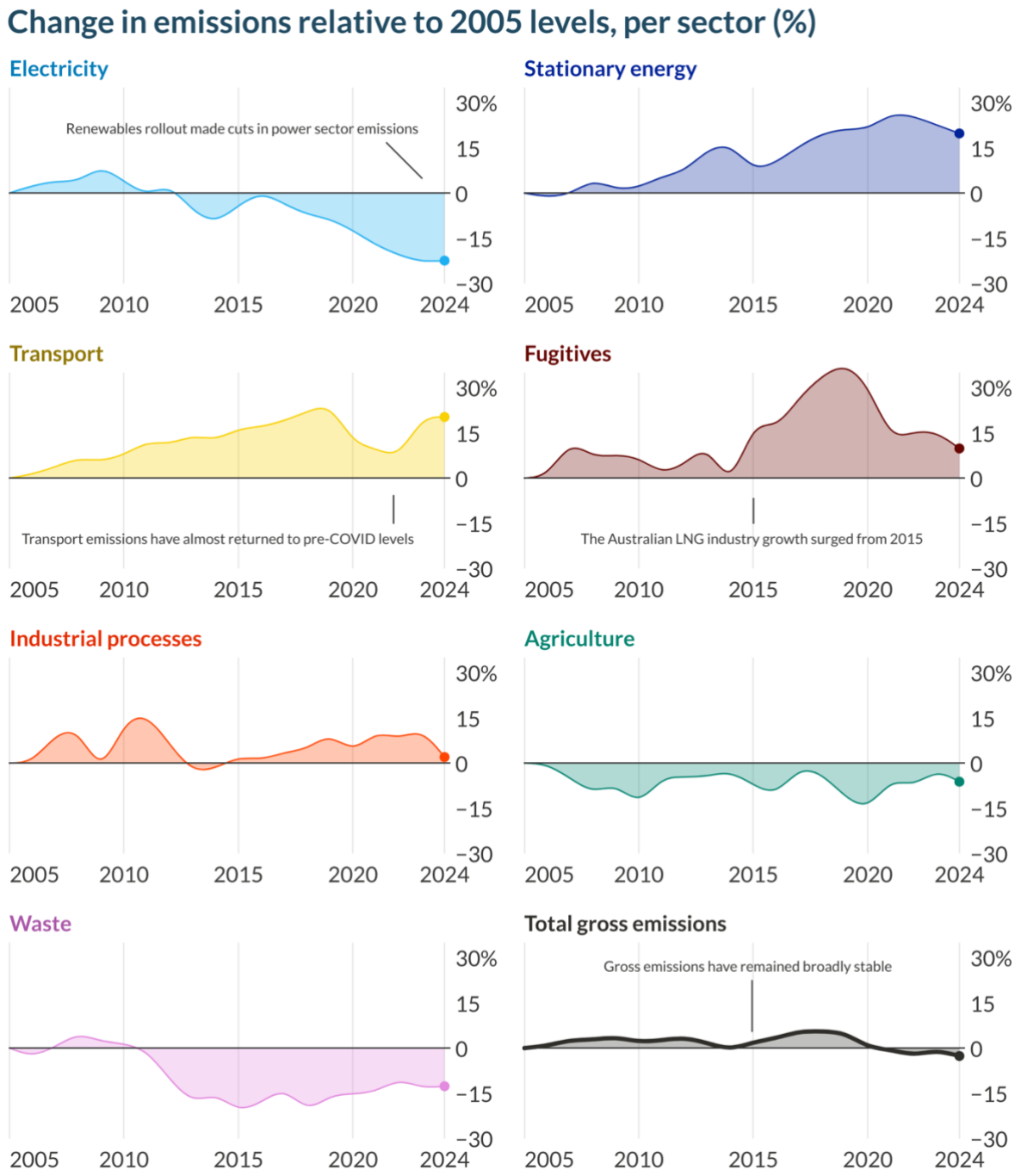



*Figure 2*

These trends reflect well identified success and failures in Australia's approach to date (Climate Action Tracker, 2025). The rollout of renewables, one of Australia's easiest opportunities, has lowered power sector emissions by pushing some coal plants out of the system. Yet inaction in other sectors, such as transport, and ongoing support for the fossil fuel industry, which drives up fugitive and stationary emissions, have effectively cancelled out the gains from early power-sector decarbonisation.

Unlike gross emissions, net emissions, which include LULUCF, have declined steadily since 2005 to 435 $MtCO_2e$ as the LULUCF sector shifted from a *source*, which emits more

greenhouse gas than it sequesters, to a *sink*, which sequesters more than it emits. LULUCF emissions peaked at 106 $MtCO_2e$ in 2006. In 2024 they reached −88 $MtCO_2e$, that is, the sector sequestered 88 $MtCO_2e$ more than it emitted. Including the contributions from the LULUCF sector, net emissions were 29% below 2005 levels, compared to only 2% for gross emissions.

## Australia's heavy reliance on LULUCF

Australia's heavy reliance on the LULUCF sector, emphasised by the discrepancy between net and gross emissions reductions to date since 2005, masks the absence of effective policy actions in cutting energy and industrial emissions outlined above.

Each year the Department of Climate Change, Energy, the Environment and Water publishes its emissions projections, which forecast Australia's emissions path under current policies. The most recent projections, published in December 2024 and extending to 2040, forecast the government to nearly meet its Nationally Determined Contribution target of reducing net emissions by 43% below 2005 levels by 2030, and reaching 51% below the same baseline year by 2035 (DCCEEW, 2024c). Gross emissions, on the other hand, are forecast to only be 23% below 2005 levels by 2030, and 33% by 2035.

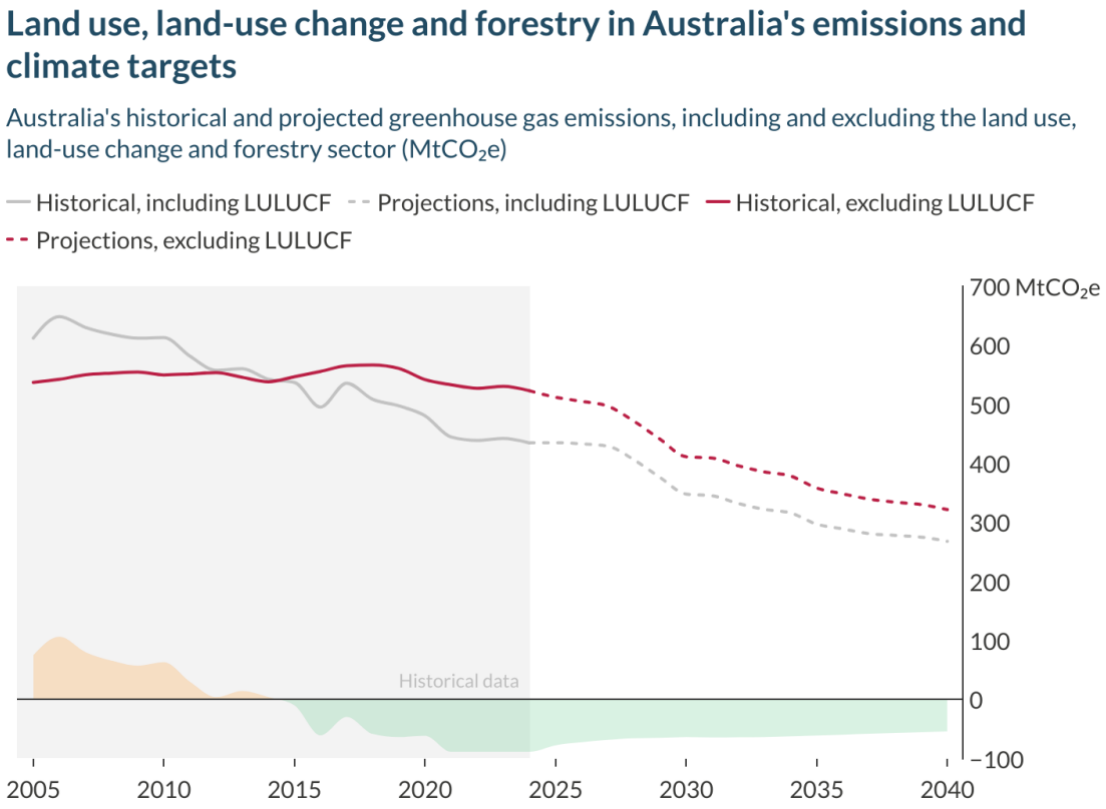



*Figure 3*

Australia has had a controversial history of using land-related emissions accounting methods in global climate governance, including its now-abandoned proposal to carry emission units over from the Kyoto Protocol to the Paris Agreement (Climate Analytics, 2019).

LULUCF emissions and sequestrations are highly uncertain, hard to verify, prone to accounting manipulation, and even harder to forecast. Globally, a seven billion tonne annual gap remains between IPCC models and national inventories for land emissions (Grassi et al., 2025). The latter tend to report much higher sinks from land than the Integrated Assessment Models used to build these pathways, due to differences in the accounting of anthropogenic emissions and managed land (Climate Analytics, 2024b).

National inventories tend to include carbon storage due to indirect human effects and the consequences of $CO_2$ fertilisation due to high atmospheric $CO_2$ concentration caused by fossil fuel emissions. Projected increases in carbon storage, including in Australia, may be uncertain because of the effects of climate change on forest and vegetation, particularly extreme heat, drought and wildfire. In 2023 and 2024, carbon land sink collapsed due to the effects from extreme heat, drought and wildfire caused by human-induced climate change (Ke et al., 2025)

Australia has repeatedly revised its inventories and projections in the last few years, in ways that benefit the government. In every update of the last four emissions projections, the government revised its projected LULUCF sink levels upwardly. In December 2021, the government expected the sector to sequester 16 $MtCO_2e$ by 2030. In December 2024, this figure was 64 $MtCO_2e$ (DCCEEW, 2022, 2023a, 2024c; DISER, 2021). This means that between the 2021 and 2024 projections, in just three years, the government had increased its forecast 2030 LULUCF sink by over 50 $MtCO_2e$.[4]

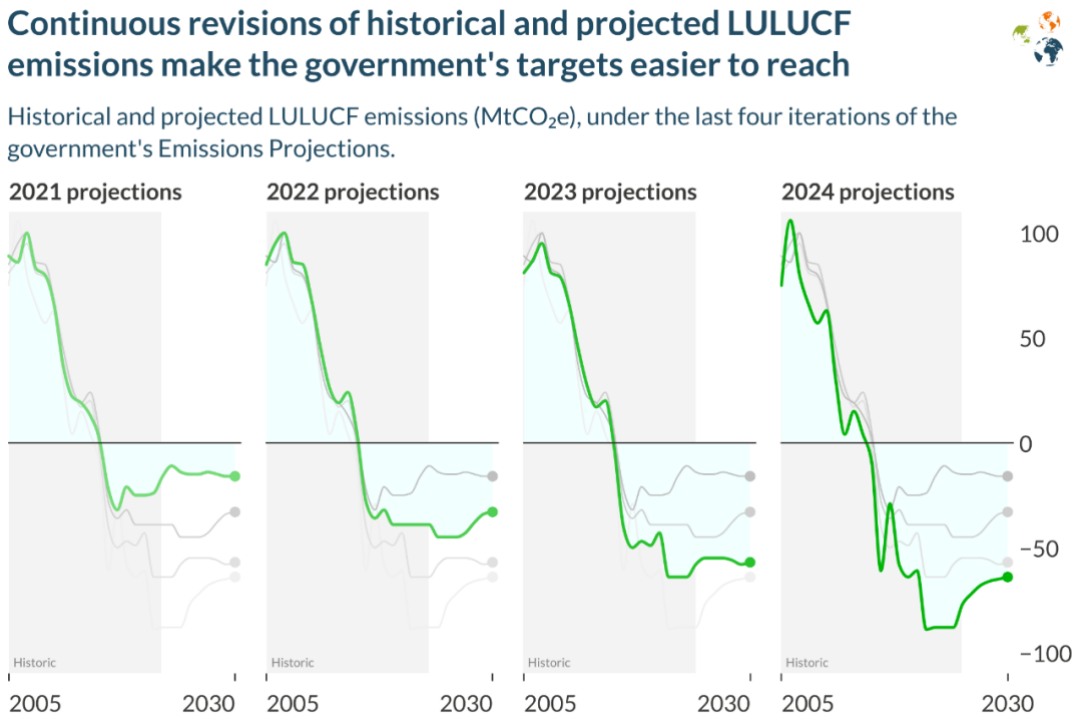



*Figure 4*

[4] Data converted when needed from AR4 global warming potential to AR5 with the 2022 National Inventory Report's LULUCF AR4/AR5 ratio, assumed to remain stable post-2022.

Each upward revision means that there is less action from other sectors, and hence on fossil fuel use, to meet the national 43% emissions target for 2030.[5] If the LULUCF sector is projected to sequester more $CO_2$, the government faces less pressure to introduce policies in the rest of the economy to reduce emissions.

In December 2021, meeting the 2030 NDC target of a 43% reduction below 2005 levels by 2030 would have required a 31% cut from the rest of the economy. After revisions to LULUCF projected data, that figure fell to 23%.

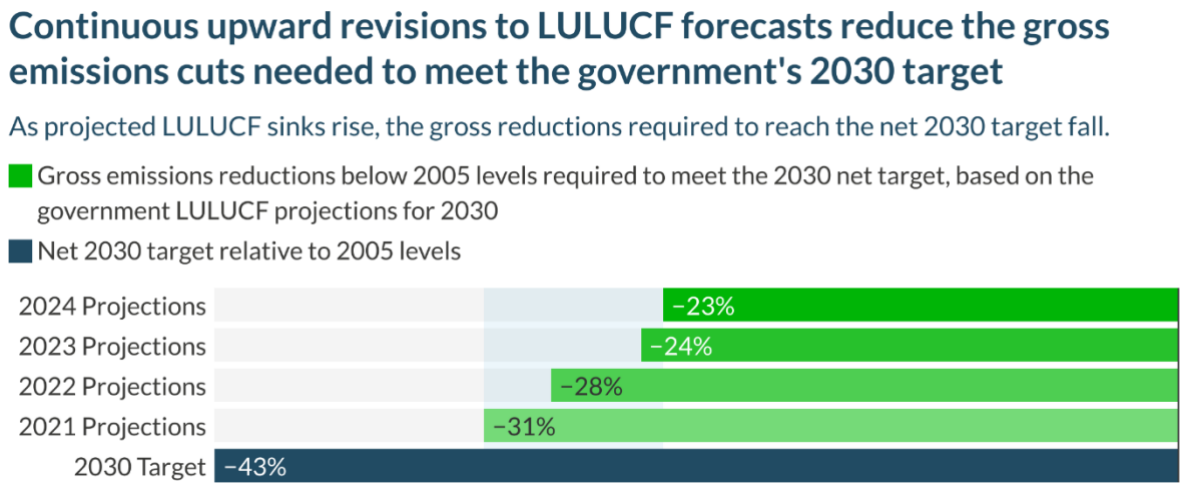



*Figure 5*

## Gross greenhouse gas emission reduction and residual emissions

The first step in calculating 1.5°C aligned emission reductions for a country or region is to evaluate the gross emission cuts required and how they can be achieved. While the Paris Agreement NDCs are set on a net basis, gross emission reduction pathways permit assessment of the likely level of residual emissions by mid-century and the resulting need for negative $CO_2$ emissions. Examining emissions outside the LULUCF sector also enables analysis of what must be done across the economy. Fossil fuel and industrial GHG emissions have vastly different dynamics from LULUCF emissions and are a primary focus of 1.5°C aligned pathways.

Enacting a domestic climate target that excludes this sector provides greater clarity on the levels of emission reductions to be reached within the economy. Increases in the land use, land use change, and forestry sector carbon uptake capacity cannot substitute for deep cuts in fossil

[5] Conversely, if LULUCF historical emissions for the year 2005 (when the Australian LULUCF sector used to be a net emitter, as opposed to the net sink it is now) were to be revised downward due to a change in accounting methodology, then meeting the 2030 goal of a 43% reduction in net emissions would demand deeper cuts outside LULUCF.

fuel emissions, nor can they reliably compensate for the development of emissions-intensive infrastructure that will lock emissions in for decades (IPCC, 2018).

The government expects gross emissions to decrease by 23% below 2005 levels by 2030, which is 21% below current levels. This decline is projected to be driven by the electricity sector, whose emissions are projected to halve between 2024 and 2030 thanks to the achievement of the 82% renewables target for Australia's main grids.

The 2023 Safeguard Mechanism reform requires emissions from large industrial emitters to fall by 4.9% each year, with the goal of cutting emissions from covered facilities by 28% below 2023 levels by 2030. Its effect on gross emissions is uncertain, since companies can use offsets instead of on-site abatement.

While the legislation allows for a cap on offset use, current settings create a risk that on-site emissions remain close to present levels throughout the decade (Climate Action Tracker, 2025). The government projects gross Safeguard emissions to decrease to 121 $MtCO_2e$ from 139 $MtCO_2e$ in 2023, a 13% reduction, with CCA and DCCEEW modelling indicating that 58% to 68% of these reductions would come from ACCUs (CCA, 2024a; DCCEEW, 2023a, 2024c).

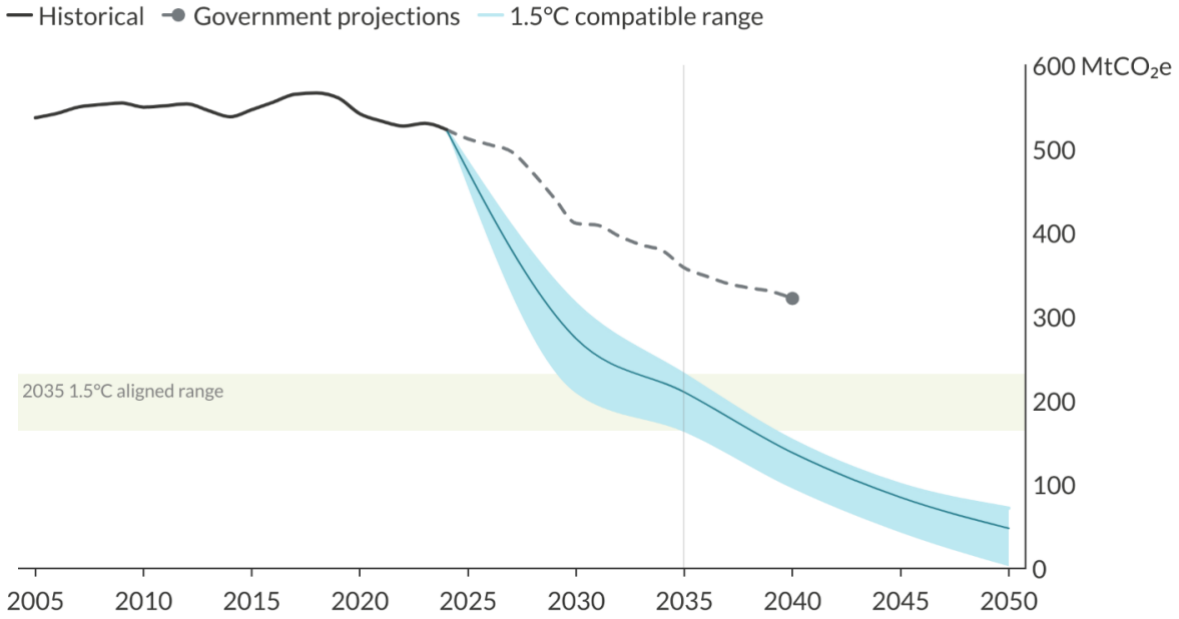
Meanwhile, most emissions across other sectors of the economy see a slower decrease in the short-term. With the pace of decarbonisation slowing down post-2030 as the momentum from current policies and the picking of low hanging fruit start to run down, the government then projects gross emissions to reach 33% below 2005 levels by 2035.

In contrast, to be consistent with 1.5°C aligned pathways, Australia must cut its gross emissions by 61% below 2005 levels by 2035 (57%-70%).[6]

[6] Throughout this report, for consistency with the 1.5°C National Pathway Explorer, the highlighted headline value (dark line) corresponds to the 25th percentile of the set of pathways. Refer to the methodology section for more details.

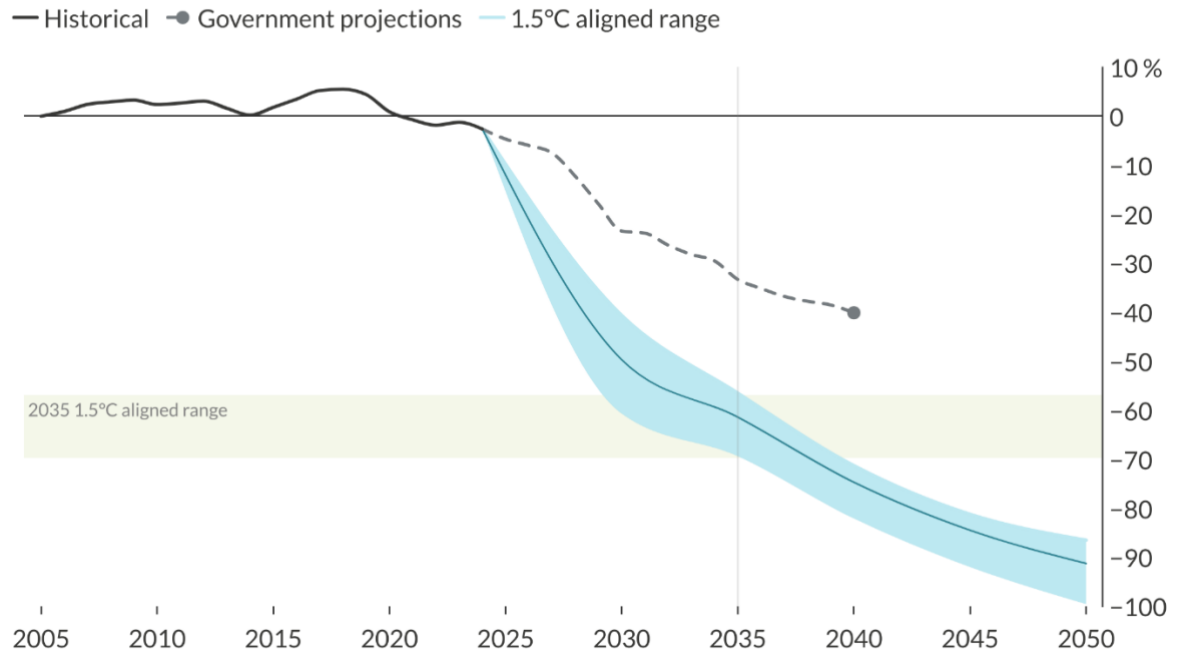
## Australia's gross emissions from fossil fuels, industry and other sources

Australia's historical and projected greenhouse gas emissions, excluding land use, land use change and forestry, compared to 1.5°C aligned pathways ($MtCO_2e$).




## Australia's gross emissions, relative to 2005 levels

Australia's historical and projected greenhouse gas emissions, excluding land use, land-use change and forestry, compared with 1.5°C aligned pathways, relative to 2005 levels (%).




| | 2030 | 2035 | 2050 |
|---|---|---|---|
| **1.5°C aligned gross emissions reduction below 2005 levels** | **-50% (-41% to -61%)** | **-61% (-57% to -70%)** | **-91% (-87% to -100%)** |

*Table 1*

By 2050, the amount of residual emissions in the set of 1.5°C compatible pathways range from 0 to around 70 $MtCO_2e$. Unless steeper emissions reductions are achieved, negative $CO_2$ deployment (referring to technological CDR solutions such as direct air capture in this case, since these figures refer to emissions excluding LULUCF), would be needed to bring gross emissions to net zero.

## Net greenhouse gas emissions

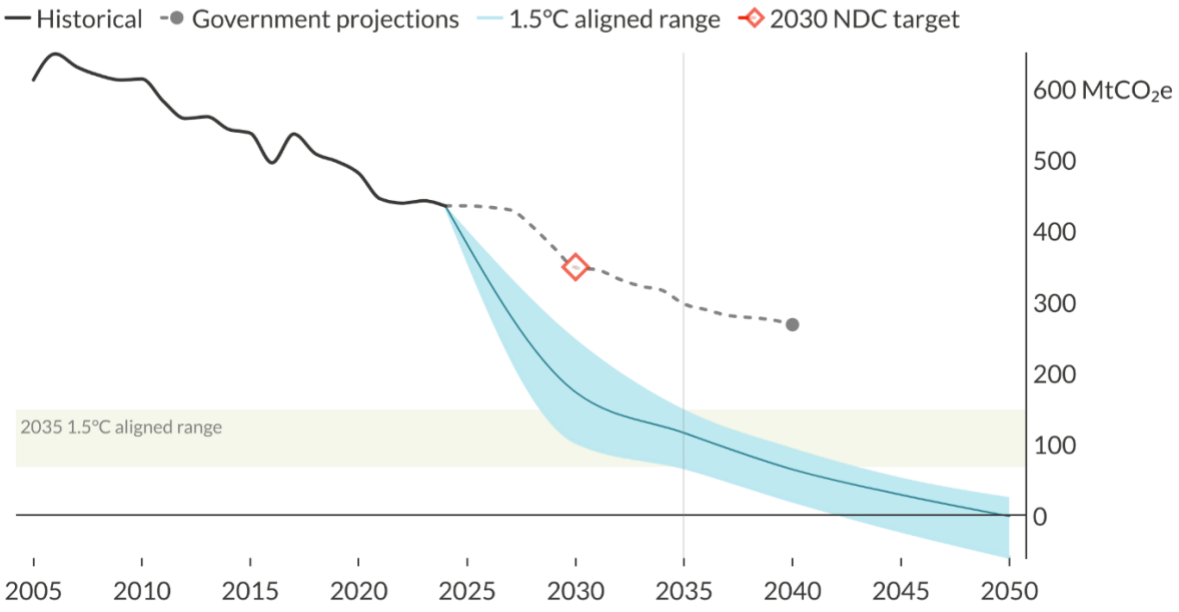
Pathways compatible with the 1.5°C limit require net emission reductions of 72% (60%-83%) below 2005 levels by 2030 and 81% (76%-89%) by 2035. The divergence between Australia's emissions trajectory and a 1.5°C pathway is already clear by 2030, when pathways require cuts of at least 60% below 2005 levels compared with Australia's inadequate 43% 2030 net emissions target.

In absolute terms, Australia's net emissions need to be at 173 $MtCO_2e$ by 2030 (248-103 $MtCO_2e$ compared with the 2030 NDC target of 314 $MtCO_2e$) and at 116 $MtCO_2e$ by 2035 (67-149 $MtCO_2e$). Under the most ambitious pathways, Australia needs to reach net zero greenhouse gas emissions as soon as between 2040 and 2045. By 2050, emissions range between -59 and 25 $MtCO_2e$. If net emissions remain above zero, additional carbon dioxide removal, whether conventional or technological, will be required to meet the government's legislated goal of reaching net zero greenhouse gas emissions by 2050.

What is needed for this round of NDCs is identified in the above sections (Climate Action Tracker, 2024b). A comprehensive climate target package must include 1.5°C aligned 2030 and 2035 targets. The design of the new net-zero plan provides an opportunity for alignment among submissions to the UNFCCC. The NDC and net-zero plan must set out sectoral pathways with dates and milestones so the public and policymakers can see what must be done across sectors of the economy, and report the contributions from LULUCF and other carbon dioxide removals separately.

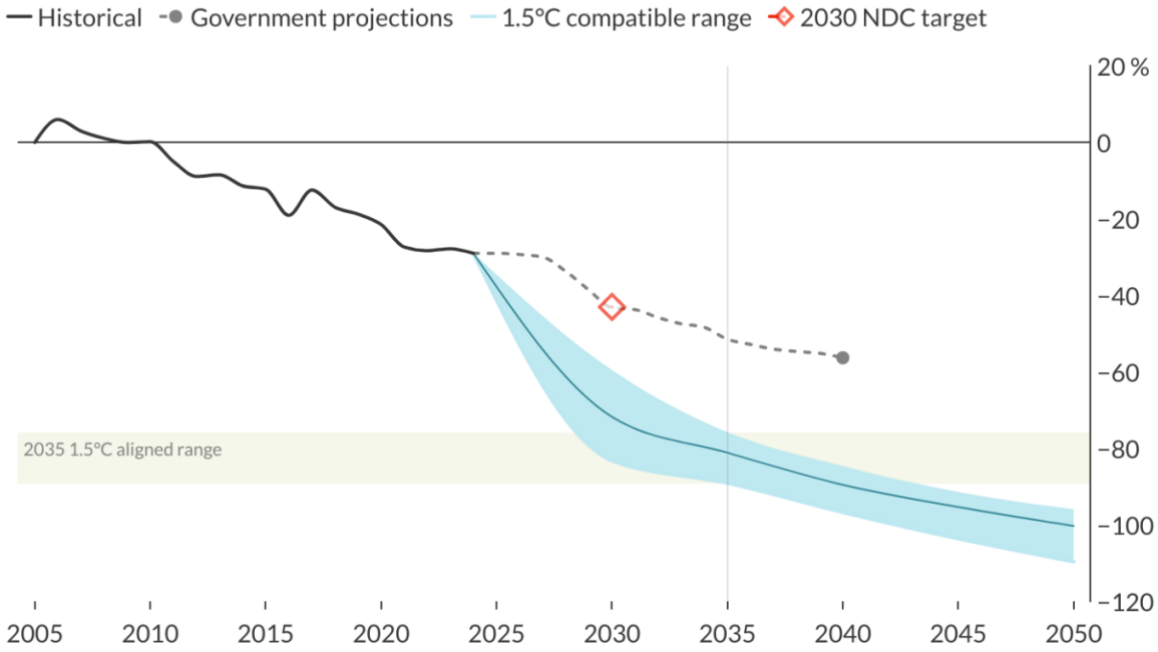
## Australia's net emissions

Australia's historical and projected greenhouse gas emissions, including land use, land-use change and forestry, relative to 1.5°C aligned pathways ($MtCO_2e$).




## Australia's net emissions, relative to 2005 levels

Australia's historical and projected greenhouse gas emissions, including land use, land-use change and forestry, compared with 1.5°C aligned pathways, relative to 2005 (%).




| | 2030 | 2035 | 2050 |
|---|---|---|---|
| **1.5°C aligned net emissions reduction below 2005 levels** | **-72% (-60% to -83%)** | **-81% (-76% to -89%)** | **-100% (-91% to -104%)** |

*Table 2*

## Getting to net-zero $CO_2$ emissions

Carbon dioxide emissions are the main driver of climate change, with a near-linear relationship between this gas's cumulative emissions and average global temperature rise (IPCC, 2021). Australia's net carbon dioxide emissions have dropped by more than a third between 2005, the NDC's base year, and 2024, but most of this reduction is due to the transition of the LULUCF sector from a net emitter to a net sink. In 2005, the sector *emitted* over 50 $MtCO_2$; by 2024, it *sequestered* around 100 $MtCO_2$.

If we exclude the LULUCF sector, fossil $CO_2$ emissions from the Australian economy are similar to 2005 levels, at close to 380 $MtCO_2$, after peaking at 420 $MtCO_2$ in 2018. No material progress has been made in cutting fossil carbon emissions. At the time of writing, carbon dioxide accounted for close to two thirds of Australia's greenhouse gas emissions (excluding the LULUCF sector), around the same share of greenhouse gas emissions we can see globally. Most of these $CO_2$ emissions result from the burning of fossil fuels for energy.

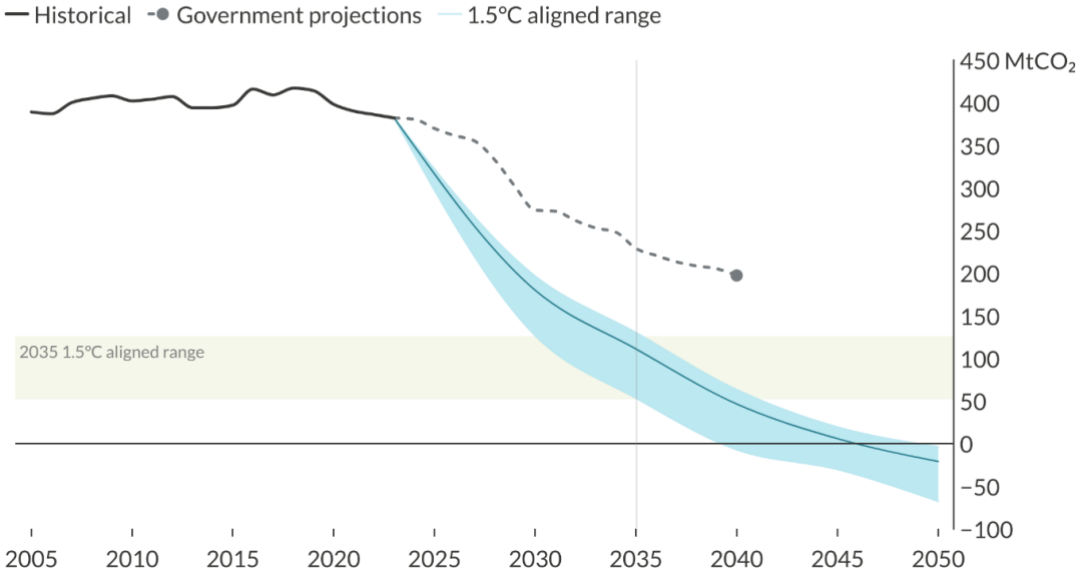
In the government projections, by 2030, $CO_2$ emissions are 28% and 30% below their 2023 and 2005 levels, respectively, and 40% and 41% below 2023 and 2005 levels by 2035, excluding LULUCF. As per the government, the power sector transition and the closure of carbon-intensive coal power plants will make the bulk of the $CO_2$ emissions reduction to 2040. As with net greenhouse gas emissions, the government anticipates the pace of $CO_2$ emissions reductions to decrease in the period post-2035.

Under 1.5°C aligned pathways, $CO_2$ emissions must decrease at a much steeper pace from now to 2040. By 2030, $CO_2$ emissions need to be 54% below 2005 levels (50-67%), and 71% (67-86%) by 2035.

Reaching such levels of $CO_2$ emissions reductions requires a whole-of-economy transformation across sectors. What is needed for the energy-consuming sectors (a swift transition to a near-fully renewable powered electricity system, decarbonisation of transport, industry and buildings energy demand) is detailed in the illustrative pathways analysis below.

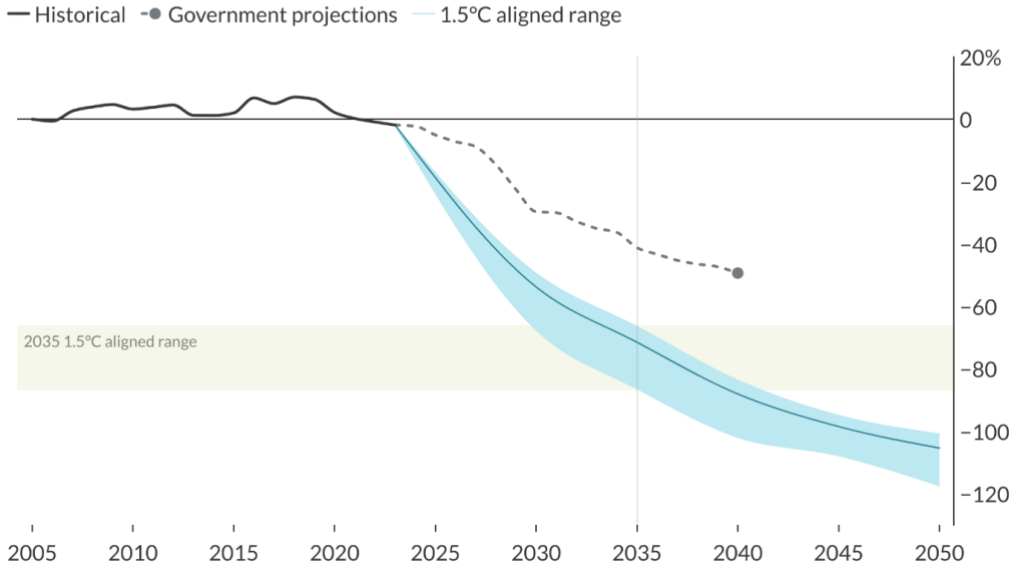
## Australia's gross $CO_2$ emissions

Australia's historical and projected $CO_2$ emissions, excluding land use, land-use change and forestry, compared with the 1.5°C aligned range ($MtCO_2$).




## Australia's gross $CO_2$ emissions, relative to 2005 levels

Australia's historical and projected $CO_2$ emissions, excluding land use, land-use change and forestry, compared with the 1.5°C aligned range, relative to 2005 levels (%).




| | 2030 | 2035 | 2050 |
|---|---|---|---|
| **1.5°C compatible $CO_2$ emissions reduction below 2020 levels, excluding LULUCF** | **-54% (-50% to -67%)** | **-71% (-67% to -86%)** | **-105% (-101% to -117%)[7]** |

*Table 3*

[7] Negative gross $CO_2$ emissions require the rollout of technologies such as BECCS and DAC.

## Urgent action on methane emissions needed

Methane ($CH_4$) is a short-term driver of climate change. Over a 100-year period, one gramme of non-fossil methane traps as much heat as 27 grammes of carbon dioxide, while fossil methane traps the equivalent of about 30 grammes before it breaks down (Greenhouse Gas Protocol, 2024). Its brief atmospheric lifetime makes it a priority for greenhouse gas emission reductions. The Global Stocktake text calls on Parties to "accelerate the substantial reduction of non-carbon-dioxide emissions globally, in particular methane emissions, by 2030" (UNFCCC, 2023).

Three sectors account for the bulk of global and Australian methane emissions. Their relative contributions have remained consistent over time. The largest source is land and agriculture (classified under LULUCF and agriculture in the UNFCCC system). Together, they account for about two thirds of Australia's methane emissions. Ruminant animals release methane during digestion, rice paddies emit it from flooded soils, manure storage and application produce it as organic waste decomposes. Land use changes such as deforestation, biomass burning, and organic matter decomposition in wetlands contribute too to methane output.

The energy sector accounts for about a quarter of Australia's $CH_4$ emissions (DCCEEW, 2024c). Fossil fuels emit methane at various stages of their value chain. Coal mining releases methane as geological seams are disrupted. In the oil and fossil gas industry (where fossil gas typically contains over 90% methane), methane escapes during extraction, processing, pipeline transit, storage and LNG handling. Such uncontrolled releases are known as fugitive emissions.

For coal, fossil gas, and oil, estimates of methane emissions have been revised upwards. A 2021 study found that satellite-gathered emissions were significantly higher than reported inventories for six coal mines in Queensland (Sadavarte et al., 2021). A 2025 report found that coal methane emissions across Australia were 40% higher than reported, and in New South Wales, fugitive emissions were twice as high as officially reported (Ember, 2025b).

Less data is available for the Australian oil and gas industry, but U.S. research points to the same trend. Using a million aerial measurements, researchers found high regional variability, with a production-weighted average loss rate of 2.95% for fossil gas, three times higher than inventory estimates (Sherwin et al., 2024).

The waste sector contributes 10% of Australia's $CH_4$ emissions (DCCEEW, 2024c). Organic material breaking down in landfills and wastewater treatment plants, in the absence of oxygen, produces methane. Australian landfill operators may earn Australian Carbon Credit Units (ACCUs) by combusting it onsite or by converting it to biomethane for subsequent use.

Overall, methane accounts for around 30% of Australia's greenhouse gas emissions (DCCEEW, 2024c).

Australia has signed the Global Methane Pledge, a call to cut $CH_4$ emissions globally by 30% below their 2020 levels by 2030 (Climate & Clean Air Coalition, 2022). As of January 2025, 159 countries had signed onto the pledge (Climate & Clean Air Coalition, 2022). Yet Australia's methane emissions are only projected to be 2% below 2020 levels by 2025. The government

anticipates that methane emissions will be 4% below 2020 levels by 2030, to be compared to the 30% target from the Global Methane Pledge represented in the graph below.

In other words, the Australian government anticipates failing to meet the target for a pledge it has itself endorsed, and by a large margin. One could argue that the Global Methane Pledge establishes an international collective goal that all countries should work toward, and that what matters is whether this goal is reached globally, not by individual countries. In an unequal world, though, not all countries have the same capacity to contribute. The hindrance Australia is causing in reaching this goal would have to be balanced by accelerated progress elsewhere. As one of the world's wealthiest countries (and, by consequence, in history), this is hardly fair.

Post-2030, the government projects a slightly accelerated decline, albeit from a low starting point, with methane emissions decreasing by 4% between 2030 and 2035.

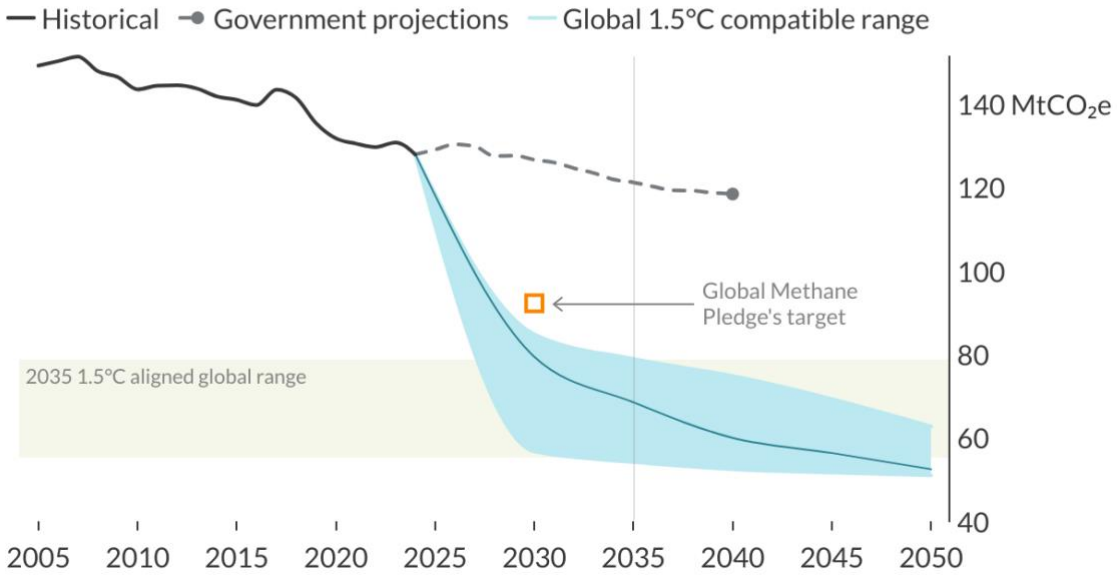
By comparison, to be consistent with global 1.5°C aligned pathways, methane emissions need to be 40% (36%-56%) below 2020 levels by 2030, slightly exceeding the level of ambition from the Global Methane Pledge.[8]

By 2035, methane emissions must be 48% (41-58%) lower than in 2020. Emissions would then need to continue to decline, though more slowly, until 2050 when sectors such as agriculture still generate residual $CH_4$ emissions. Aligning with 1.5°C pathways requires a major step change in ambition, given the already large gap between current policies and the Global Methane Pledge that Australia has signed onto, as shown below.

[8] Since methane emissions are not downscaled, unlike the other data in this report, this range is based on global pathways; it aligns with the level of methane emissions reductions required worldwide. See methodology section for more details. As identified in 2021, the Global Methane Pledge's target falls within the interquartile range of SR1.5°C pathways, but short of the median (Climate Analytics, 2021a). This report uses more recent AR6 pathways.

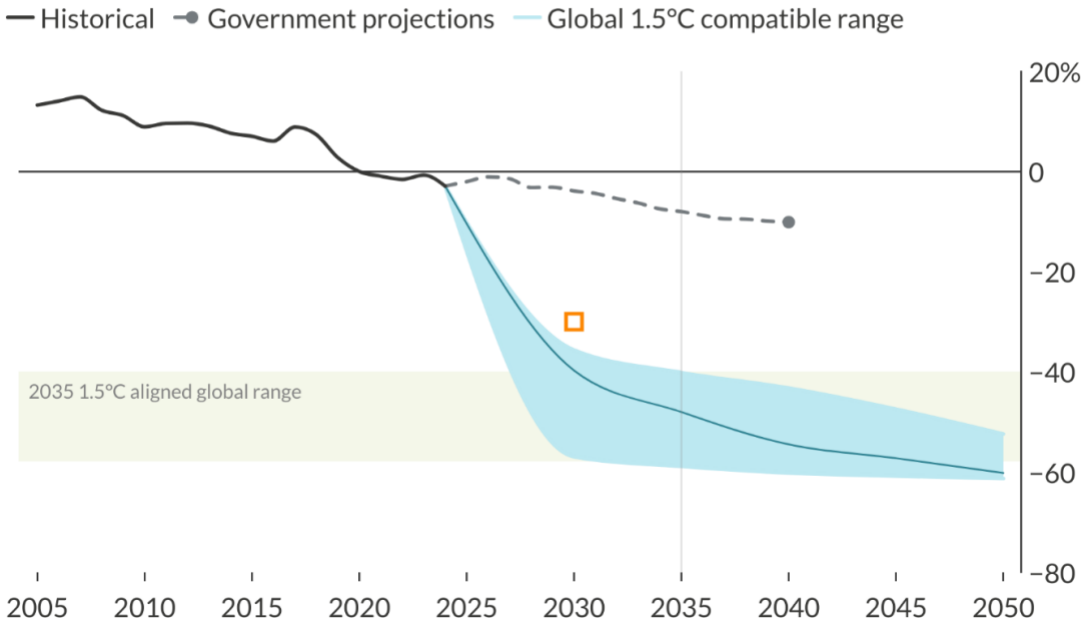
## Australia's methane emissions

Historical and projected methane emissions, shown alongside requirements under 1.5°C aligned global pathways and the Global Methane Pledge ($MtCO_2e$).




## Australia's methane emissions, relative to 2020 levels

Historical and projected methane emissions, shown alongside requirements under 1.5°C aligned global pathways and the Global Methane Pledge, relative to 2020 levels (%).




| | 2030 | 2035 | 2050 |
|---|---|---|---|
| **1.5°C aligned methane emissions reductions below 2020 levels** | **-40% (-36% to -56%)** | **-48% (-41% to -58%)** | **-60% (-52% to -61%)** |

*Table 4*

Considering Australia's methane emissions profile, multiple options can be implemented to reach these levels of emissions reductions, but this needs to be undertaken across the economy as methane abatement potential varies substantially by sector.

In agriculture, the substitution of feed supplements can reduce enteric fermentation, responsible for close to two thirds of methane emissions from the sector, although their current mitigation potential is evaluated as limited by the CCA (CCA, 2024b). Solutions for fertiliser and manure management are also commercially available, but as with supplements, cost remains the main barrier to adoption, along with awareness and capacity for improved manure management practices.

R&D provides a venue for driving down the costs of agricultural GHG emissions reduction solutions (CCA, 2024b). In 2023 the CCA recommended that the government fund an "extensive", "challenge based" R&D and incubation program for emissions reduction solutions in the sector, which could be coupled with an overhaul of existing incentives and links to international research initiatives. The CCA also cites shifts in food consumption patterns, including a switch to lower emissions protein sources and changes in dietary preferences, as additional factors that could reduce emissions (CCA, 2024b).

In the energy sector, many solutions are already financially and technically viable, notwithstanding the fact that methane leaking from the fossil gas supply chain represents money left on the table for fossil fuel producers.

The IEA notes that "tackling methane emissions from fossil fuel operations represents one of the fastest and lowest-cost opportunities to reduce greenhouse emissions globally", with nearly 40% of oil and gas methane emissions globally abatable at no net cost (IEA, 2025b).

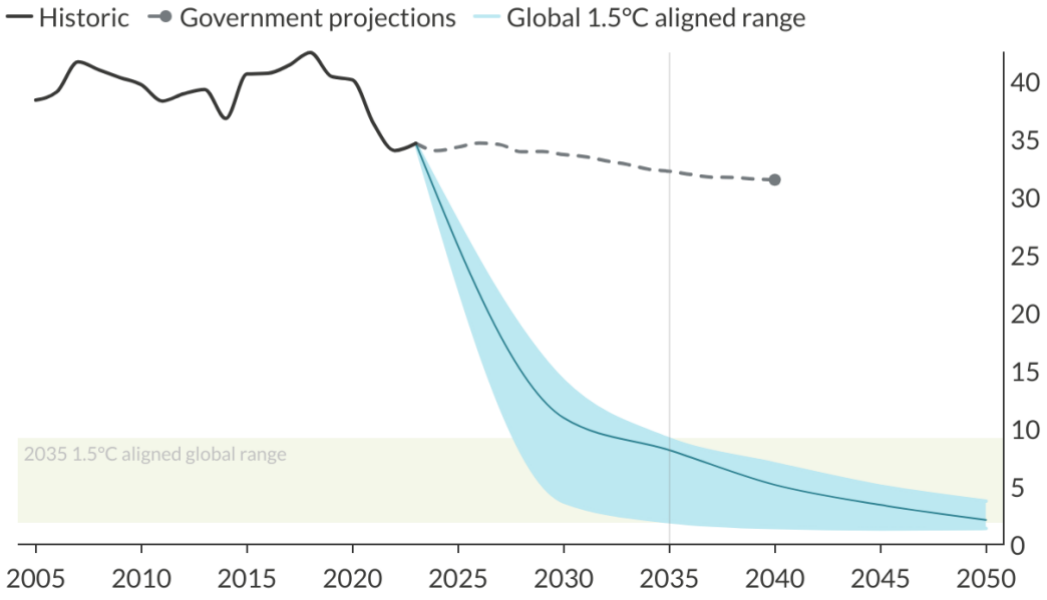
As a result, to be consistent with 1.5°C aligned global least-cost pathways, energy-related methane emissions must drop by 73% below 2020 levels by 2030 (65-91%), and 80% by 2035 (77-95%). This decline is much steeper than in agriculture, LULUCF and waste, in line with the difference in abatement potential. The IEA Net Zero Emissions scenario sits in the middle of this range, with energy-related methane emissions reductions of 75% and 85% below current levels by 2030 and 2035, respectively (IEA, 2025b).

In these scenarios, fossil fuel production and consumption decrease too; a fossil fuel phase-out in alignment with the 1.5°C limit would naturally lead to lower methane emissions, in addition to the other co-benefits linked to the transition away from coal, fossil gas and oil.

A comprehensive NDC target should include specific sectoral targets for methane emissions. Thirty NDCs from the previous update round specified measures for energy methane abatement, and multiple 2035 NDCs, such as those of Brazil, Canada and the United Arab Emirates, three fossil fuels producers, include some (IEA, 2025b).

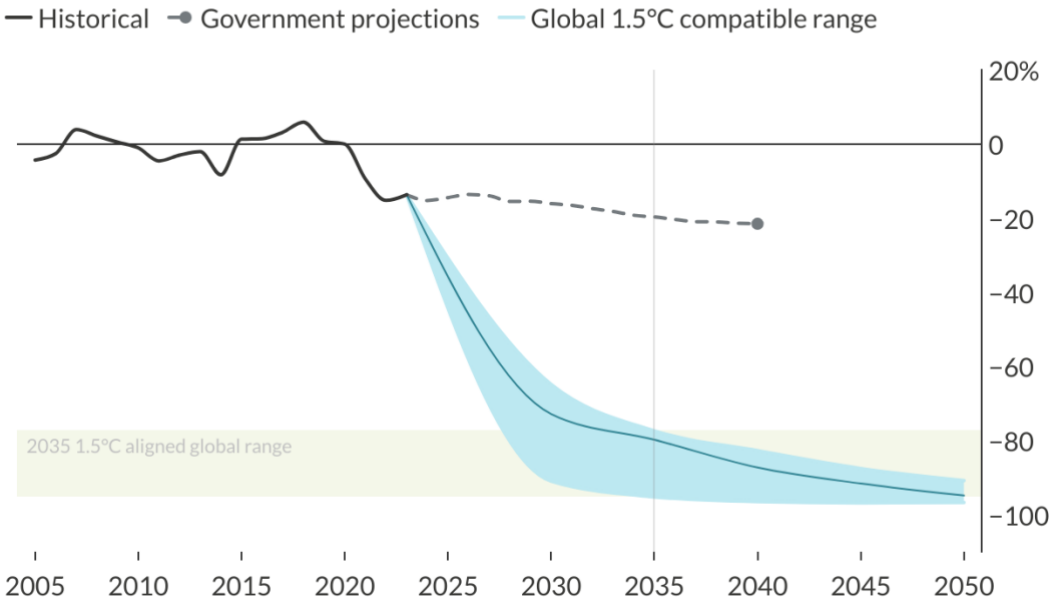
## Australia's energy-related methane emissions

Historical and projected energy-related methane emissions, compared to 1.5°C global pathways ($MtCO_2e$)




## Australia's energy-related methane emissions, relative to 2020 levels

Historical and projected energy-related methane emissions, compared with 1.5°C aligned pathways, relative to 2020 levels (%).




| | 2030 | 2035 | 2050 |
|---|---|---|---|
| **1.5°C aligned energy-related methane emissions reductions below 2020 levels** | **-73% (-65% to -91%)** | **-80% (-77% to -95%)** | **-94% (-91% to -97%)** |

*Table 5*

# Sectoral analyses

## Illustrative pathways

Bridging the gap between existing policies and pathways aligned with the 1.5°C limit requires economy-wide measures. To show what this transformation entails, we examine in detail three AR6 1.5°C aligned scenarios from the above range, selected based on sustainability criteria. These scenarios, provided at the macro-regional level, are downscaled to the sectoral level to form three *illustrative pathways* for Australia, as per (Climate Analytics, 2022). Each has its own narrative:

- The Deep Electrification pathway best captures the rapid cost reductions seen in wind and solar, as well as battery storage over the past decade and the potential for future progress, which have been historically underestimated and contribute to in-depth, society-wide electrification (Luderer et al., 2021)
- The Minimal CDR Reliance pathway limits carbon dioxide removals, thus constraining the deployment of uncertain technologies and hard-to-predict reliance on natural sinks (Strefler et al., 2021). Being the only illustrative pathway based on SSP1 (the others being based on SSP2), it factors in a shift toward more sustainable and equitable development.[9]
- Finally, the Net Zero Commitments pathway accounts for major economies reaching their net-zero goals at their stated dates (2050 for Japan, and 2060 for China and Russia, for example) through stringent policies and innovation (NGFS, 2024).

For each of these pathways, we explore their trajectories and implications for power, industry, transport and buildings.

[9] Shared Socioeconomic Pathways (SSPs) are scenarios used in climate modelling to explore how global society, demographics, and economics might change over the century. SSP2, the "Middle of the Road" pathway, assumes that trends broadly follow historical patterns (IPCC, 2023; Meinshausen et al., 2020).

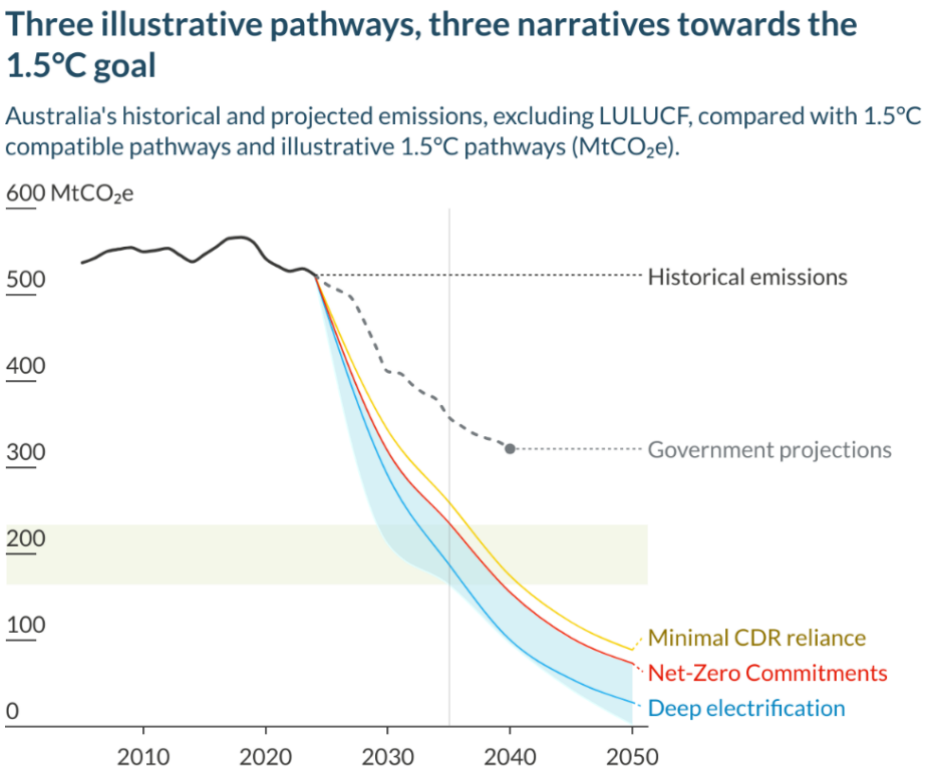



*Figure 6*

## Power sector

Electricity generation accounts for a third of Australia's emissions, including LULUCF (DCCEEW, 2024c). Relative to its peers of similar socio-economic conditions, Australia's electricity system is characterised by contradictions. It has been an early starter in renewable deployment, and is still ahead of the pack globally, although the rate of investments towards new solar and wind projects is losing momentum. In the meantime, it is still highly dependent on coal, with the ageing and increasingly unreliable fleet projected to generate 43% of Australia's electricity in 2025 and contributing to around a quarter of the country's total greenhouse gas emissions (DCCEEW, 2024c).

With some of the best renewable potential globally, decarbonising Australia's power sector is a low-hanging fruit. This NDC update round offers a chance for the government to raise ambition ahead of COP31, in line with the Global Stocktake call to triple renewable energy capacity globally and accelerate efforts towards the phase-down of unabated coal power (UNFCCC, 2023).

### Renewable power generation

The government's renewable energy target is 82% of on-grid renewable power generation by 2030. Factoring in off-grid power generation, distributed in industrial facilities in remote areas, this is equal to 77% of renewable generation nationwide by the end of this decade. The Australian Energy Market Operator factors in reaching this target as an input in their model, even for the most conservative scenario (AEMO, 2024).

The independent Climate Change Authority estimated a shortfall of 8 GW of capacity in the National Electricity Market, the East Coast's grid and the largest in the country, at the end of 2024 (CCA, 2024a). Based on trends and momentum, the International Energy Agency projected last year that renewables would account for close to 60% of Australia's power generation by 2030, well below the government's targets (IEA, 2024c). As a consequence, the government announced another overhaul of the Capacity Investment Scheme in July 2025, raising the 2030 storage capacity target by 5 GW and the generation target by 3 GW (DCCEEW, 2025a).

Various obstacles including labour shortages, permitting and grid delays, need to be overcome by strengthening the scope and scale of recent policy developments like the Capacity Investment Scheme overhaul (CCA, 2024a; Clean Energy Council, 2025). The government's election platform, in that regard, only included one policy for incentivising the rollout of home batteries (CarbonBrief, 2025).

This target, whose achievement is already challenging, is insufficient to align with 1.5°C compatible pathways. In Paris-aligned power sector benchmarks, the share of renewables in developed countries generally reaches above 90% by 2035 (Climate Action Tracker, 2023b). In the Net Zero Commitments illustrative pathway, for instance, the share of renewables in the power mix reaches 90% by 2030, exceeding the government's target, and further increases to 97% by 2040.

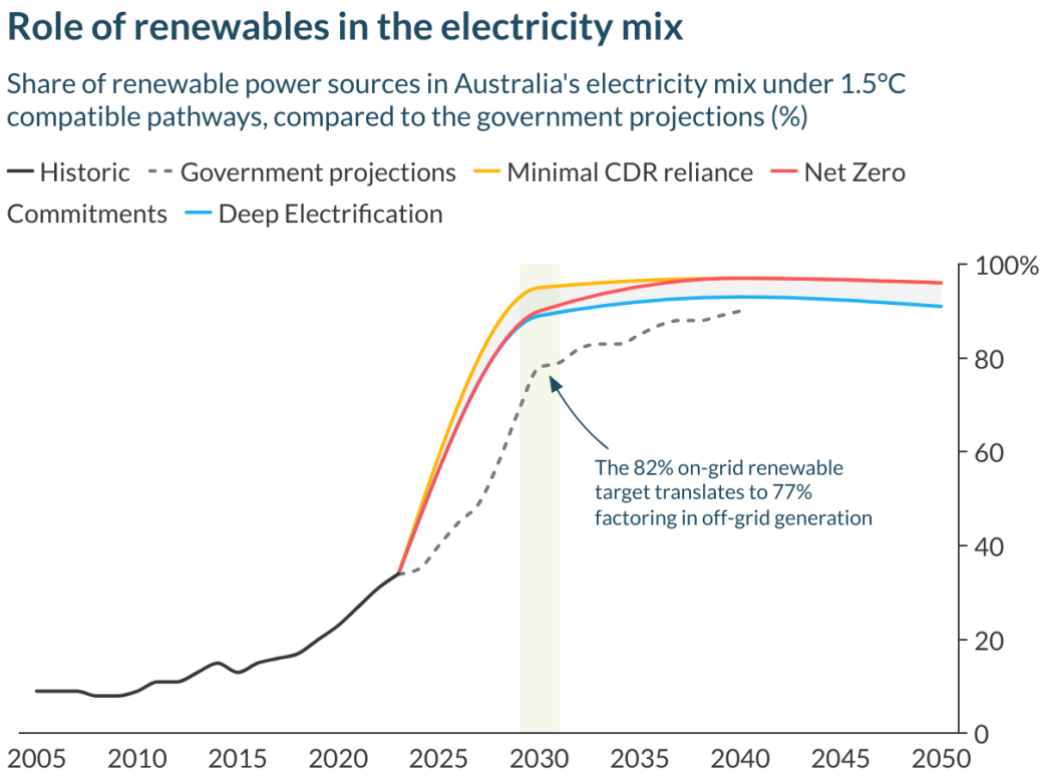



*Figure 7*

Under the 1.5°C compatible illustrative pathways, total renewable generation far outpaces the government projections, both driven by its increased penetration but also by the economy-

wide electrification of end-uses, such as households switching to electric appliances and electric vehicles, as well as industries phasing out fossil fuels for more efficient, electricity-based means of production.

As shown below, in the Deep Electrification pathway, where the cost decline in renewables is put to good use for broad, economy-wide electrification, 2050 power demand increases more than sevenfold relative to 2040.

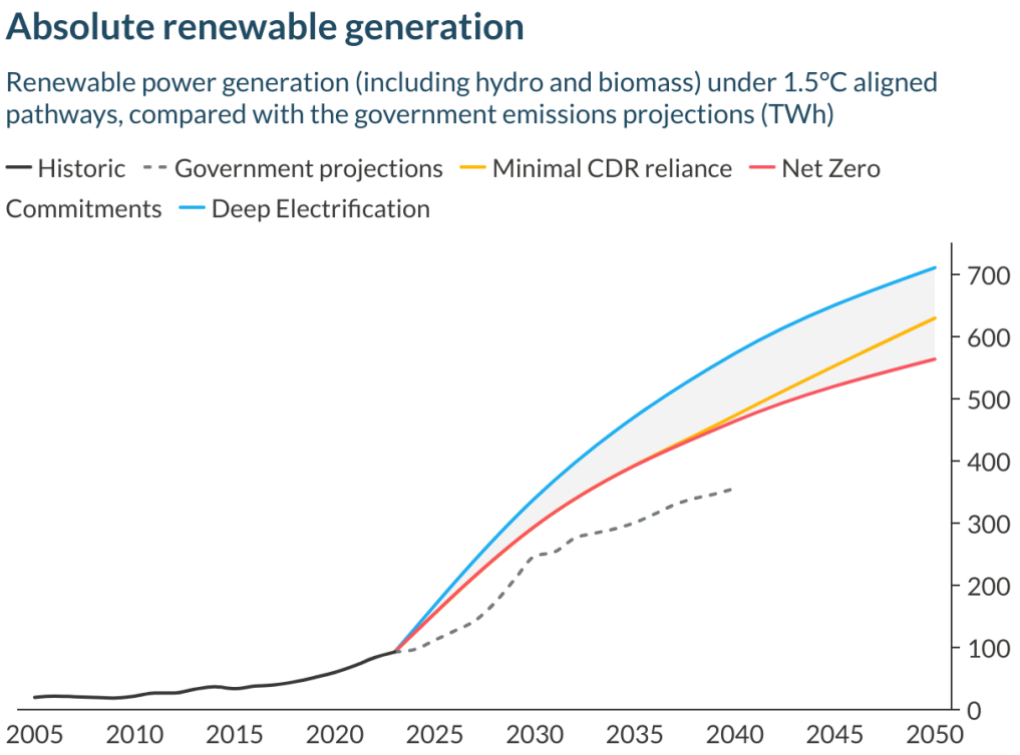



*Figure 8*

Given its abundant renewables potential, the power sector is a low hanging fruit for Australia's decarbonisation and its alignment with the 1.5°C limit. Multiple studies have shown that Australia can successfully reach a near-total renewable penetration by 2035 (CCA, 2024b).

This transition comes with economic co-benefits for citizens and businesses. The highest prices recorded in the National Electricity Market between 2018 and today occurred not when there was no wind and sun, but when floods constrained coal supply in New South Wales. Gas prices were at their highest while hydro production was low (IEEFA, 2025). Historically, gas and electricity wholesale prices had a 90% correlation in the NEM, while periods of increasingly high penetration of renewables have been consistently correlated with lower prices across all East Coast states (IEEFA, 2025).

In the context of a public discourse dominated by the theme of cost-of-living, fostering renewables deployment has the potential to ease power bills by displacing increasingly unreliable and expensive fossil fuel-powered generation. To align with 1.5°C compatible pathways, the government needs to enhance the ambition of its renewable energy target,

increase its scope to include off-grid power generation, and implement the policy and actions needed to meet it.

### Coal power

Accelerating renewables deployment would invariably displace coal power from the electricity mix. Coal power generation emissions account for over 80% of total power system emissions, around one quarter of Australia's total emissions.[10] The latest IPCC assessment concluded that meeting the global climate commitment of limiting warming to 1.5°C requires a "rapid shift away from unabated coal consumption" and an "accelerated retirement of existing coal plants" (IPCC, 2023).

Coal's harm does not stop at climate. The coal fleet's dwindling reliability and fuel price volatility have been linked to the rise in electricity prices, ultimately impacting businesses and households (Reserve Bank of Australia, 2022). The pollutants released at the Tarong plant, in Queensland, impact the air quality of Brisbane's inhabitants, 200 kilometres east (Greenpeace, 2020).

Progress is slowly being made to get coal out of Australia's two main grids, the National Electricity Market and the South West Interconnected System. 2022 marked the first time it contributed less than half of the country's total electricity generation. As of 2024, the national coal fleet comprised 18 plants totalling 53 units, for a total installed capacity of over 22 GW. The existing fleet is old, with a capacity-weighted average age of 36 years. Eight units deployed back in the 1970s are still operating, and two-thirds of the fleet started operating before 1989. Its age contributes to the fleet's dwindling availability, which has reached new lows in the first quarter of 2025 (AEMO, 2025).

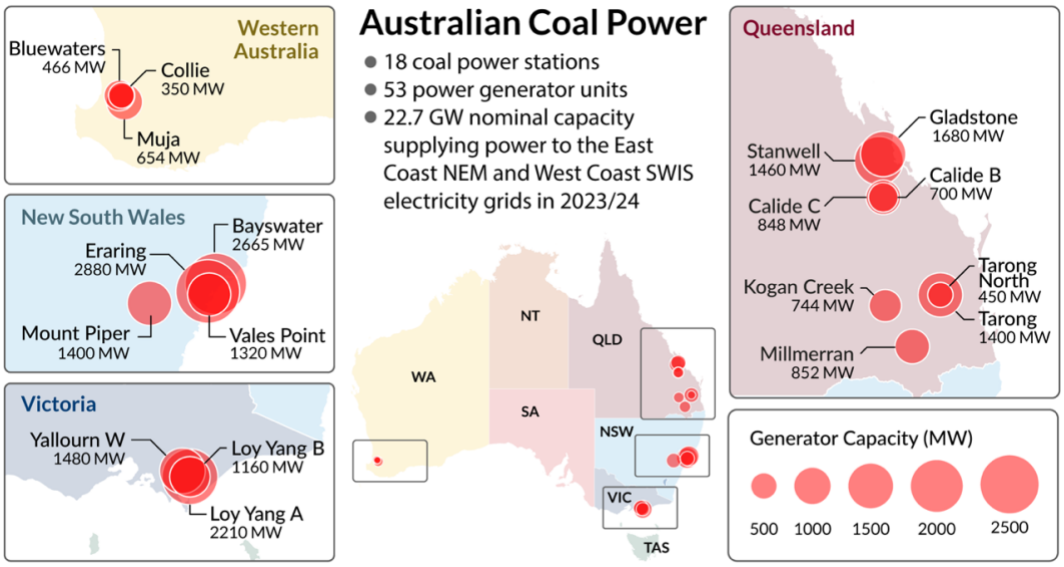



*Figure 9: Map of Australia's coal power stations (AEMO, 2024; Energy Transformation Taskforce, 2020; Open Electricity, 2025).*

[10] Using the NEM coal power emissions intensity for the year 2024 (Open Electricity, 2025).

The government's emissions projections forecast coal capacity to decline to 9 GW in 2030, and 1 GW by 2040. Under this scenario, projected coal generation falls from 120 TWh in 2025 to 38 TWh by 2030 and then to 7 TWh in 2035.

Over the same period, power sector emissions decline from 144 $MtCO_2e$ in 2025 to 59 $MtCO_2e$ by 2035 and reach 29 $MtCO_2e$ in 2040. Because the government projections report extends only to 2040, it does not include a coal phase-out, which, considering the remaining fleet's age and Australia's net-zero goal, would more likely occur between 2040 and 2050.

Such unfolding would not be aligned with Paris-aligned global benchmarks for the power sector, which require developed countries to essentially phase out coal by 2030 (Climate Action Tracker, 2023b). The Minimal CDR Reliance illustrative pathway, for instance, shows that a rapid exit from coal power generation in accordance with the benchmarks is possible.

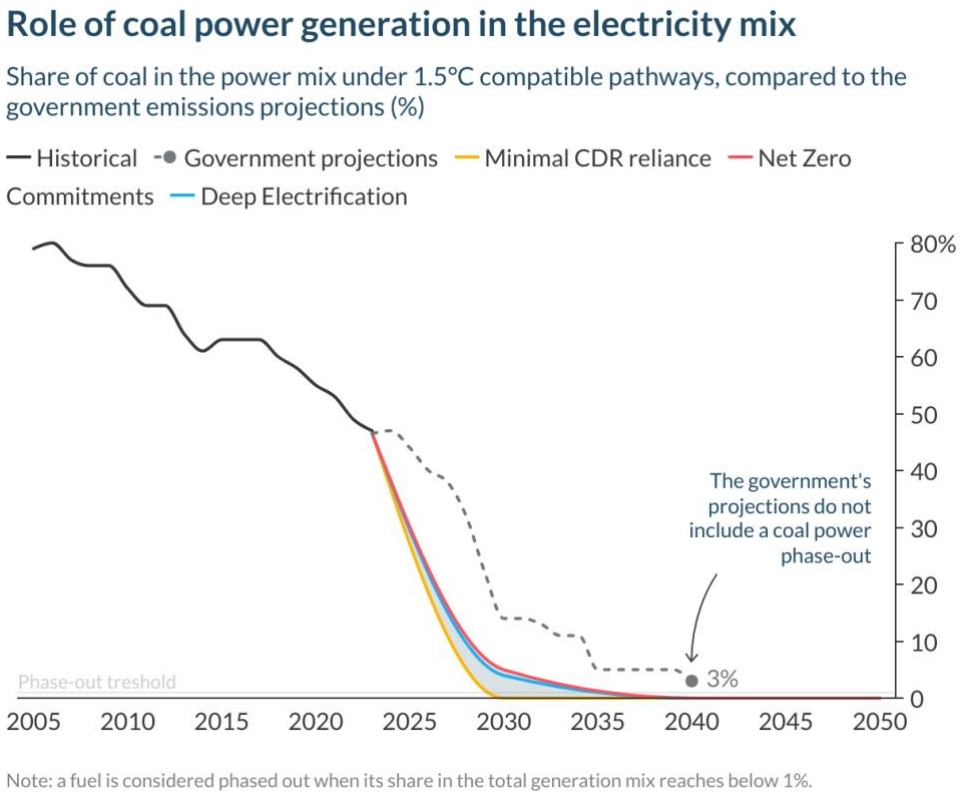



*Figure 10*

This type of power system transformation is not unheard of, although not of this magnitude. While far from being best-in-class in terms of climate action, the United Kingdom cut the share of coal in its power mix from 39% in 2012 to 2% in 2022 (Ember, 2023). It shut down its last coal plant in 2024, 142 years after having built the world's first coal-fired power station (ABC, 2024).

Chile, which shares with Australia not only a comparable population but also significant renewable potential, saw electricity demand rise by 30% between 2014 and 2024 as it moved from a middle to a high-income country. Yet, during that period, the share of coal in its power mix fell from 38% to 16% and the roles of fossil gas and oil declined as well. The government

signed bilateral agreements with coal plant owners and operators to retire all capacity by 2040 at the latest (Ember, 2025a; GIZ & PPCA, 2024; World Resources Institute, 2023).

Coal's dominant role in both Australia's emissions profile and power system makes it an immediate priority for government action, the most direct and potentially effective lever available to policymakers. So far, its future has been left to hinge on the as-yet uncertain reliance on gas for power and pace of renewable deployment, introducing an ambiguity further compounded by the delayed retirement of plants like Eraring in New South Wales (RenewEconomy, 2025).

The uncertainty is felt across society. The results from one of the supporting materials for the draft ISP 2024, a survey of Australian citizens on their perception of the power system transition led by Antenna Insight, are telling:

- "*We do not seem to have a direction where we are going with the electricity supplies, which kind of hating on the coal, kind of touching base a little bit on renewables, but there is no real direction*", observes a citizen from Goulburn.
- *"So is this plan out 'til 2030, 2035, is that going to be an open plan? Are they going to be sharing about this is what we expect to happen and stuff like that?"*, notes another.
- "*I think transparency is really important and knowing what's coming sort of helps*", explains a citizen from Rockingham, Queensland, where coal contributes to the local economy (Antenna Insight, 2023).

This is not restricted to the public. As noted by the Clean Energy Investors Group, "*many investors and lenders require a high bar of legislated policy or a clear implementation plan*" for the power sector transition (Clean Energy Investor Group & Baringa, 2023).

Filling this policy gap with a clear, 1.5°C aligned timeline for coal plant retirements and a definitive phase-out date would send a strong signal in position to give stakeholders and the public the visibility they currently lack on one of the largest national sources of emissions.

### Fossil gas

Coal's exit from the power system should not leave the door open for fossil gas, another fossil fuel. This energy carrier was the largest source of $CO_2$ emissions increase from 2010 to 2019 (Climate Analytics, 2021b). Like coal, its emissions are still underestimated because of the inadequate monitoring and accounting of methane emissions from its lifecycle. The IEA estimates that energy methane emissions in Australia are more than twice the amount reported as per the Australian National Greenhouse and Energy Reporting scheme (IEA, 2025b).

Fossil gas plays a vastly different role across Australia's diverse power grids. While it is a relatively minor contributor in the NEM, accounting for less than 5% of generation in 2024, it represented close to one third of the power output in the South West Interconnected System, Western Australia's major grid, and the majority of total power generation, including off-grid facilities, in WA and the Northern Territory (DCCEEW, 2024a; Open Electricity, 2025). More gas is consumed at LNG plants for electricity generation and other production-oriented uses than at all the country's gas fired power plants combined (DCCEEW, 2024a).

Given its relative importance in Australia's trade profile (close to 80% of Australia's gas production is exported as LNG), the role and potential contribution of fossil gas to global decarbonisation is often overstated (Climate Action Tracker, 2024a; DCCEEW, 2024a).

An industry-related website, for example, explains that gas "*produces fewer emissions when combusted […] than coal, contributing to a cleaner energy future*" (Keeping the Country Running, 2024). The traditionally conservative International Energy Agency recently addressed this type of commonly-made claim by stating that "*beating coal on environmental grounds sets a low bar for natural gas, especially since there are lower-emissions – and often lower-cost – alternatives to both fuels*" (IEA, 2025b). Of two evils, the lesser is still evil and does not become good by contrast.

Similarly, commenters have been quick to interpret the AEMO's Integrated System Plan as suggesting that fossil gas is necessary in the transition. The industry lobby Australian Energy Producers, the rebranded Australian Petroleum Production and Exploration Association under a more innocuous name, said the plan "*reaffirmed the critical role of gas in Australia's energy security and the urgent need for investment in new gas supply and infrastructure to enable the transition to net zero by 2050*" (EAP, 2025).

This is an instrumentalised and purposely ambiguous interpretation of AEMO's document; its modelling results show that gas-fired generation never exceeds its 2020 levels, meaning output sits below historical levels for most of the modelling period, and gas-fired plants are used much less than in the past. Installed capacity increases, with a shift from current mid-merit plants to flexible units that can be called upon when demand arises (AEMO, 2024; IEEFA, 2024b).

Under the government projections, which include off-grid power generation, such as off-grid mines or remote industrial facilities, total gas-fired generation declines from 45 TWh in 2024 to 30 TWh by 2030, reaching a low of 26 TWh by 2032, before rising again to 34 TWh by 2040. These figures should be viewed in the context of a steep increase in total power generation: gas-fired generation's share in the power mix decreases from 16 % in 2024 to 10 % in 2030 and less than 9 % in 2040 (DCCEEW, 2024c).

In comparison, Paris-aligned benchmarks for the power sector show that fossil gas must be phased out from developed countries' power system by 2035 (Climate Action Tracker, 2023b). Across all analysed pathways, fossil gas use declines rapidly and is fully phased out between 2030 and 2035.

The figures for fossil gas incorporate both unabated and abated gas-fired generation, which means these figures include units equipped with carbon capture and storage infrastructure (CCS). CCS for power is inefficient and costly, in part because of the low concentration of $CO_2$ in the exhaust streams of fossil fuel-fired plants (IEEFA, 2023).

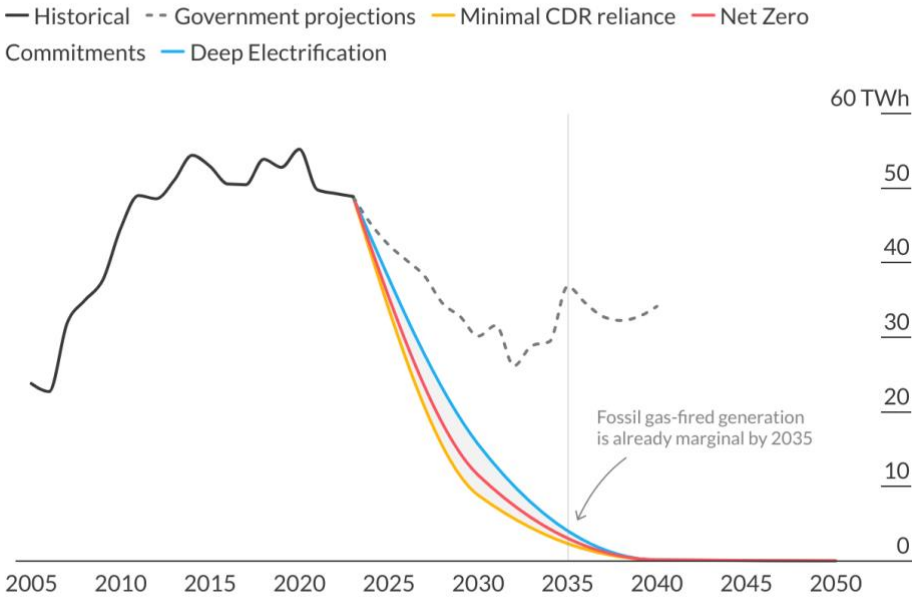
Like for coal, devising a 1.5°C aligned clear-cut timeline for the phase-out of gas units, or committing to a phase-out date instead of contingent plans for a phase-down, would provide certainty for the general public, regulators and investors.

| | Phase-out benchmarks for developed countries |
|---|---|
| **Coal-fired power generation** | 2030 |
| **Fossil gas-fired power generation** | 2035 |

*Table 6*

## Absolute fossil gas power generation

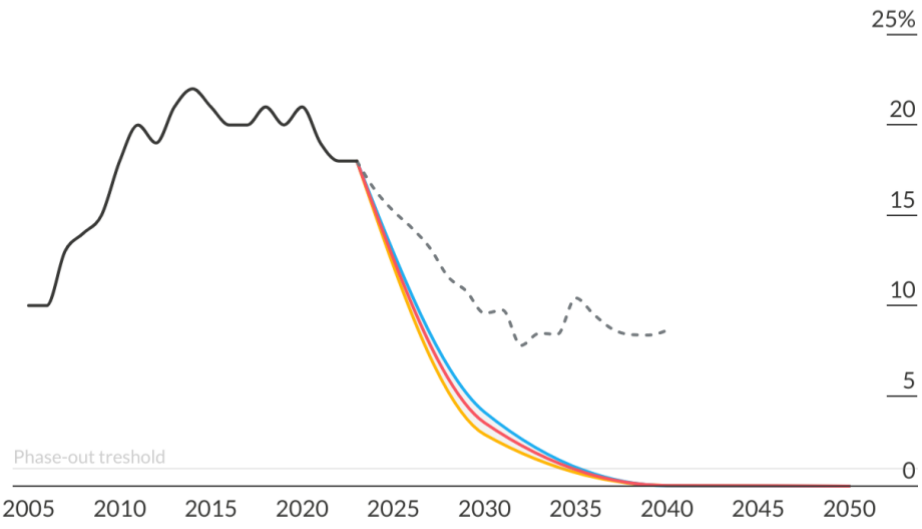
Fossil gas power generation under 1.5°C aligned pathways, compared with the government emissions projections (TWh).




Note: the 1.5°C aligned pathways include fossil gas power generation both with and without carbon, capture and storage. These figures include off-grid generation.

## Role of fossil gas power generation in the electricity mix

Share of fossil gas in the power mix under 1.5°C aligned pathways, compared with the government emissions projections (%)




Note: the 1.5°C aligned pathways include gas both with and without carbon, capture and storage. These figures include off-grid generation.

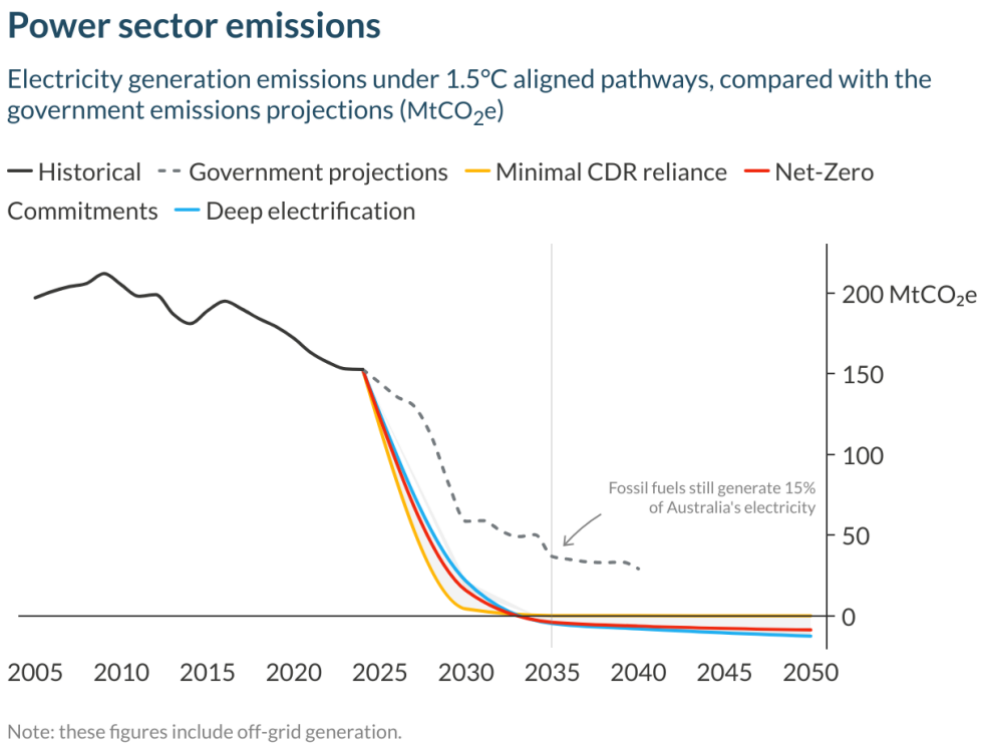



*Figure 11*

## Transport

As emissions from the power sector are set to decline under current policies, transport is projected to become the country's largest source of emissions by 2030 (DCCEEW, 2024c). It already accounted for more than a quarter of Australia's net energy consumption in 2023, of which 98% is met by oil (DCCEEW, 2024a; IEA, 2024d).

Australia's approach to transport decarbonisation remains narrow. The government legislated its long-anticipated New Vehicle Efficiency Standard (NVES) in 2024; before its release, Australia was, along with Russia and New Zealand, one of the last developed countries in the world to have no fuel efficiency standards at all, and passenger cars on Australia's roads emit 43% more $CO_2$ than in the European Union (Komnos et al., 2025). The NVES is expected to reduce passenger vehicle emissions by 11% by 2030 relative to 2025, but does little to address freight, public transport, or aviation (DCCEEW, 2024c).

The National Electric Vehicle Strategy, published in 2023, much later than in other countries with similar socio-economic conditions, is an aspirational document without binding targets, equity considerations, nor incentives for heavy duty vehicles. Policies for encouraging electric vehicle adoption are set by individual states, with all states and territories except the Northern Territory and Tasmania having electric vehicle targets of varying ambition (DCCEEW, 2023b).

Structural factors also contribute to Australia's lag. It has a high per capita car ownership rate, a strong cultural dependence on private vehicles, and vast distances between major cities that

make electrification more complex than in many peer countries (BITRE, 2024; Philip et al., 2023).

New electric vehicle sales, after historically trailing behind other developed countries, have finally started to catch up with global momentum. In 2024, 13% of vehicles sold in Australia were electric, higher than in the US (10%), New Zealand (11%), but much lower than in the United Kingdom (28%) or China (48%). Because of this lag, the share of electric vehicles in the stock was still relatively low, at only 2%, compared to 3% in the US and New Zealand, 6% in the United Kingdom, and 11% in China in 2024 (IEA, 2025a).

The delayed takeoff of electric mobility is now leading to an imbalance in charging stations, as identified by the Climate Change Authority in its latest Annual Progress report. There was one fast charger for slightly over 80 battery vehicles in 2022; that number rose to more than 200 in 2024 (CCC, 2024).

Under 1.5°C compatible pathways, transport sector decarbonisation accelerates rapidly. The Deep Electrification pathway projects a fifteen-fold increase in electricity demand from transport between 2022 and 2035, with electricity reaching 26% of the transport energy mix by 2035 and 60% by 2050.

In this scenario, broad support for electric vehicles, through a policy mix including subsidies, infrastructure investment, and other incentives, drives deep reductions in oil demand. Hydrogen plays a limited role, mainly for specific uses like heavyweight trucking. Limited deployment of biomass in transport, such as fuel blending, also supports the transition away from fossil fuels.

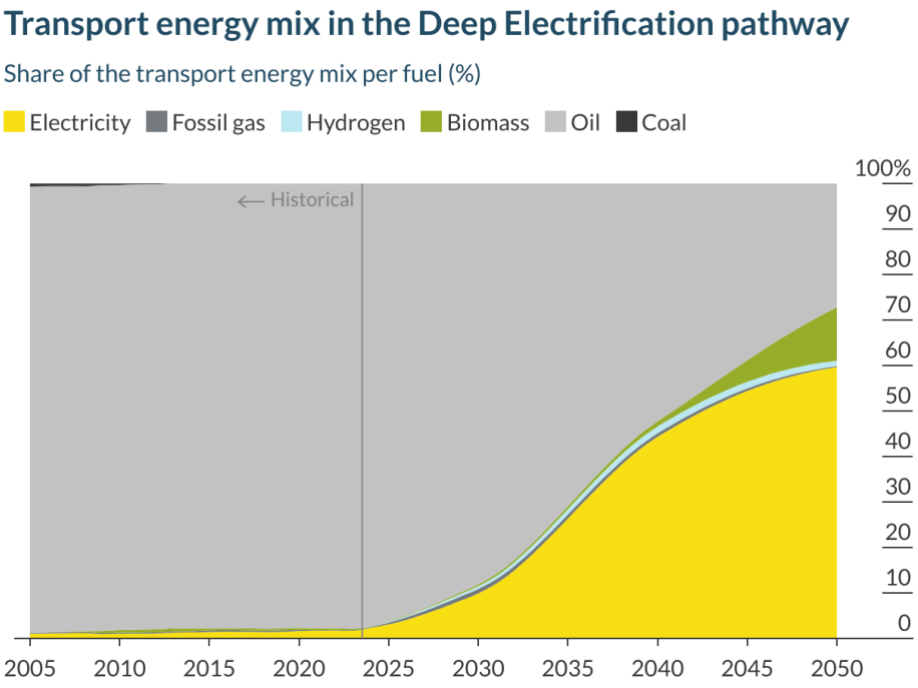



*Figure 12*

The other illustrative pathways show different paces of development but follow the same pattern: electrification then, to a limited extent, other decarbonisation such as hydrogen and biomass progressively replace oil. Under the Minimal CDR Reliance pathway, electricity consumption in transport reaches 17% in 2035 and 52% in 2050, with biomass contributing 15% of total sector consumption.

Remaining oil demand concentrated in long-haul transport like shipping and aviation may be further mitigated with synthetic fuels, not factored into these pathways. Similarly, in the Net Zero Commitments pathway, electricity accounts for 17% of transport energy consumption in 2035, rising to 46% by 2050.

This change of energy consumption for transport translates into emissions reductions. Through immediate measures for incentivising electrification, the pathways avoid the government's projections bounce in transport emissions that occurs between 2025 and the late 2020s. Overall, across the three 1.5°C compatible illustrative pathways for Australia, emission reductions for this sector reach between 27 and 45% below 2023 levels by 2035, while government projections show only around 10% decline in emissions of transport sector over the same period. Moving forward to 2050, transport emissions reach 64% to 86% below 2023 levels, at most 35 $MtCO_2e$.

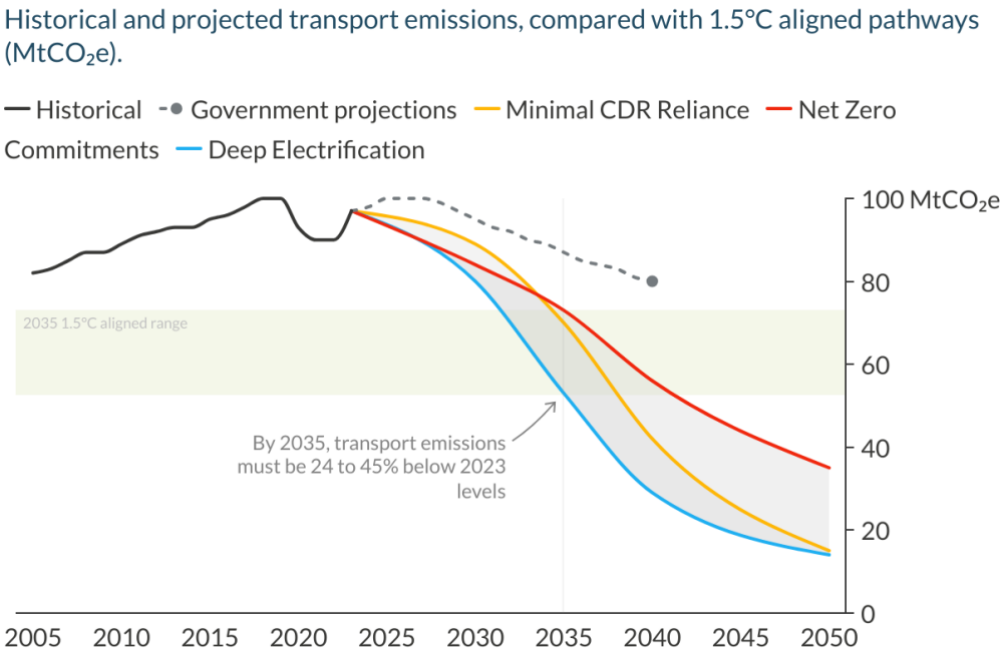



*Figure 13*

To align with these more ambitious transport pathways, Australia needs strong and immediate measures to increase EV deployment and close the gap with other countries. The Climate Change Authority names capital cost, consumer choices and challenges for charging infrastructure as barriers to adoption for light electric vehicles (Climate Change Authority, 2024). In a submission to the CCA, Tesla noted that "Australia is the most difficult country in the region to install direct current fast chargers" (Climate Change Authority, 2024).

Policy options like financial incentives, such as subsidies for purchasing EVs, support for home charging infrastructure, tax credits, and infrastructure planning to develop the charging network, as recommended by the Electric Vehicle Council, can accelerate EV rollout (Electric Vehicle Council, 2024). These would be complemented by a currently lacking target for EV rollout.

Road transport decarbonisation through electrification aligns with the expansion of renewable energy in the power sector. Renewables reduce electricity costs, lowering the total cost of electric vehicle ownership. These batteries on wheels have the potential to interact with the grid; installing chargers at workplaces allows absorbing excess power when variable renewable energy production peaks during daytime. The Australian Renewable Energy Agency's National Roadmap for Bidirectional EV Charging estimates that by 2050, the usable storage capacity of Australia's EV fleet will exceed three times the total storage capacity of the National Electricity Market (ARENA, 2025).

Heavy transport is currently a policy gap, with, as per the Productivity Commission, limited incentives to reduce their emissions (Productivity Commission, 2025). The Safeguard Mechanism has a limited coverage of heavy road freight. Submissions to the Productivity Commission have noted that there is a risk, under the current policy framework, that freight stands as a major source of residual emissions. The Commission suggests multiple policy options to fill the gap, including a component linked to emissions in a road user charging scheme, an expansion of the Safeguard Mechanism to fuel wholesalers, or adjusting the fuel tax credit rate.

Modal shift and urban mobility solutions remain a missed opportunity to cut energy demand and improve traffic, travel time, and air quality. States are leading efforts, for lack of a unified, coordinated Federal strategy. Western Australia and Victoria, for example, are expanding rail networks in their urban areas. Modeling for Australia’s transport sector shows that a diverse policy mix makes emission reduction pathways more resilient (ClimateWorks, 2024).

## Industry

Industrial emissions comprise both emissions linked to energy demand for industrial purposes and industrial processes.[11] The former refers to greenhouse gases released when an industry consumes energy to run its equipment and maintain its facilities. The latter denotes gases released during chemical or physical transformations of raw materials, such as when limestone is calcined to produce cement. Non-energy industries accounted for 18% of Australia's emissions in 2022, of which 60% were related to energy demand.

The Australian government's 2024 projections show that energy demand-related emissions from manufacturing, mining and agriculture remain broadly stable between 2025 and 2030. Mining emissions then halve between 2030 and 2035, while other sectors do not undergo structural changes. Emissions from industrial processes and product use (IPPU) are projected to fall by 25% from 2025 to 2035, driven mainly by the phase down of ozone depleting hydrofluorocarbons and technological advances in the metal industry (DCCEEW, 2024c).

To align with 1.5°C compatible pathways, Australia's industry sector must go beyond the incremental improvements achieved through increased energy efficiency thus far. Enhanced fuel switching and electrification, innovations in materials efficiency, and transformation of chemical processes and product offerings will also be necessary.

Where production-centric elimination of emissions is not immediately possible, as with some process and heat applications, efforts must be made to reduce demand for related goods. This can be achieved through materials efficiency, substitution, and circularity in downstream stages of industry value chains and the broader economy. At the global level, these strategies are estimated to be capable of reducing the embodied material emissions in the built environment by up to 56% per year by 2050 (Ellen MacArthur Foundation, 2021).

As explored below, Australia's current major industrial emissions policy, the Safeguard Mechanism, provides inadequate incentives for production-centric emissions reduction. To be an effective regulatory 'stick', it requires reform or replacement by an effective carbon pricing regime. The government has been more willing to provide policy 'carrots' to greener industrial production, primarily through the Future Made in Australia Act of 2024 (Prime Minister of Australia, 2024). This has provided production credits and other subsidies to decarbonise sectors such as iron, aluminium and related hydrogen production.

Putting the industrial sector on track for a 1.5°C future will, however, require far more commitment to phasing out emissions-intensive production and consumption, alongside the phase-in of lower emissions products and practices. This includes efforts to remove cost and technical barriers, create new green markets, and ensure continued technological breakthroughs through supported R&D. Australia also has significant room to improve its circular economy potential; recycling of metals is already a particularly mature and cost-effective technology option and is central to 1.5°C aligned pathways; scrap-based product

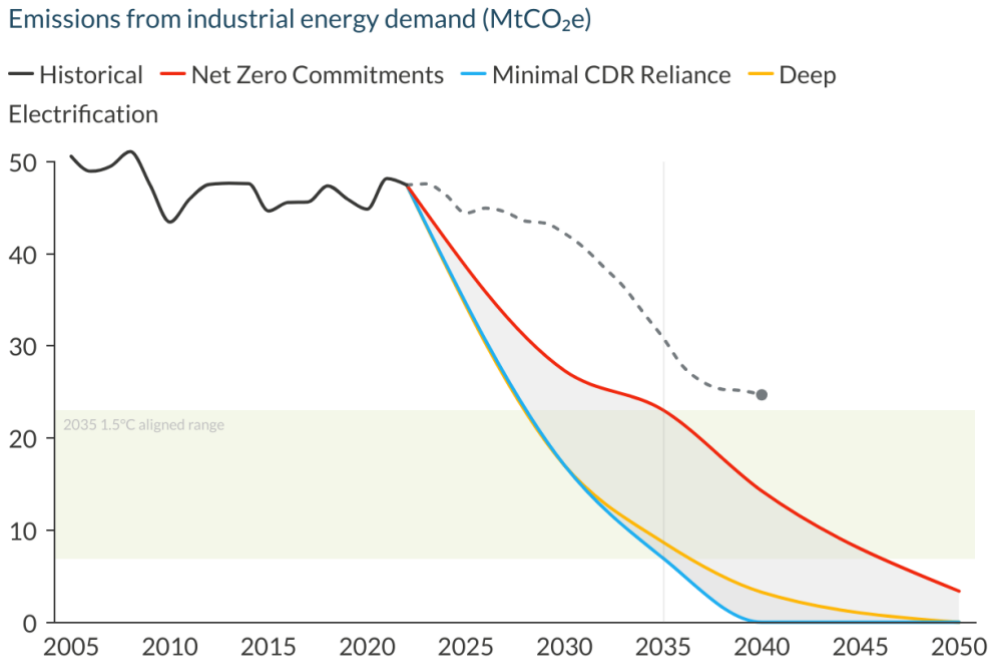
[11] This section focuses on non-energy industries (industries that do not transform an energy input into an energy output, like coal mining or LNG production). See methodology for more details.

makes up to half of global steel production under the IEA Net Zero Emissions Scenario, for example (IEA, 2023).

The industry sector is varied and individual processes face unique challenges. But technologies with significant decarbonisation potential already exist and are likely to continue emerging. Electrification of processes that currently rely on fossil fuel combustion is key to eliminating energy-related emissions. In the Deep Electrification scenario, a 1.5°C compatible pathway that factors in an in-depth, economy-wide electrification, energy demand-related industrial emissions are cut by 64% between 2023 and 2030 thanks to facility electrification and further drop to 9 $MtCO_2e$ by 2035 – 83% below their 2005 levels and zero by 2050.

Renewable hydrogen and its derivatives, and substitution of alternative raw materials and technologies could also avoid process emissions in sectors such as steel and cement. Under the illustrative 1.5°C compatible pathways, IPPU emissions decline by 27-41% below 2005 levels by 2030 as clean, less carbon intensive technologies are deployed. They fall an additional 26-38% by 2035, then stabilise after 2040 at no more than 10 $MtCO_2e$, leaving a residual emissions burden.

Long investment lead times in industry infrastructure mean transformational efforts must start as soon as possible to reach zero emissions by 2050. A well-managed and planned transition can lead to large co-benefits for employment and growth. Australia's pre-existing national advantages, such as its resource wealth, could, when coupled with its renewable energy potential, allow for development of new value-adding opportunities. By one estimate, the export value of Australian green iron could be three times higher than its current iron ore exports, while green aluminium could generate six times the value of bauxite and alumina (The Superpower Institute, 2024).




Note: excluding fossil fuel industry.

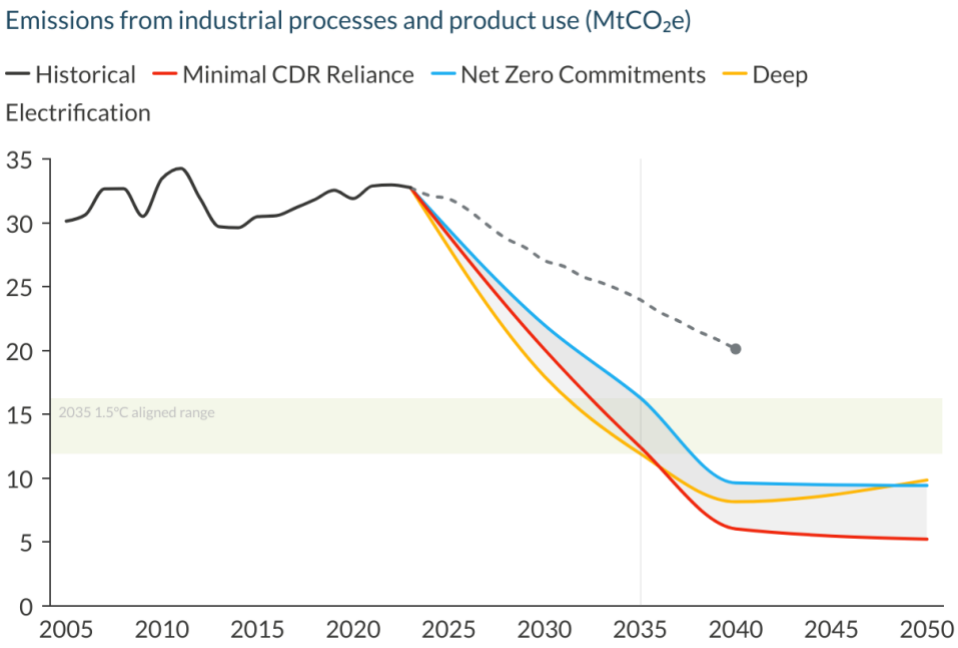



*Figure 14*

### The Role of the Safeguard Mechanism

The Safeguard Mechanism reform is a key component of the government's climate policy. It applies to every industrial facility that emits more than 100,000 $tCO_2e$ a year. Following the reform's amendments, each facility receives a net emissions allowance, known as a baseline, which declines by 4.9% annually until 2030. The government's goal is to reduce net emissions from covered facilities to below 100 $MtCO_2e$ by the end of the decade. In fiscal year 2024, Safeguard emissions were 136 $MtCO_2e$, down from 138 $MtCO_2e$ in 2023. The reform is designed to achieve a 27% reduction in net emissions relative to 2024 levels, and 28% relative to 2023 levels (Clean Energy Regulator, 2024; DCCEEW, 2024c).

More than half of these emissions come from the fossil fuel industry. Parliamentary negotiations added a net zero Scope 1 condition for shale gas and a zero emissions baseline for reservoir CO2 in new gas fields, yet the Safeguard Mechanism has had virtually no impact on curbing new fossil fuel developments (Climate Action Tracker, 2024a)

Because baselines apply to net emissions, they factor in both direct on-site emissions and offsets via ACCUs or Safeguard Mechanism Credits issued by facilities emitting below their baselines. This framework allows companies to meet reduction targets by purchasing cheap offsets. The reform also contains a mandatory requirement for gross emissions to decline, sets a cap on gross emissions defined as a five-year rolling average that must decrease with a built-in time lag. Observers have questioned the cap's additionality, as well as the convoluted legal process for tightening the mechanism if it is breached (Renew Economy, 2023).

As a result of the scheme's structure, its effectiveness in driving gross emissions reductions is uncertain, and there is a high risk that gross emissions reductions remain misaligned with what is needed for 1.5°C alignment. Both the government and the CCA project that on-site reductions will account for less than half of net reductions, and in the CCA's modelling, less than one third (CCA, 2024a).

The government projects a 22 $MtCO_2e$ emissions reduction compared with a business as usual scenario where emissions intensity remains constant; in comparison, it expects demand for ACCUs under the SGM to reach 25 $MtCO_2e$ by 2030. The Safeguard Mechanism creates what the Climate Action Tracker calls a "legally mandated use of offsets" (Climate Action Tracker, 2024a).

### Offsets and the SGM

Overreliance on offsets carries its own risks for climate. Since 2020, the integrity of Australia's offsetting scheme has been questioned, with multiple studies over the years finding that many offsetting methods lack integrity, meaning they do not deliver the emissions reductions they promise, or they reward sequestration that would have occurred naturally (Climate Action Tracker, 2024a; Climate Analytics, 2023b). If facilities make extensive use of Australian Carbon Credit Units (ACCUs) to meet their decreasing baselines, and if those ACCUs do not correspond to actual sequestration, then actual greenhouse gas emissions in the atmosphere may be higher than accounted for.

A 2024 study, for example, examined the human-induced regeneration scheme, which rewards regeneration of native forests. As of 2023, the method generated almost 30% of ACCUs, and HIR projects in Australia covered an area larger than Japan.

Analysing the relative dynamics of areas covered by projects compared with adjacent areas outside the projects, researchers found that "*changes in woody vegetation cover within the areas that have been credited also largely mirror changes in adjacent comparison areas, outside the projects, suggesting the observable changes are predominantly attributable to factors other than the project activities*". They suggest that rainfall could be the main factor actually driving regeneration, instead of human activities (Macintosh et al., 2024).

Beyond integrity concerns, since fossil carbon remains in the atmosphere for thousands of years while offsetting projects last only a few decades, at most one hundred years, they are a flawed means of addressing fossil fuel emissions (Climate Analytics, 2023b).

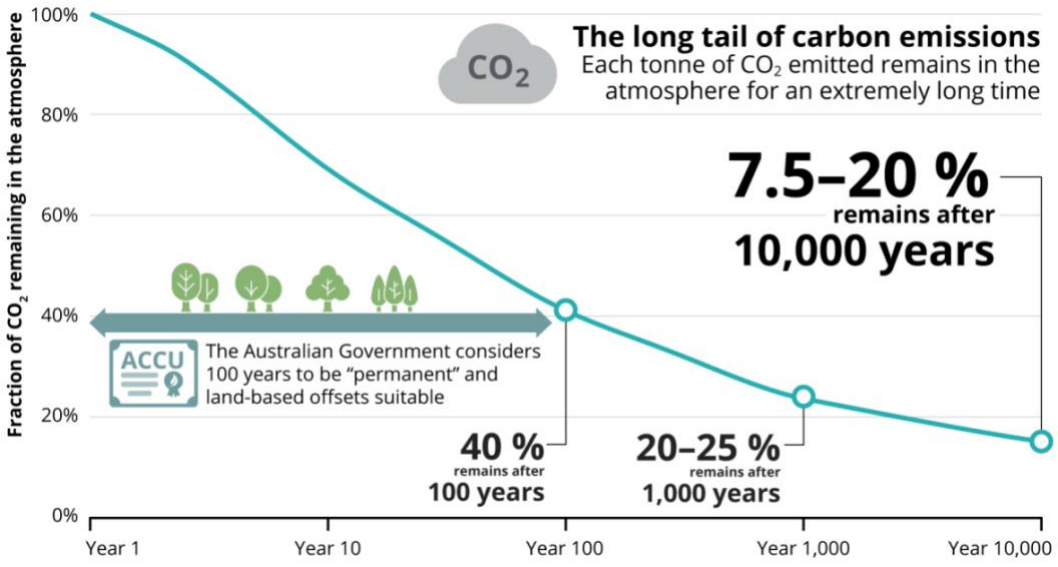



*Figure 15: Fraction of emitted $CO_2$ remaining in the atmosphere after emissions (Climate Analytics, 2023b).*

## Buildings

The government projects buildings sector emissions to decrease slightly in the next ten years, by only 11 % between 2025 and 2035, including emissions from construction activities. In 2023, energy demand in both residential and commercial buildings is mostly met by electricity, which accounts for 60 % of the sector's energy consumption, and by gas, which provides 25 % and remains widely used for cooking and heating. Residential and commercial buildings, together, accounted for half of Australia's electricity use (DCCEEW, 2024d).

The sector presents a challenge for policymakers. Two approaches can help reduce buildings' emissions: electrification and energy efficiency.

Little progress has been made to accelerate electrification, despite the successful rollout of rooftop PV and home batteries in Australia and the health benefits that come from switching from gas to electricity, such as eliminating indoor air pollutants from gas stoves.

In the United States, a study found that one in eight childhood asthma cases was linked to gas-fired cooking and its $NO_2$ emissions (Gruenwald et al., 2022). This condition affects one in ten children in Australia (UNSW, 2023). In 2023, the Minister for Climate Change, Energy and Water rejected the Climate Change Authority's recommendation to phase out new gas connections for new and existing residential buildings (RenewEconomy, 2023).

Energy efficiency also lags behind. The residential stock is old, with most houses built before 2003, before insulation standards were introduced. According to the UNSW head of the School of the Built Environment, Australian homes are "closer to tents than insulated eco-buildings" (The Guardian, 2022, 2024). Australian buildings have some of the poorest energy efficiency in the world (CCA, 2024a).

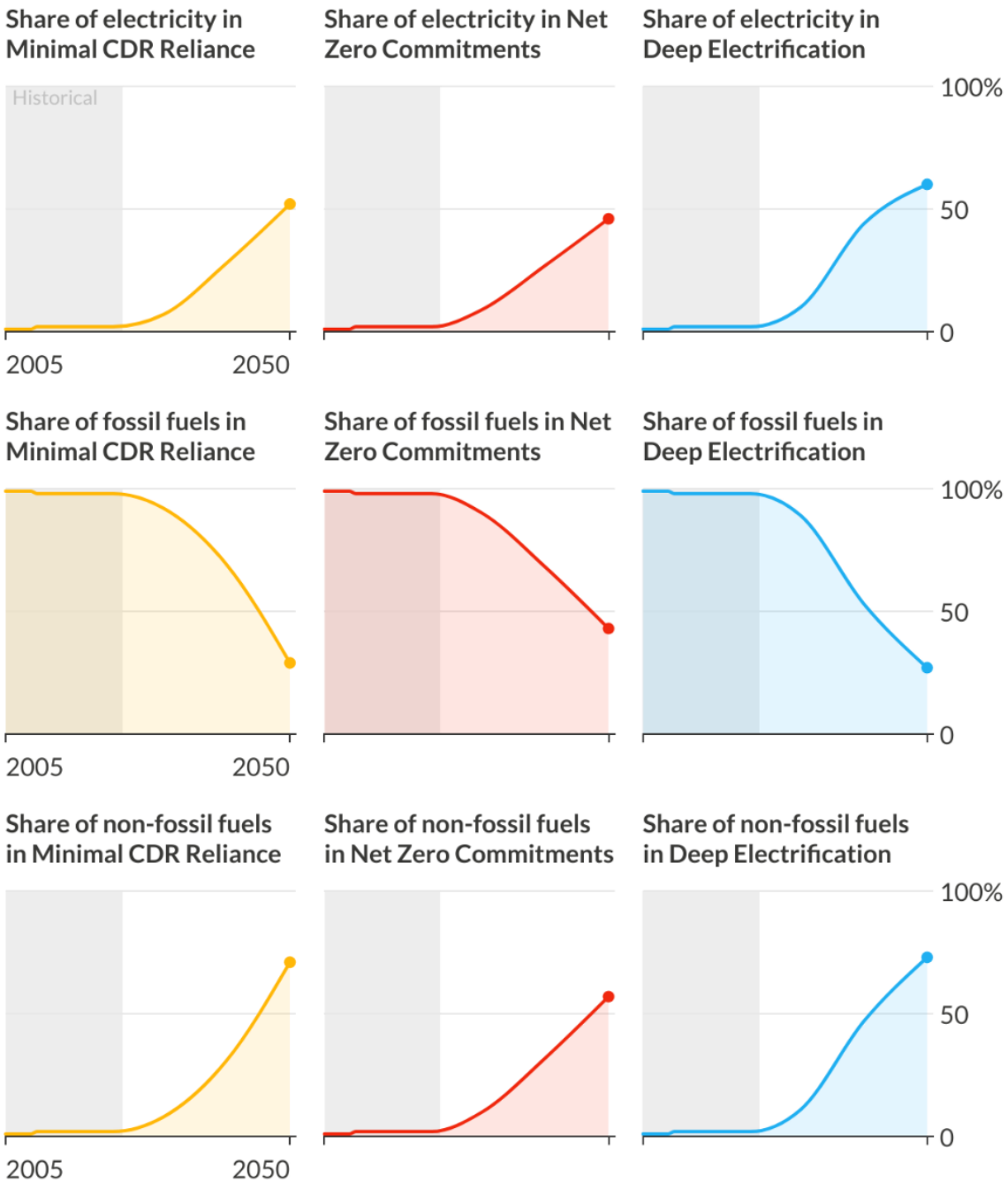
Some progress is underway. The CSIRO found that, at least in their sample, Australian homes are now up to 50 % more airtight than in 2015, though there is still room for improvement (CSIRO, 2024). Building energy codes are now being overhauled, but their effects will be felt progressively as the stock evolves (IEA, 2024a). Energy efficiency improvements from a low starting point, as in Australia, lead to lower energy bills, improved indoor comfort, and stronger resilience against extreme weather events (CCA, 2024a).

All 1.5°C aligned pathways analyzed in this report show increased building electrification. Under the Net Zero Commitments pathway, electricity reaches two-thirds of the building energy mix by 2030 and 94% by 2050. Displacing fossil fuels, primarily gas, with more efficient electric appliances, combined with improved building efficiency and thermal retrofits, limits the sector's total energy consumption to an 11 % increase between 2023 and 2030, and a 13 % increase between 2023 and 2050. This results in lower bills and higher indoor quality of life. The Minimal CDR Reliance and Net Zero Commitments pathways foresee similar electrification and energy consumption levels.

Together, these two trends drive a more substantial drop in emissions than government projections, falling by one third to one half by 2035 and reaching zero to 2 $MtCO_2e$ by 2050.

## Electrification and fossil fuel demand in the buildings sector

Historical and projected share of electricity, fossil fuels and non-fossil fuels in Australia's transport energy mix across 1.5°C aligned pathways (%)




Note: Non-fossil fuels include biomass and hydrogen.

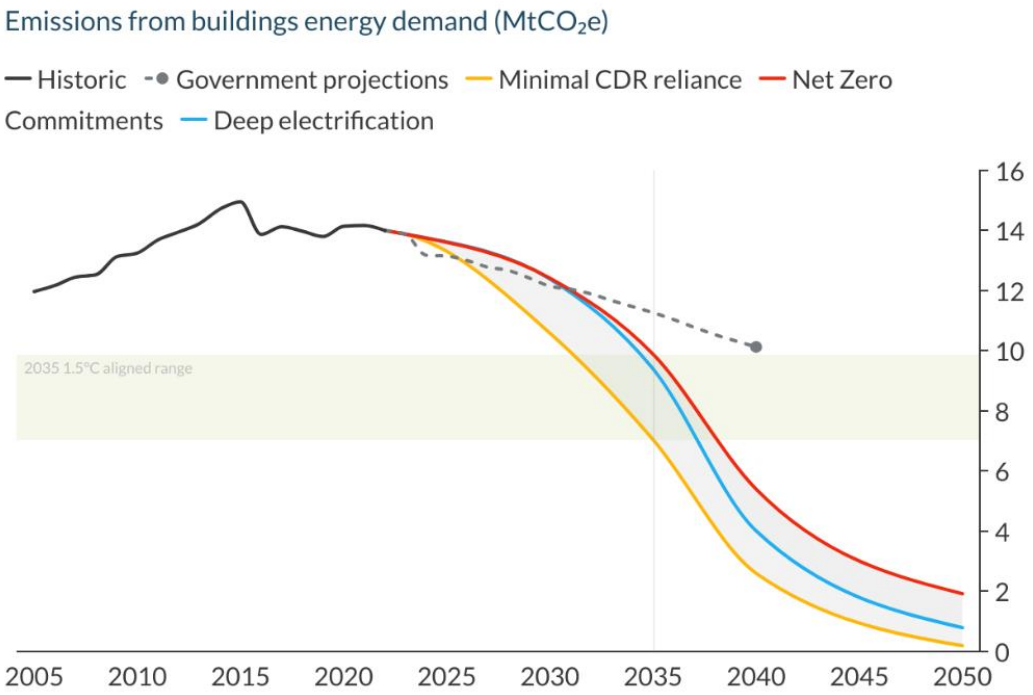



*Figure 16*

With regard to energy efficiency, the government has made some recent policy moves, establishing a Household Energy Upgrades Fund and increasing the minimum energy performance standards for residential buildings. More can and should be done to encourage the uptake of energy-efficient appliances and heating systems (both space and water heating), as well as the insulation installation in residential and commercial buildings (EEC, 2025).

Financial incentives represent low-hanging fruit for retrofits and appliance electrification, contributing to economies of scale. Progressive improvements to building codes and standards will enhance new buildings and gradually improve the efficiency and reduce emissions of the overall building stock (CCA, 2024a; Net Zero Australia, 2023).

Some options are still missing from the building codes, such as demand-side measures and integration of so-called smart solutions, like controls and meters (IEA, 2024c). The Climate Change Authority recommends a comprehensive overhaul of government policies, including expanding the scope of energy standards, providing financial mechanisms to support low-income household renovations, and improving transparency in coordination with states and territories (CCA, 2024a).

## The inclusion of international aviation and maritime emissions in the NDC

Australia's international aviation and maritime emissions were equivalent to 3% of its net emissions in 2023.[12] They include, for example, fuel supplied at Australian airports or ports for international flights and voyages (DCCEEW, 2024a). Unlike the domestic maritime and aviation sector, these emissions do not appear in Australia's national inventories but are monitored as a memo item based on energy consumption data from national energy statistics (DCCEEW, 2024a, 2025b).

Australian international aviation emissions from fuel use increased by 6% between 2018 and 2019, before the pandemic. International maritime emissions have remained roughly stable since 2005. A return to pre-COVID high-growth trends will likely increase emissions from international aviation. ICAO projects global $CO_2$ emissions from international aviation will nearly triple between 2025 and 2050 under a baseline scenario driven by rising demand. Even in ICAO's most ambitious scenario, emissions would double by mid-century (Climate Action Tracker, 2024d; ICAO, 2022).

ICAO's measures for emissions reductions, such as CORSIA, are voluntary, limited, rely on offsets with all their known issues, and promote sustainable aviation fuels, which are insufficient. Climate Action Tracker reports that if all sectors followed aviation's emissions path, global warming would reach 4°C above pre-industrial levels by the end of the century (Climate Action Tracker, 2024d).

Similarly, in April 2025, the IMO adopted the Net Zero Framework, the first ever global fuel standard and carbon-pricing mechanism, which represented a significantly watered-down compromise on the ambitions of Small Island Developing States.

Under this Framework, shipping fleets must reduce their carbon intensity by given deadlines or face steep fines, the revenues from which will finance the monitoring mechanism and support the global transition to zero-emission fuels. The Net Zero Framework has been called riddled with compliance flexibilities that could weaken the incentive for companies to switch to zero-emission fuels at the pace needed for 1.5 °C compatible pathways (T&E, 2025).

Considering the rise in these emissions and the projected decline in Australia's, their relative importance will increase. In 2005, the NDC's reference year, international aviation and maritime emissions were equivalent to 1.8% of Australia's net emissions. By 2030, if pre-COVID trends resume, this figure will reach 7%, rising to over 9% by 2035. If these are not addressed, the 43% target (excluding international aviation and maritime) would translate into only a 39% reduction in total 2005 emissions when these sectors are included.

[12] Derived from the fuel consumption of these two sectors, to which the Australian National Greenhouse Accounts Factors were applied. For more details, refer to the Methodology.

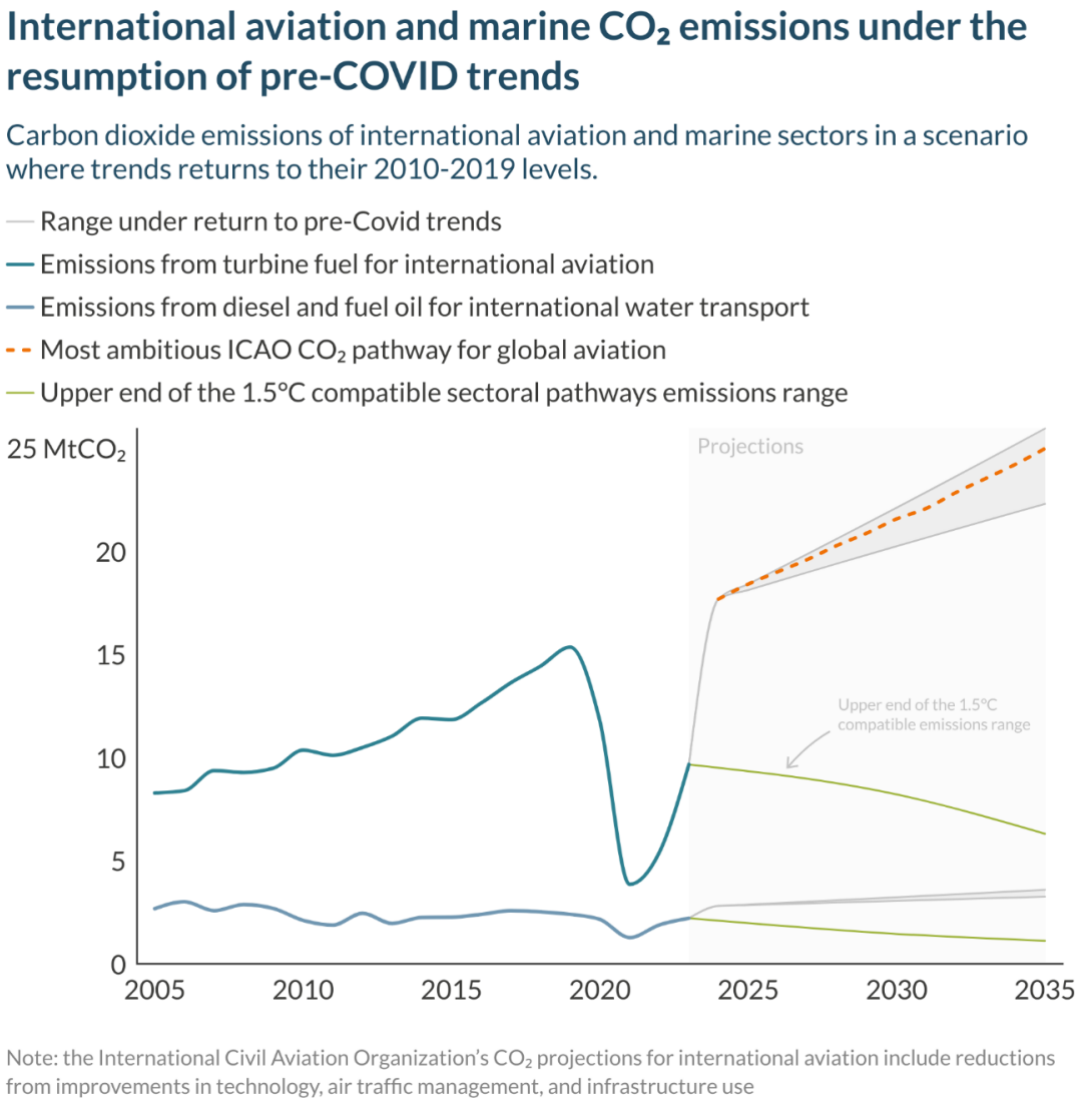



*Figure 17*

Given ICAO's failures, countries can lead decarbonisation in these sectors. The European Union and its member states, for example, include international aviation in their NDCs, and the expansion of the EU ETS covers maritime emissions (Climate Action Tracker, 2024d).

Including international aviation and maritime emissions in national targets would prevent the unchecked growth of sectoral emissions and bolster confidence in meeting the Paris Agreement's temperature limit. In the SR1.5 report, the IPCC noted that "higher policy ambition often takes the form of [...] larger coverage of NDCs to more gases and sectors", citing international aviation (IPCC, 2018).

In Australia's case, it would consolidate bilateral initiatives such as the formation of green shipping corridors with Singapore and South Korea, trade routes where ships will have zero or near-zero greenhouse-gas emissions, and the Australia–Singapore Low Emissions Maritime Technology Partnership (DFAT, 2024; DITRCA, 2024; Ministry of Oceans and Fisheries, 2025).

Provided it avoids the pitfall of LNG adoption as a bunker fuel, including these sectors within the scope of its NDC (like the European Union did for its 2030 NDC) and an ambitious Australian sectoral plan for international transport, for example as part of the Maritime Emissions Reduction National Action Plan it is preparing, would position Australia as a global leader (Climate Action Tracker, 2023a; DITRCA, 2024, 2025).

# Conclusion

After the 2025 plebiscite and the public rejection of the opposition's climate-harming plan, the government now holds all the cards to implement more ambitious policies and move beyond the contradictions that have undermined its climate action so far (Climate Action Tracker, 2025).

The government's bid to host COP31 alongside Pacific countries, if successful, will place global attention on its climate record. Australia's potential Pacific co-hosts, which include 11 island nations and territories that are members of the Fossil Fuel Non-Proliferation Treaty Initiative, have been vocal about its climate policy. In June 2025, the Pacific Elders' Voice, a group of former Pacific leaders, expressed "deep concern" over the government's conditional approval of the North West Shelf expansion, echoing criticism from Tuvalu's Climate Minister (Pacific Elders' Voice, 2025).

This NDC update round is the right time to change course, with a step change in ambition that would bring co-benefits for all Australians, such as better health outcomes and lower energy bills. Our 1.5°C compatible range shows that Australia should aim for net emissions reductions of 81% (76% to 89%) below 2005 levels by 2035.

In comparison, a target within—or worse, below—the range proposed by the Climate Change Authority, which would be an extrapolation of the 2030 NDC target, would fail to align with the 1.5°C limit, the importance of which has been reaffirmed in both the Global Stocktake and the International Court of Justice's Advisory Opinion.

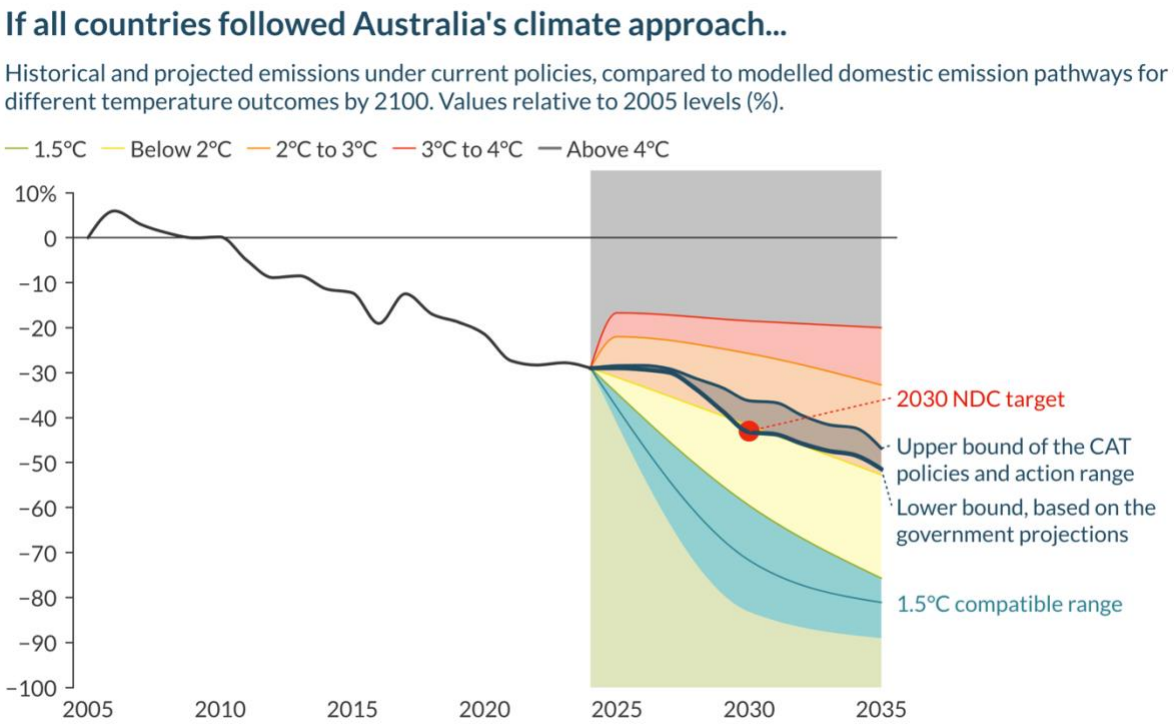



*Figure 18*

As we have seen in our discussion of fossil fuel exports, Australia's climate action and responsibilities extend beyond its borders. The domestic pathways presented in this report are least-cost pathways. As a developed country, under the Paris Agreement, Australia should support developing countries in reaching their own domestic goals, through additional emissions reductions or through climate finance.

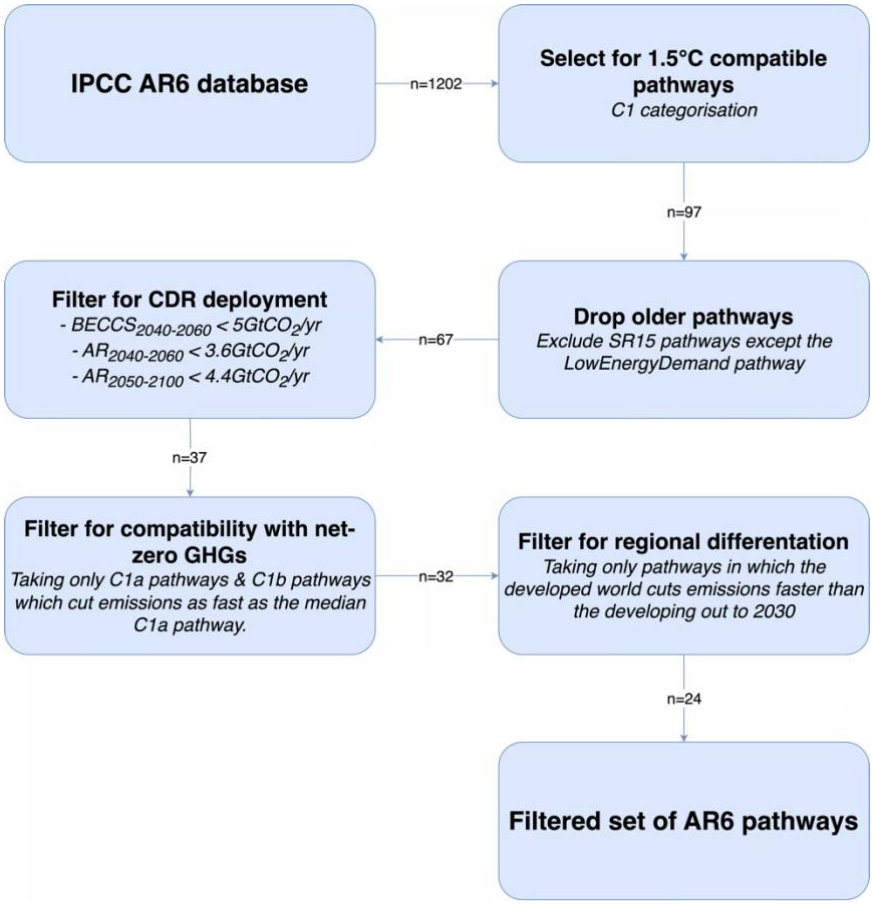
The quantification of those additional efforts, whether in domestic abatement or financial contribution, lies beyond the scope of this report. Still, in an increasingly polarised global political environment, and with COP31 on the horizon, these questions are set to become more pressing.

# Methodology

## 1.5°C compatible range and illustrative pathways

This report's approach is based on the methodology from the1.5°C National Pathway Explorer. More details are available in (Climate Analytics, 2023a) and at this link. The Paris Agreement compatible pathways used in the 1.5°C National Pathway Explorer, and therefore throughout this report, are defined in the IPCC Special Report on 1.5°C as those that limit warming to 1.5°C with no or limited overshoot (<0.1°C). In these pathways, the increase of the global average temperature above its pre-industrial level is limited to below 1.6°C for the whole twenty-first century and below 1.5°C by 2100.

The IPCC AR6 Working Group III subsequently established a subcategory C1a, where all pathways achieve net zero GHGs around 2070-2075, to be consistent with Article 4.1 of the Paris Agreement. IPCC AR6 least-cost pathways fully consistent with the Paris Agreement are identified through the filtering process illustrated below (Climate Analytics, 2022).

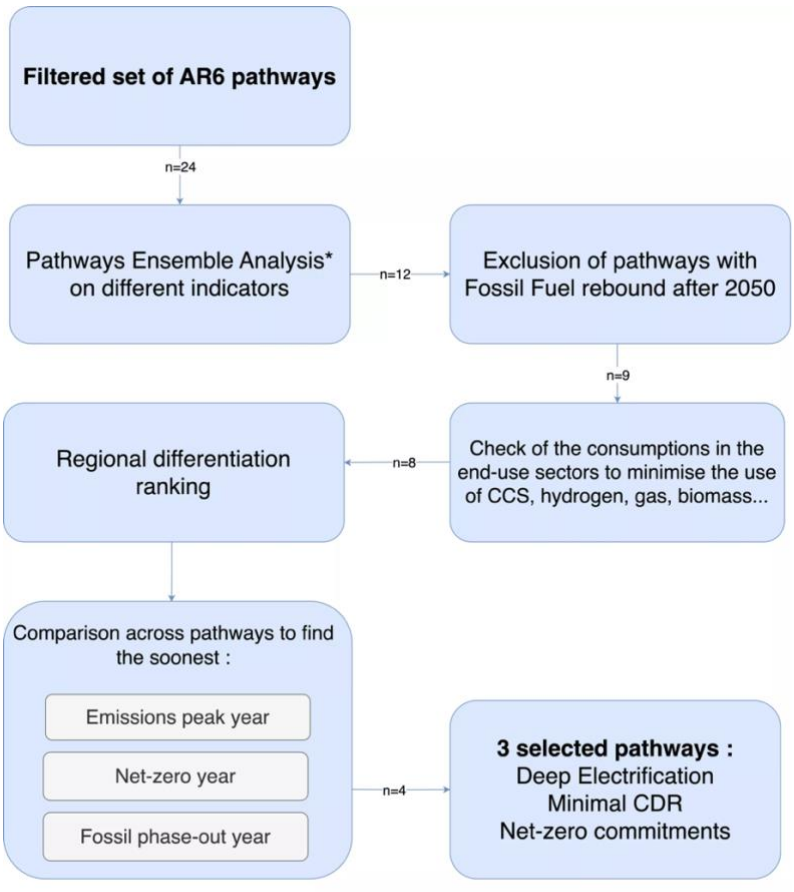



Since data for those pathways is available at the macro-regional level, these pathways need to be downscaled to yield country-level figures. The downscaling process consists of several stages. After collecting individual historical country data, the macro-regional data is harmonised with the most recent historical datapoint available. This harmonised macro-

regional data is then distributed to each country within that region in a manner that maintains internal consistency, so that both total aggregated values and individual country-level historical values are preserved (Welder et al., 2021). More information on the downscaling process is available at this link.

The downscaled set of filtered AR6 pathways, as well as the illustrative pathways mentioned below, forms the 1.5°C range mentioned and shown throughout the report. The full distribution of downscaled outcomes is used to find the median (50$^{th}$ percentile) of the country-level emissions pathway, in order to form an upper bound for Paris Agreement-compatibility for each country. The lower bound is defined by the 5$^{th}$ percentile.

As each pathway is internally consistent, a sum of different pathways might not guarantee that their respective constraints are respected. For example, if all countries followed their respective 1.5°C pathways that fall within their highest emission budget range, the combined result would exceed the Paris Agreement's goal. Three illustrative pathways are therefore selected through the process described below, based on their global characteristics, as per (Climate Analytics, 2023a). While each individual pathway in the set follows a single consistent trajectory, the boundaries of the 1.5°C compatible range are based on a statistical distribution, so the emissions of illustrative pathways may appear outside of the range. This is for example the case of the Minimal CDR pathway in the illustrative pathways section.



1.5°C pathways and corresponding methodology are available for selected countries, on the 1.5°C National Pathway Explorer website. The primary difference between the data displayed on the web platform and the data used in this report is the exclusion of the 2025 datapoint, which was removed due to its limited policy relevance as it represents an incomplete current year at the time of writing.

## Sectoral methodology

To align with Australian historical data and maintain consistency with the government's projections, specific adjustments have been made to the time series presented in this report.

**$CO_2$ and $CH_4$ emissions**

Gas-by-gas historic and projected breakdowns require accommodations, but their scope is limited thanks to the availability of Australian-level data.

$CO_2$ figures include the massive amounts of sequestration realised in the LULUCF sector. According to the National Inventory 2022, the sector sequestered more than 100 $MtCO_2$ in 2022, more than the entire transport sector's emissions for that year.

The National Inventory (NI) report provides data broken down by gas and sector through that year. The most recent Quarterly Update of Australia's National Greenhouse Gas Inventory (QU) at the time of writing, with historic data estimates through the quarter from June to September 2024, contains time series for total $CO_2$ and $CH_4$ emissions, but only greenhouse gas emissions in $CO_2e$ per sector. This document was published after the release of the 2024 Projections, and we consider the historic inventories in the QU to supersede previous sources. While the 2024 Projections report contains only values with five-year time steps, its gas-by-gas time series are available on Australia's National Greenhouse Accounts web platform.

We note there were no revisions in LULUCF time series between the 2022 NI and the most recent QU, and there is continuity between the two documents (and the 2024 Projections) for total LULUCF greenhouse gas emissions; their values remain stable from 2022 to 2024 at the second digit. Considering this, we reasonably assume that the historic $CO_2$ emissions for the LULUCF sector for the year 2023 are the values included in the 2024 Projections. The $CO_2$ 1.5°C compatible range was harmonised to the historic government timeseries with their base year of 2019.

The downscaling excludes methane time series. To provide a 1.5°C compatible range for methane, we used the median and fifth percentile from the set of IPCC AR6 pathways in this report. The range and the government's forecasts are harmonised to the historical data from the QU. Unlike other ranges, if not specified otherwise, this shows global methane emissions pathways, not values downscaled to Australia. This approach has limitations; as a developed country, Australia should reduce methane faster than the global average for equity reasons. Since the QU does not provide methane emissions by sector, historic time series are drawn from the latest inventories at the time of writing, based on the National Inventory Report 2023 (DCCEEW, 2025b).

The Global Methane Pledge, which Australia signed onto, aims to reduce methane emissions by 30% below 2020 levels by 2030, globally. The shortcomings of this pledge are well identified and pose fairness issues; it establishes a collective goal that countries voluntarily commit to, but in an unequal world, not all countries have the same capacity to contribute.

**Power**

For the power sector, we used the Energy Update 2024 Table O, and data from Figure 18 and 19 of the Emissions Projections (DCCEEW, 2024a). Growth rates from the government projections per fuel and source were harmonised to the latest historical data. Pathway values for each fossil fuel include both with and without CCS.

**Transport**

Transport energy consumption per fuel and per mode is taken from tables F and H of the 2024 Energy Update, removing international bunkers and air transport (DCCEEW, 2024a).

**Industry**

The downscaling employed for this work yields $CO_2$ emissions for industrial energy demand from non-energy industries (industries that do not transform an energy input into an energy output). This includes manufacturing, construction, agriculture and fishing but excludes sectors such as coal mining or LNG production. Historical data is harmonised to the IEA's World Energy Balances and Greenhouse Gas 2024 datasets (DCCEEW, 2024a; IEA, 2024b, 2024d).

The 2024 Emissions Projections provide stationary emissions forecasts broken down by source, which allows us to isolate energy consumption from our industries of interest from energy-related industries (for example diesel consumption at coal mines or self-generation at LNG plants), but not by gas. The IEA Greenhouse Gas data show that methane and nitrous oxide emissions from these industries accounted for 0.35% and 0.48% of their total greenhouse gas emissions in 2022, an intuitive result reflecting that industrial energy consumption at these facilities is mostly through fossil fuel combustion, primarily emitting $CO_2$. Since non-$CO_2$ emissions are residual, we estimate the comparison of our downscaled $CO_2$ pathways for these industries to the 2024 Emissions Projections for stationary emissions in $CO_2$ equivalent, which we harmonised to the IEA data for consistency, to be relevant.

**Buildings**

For buildings, the scope of stationary emissions in the Emissions Projections dataset is significantly broader than in the IEA GHG dataset. In 2021, the IEA categories "commercial and services" and "residential" sum to 14 $MtCO_2e$, while the Emissions Projections report 18 $MtCO_2e$ for the same year. This difference likely reflects divergent accounting frameworks; for instance, the Emissions Projections include construction within stationary emissions, whereas the IEA classifies construction under "manufacturing and construction"; this sub-sector explains slightly less than half of the difference. For this timeseries, data from the projections is harmonised with the IEA dataset. $CO_2$ is assimilated to $CO_2e$, as $CO_2$ represented 97% of sectoral emissions in the last historical year (DCCEEW, 2024c; IEA, 2024b).

**International aviation and maritime emissions**

Historical energy consumption for both sectors comes from Table F of the Energy Update 2024, which details aviation fuel and marine fuel use, including diesel and fuel oil for international marine activity (DCCEEW, 2024a). For 2019 to 2023, marine fuel breakdowns are not provided. The proportion of diesel to fuel oil is assumed constant at 6%, based on 2010 to 2018 data. $CO_2$ emissions are calculated from the fuel consumption using emissions factors from the Australian National Greenhouse Accounts Factors, noting that non-$CO_2$ combustion emissions are negligible (DCCEEW, 2024b). Projections from 2024 onward, under resumed pre-pandemic trends, follow the trajectory observed from 2010 to 2019. The projected range spans 75% to 125% of the growth rate found in that period.

For comparison, the graph includes forecasts from the International Civil Aviation Organization, first published in late 2022, with $CO_2$ emissions from international aviation to 2050. Historical values are harmonised with the global growth rate of emissions under the most ambitious ICAO scenario, which factors in technology upgrades, air traffic management, and infrastructure improvements. This scenario projects emissions 27% lower than the baseline, which already includes fleet renewal (ICAO, 2022). We compare both international aviation and marine emissions trajectories with the upper end of the range of the 1.5°C compatible modelled sectoral pathways from the Climate Action Tracker's assessment (Climate Action Tracker, 2023a, 2024d).

## References


ABC. (2024). UK's last coal-fired power plant officially closes as "ambitious" energy transition takes hold.

AEMO. (2024). 2024 Integrated System Plan.

AEMO. (2025). Quarterly Energy Dynamics Q1 2025.

Antenna Insight. (2023). Exploring Australian consumer perceptions of risk and cost in a changing electricity network.

ARENA. (2025). National Roadmap for Bidirectional EV Charging.

Australia Institute. (2025a). Coal Mine Tracker.

Australia Institute. (2025b). Fossil fuel subsidies in Australia 2025.

Australian Government. (2024). Investing in a Future Made in Australia.

BITRE. (2024). Road Vehicles Australia January 2024.

Carbon Brief. (2024). Analysis: What record global heat means for breaching the 1.5C warming limit.

CarbonBrief. (2025). Australia election 2025: Where parties stand on climate change, energy and nature.

CCA. (2024a). 2024 Annual Progress Report.

CCA. (2024b). Sector Pathways Review. Climate Change Authority.

CCA. (2025). 2035 Emissions Reduction Targets.

CCC. (2024). 2024 Progress Report to Parliament.

Clean Energy Council. (2025). Clean Energy Australia 2025.

Clean Energy Investor Group, & Baringa. (2023). Accelerating our energy transition with a credible 1.5°C scenario.

Clean Energy Regulator. (2024). Safeguard Mechanism.

Climate & Clean Air Coalition. (2022). Global Methane Pledge.

Climate Action Tracker. (2023a). International Shipping. October 2023. Climate Analytics, NewClimate Institute.
Climate Action Tracker. (2023b). Paris-aligned benchmarks for the power sector. Climate Analytics and NewClimate Institute.
Climate Action Tracker. (2024a). Australia. November 2024. Climate Analytics, NewClimate Institute.
Climate Action Tracker. (2024b). Guide to a good 2035 climate target.
Climate Action Tracker. (2024c). Highlighting the hypocrisy: Fossil fuel export emissions.
Climate Action Tracker. (2024d). International Aviation. October 2024. Climate Analytics, NewClimate Institute.
Climate Action Tracker. (2025). Australia. June 2025. Climate Analytics, NewClimate Institute.
Climate Analytics. (2019). Australia's proposed 'Kyoto carryover'—Nature, scale, implications, legal issues and environmental integrity of the Paris Agreement.
Climate Analytics. (2021a). The Global Methane Pledge and 1.5°C.
Climate Analytics. (2021b). Why gas is the new coal.
Climate Analytics. (2022). 1.5°C national pathway explorer—Methodology.
Climate Analytics. (2023a). 2030 targets aligned to 1.5°C: Evidence from the latest global pathways.
Climate Analytics. (2023b). Why offsets are not a viable alternative to cutting emissions.
Climate Analytics. (2024a). Australia's global fossil fuel carbon footprint.
Climate Analytics. (2024b). The role of northern forests in limiting warming to 1.5°C.
Climate Analytics. (2025). Addressing challenges in the land sector under the Paris Agreement.
Climate Change Authority. (2024). Sector Pathways Review.
Climate Change Authority. (2025). Understanding climate threats to the Great Barrier Reef.
ClimateWorks. (2024). Decarbonising Australia's transport sector: Diverse solutions for a credible emissions reduction plan.
CSIRO. (2024). Comfort and energy efficiency on the rise in new Australian homes.
DCCEEW. (2022). Australia's emissions projections 2022.
DCCEEW. (2023a). Australia's emissions projections 2023.
DCCEEW. (2023b). National Electric Vehicle Strategy. Australian Government.
DCCEEW. (2024a). Australian Energy Update 2024. Australian Government.
DCCEEW. (2024b). Australian National Greenhouse Accounts Factors.
DCCEEW. (2024c). Australia's emissions projections 2024. Australian Government.
DCCEEW. (2024d). Residential Buildings.
DCCEEW. (2025a). A 40 GW target to boost Australia's energy system.
DCCEEW. (2025b). National Inventory Report 2023.
DCCEEW. (2025c). Quarterly Update of Australia's National Greenhouse Gas Inventory: September 2024.
Department of Industry, Science, Energy and Resources. (2021). Australia's Long-Term Emissions Reduction Plan: Modelling and Analysis. Australian Government.
DFAT. (2024). Singapore and Australia Green and Digital Shipping Corridor.
DISER. (2021). Australia's emissions projections 2021. DISER.
DISR. (2024). Future Gas Strategy.
DISR. (2025). Resources and Energy Quarterly, March 2025.
DITRCA. (2024). MERNAP Issues Paper 4: Green Shipping Corridors and Partnerships.
DITRCA. (2025). Charting Australia's Maritime Emissions Reductions.
EAP. (2025). AEMO highlights need for new investment, critical role for gas to 2050.
EEC. (2025). Demanding Better. Energy Efficiency Council.
Electric Vehicle Council. (2024). State of Electric Vehicles.

Ellen MacArthur Foundation. (2021). Completing the picture: How the circular economy tackles climate change.
Ember. (2023). United Kingdom electricity generation by source.
Ember. (2025a). Electricity Data Explorer.
Ember. (2025b). Satellite analysis identifies 40% more methane from Australian coal mines.
Energy Transformation Taskforce. (2020). Whole of System Plan 2020. Government of Western Australia.
Forster, P. M., Smith, C., Walsh, T., Lamb, W. F., Lamboll, R., Hall, B., Hauser, M., Ribes, A., Rosen, D., Gillett, N. P., Palmer, M. D., Rogelj, J., Von Schuckmann, K., Trewin, B., Allen, M., Andrew, R., Betts, R. A., Borger, A., Boyer, T., … Zhai, P. (2024). Indicators of Global Climate Change 2023: Annual update of key indicators of the state of the climate system and human influence. Earth System Science Data, 16(6), 2625–2658.
GIZ, & PPCA. (2024). Progress achieved in the retirement of coal facilities in Chile and the definition of a Just Energy Transition Strategy.
Grassi, G., Peters, G. P., Canadell, J. G., Cescatti, A., Federici, S., Gidden, M. J., Harris, N., Herold, M., Krug, T., O'Sullivan, M., Pongratz, J., Sanz, M. J., Schwingshackl, C., & Van Vuuren, D. (2025). Improving land-use emission estimates under the Paris Agreement. Nature Sustainability.
Greenhouse Gas Protocol. (2024). IPCC Global Warming Potential Values.
Greenpeace. (2020). Lethal Power: How Burning Coal is Killing People in Australia.
Gruenwald, T., Seals, B. A., Knibbs, L. D., & Hosgood, H. D. (2022). Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States. International Journal of Environmental Research and Public Health, 20(1), 75.
ICAO. (2022). Trends in Emissions that affect Climate Change.
IEA. (2023). Net Zero Roadmap (2023 update): A Global Pathway to Keep the 1.5 °C Goal in Reach – Analysis. IEA.
IEA. (2024a). Energy Efficiency 2024. IEA.
IEA. (2024b). Greenhouse Gas Emissions from Energy. IEA.
IEA. (2024c). Renewables 2024. IEA.
IEA. (2024d). World Energy Balances 2024. IEA.
IEA. (2024e). World Energy Outlook 2024. International Energy Agency.
IEA. (2025a). Global EV Outlook 2025. IEA.
IEA. (2025b). Global Methane Tracker 2025.
IEEFA. (2023). CCS for power yet to stack up against alternatives.
IEEFA. (2024a). CCS hype and hopes sinking fast.
IEEFA. (2024b). How much gas does the future grid need?
IEEFA. (2025). What are the factors driving changing power bills, and are there any opportunities for reductions?
IISD. (2025). What NDCs 3.0 Are (and Aren't) Saying About Fossil Fuel Production.
International Court of Justice. (2025). Obligations of States in respect of Climate Change—The Court gives its Advisory Opinion and responds to the questions posed by the General Assembly.
IPCC. (2018). Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development.
IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
IPCC. (2022). Working Group II: Impacts, Adaptation and Vulnerability. In IPCC. IPCC.
IPCC. (2023, August 17). Climate Change 2022 - Mitigation of Climate Change: Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Intergovernmental Panel On Climate Change (Ipcc), Ed.). Cambridge University Press.

Ke, P., Ciais, P., Yao, Y., Sitch, S., Li, W., Xu, Y., Du, X., Gui, X., Bastos, A., Zaehle, S., Poulter, B., Colligan, T., Woude, A. M. van der, Peters, W., Liu, Z., Jin, Z., Tian, X., Wang, Y., Liu, J., … Chevallier, F. (2025). Low latency global carbon budget reveals a continuous decline of the land carbon sink during the 2023/24 El Nino event (No. arXiv:2504.09189).
Keeping the Country Running. (2024). Australian Natural Gas.
Komnos, D., Smit, R., Ntziachristos, L., & Fontaras, G. (2025). A comparative analysis of car fleet efficiency evolution in Europe and Australia insights on policy influence. Journal of Environmental Management, 373, 123313.
Luderer, G., Madeddu, S., Merfort, L., Ueckerdt, F., Pehl, M., Pietzcker, R., Rottoli, M., Schreyer, F., Bauer, N., Baumstark, L., Bertram, C., Dirnaichner, A., Humpenöder, F., Levesque, A., Popp, A., Rodrigues, R., Strefler, J., & Kriegler, E. (2021). Impact of declining renewable energy costs on electrification in low-emission scenarios. Nature Energy, 7(1), 32–42.
Macintosh, A., Butler, D., Larraondo, P., Evans, M. C., Ansell, D., Waschka, M., Fensham, R., Eldridge, D., Lindenmayer, D., Gibbons, P., & Summerfield, P. (2024). Australian human-induced native forest regeneration carbon offset projects have limited impact on changes in woody vegetation cover and carbon removals. Communications Earth & Environment, 5(149).
Meinshausen, M., Nicholls, Z. R. J., Lewis, J., Gidden, M. J., Vogel, E., Freund, M., Beyerle, U., Gessner, C., Nauels, A., Bauer, N., Canadell, J. G., Daniel, J. S., John, A., Krummel, P. B., Luderer, G., Meinshausen, N., Montzka, S. A., Rayner, P. J., Reimann, S., … Wang, R. H. J. (2020). The shared socio-economic pathway (SSP) greenhouse gas concentrations and their extensions to 2500. Geoscientific Model Development, 13(8), 3571–3605.
Ministry of Oceans and Fisheries. (2025). Signing of an MOU on the Establishment of a Green Shipping Route between Korea and Australia.
Net Zero Australia. (2023). Final Modelling Results.
NGFS. (2024). NGFS Scenarios Portal. NGFS Scenarios Portal.
Open Electricity. (2025). Tracker.
Pacific Elders' Voice. (2025). Australia's decision to extend the Woodside gas project and implications for co-hosting COP31 with the Pacific.
Philip, T., Whitehead, J., & Prato, C. G. (2023). Adoption of electric vehicles in a laggard, car-dependent nation: Investigating the potential influence of V2G and broader energy benefits on adoption. Transportation Research Part A: Policy and Practice, 167, 103555.
Prime Minister of Australia. (2024). Investing in a future made in Australia.
Productivity Commission. (2025). Investing in cheaper, cleaner energy and the net zero transformation: Interim report.
Renew Economy. (2023, April 8). Why the Safeguard Mechanism deal might not be all it's cracked up to be.
RenewEconomy. (2023). Bowen rejects CCA call for home gas ban and zero emissions for cars by 2040.
RenewEconomy. (2024). "Slow moving train wreck:" Gas prices triple since Woodside cut special deal with state government.
RenewEconomy. (2025). Origin spares taxpayer the tab for Eraring coal plant extension, because the consumer will pay.
Reserve Bank of Australia. (2022). Statement on Monetary Policy—August 2022. Box A: Recent Developments in Energy Prices.
Sadavarte, P., Pandey, S., Maasakkers, J. D., Lorente, A., Borsdorff, T., Denier van der Gon, H., Houweling, S., & Aben, I. (2021). Methane Emissions from Superemitting Coal Mines in Australia Quantified Using TROPOMI Satellite Observations. Environmental Science & Technology, 55(24), 16573–16580.

Schleussner, C., Ganti, G., Rogelj, J., & Gidden, M. J. (2022). An emission pathway classification reflecting the Paris Agreement climate objectives. Communications Earth & Environment, 3(1), 1–11.
Sherwin, E. D., Rutherford, J. S., Zhang, Z., Chen, Y., Wetherley, E. B., Yakovlev, P. V., Berman, E. S. F., Jones, B. B., Cusworth, D. H., Thorpe, A. K., Ayasse, A. K., Duren, R. M., & Brandt, A. R. (2024). US oil and gas system emissions from nearly one million aerial site measurements. Nature, 627(8003), 328–334.
Strefler, J., Bauer, N., Humpenöder, F., Klein, D., Popp, A., & Kriegler, E. (2021). Carbon dioxide removal technologies are not born equal. Environmental Research Letters, 16(7), 074021.
T&E. (2025). IMO Net-Zero Framework.
The Guardian. (2021). Australia commits to 2050 net zero emissions plan but with no detail and no modelling.
The Guardian. (2022). Freezing indoors? That's because Australian homes are closer to tents than insulated eco-buildings.
The Guardian. (2024). Why so many Australian homes are either too hot or too cold.
The Superpower Institute. (2024, July). Unlocking green metals opportunities for a Future Made in Australia.
UNFCCC. (2023). Outcome of the first global stocktake.
UNFCCC. (2024). Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023. Addendum. Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session (FCCC/PA/CMA/2023/16/Add.1).
UNSW. (2023). A heated debate – how safe are gas stoves?
Welder, L., Hörsch, J., Gidden, M., Schaeffer, M., & Hare, B. (2021). 1.5°C National Pathways Explorer—Methodology.
World Resources Institute. (2023). These 10 Countries Are Phasing Out Coal the Fastest.


www.climateanalytics.org