Climateworks CENTRE

Climateworks Centre decarbonisation scenarios 2023 – Policy Insights

Key insights for policy makers from Climateworks Centre's 2023 Paris Agreement-aligned scenarios.

A companion document for *Climateworks Centre decarbonisation scenarios 2023: Paris Agreement alignment for Australia*, which can be accessed at climateworkscentre.org/scenarios2023.

Whole-of-economy insights

- Policy and actions to reduce Australia's emissions should be in line with a 1.5 degrees Celsius least-cost pathway – reflecting the growing global consensus that every .1 of a degree matters to avoid the worst impacts of climate change in Australia and internationally.
- Our latest analysis shows a 1.5 degrees least-cost pathway would see Australia reach net zero more than a decade earlier than the current goal of 2050.
- In pursuit of this target, the emission reduction target for 2035 requires at least an 85 per cent reduction below 2005 levels.
- The 1.5°C pathway has stronger reductions than Australia's current 2030 emissions reduction target. If these stronger reductions do not occur by 2030 then net zero emissions would have to be reached earlier to stay within the carbon budget.
- In both the 1.5°C and well-below-2°C (1.8°C) lowest-cost scenarios, our analysis finds all sectors have opportunities to decarbonise. It is cost-effective to ensure action across all sectors to unlock these opportunities.
- Sectors move at different rates on a least-cost pathway:
  - Ensuring the electricity sector rapidly reaches near zero will underpin actions in other sectors – especially buildings, industry and transport.
  - Electricity and buildings emissions decrease rapidly in both scenarios, showing that strong policy action in these sectors is important for Australia to decarbonise in line with the Paris Agreement.

Sectoral insights

Electricity and Energy

- In these 1.5°C and well-below-2°C least-cost scenarios, the electricity sector reaches near zero between 2034 and 2038. This reflects that renewable energy is already the least-cost form of generation and the role that clean electricity plays in decarbonising the rest of the economy.
- To align with a 1.5°C pathway, coal-fired generation is closed before 2035. Around the same time, gas generation is greatly reduced. Gas fills short-term energy supply gaps from variable renewable energy that cannot be filled in other ways, such as from storage or hydropower. Improved use of energy management on the demand side would further reduce gas use.
- In both scenarios, capacity in the electricity sector increases to 166–177 GW by 2030 and to 210–234 GW by 2035.
- By 2030, both least-cost scenarios show renewable energy reaches an 83–90 per cent share of electricity generation. An overall increase in electricity generation powers decarbonisation in other sectors. Renewable-powered electricity generation in 2030 is greater than the total amount of electricity generated in 2020. By 2050 it is more than three times as great.
- Domestic gas use declines substantially in the scenarios, reducing emissions from production and use. This modelling does not explore in detail the implications for gas infrastructure, but combined with other analysis, the level of reduction indicates there is a high risk of disorderly exit of gas infrastructure. This highlights the importance of governments and businesses planning for the orderly phase out of gas as part of transition policies and energy investment.
- Hydrogen is found to have a role in industry and heavy transport. The model finds green hydrogen will be the least-cost hydrogen production pathway by 2028. These scenarios do not assume substantial hydrogen exports. This was explored in AEMO ISP 2022 and modelling for the Australian Industry Energy Transformation Initiative which both showed greater levels of renewable energy generation to support increased green hydrogen production.

Industry

- In these 1.5°C and well-below-2°C scenarios, emissions from the industry sector reduce by 42–54 per cent by 2035 and 54–67 per cent by 2050 from current levels.
- Earlier and faster uptake of electrification and hydrogen technologies through the 2020s and 2030s drives more emissions reductions in the 1.5°C scenario.
- The 1.5°C and well-below-2°C scenarios show the shift to clean energy results in energy emissions reductions of 55–69 per cent by 2035 from current levels.
- Non-energy or process emissions reduce by 14–17 per cent by 2050 from current levels based on the two scenarios.
- There is potential for hydrogen to play a role in significantly reducing industry emissions previously considered hard to abate, with hydrogen reaching around 10–15 per cent of total energy use by 2050. Bioenergy plays a small role.

Buildings (Built environment)

- There are rapid emissions reductions in the building sector in both scenarios from electrification and improvements in energy performance.
- Gas use phases out of buildings in the 2030s.
- Housing energy efficiency improves by 41 per cent by 2050 compared to today's levels.
- These changes in buildings are some of the most cost-effective emissions reductions available in the economy. This highlights the important role for government in ensuring these changes occur in a timely and equitable manner – this is of particular importance when considering the potential risks of low-income and vulnerable households missing out on cost savings.

Agriculture and Land

- In common with our previous work on net zero pathways, staying in line with a 1.5°C scenario requires substantial additional carbon dioxide removal – predominantly in sequestration in the land sector. This does not occur at the expense of agricultural production which also increases. Total levels of removals vary greatly depending on the level of ambition, from 1.4 gigatonnes in the well-under-2°C scenario to 4.6 gigatonnes in the 1.5°C scenario.
- Agricultural emissions, mostly methane from livestock and nitrous oxide from fertilisers, continue to be substantial as emissions intensity improves but production increases. The modelling finds opportunities to reduce emissions by adding algae to livestock feed and rolling out slow and controlled release fertilisers.

Transport

- Without strong action on transport now, emissions will continue to grow. Both scenarios show that until the mid 2030s there is minimal change in transport sector emissions. The increase in transport activity prevents overall reductions despite reduced emissions intensity.
- The scenarios see major changes in the sector, such as electric vehicles (EVs) becoming dominant in new car sales. Our 1.5°C scenario sees a higher uptake of EVs, which make up 73 per cent of new passenger car sales by 2030 compared to 56 per cent in the well-below-2°C scenario. This EV uptake is the main difference between the two scenarios in this sector. A strong Fuel Efficiency Standard and additional policies to support EV roll out would ensure these opportunities are unlocked in a fair and cost-effective manner.
- These scenarios do not yet account for the benefits of mode shifts such as from private vehicles to public transport, cycling, and walking or shifting from road to rail freight – Climateworks is producing further analysis on the emissions reductions from these opportunities.
- Climateworks research on decarbonising freight shows electrifying short-haul freight is the best area of focus for near-term reductions.

Assumptions and explanatory notes

- Our scenarios assume immediate action to reduce emissions. If this isn't taken, the net zero date will need to shift earlier than our current modelling presents. Currently, a 1.5°C least-cost pathway demonstrates steep reductions in early years and a longer decline to net zero when compared to our 2020 release. AusTIMES models how the whole of the Australian economy could decarbonise in a way that reflects the lowest overall cost between now and 2050. Climateworks and CSIRO have been developing the model since 2018. AusTIMES produces what we refer to as a 'pathway', which includes:
  - the changes in emissions from the whole economy over time
  - the changes in emissions from each sector of the economy over time
  - the types of technologies that get implemented in the scenario, and when they are implemented.
- The model has access to a number of technologies that it does not use on a least-cost pathway. These include any form of nuclear, non-renewable hydrogen, and CCS in the power sector or in industry other than or limited uses in some sectors. Blue hydrogen was found to provide a minor contribution, with the technology and cost assumptions leading the model to take it up more quickly than green hydrogen.
- Export demand for coal and gas are aligned with IEA World Energy Outlook scenarios. The 1.5°C scenario is aligned with the IEA Net Zero by 2050 scenario.
- Carbon dioxide removals identified in the model include land based sequestration and direct air capture. We note direct air capture remains a speculative technology – it only accounts for a minority of the carbon removals and not until the 2040s.

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