

The Finkel Review and scientific consistency with the Paris Agreement

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The [Finkel Review](#)¹ was an opportunity to propose a science-based approach to the short and long-term development of Australia's electricity sector consistent with the low-carbon transformation required to meet the goals and obligations of the Paris Agreement. Unfortunately, should the government accept the minimum electricity sector pathway suggested by the Finkel Review, Australia would very likely not be able to meet its obligations under the Paris Agreement, which calls for countries to adopt measures to hold global warming well below 2°C and limit this to 1.5°C.

The Finkel Review specifically deals with the question of the Australian electricity sector transformation and emissions within the context of the Paris Agreement. Scientific studies universally show that the electric power sector needs to make faster reductions than all other sectors in order to minimise costs and maximise transformation opportunities.

The minimum electricity sector pathway suggested by the Finkel Review is inconsistent with either the [2°C warming limit, or the stronger “well below 2°C, limit to 1.5°C”](#) goal in the Paris Agreement (Schleussner et al., 2016). If implemented as suggested, it would lock Australia's electric sector into a higher carbon pathway than is consistent with the Paris Agreement.

The minimum electricity sector emissions reduction pathway suggested in the Finkel Report (26-28% reduction from 2030 levels from 2005) is not consistent with the scientific understanding, as its reductions only track the (already inadequate) 2030 reductions proposed for the entire Australian economy. The minimum pathway suggested is also inconsistent with CSIRO's recent technology assessments, and Climate Change Authority's recent review of electricity sector developments through to 2030.

This minimum electricity sector pathway would ultimately risk large stranded investments in fossil fuel-intensive infrastructure, likely raise direct and indirect consumer costs for electricity above levels that would have applied in a lower carbon pathway, and risk lock-in of carbon intensive infrastructure with associated economic and social costs.

¹ Independent Review into the Future Security of the National Electricity Market, <http://www.environment.gov.au/energy/national-electricity-market-review>

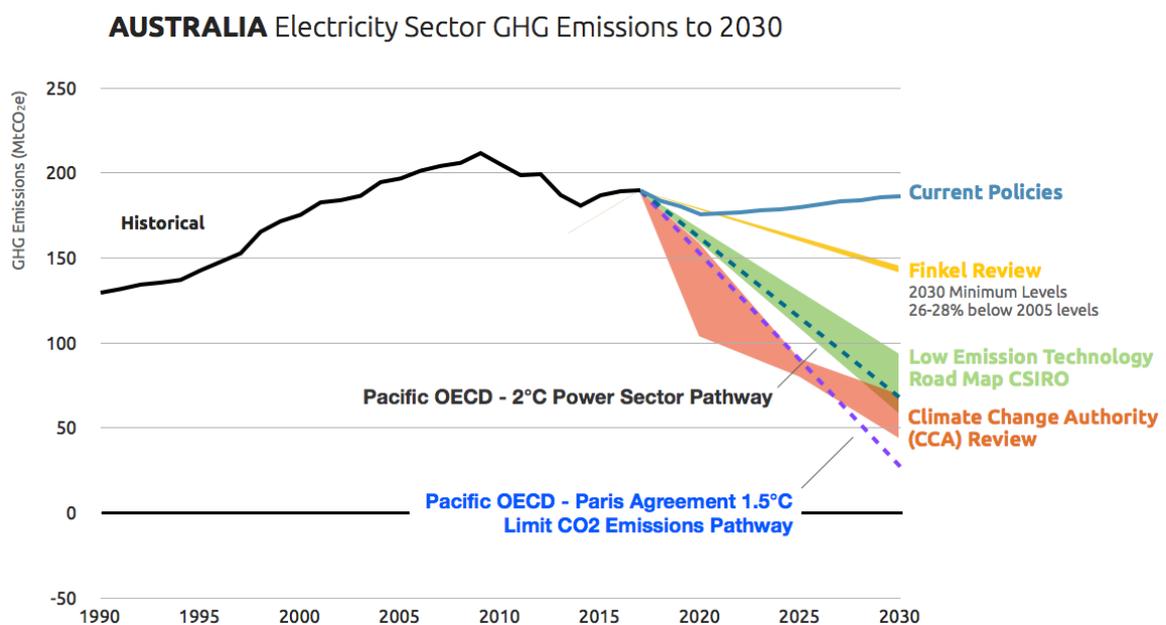
The Finkel Review modelling retains a surprisingly high fraction of coal in the electricity supply mix through to mid-century. This would require very large-scale deployment of carbon capture and storage technologies. As the Finkel report highlights, the 2015 Australian Power Generation Technology Report notes “CCS technologies are not very mature.” There are quite fundamental problems with the use of CCS in relation to achieving zero emissions required in the next 25-30 years. CCS reduces emissions by only 80-90, not 100% and requires 25-40% more energy for a given output. CCS can require significant additional water

for cooling or processing, risking an increased water stress in already water scarce regions (Fricko et al., 2016). A recent review shows that costs have increased significantly compared to earlier IPCC Assessments (Rubin, Davison, & Herzog, 2015).

An analysis by Climate Analytics shows that to meet the Paris Agreement goals, unabated coal-fired power plants would need to be phased out² globally by around mid-century, and by 2030 in the OECD region. A more recent assessment by the IEA (2017) indicates that unabated coal-fired power generation needs to be phased out globally by 2040, with emissions intensity of power generation reaching zero by 2050.

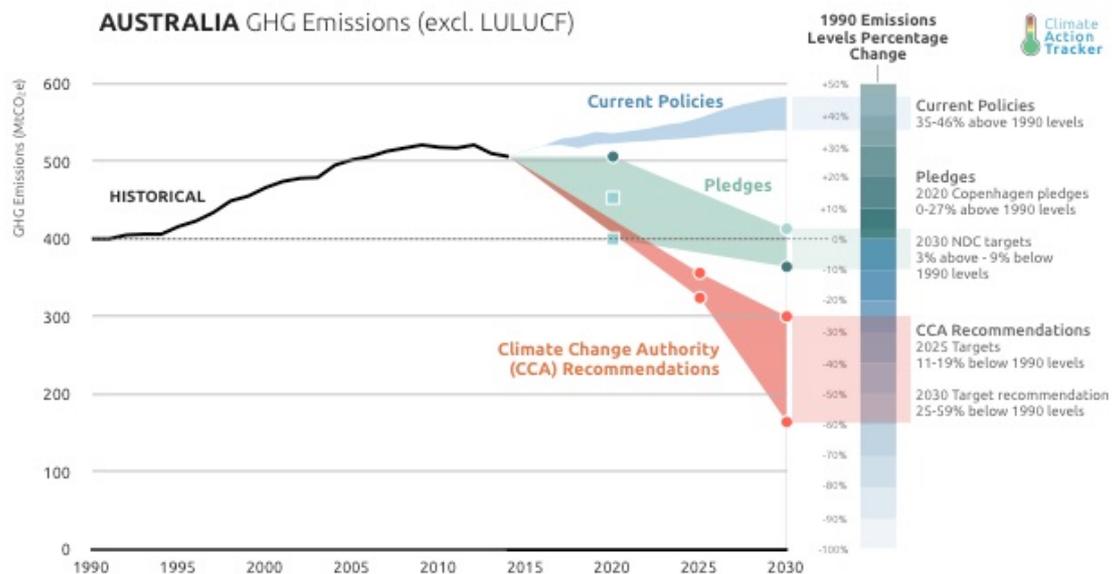
The Finkel Review has emphasised the role of natural gas, in particular the need to expand exploration and development, however this is inconsistent with the transition towards a zero CO₂ emissions energy sector. While energy/electricity security considerations lie behind this suggestion, it is not in line with state-of-the-art developments in this area.

A salient recent example drawn from the United States shows that solar photovoltaics and battery storage are [now outcompeting peaking-gas power on price](#) in that market, where gas prices are considerably lower than in Australia. A [prominent Australia electricity market entity \(AGL\)](#) has also reached a similar conclusion.



² Phase-out here means reduction by 90%.

Australia's present commitments under the Paris Agreement (26 to 28% reduction by 2030 from 2005 levels) are inconsistent with the former 2°C limit, and even more so with the Paris Agreement long-term temperature goal. All expert assessments show that Australia's current policies will not meet the Paris Agreement 26 to 28% reductions by 2030. Adoption of the minimum pathway suggested in the Finkel Review for the electricity sector would make achieving this goal even more unlikely, as it would require much faster action in other sectors that would be costlier, and intrinsically slower to act or to have effect.



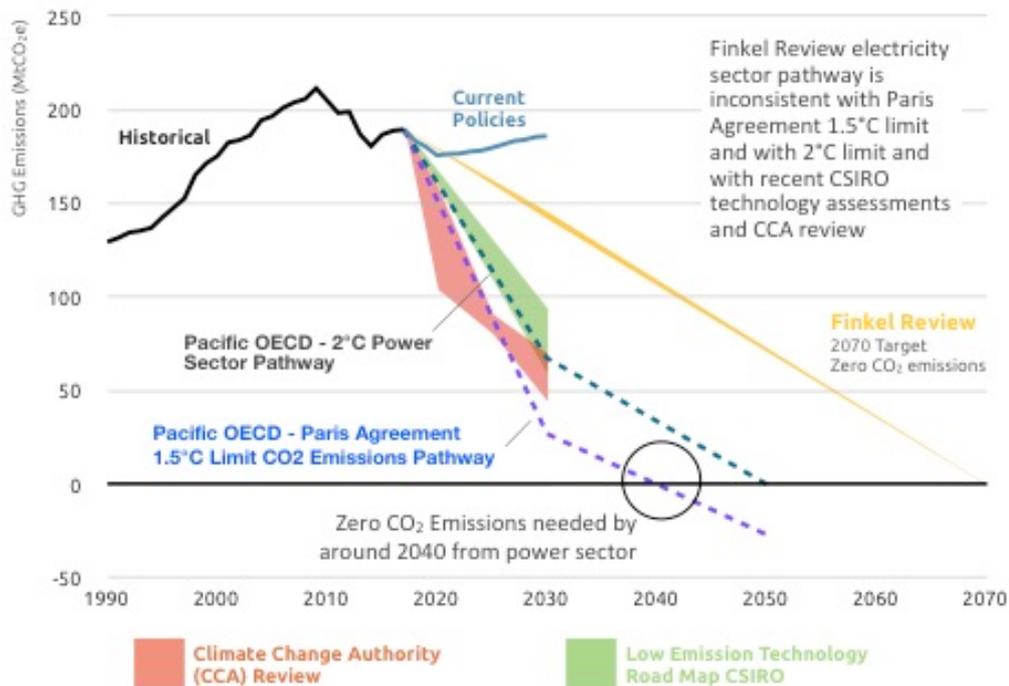
References

Climate Change Authority Recommendations In July 2015, the CCA recommended an emissions reduction target of 30% below 2000 levels by 2025 (incl. LULUCF). The Authority did not recommend a target for 2030, but has estimated that Australia should be aiming to reduce emissions by 40–60% below 2000 levels (incl. LULUCF) by 2030. These targets have been converted to percentages compared to 1990 levels (excl. LULUCF). For more information refer to the [2015 Climate Action Tracker briefing paper](#).

Historical, Current Policies and Pledges Data [Climate Action Tracker 2017 update](#) (forthcoming).

The zero-emissions timeframe for the power sector outlined in the Finkel Review – sometime in the second half of this century - is much slower and later than what is consistent with the Paris Agreement. A linear continuation of the minimum electricity sector emissions reduction pathway would reach zero emissions by 2070, some 30 years later than what is required under the Paris Agreement (around 2040), and about 20 years later that would be required under the weaker to 2°C degree limit (around 2050).

AUSTRALIA Electricity Sector GHG Emissions to 2070

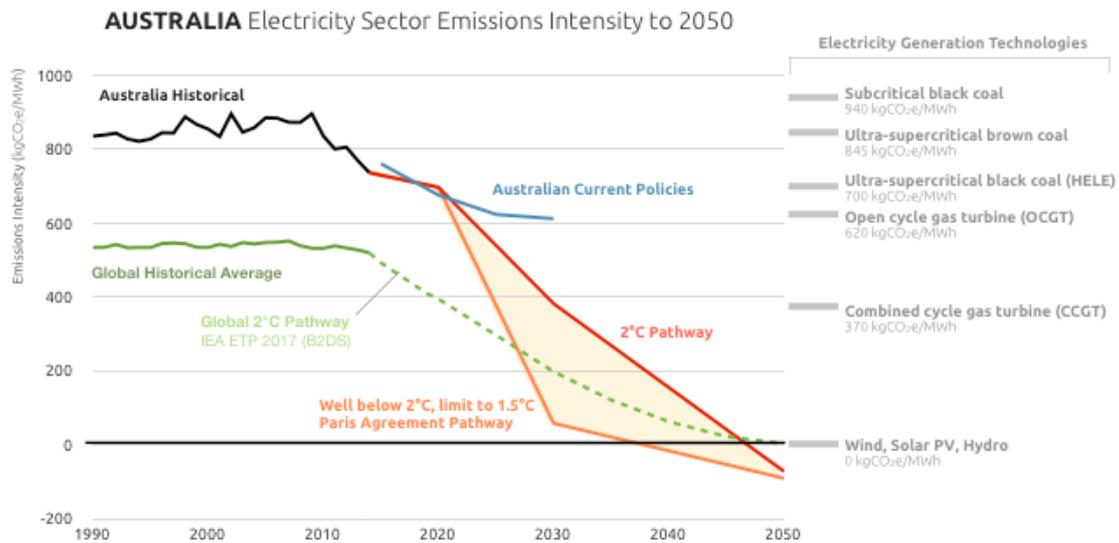


Background

- The electricity sector accounts for the largest share (about 35%) of Australian emissions and were about 187-189 MtCO₂ equivalent (MtCO₂-e) emissions in 2015. With existing policies, emissions are projected to increase after 2020 to 186 MtCO₂-e in 2030, which is about the same level as 2015 (Australian Government, 2016).
- The electricity sector is crucial for achieving the overall goal of net zero emissions. The IPCC has shown that decarbonisation of the electricity sector can and has to happen by 2050 with existing technologies to achieve the goal of globally aggregated zero emissions in the second half of the century (Bruckner et al., 2014; Rogelj et al., 2015). This is also confirmed by the IEA in its [2017 Energy Technology Perspectives](#) report (IEA, 2017).
- Because of the longevity of infrastructure in the electricity sector, it is important to avoid lock-in of technologies that do not achieve deep enough reductions.
- Full decarbonisation of the electricity sector can be achieved using known technologies and is a key strategy to decarbonise other sectors (buildings, industry, transport). This is a robust finding – both globally (Bruckner et al., 2014; CAT, 2016) as well as for Australia (Climate Change Authority, 2016a; Climate Works, 2014).
- An indicative least-cost pathway for the Australian electricity sector consistent with the Paris Agreement 1.5°C limit can be inferred from the MESSAGE IAM Model from its PAO - Pacific OECD – region comprising Australia, New Zealand, Japan (IIASA, 2017). This involves emissions reductions of about 85% in 2030 and zero emissions by 2040 (Rogelj et al., 2015; Rogelj, McCollum, O'Neill, & Riahi, 2013). A pathway

consistent with limiting global warming to below 2°C indicates reductions required of about 65% in 2030, reaching zeroCO₂ emissions by 2050.

- Many studies have shown that Australia has opportunities to achieve cost-effective reductions in the electricity sector emissions in this range, see for example the review published by CCA in 2016 (Climate Change Authority, 2016a).
- The lowest cost option for decarbonising the electricity sector are renewable energy technologies, combined with improvements in energy efficiency across all sectors.
- The share of renewable energy in the available studies analysed by CCA (2016b) is between 46 and 74% in 2030, however the Finkel Review suggest a level of 42% in 2030.
- The [CSIRO](#), in a report for Department of Energy and Environment (DOEE) released on 2 June this year, has outlined several energy emissions scenarios (CSIRO and Energy Networks Australia, 2017). While it assumes a proportional share of the 2030 target for the whole energy sector (including buildings, industry, transport), the resulting emissions reductions in the electricity sector are much higher, ranging between 52% and 70% from 2005. These are explicitly based on separate technology pathways, such as increased productivity or higher shares of renewable energy. If these were combined (higher renewable energy share plus ambitious increase in energy productivity across all the sectors), even higher reductions could be achieved.
- The Finkel Review suggested minimum electricity sector pathway is inconsistent with these assessments and reviews. It assumes a reduction pathway proportional to the overall emission reduction objectives for the entire Australian economy. This implies proportional reductions in other energy and non-energy sectors. This is not consistent with an overall least-cost pathway consistent with the Paris Agreement.
- A wide range of studies (CSIRO and Energy Networks Australia, 2017; Teske, Dominish, Ison, & Maras, 2016) show that a transformation to 100% renewable energy in the electricity sector can be achieved cost-effectively – given the disruptive transformation of the market taking place and the dramatic decrease in costs for wind and solar combined with battery storage.
- Under a range of studies reviewed by the Climate Change Authority (CCA) in 2016 emissions in relation to implementing the Paris Agreement, the intensity of electricity generation would go down from 0.81 t CO₂-e/MWh in 2015 to around 0.25 t CO₂-e /MWh or lower by 2030, and below 0.1 t CO₂-e/MWh by 2050 (Climate Change Authority, 2016a). Another CCA analysis in 2016 by had proposed a pathway for emissions intensity to reach zero “well before 2050” (Climate Change Authority, 2016b).



- The CSIRO and Energy Networks Australia 2017, Electricity Network Transformation [Roadmap final report](#) shows that the electricity sector can achieve zero net emissions by 2050 with less costs compared to a business-as-usual path, due to avoided investments in network infrastructure by orchestration of distributed energy resources (CSIRO and Energy Networks Australia, 2017). This results in a reduction in cumulative total expenditure of \$101 billion in 2050, and \$414 annual saving in average household electricity bills compared with a business-as-usual pathway.

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About Climate Analytics

Climate Analytics is a non-profit climate science and policy, which focuses on assessing climate change impacts, adaptation and mitigation. This includes the study of emissions pathways and energy transformation pathways globally, regionally and nationally to avoid dangerous levels of climate change in accordance with Paris Agreement goals, as well strategies and implementation policies consistent with these goals. Examples include the [2016 Low Carbon Monitor](#) for the [Climate Vulnerable Forum](#), which looks at global and regional environmental, social and economic benefits and opportunities of a transformation pursuing the 1.5°C limit of the Paris Agreement; and the [2016 coal report](#) looking at the implications of the Paris Agreement for coal use in the power sector globally and regionally (EU, OECD, USA). This was followed by a detailed analysis of a [strategy for phasing out coal in the European Union and its Member States](#), providing a science-based shut-down schedule of coal power plants at the individual unit level, in line with the Paris Agreement long-term temperature goal.

It also is part of the [Climate Action Tracker](#), an independent scientific assessment of progress towards the globally agreed aim of holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C. The Climate Action Tracker also tracks important decarbonisation pathways and provides recommendations for key strategies, such as the [ten most important short-term steps for decarbonisation](#).

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