Australia's 2030 emissions: States lead the way

With Federal policies, Australia could easily halve emissions this decade

AUSTRALIAN CONSERVATION FOUNDATION

CLIMATE ANALYTICS

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Executive Summary

In December 2020, the Federal Government projected Australia's emissions would reach roughly 22% below 2005 levels by 2030 which falls short of its 26 - 28% Paris Agreement target.

We anticipate the Federal Government will soon announce an increase in projected emissions reductions for 2030 under a business-as-usual scenario.

This report reveals virtually none of the likely reductions are a result of the Federal Government's own policy.

The anticipated emissions reductions are largely due to climate action implemented by state governments in the power sector and electric vehicles, earlier retirement of coal, trends in the land sector, market pressure on gas companies - and a shift in international markets for coal and LNG expected in countries adhering to the Paris Agreement.

Considering those factors, this analysis shows that emissions are due to be reduced by 30-38% by 2030, exceeding the Federal Government's current 2030 Paris target, but not due to its own climate action.

The States are leading the way by increasing renewable energy, rolling out strong electric vehicles policies and dealing with land clearance issues.

The early closure of coal plant: Victoria's brown coal plant in Yallourn, Latrobe Valley, and units at the NSW black coal Eraring plant, will also assist in bringing down emissions.

The Federal Government's claim that it is "meeting and beating" its targets is a falsehood because it is doing little but claiming credit from the hard work of Australia's states and territories.

This report makes it clear that to increase ambition, the Federal Government will need to commit to a target well beyond the anticipated 2030 reduction of 30-38% by 2030.

This report provides three clear scenarios that show the Federal Government can easily raise the ambition of its 2030 target to reach 50% - 60% below 2005 levels.

Australia needs a Federal Government that leads the way.

Emissions reductions greater than government target are likely from States

Analysis in this report shows there are several factors at work, both domestically and internationally, that have little or nothing to do with the Federal Government, and that indicate the next official projections will show emission reductions close to 30% below 2005 levels by 2030 and up to 38%. They include:

- The earlier closure of two coal plants or units: Victoria's brown coal Yallourn plant in La Trobe Valley will close in 2027, and the NSW Eraring black coal plant will close one of four units in 2030 (a second in 2031). These closures could bring 2030 emissions down by 1.2-1.5% if they are replaced by renewables and storage as appears to be the case.
- The government has projected renewables in the power sector to be 51% of supply by 2030. Our provisional analysis shows renewables penetration is likely to be 58-65% by 2030, due to State Government action. The likely net effect on emissions (considering the earlier retirement of the coal plant/units as estimated above) would further lower national emissions by 1.7-4.8%.
- The Federal Government's projections for electric vehicle (EV) rollout indicate an assumed market penetration of around 6.5% of light duty vehicle stock in 2030. But reality on the ground, with strong State-level policies in NSW, Victoria, the ACT and South Australia, could see EV penetration in the light duty vehicle (LDV) market of between 13-18.5% by 2030. This could result in 2030 emission reductions a further 0.7-1.2% below 2005.
- The government's 2020 projections indicate a declining land use and forestry sink in 2030, reducing from -17 $MtCO_2e$/year in 2020 to -5 $MtCO_2e$/yr in 2030. The government also assumes that there will not be a significant reduction in land and forest clearance rights below recent levels. Present trends however indicate this sink is more likely to be flat - or will increase by 2030 above present levels. Whilst uncertain the net effect of this would be a reduction of net national emissions by 2.4-3.2% by 2030 compared to 2005 levels. Again, national policies have not impacted this sector.
- Two additional projects to capture reservoir CO_2 from natural gas production appear likely to proceed before 2030. These do not appear to be included in the Federal Government's 2020 projections and would reduce 2030 emissions by 0.3-0.7%.
- This limited set of changes since 2020 would bring emissions reductions above the Government's 26-28% target to 28.5% to 33.6%. Nearly all of the additional 2030 emissions reductions projected here are a result of additional Federal Government policy actions.
- Further significant domestic emission reductions by 2030 are likely to result from Australia's major trading partners implementing the Paris Agreement and reducing their LNG and coal imports from Australia. The resulting reduction in fugitive emissions (mainly CO_2 from natural gas reservoirs and methane from natural gas production and from coal mining) could reduce 2030 emissions by 1.9-4.6% and would extend total reductions to 30.4-38.2%.

Scenarios that would reduce Australia's emissions by least 50% by 2030

- Three scenarios set out in this report demonstrate how Australia can easily raise the ambition of its 2030 target to reach 50 - 60% below 2005 levels. For a fully 1.5°C compatible domestic emission pathway, effort would need to be made in all sectors to achieve at least a 65-75% domestic emission reduction from 2005 levels by 2030.

Australia's 2030 target compares poorly with other OECD countries

- When compared to eight similarly wealthy OECD countries[1] (including EU27), Australia's 2030 climate target is the second worst. Factoring out the uncertain emissions from the forestry and land sector, Australia has the lowest target ambition by a wide margin.

[1] South Korea, New Zealand, Canada, Japan, Germany, USA, EU27, and UK.

Where are Australia's emissions headed?

This brief report looks at three main questions:

- Where are Australia's emissions headed with present Federal Government policy settings
- What are the options for increasing the level of action to 50% or more reduction by 2030
- How do Australia's present commitments and actions compare to similar countries?

Where do Australia's national emissions stand in 2021?

The Government's December 2020 projections indicate that Australia's 2020 emissions were estimated to be 16.6% below 2005 levels. More recent emission reports indicate slightly higher decline in 2020 of about 18% and in 2021 of about 20% likely largely due to COVID related economic issues, from which rebound is likely[2]. Notwithstanding these recent greenhouse inventories most of the reductions since 2005 have come from changes in the land sector (of these about half due to reductions in deforestation and land clearance), with the remainder largely from the rollout of renewable energy in the power sector: neither is the result of the current Federal Government's policy.

For the rest of the economy, including the stationary energy, transport, fugitives, agriculture, industrial processes and waste sectors, emissions have continued to increase, in aggregate by 9.7% above 2005 levels in 2020, and based on the Government's 2020 projections will continue to increase - to 13% above 2005 levels by 2030.

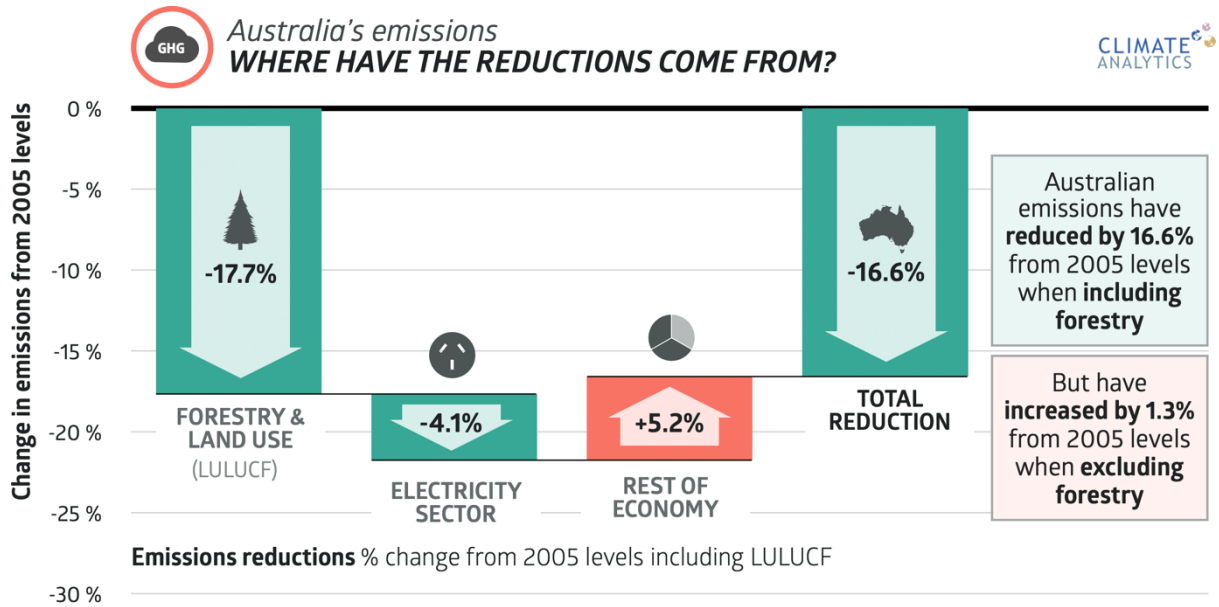

Figure 1 Source of 16.6% reductions from 2005 emissions levels in 2020

[2] Most recent greenhouse gas inventory published up to March 2021 indicates am estimated reduction to the end of the 2021 financial year, the reporting period used by Australia, of around 18% for 2020, and about 20% to mid 2021. The significant decline observed over this period this is likely largely due to COVID related economic issues and rebound is expected.

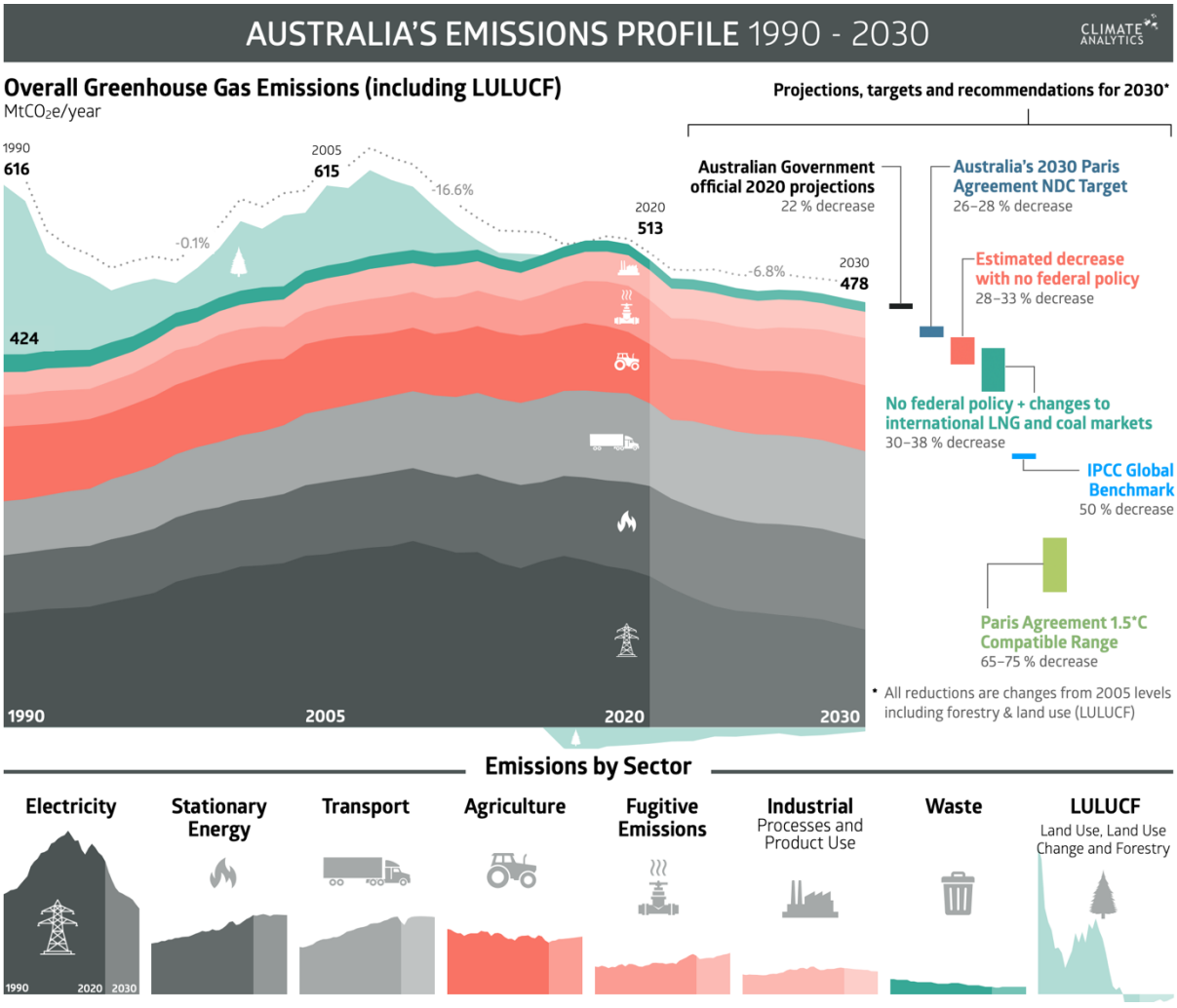

Figure 2 Likely Australian emissions reductions by 2030 compared to Federal Government target and international Paris Agreement benchmarks

What is the government projecting by 2030?

Australia's 2030 Paris Agreement target was set in 2015[3] as a 26-28% reduction in emissions below 2005 levels, including land use change and forestry. The most recent government projections show an emissions reduction of about 22.3% below 2005 levels by 2030, several percentage points short of the target[4].

The Government also includes a range of other projections, including a stronger and weaker recovery from COVID-19 impacts, and a high technology pathway (details of which are not included in the government's released projections). The stronger recovery pathway results in a reduction of around 20%, the high technology pathway a reduction close to 29%, and the weak recovery a reduction of up to 37%.

It is already clear the weak recovery scenario does not apply, and that the economic recovery from COVID-19 is close to what the government had projected in December 2020. The high technology pathway has emission reductions exceeding the Government's 26%-28% 2030 target, but there have been no supporting details published to date for this pathway.

The Government consistently refers to its 2030 emissions projections decreasing every year. For example, the 2016 projections were for a 0.5% reduction by 2030, whereas the 2020 projections were for a 22.3% reduction. Yet there are no substantive Federal policies in place that can be attributed to this result. It is therefore important to understand the reasons behind this projected decrease, which creates a misleading impression of Federal Government progress.

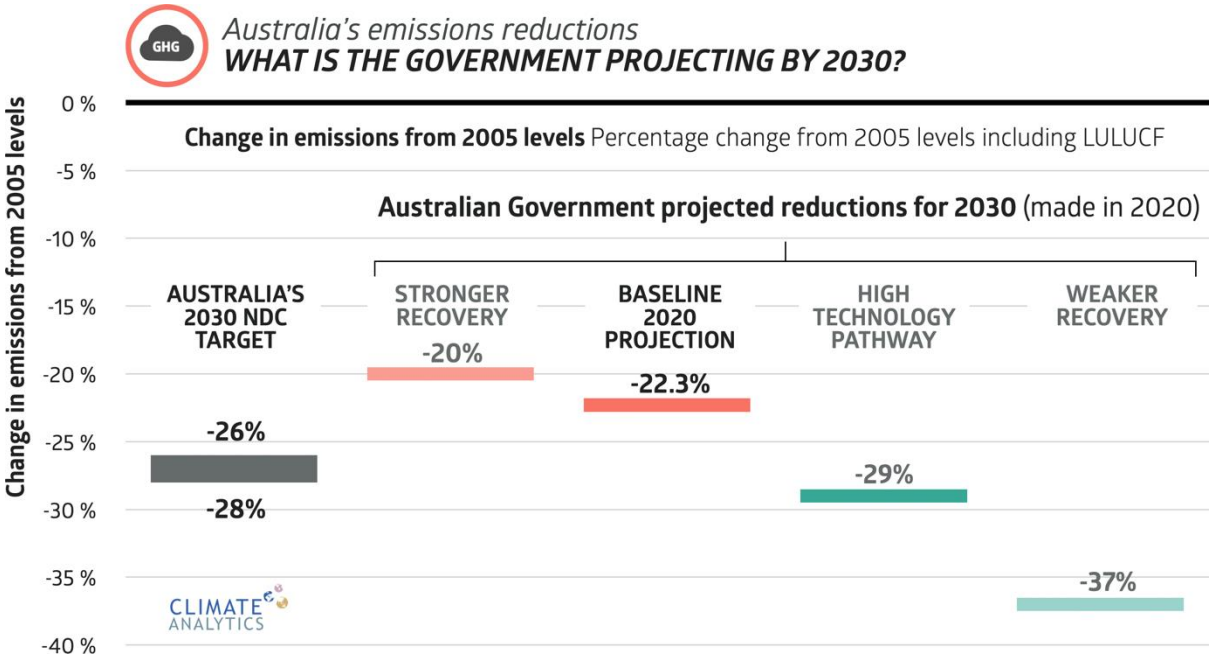

Figure 3 December 2020 Australian Government projections

[3] Australian government
[4] Australian emissions projections 2020

Analysis of the differences in projections over the five years from 2016 - 2020 shows that over 80% of the reductions in 2030 emission projections arise from reductions in the electricity sector (66%) and the land sector (16%). Neither of these sectors are subject to any new or substantial policies established by the Federal Government.

While there have been emissions reductions connected to the work of the Australian Renewable Energy Agency (ARENA), the Clean Energy Finance Corporation (CEFC) and the national Renewable Energy Target (RET), the current Federal Government has worked to either abolish or significantly change each of these in ways that would negatively impact their ability to support emissions reduction, particularly through the growth of renewable energy.

Indeed, in the power sector, the Federal Government's main action was a 2015 attempt to reduce the 2020 RET (41,000 GWh) by 37% which it lowered to 20% (33,000 GWh) after a forced compromise with the Opposition[5]. The RET was the main national level policy in the electricity sector. The target was met in 2019 and expired in 2020, with no new national target or policy set for beyond 2020.

See Appendix I for more detail.

[5] https://www.smh.com.au/politics/federal/abbott-government-and-labor-reach-renewable-energy-target-deal-20150518-gh4161.html

Where are emissions headed in the absence of additional policies by 2030?

The Federal Government's own emissions projections have shown that without further action, Australia will fall short of its current target, only reducing emissions by 22 per cent by 2030 (below 2005 levels). This is despite government claims that it will "meet and beat" its Paris targets.[6]

The government produces new projections every year, each time with lower emissions in 2030. This is mainly due to changes in the power sector and the land sector, which are under State rather than Federal control. Given this pattern, it is useful to assess the drivers of the emissions reductions, and how they may be reflected in the government's new, 2021 projections.

The key question is whether the trends in the power sector, land sector emissions and removals, and any other one-off or systematic changes in sectors outside of the Federal Government's influence bring emissions closer to its stated 26 - 28% target, or even beyond their target?

Here we assemble a likely range of emission reduction outcomes for Australia by 2030 given the present starting conditions. We also consider the factors that may have changed since December 2020 in a few key sectors, and how this may affect emission reductions in 2030 compared to 2005 (the base year for the Government emissions target).

The bottom line of this analysis is that after stacking up the domestic factors that have observably changed, or that are very likely to have changed by 2020, but that are not due to Federal Government policy, it is likely that emission reductions of 28-33%, exceeding the Government's 26-28 % target, will occur without any Federal Government action (see Table 1).

Larger reductions may occur if Australia's markets for LNG and coal are affected by key international markets implementing the Paris Agreement, according to recent Reserve Bank and IEA Net Zero scenarios. These market impacts would extend the 2030 reductions to 30-38% by 2030.

[6] The government claims the high technology uptake scenario will meet the 2030 target of emissions reaching 26-28% below 2005. This scenario is not based on current policies but a number of non-policy related assumptions. The same government report and dataset provides emissions projections based on policies that does not meet the target. See https://www.industry.gov.au/data-and-publications/australias-emissions-projections-2020. Recalculations of historical data can have repercussions for meeting the NDC target. For example, emissions in a Government report published in 2019 for the year 2005 were 611 MtCO2e, and a 26% to 28% reduction is 440 MtCO2e, in the next years report they were revised to 615 MtCO2e and the 26% to 28% reduction is 443 MtCO2e. Increasing the baseline, increases the level of emissions of the 2030 target in absolute terms. Revisions are a regular occurrence in Australian Government emissions reporting.

Table 1 Additional emission reductions by 2030 likely to occur without action by the Federal Government

	Low estimate	High estimate	Low estimate of total reduction by 2030 from 2005	High estimate of total reduction by 2030 from 2005
Federal Government December 2020 Projections			**-22.3%**	**-22.3%**
Faster EV sales by 2030 due to state policies	-0.7%	-1.2%	-23.0%	-23.5%
Earlier coal plant or unit retirement	-1.2%	-1.5%	-24.1%	-25.0%
Electricity sector renewable penetration in 2030 of 58-65%	-1.7%	-4.8%	-25.8%	-29.7%
Land use, land use change and forestry	-2.4%	-3.2%	-28.2%	-33.0%
Gas - additional reservoir CO_2 capture and storage (Moomba and Barossa)[7]	-0.3%	-0.7%	-28.5%	-33.6%
Additional reductions due domestic changes	**-5.9%**	**-10.6%**	**-28.2%**	**-32.9%**
Paris Agreement LNG demand reduction - `	-0.2%	-2.4%	-28.7%	36.0%
Paris Agreement Coal demand reduction – 2°C and Net Zero scenarios	-1.7%	-2.5%	-30.4%	-38.5%
Additional reductions due to international changes	**-2.6%**	**-3.4%**	**-30.4%**	**-38.5%**
Total additional reduction by 2030	**-8.1%**	**-15.9%**	**-30.4%**	**-38.5%**

Note: Year 2005 emissions are assumed to be 615 $MtCO_2$/year as in the December 2020 Projections

Early closure of coal plants compared to the 2020 projections.

One of the key components that has changed since the government's 2020 projections is the earlier phase-out of two coal plants and units which are being replaced by batteries and renewables: the brown coal Yallourn plant in Victoria's Latrobe valley, and units at the Eraring Power station in NSW[8] (see figure below).

[7] Two additional projects to capture reservoir CO_2 from natural gas production appear likely to proceed before 2030. These do not appear to be included in the Federal Government's 2020 projections. Both are projects run by Santos, the first at Moomba is reported by the company to be projected to capture 1.7 $MtCO_2$ per year, and the second relates to the company's Barossa gas production project which has very high levels of reservoir CO_2 (18%), and it has been reported that the company would capture and store around 2.3 $MtCO_2$ per year before 2030. See Santos and Upstreamonline

[8] Renew Economy

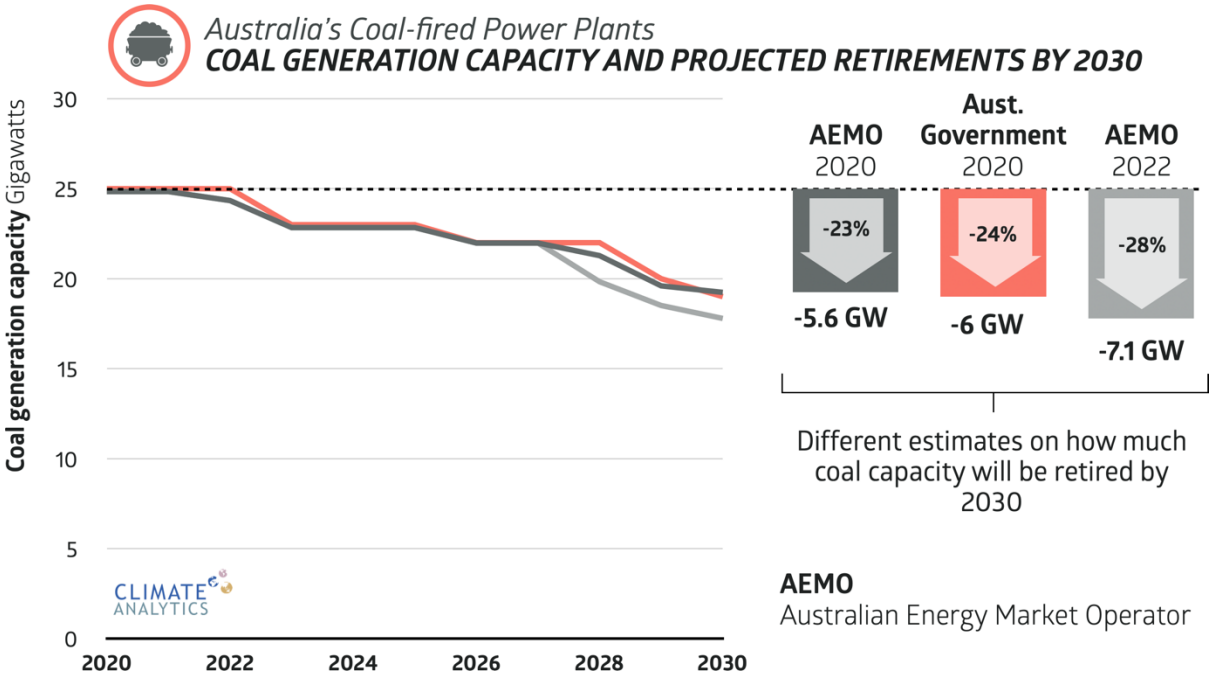

Figure 4. Schedule of coal plant and unit retirements - capacity (GW) from government sources.

The early shutdown of the Yallourn plant in Victoria yields a reduction of about 4.3-4.9 $MtCO_2e$ in 2030, and the black coal units in New South Wales averages about 3-3.4 $MtCO_2e$, for a 7.3-8.9 $MtCO_2e$. Based on total emissions in 2005 of 615 $MtCO_2e$[9] this is equivalent to additional reductions of about 1.2-1.5%.

Faster renewable energy rollout in the power sector

In the government's 2020 projections, renewables in the power sector were projected to be 51% of supply by 2030. Evaluation of a range of factors, including the continued rapid rollout of solar photovoltaic systems, the measures being taken at State level, and the likely uncommitted additional renewable capacity in AEMO planning documents, it seems much more likely that the renewable penetration rate into the power system nationally will be significantly higher than 51%.

Our provisional estimate is the renewable penetration into the power sector by 2030 is likely in the range 58-65%, which could reduce emissions by 17.6-36. $MtCO_2e$/year in 2030. Considering the effects on emissions of the early retirement of the coal plant and units estimated above, the additional reductions from 2005 levels by 2030 would be 1.7 to 4.8%.

[9] See Figure 5. Quarterly Update of Australia's National Greenhouse Gas Inventory Figures and Tables for the March Quarter 2021. Data in this figure and in the relevant sectors elsewhere in this update have been assembled into a time series of absolute emissions from 1990 until 2021. Data for the final quarter of the year ending June 2021 has been infilled based on trends in earlier years for that quarter and hence this is to be seen as preliminary. Nevertheless, it provides data for the period until June 30th 2020 and hence provides invalidation against the government's 2020 projections. See https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-quarterly-update-march-2021

Likely more rapid take-up of electric vehicles in the light duty vehicle sector than anticipated in the 2020 projections

The transport sector accounted for around 18% of national emissions in 2020. Emissions were 14% above 2005 levels despite the observed reduction due to COVID-19 and are projected to increase to 22% above 2005 levels by 2030 (6% above 2020 levels). Within this, light duty vehicles (LDVs) accounted for about 61% of emissions in 2020. Emissions from LDVs in 2030 are projected to remain above 2005 levels, and slightly above 2020 levels.

Australia has no vehicle efficiency standards. It has no Federal Government policies to accelerate the rollout of electric vehicles (EVs). Indeed, there appears to be hostility towards EVs at the federal level.[10]

The government's projections for EV rollout indicate market penetration of around 1.5% of LDV vehicle stock in 2025 and 6.5% in 2030. By 2030 emissions from this sector will be in decline.

There are now several state programs encouraging the rollout of electric vehicles, and these appear likely to increase the rate of electric vehicle sales and hence penetration into the LDV market above the levels assumed by the Federal Government in 2020. NSW and Victoria have policies requiring that 50% of all new cars sold in 2030 must be EVs, and South Australia has a policy that EVs should be the "common choice" by 2030. The ACT has a target for all car sales to be EVs by 2030.

In terms of estimating what this might mean for total EV penetration by 2030 - and hence additional emission reductions beyond those projected by the government - we assume two scenarios:

- the fraction of EVs in new vehicles sold in 2030 is common across Australia at around 50%, and
- this only applies to the present total fleet share of NSW, Victoria and South Australia.

This results in a range of EV penetration in the LDV market of between 13.5-18% by 2030. Applying the assumptions embedded in the government's 2020 projections, this could result in emission reductions of 4.3 to 7.1 $MtCO_2e/yr$ in 2030, bringing down national emissions a further 0.7-1.2% below 2005.

[10] https://www.smh.com.au/business/companies/not-even-tesla-can-overcome-australia-s-hostility-to-electric-cars-20210414-p57izn.html

Trends in the Land Use, Land Use Change, and Forestry (LULUCF) sector

The government's 2020 projections indicated a declining sink from around 17 $MtCO_2e$ in 2020 to around 5 $MtCO_2e$ in 2030. Present trends indicate that this is more likely to be a small increase by 2030 to between 19-24 $MtCO_2e$/year. The net effect of this would be a further reduction of net national emissions by 2.4-3.2%.

Implications of COVID-19 economic recovery and population projections.

We do not see the effects of COVID-19 and subsequent projected economic recovery making a significant difference to 2030 emission levels, considering the other factors analysed here.

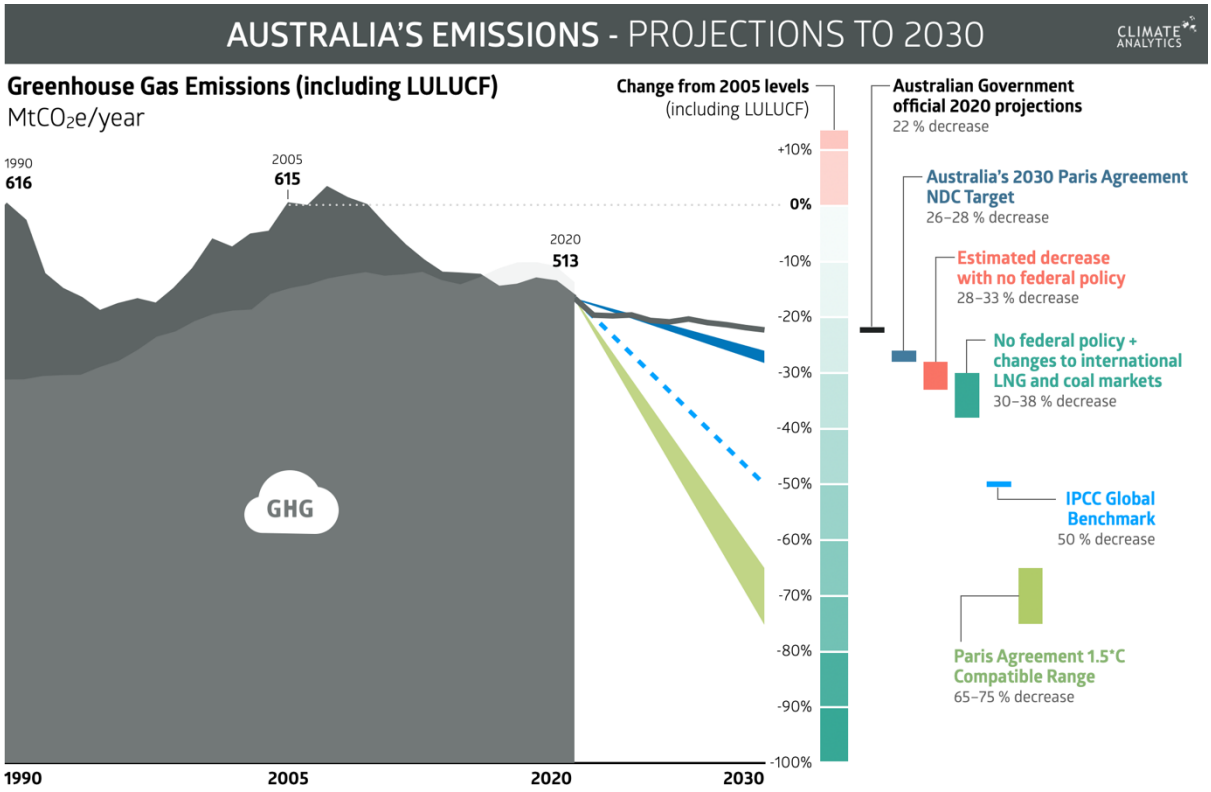

Figure 5 Australian greenhouse gas projections 2030[11]

[11] This figure shows the government's baseline projections to 2030, is 26 to 28% target and the additional emission reductions estimated this for 2030 from the sectors examined in this report. Variations in the recent available inventory compared to the inventory published in the government's December 2020 projections. The March 2021 National Greenhouse Gas Inventory (NGGI) contains data until March 2021, analysed statistically with the missing quarter June 30 infilled statistically to provide an estimate of the full financial year (June 30, 2021) emissions data. In addition, the AGEIS data are shown to 2019. Unlike many other countries, Australia's official reporting period is the financial year.

Implications of Australia's major international coal and liquefied natural gas (LNG) markets implementing Paris Agreement targets

Reductions in international demand for LNG and coal exports appear likely, as Australia's major trading partners in East Asia implement the Paris Agreement. The September 2021 Reserve Bank Bulletin[12] looked at three scenarios - present NDC, 2°C compatible, and Net Zero scenarios – impacting demand for Australian coal and LNG. In addition, the new International Energy Agency Net Zero by 2050 Roadmap for the Global Energy Sector[13] provided a detailed scenario for the LNG sector.

For LNG we looked at the range from the RBA 2°C pathway to the IEA Net Zero Scenario for Australia which range from 3- 34% reduction compared to the governments assumed export levels in 2030 of 88 Mt LNG per year. Emission reductions accounted for include fugitives and reservoir CO2 emissions, reductions in gas used in LNG production, and reductions in electricity used by the LNG industry (principally in Queensland). The net reduction from 2005 levels by 2030 is calculated at 0.2-2.4%.

For coal exports we followed the RBA 2°C and Net Zero pathways, would see coal exports reduced by about a third and a half respectively from the levels assumed in 2030. Accounting for fugitive emissions from coal mining and the energy used for coal production within Australia for these exports The net reductions from 2005 levels by 2030 is calculated at 1.7-2.5%.

In total we estimate the reduction of Australia's domestic emissions due to the decline in the exports of LNG and coal to be in the range of 2.0-4.9%, from a reduction in fugitive emissions and emissions from energy used in the production of LNG and for coal mining.

This would bring the total reductions below 2005 levels to approximately 30-38% by 2030, achieved from the developments outlined above in the domestic economy and internationally, without Federal Government input.

[12] https://www.rba.gov.au/publications/bulletin/2021/sep/towards-net-zero-implications-for-australia-of-energy-policies-in-east-asia.html
[13] https://www.iea.org/reports/net-zero-by-2050

How can Australia reduce 2030 emissions by more than 50%, and how does this relate to getting to net zero "as soon as possible"?

We have developed three scenarios[14] to show how Australia can increase its climate ambition more than 50%. (See Appendix II).

These scenarios demonstrate that Australia can relatively easily raise the ambition of its 2030 target to reach 50% - 60% below 2005 levels. For a 1.5°C compatible pathway the Climate Action Tracker (2020) Scaling Up Climate Action Australia Report shows that effort would need to made in all sectors to achieve at least a 66% reduction from 2005 emissions levels including land use change and forestry by 2030.[15] This pathway halves emissions from fossil fuels, industry, transport, agriculture, buildings (excluding land use change and forestry) by more than 50% by 2030 (See Appendix II).

Each of the scenarios also assume a significant amount of action in the land sector to maintain the forest sink, significantly reduce deforestation and limit greenhouse gas emissions from agriculture.

For scenarios A-C policies in these areas would see the present carbon sink nationally of close to 20 $MtCO_2e$ maintained and increased towards 35 $MtCO_2e$ by 2030. To reach net zero greenhouse gas emissions in the 2040s, and by 2050 at the latest, further efforts in the land sector to maintain forest carbon storage, reduce net deforestation emissions towards zero, and limit agricultural emissions from the land sector will be essential.

The reason for this is that based on present knowledge it will be very difficult to reduce non-CO_2 GHG emissions from agriculture and some industrial sectors to zero by 2050. Therefore, there needs to be a significant increase in the amount of carbon stored in vegetation soils to bring greenhouse gases into balance by the 2040s. This is a common pattern across all net zero pathways for many countries. We assume that technologies to remove CO_2 from the atmosphere are not deployed, and the focus of attention is on reducing emissions and protecting our vegetation and land.

It should be noted that the focus here has been on getting to net zero greenhouse gas emissions by the 2040s, latest 2050. These pathways will reach net zero for carbon dioxide somewhat earlier. In the CAT Scaling up Australia pathway this is in the late 2030s, an indication of the significance of the task in reducing emissions of non-CO_2 greenhouse gases.

[14] These scenarios have been based on the 1.5°C sector pathways by the Climate Action Tracker (2020) Scaling Up Climate Action Australia Report. However, the data presented here may differ as the CAT report assumes climate action would have already started. Our analysis has estimated a higher rate of emissions reduction from 2022 to 2030 due to the inaction of previous years. We estimate an increased in rate of sectoral action assumed for this period of about 15% average across all sectors.

[15] https://climateanalytics.org/media/cat_2020-11-10_scalingup_australia_fullreport.pdf

Table 2 Summary of scenarios

	Emissions in 2030 incl. LULUCF	Description	Additional mitigation efforts are made in the following sectors
Scenario A	**≈50%** below 2005 levels	A scenario focused on decarbonising energy.	• Electricity • Buildings • Transport
Scenario B	**≈50%** below 2005 levels	A scenario to show if only partial mitigation efforts are made in the energy sector, other sectors will need to ramp up decarbonisation efforts to meet a 50% target.	• Buildings • Agriculture • Waste • Industry • Some effort made in electricity sector but to a lesser extent than scenarios A and C.
Scenario C	**≈60%** below 2005 levels	Scenario to show mitigation efforts focusing on the emissions intensive sectors (energy and industry sectors).	• Electricity • Buildings • Transport • Industry
Scenario 1.5	**≈67%** below 2005 levels	A 1.5°C compatible scenario covering all sectors of the economy.	• Economy wide

CAT Scenario 1.5°C compatible scenario

Figure 6 shows the scenarios described here, including a stylised extension of the government's projections to 2030, extended to 2050. Scenarios A-C and the Climate Action Tracker pathway reach net zero between 2045 and 2050.

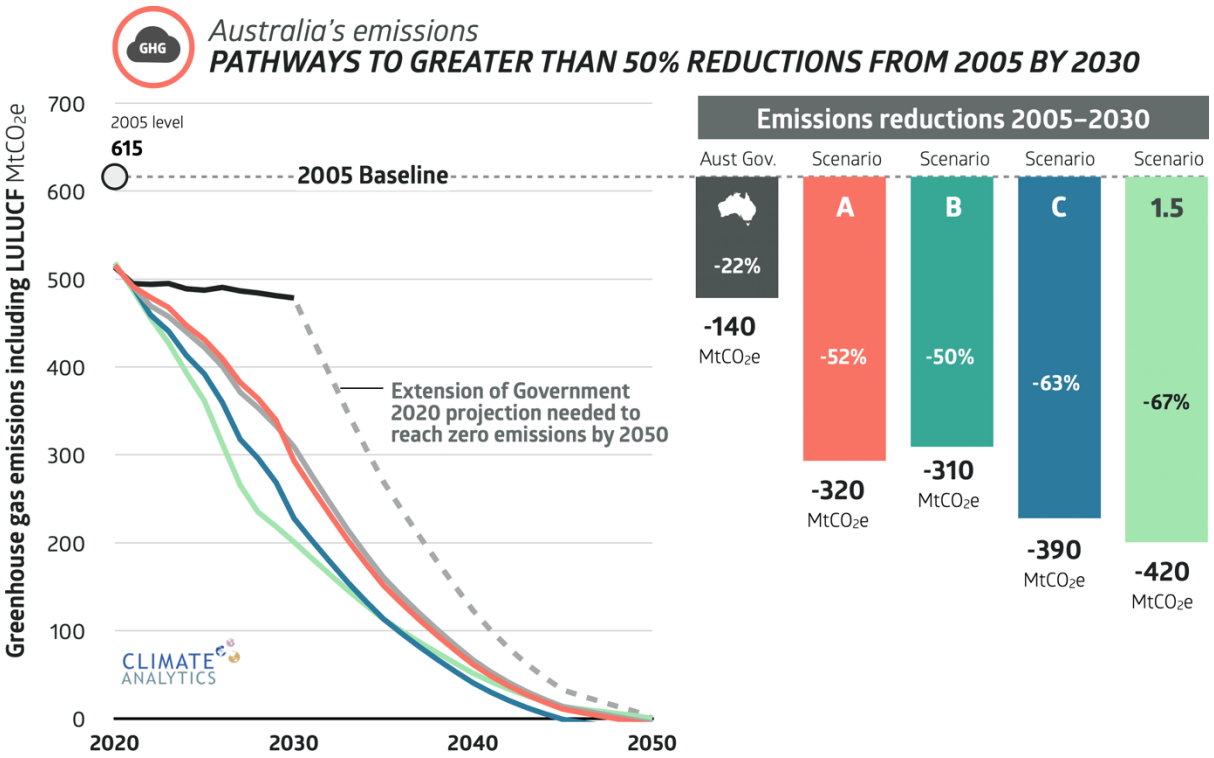

Figure 6 Scenarios to reach 50%+ emission reductions by 2030

How does Australia compare to other countries?

Here, we assess how Australia compares to other countries on several different metrics, both internationally and domestically.

2030 emission reduction targets

At the international level what is important is the 2030 emissions reduction that Australia is committed to, termed the Paris Agreement "NDC" (or Nationally Determined Contribution). The NDC is meant to be updated to a higher level of ambition by Glasgow. Figure 7 compares 2030 emission reductions for a selected group of developed countries compared to a common year, 2005, which is the base year Australia is using for its 2030 emission reduction target.

We have also included a comparison between targets with and without land use change in forestry, which can make a very big difference in the real emission reductions achieved, and specifically to Australia's advantage given its very high deforestation emissions in 2005.

Figure 7 shows that Australia's 26-28% reduction target is the second lowest compared to the wealthiest OECD countries, only beaten to first place by South Korea.

Factoring out the land sector places Australia in the lowest ambition position compared to this set of countries, by a wide margin. Excluding the land sector from comparisons is important because it provides a better basis for comparing the actual mitigation effort undertaken by countries, as opposed to changes in emissions or targets that result from a highly variable and often manipulated land sector emissions or removals.

Another key point that this figure shows is that with an emissions reduction of 35% - close to where Australia's emissions are headed in the absence of action by the Federal Government - Australia is at the bottom end of the G7 scale and competing with New Zealand for the bottom place overall when excluding accounting for the land sector.

It is only once Australia's target gets to the 50% reduction by 2030 level that it is placed firmly in the range of outcomes that the G7 countries have put on the table and makes its ambition comparable to the USA and the EU27, but still far short of matching the UK's level of domestic emissions reduction ambition. It would only be by adopting a target close to 67%, including land use change and forestry, that Australia would be at a similar level to the UK.

Factoring out land use change in forestry, even a 50% target would leave Australia at a lower level of emissions reduction commitment than the G7 countries in this group, with real reductions in fossil fuel and industrial emissions of the order of 35%, it is only at a 67% reduction commitment that Australia's reductions in fossil fuel and industrial emissions would be within the range targeted by the US, the EU and the UK.

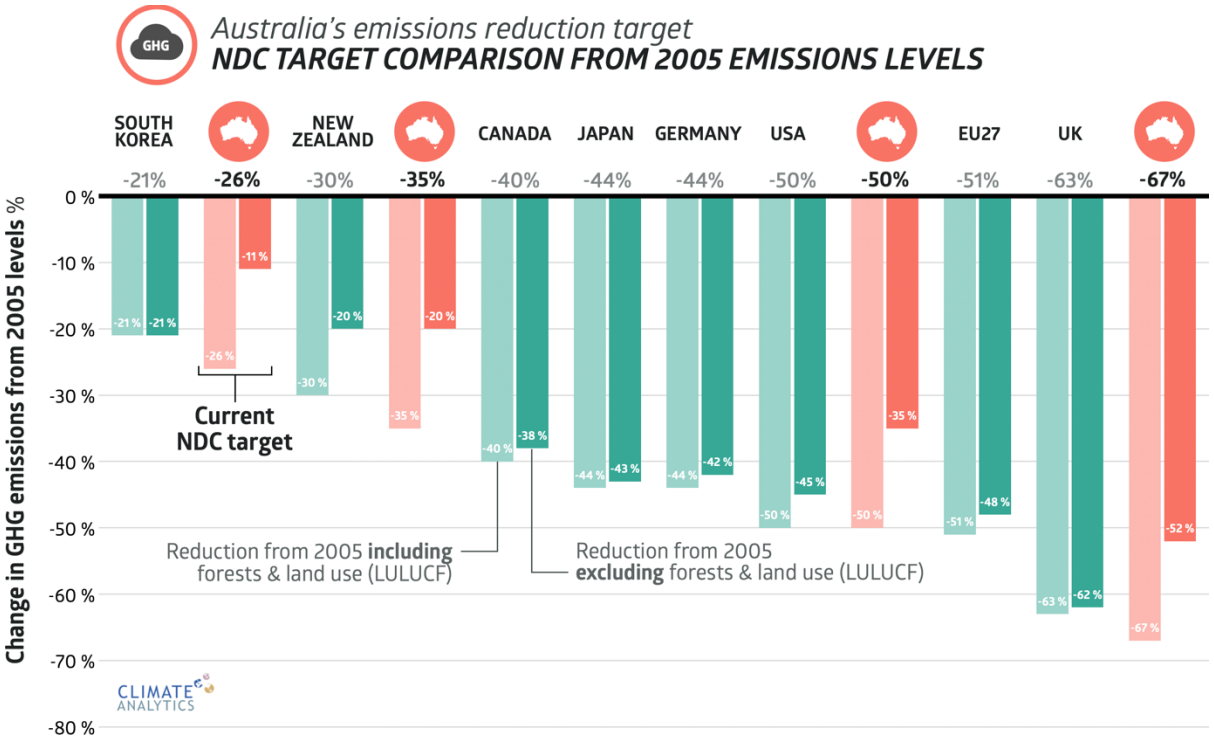

Figure 7 Comparison of 2030 emission reductions based on Paris Agreement targets for 2030

How does Australia compare on per capita emissions?

Energy Minister Angus Taylor claims that Australia's 2030 target will result in emissions reductions of 50% per capita[16]. Before unpacking this, it is important to emphasise that per capita emissions are only a relative measure and what matters in terms of reaching net zero emissions is absolute emission reductions. This means that all countries' per capita emissions will need to reduce relatively quickly in the coming decades.

The projected reduction in per capita emissions which would result from achievement of Australia's 26-28% reduction target compared to other comparable countries also shows Australia lags behind the improvements projected for many other similar countries. This situation would improve as the Australian 2030 target increases above 50%.

With greenhouse gas emissions from fossil fuels, industry, agriculture, buildings, commerce and transport being the main driver of climate change, the trend in GHG's excluding LULUCF appears more important as it also reflects the larger pattern of decarbonisation in the economy much better than measures including the highly volatile land sector.

Changes in per capita emissions obscure another key issue - the very high absolute value of Australia's per capita greenhouse gas emissions.

Figure 8 shows that Australia's per capita emissions are extraordinarily high, and whilst reducing, remain much higher than our peers and counterparts. The government's 26%-28% reduction target by 2030 does little to remove this disparity, which is only significantly improved at a 50% reduction and brought into line with a 65% reduction by 2030.

[16] The Guardian April 23 2021

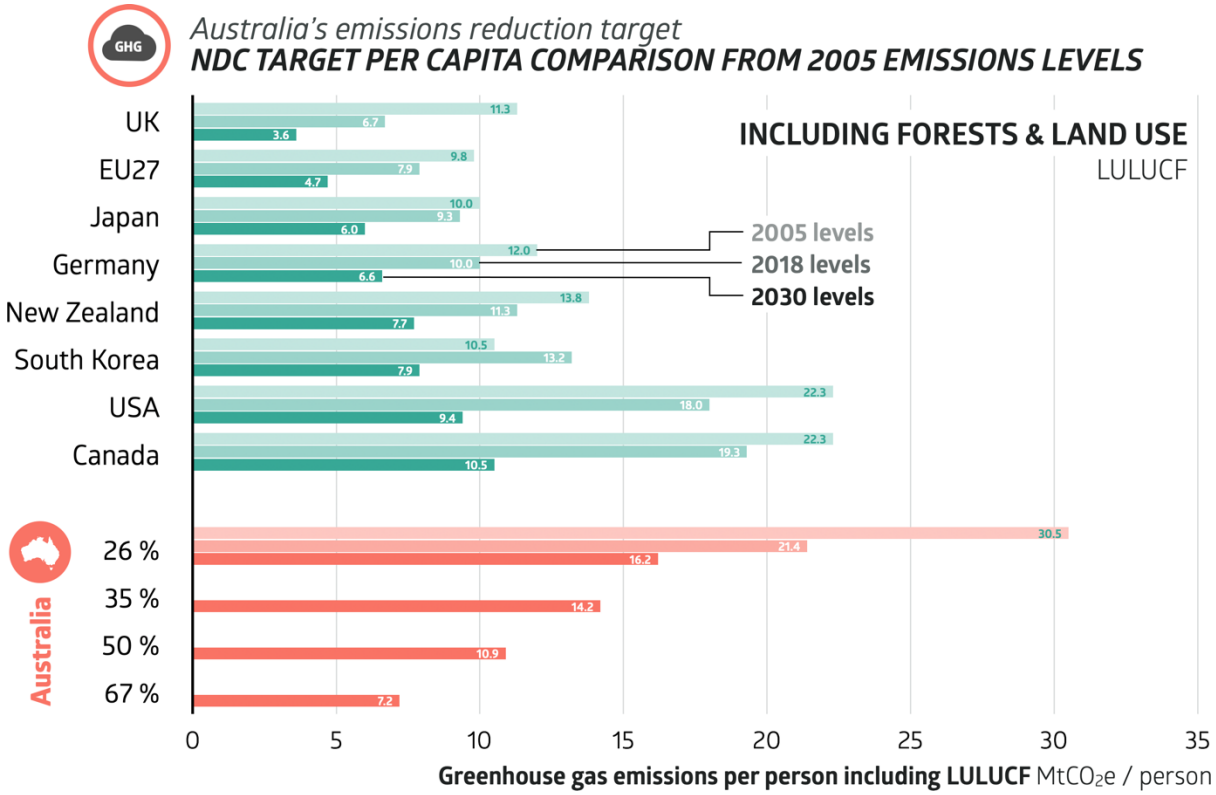

Figure 8 a) Absolute per capita emissions including LULUCF of selected countries 2015, 2018 and 2030

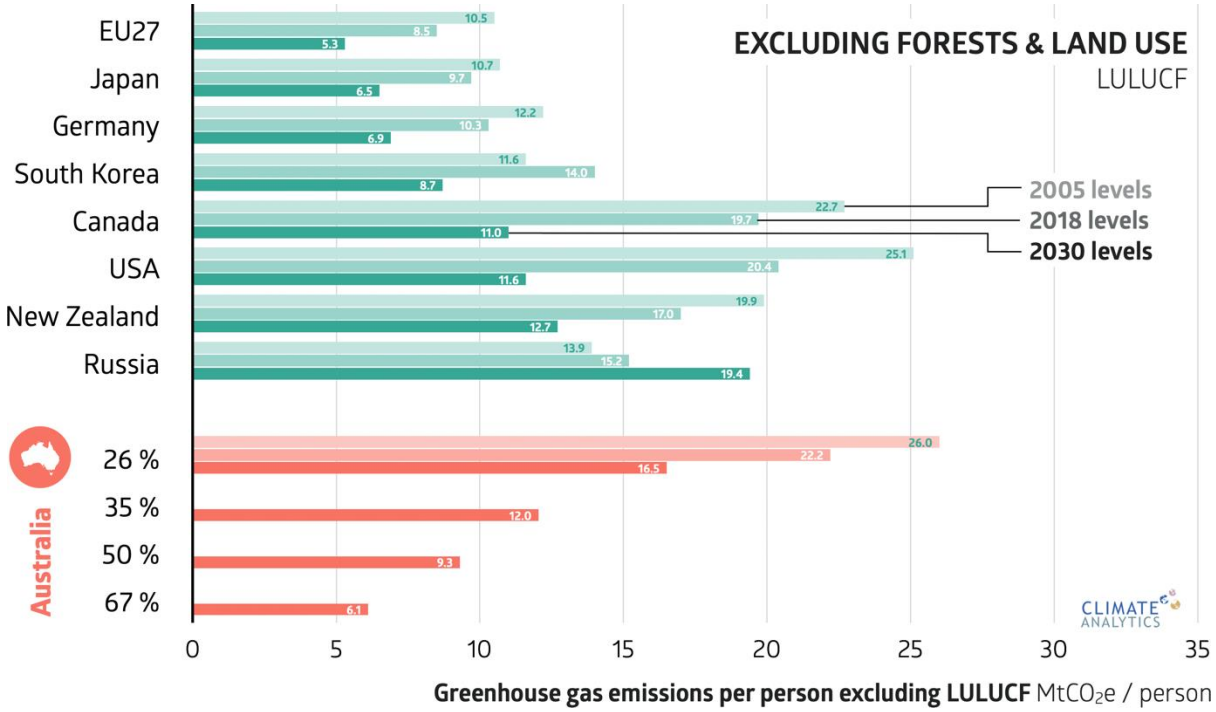

Figure 8 b) Absolute per capita emissions excluding LULUCF of selected countries 2015, 2018 and 2030

Data for 2015 and 2018 are historic, and for 2030 based on each country's NDCs, except for Korea which is based on its announced 40% target, Germany which is based on its national targets

Decarbonising the power sector

Taking a look at historical trends, one can see why Australia would need to commit to high levels of relative emissions reductions to be on par with its G20 counterparts.

As shown in Figure 9, Australia's emissions-intensity of power generation lies well above comparable countries, and this has been the case for decades. Although this has begun to decline in recent years with the introduction of renewables, the decline is relative to a significantly worse (i.e., more emissions intensive) baseline.

So, while the trend in renewables share in power has been similar for Australia and the US (Figure 10), the corresponding trends for the power sector's emissions intensity has occurred at a higher level for Australia. The bottom line here is that Australia cannot merely follow to progress at the same pace, it will need to rather significantly accelerate emissions reduction in the power sector.

What can also be noticed is that the accelerated phase-out of coal in the UK is visible in the declining carbon intensity of power production. It should also be noted that the reduction in carbon intensity of power in Germany is contemporaneous with the phase-out of nuclear power, reflecting a ramping up of renewable energy.

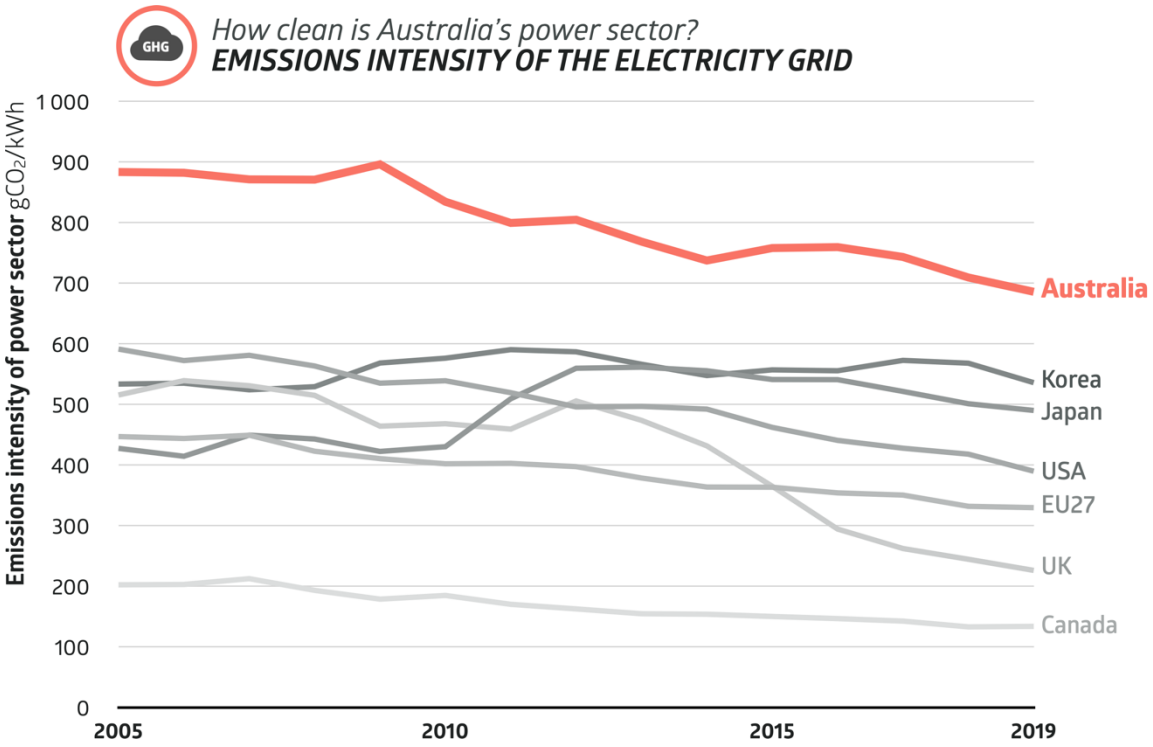

Figure 9: Emissions intensity of power generation (g CO_2/kWh)

In terms of the share of renewable energy in the power sector, the Australian government claims that it is a world leader. Australia's performance through 2019 is very similar to the United States. The UK has achieved much higher growth rates contemporaneous with the phasing out of coal.

Nevertheless, Australia's power system is decarbonising rapidly, but the main driver behind this is not the Federal Government, given that the renewable energy target has expired and is instead driven significantly by state renewable energy policies and by market pressures given the declining costs of renewables and storage compared to fossil fuel generators.

The penetration of renewables has grown from about 21% in 2019 to about 29% in 2021, and, on the government's projections, will grow to around 51% by 2030. We estimate in this report that growth beyond this is likely due to a variety of issues, including the earlier phaseout of coal-fired power stations which are going to be replaced by renewables and storage as well as state based renewable energy targets and policies and could easily be in the range of 55 to 60% by 2030.

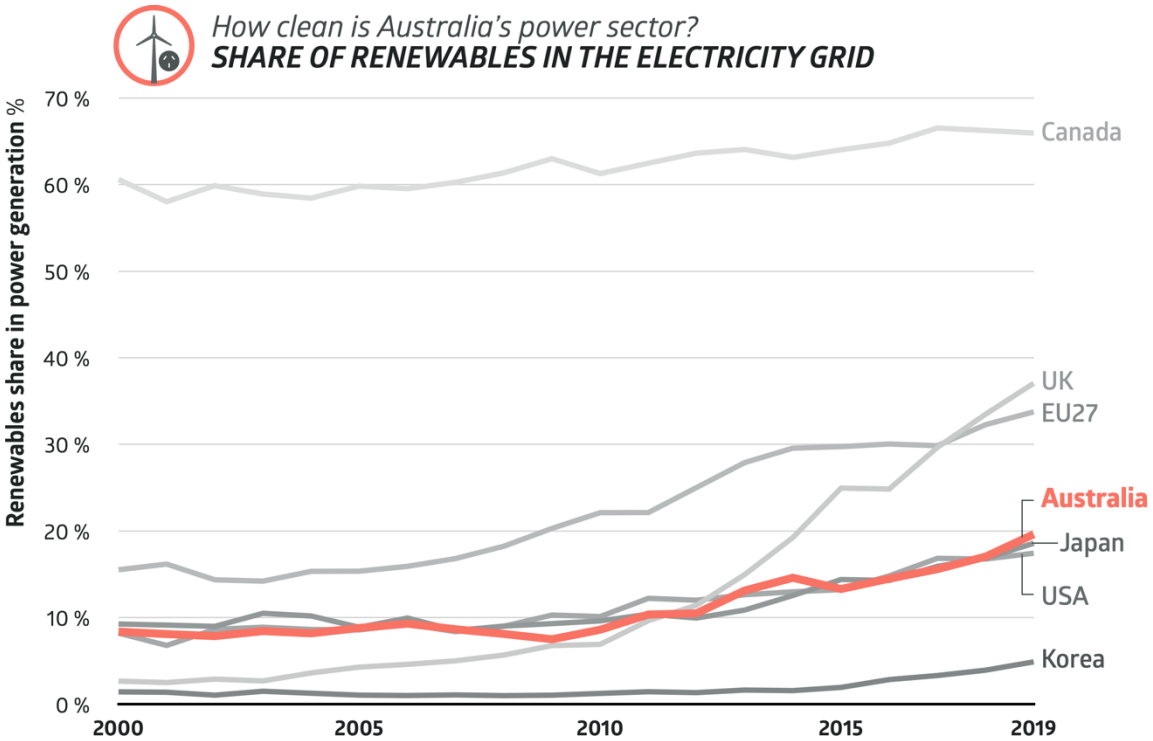

Figure 10: Renewables share in power 2000 - 2019 comparison

Decarbonising the energy system

While the growing decarbonisation of Australia's power sector is a positive development, there are growing concerns that the Federal Government policies could slow this down.

Decarbonisation of the whole energy system is needed to reach net zero and Australia is clearly lagging many others.

Over the past decades the renewable component of the total primary energy system has been in a range of 6 to 7% (Figure 11) and it is only with the State-level action increasing the penetration of renewables in the power sector that this fraction has begun to increase slowly. However, even a fully renewable power sector would not change this picture fundamentally, because of the energy and carbon-intensive character of much of the economy.

When one observes trends in total primary energy supply (TPES), it is clear what is holding Australia back in reducing emissions. While the share of solar and wind in the country's TPES has been growing at a similar rate as comparable countries (Figure 12), any emissions improvements due to this are eclipsed by the relatively large amount of coal remaining in the system (Figure 13).

The bottom line here is that Australia cannot merely move at the same pace as others but needs to significantly accelerate emissions reductions in the power sector and the phase-out of coal, gas and oil products in the energy system as a whole.

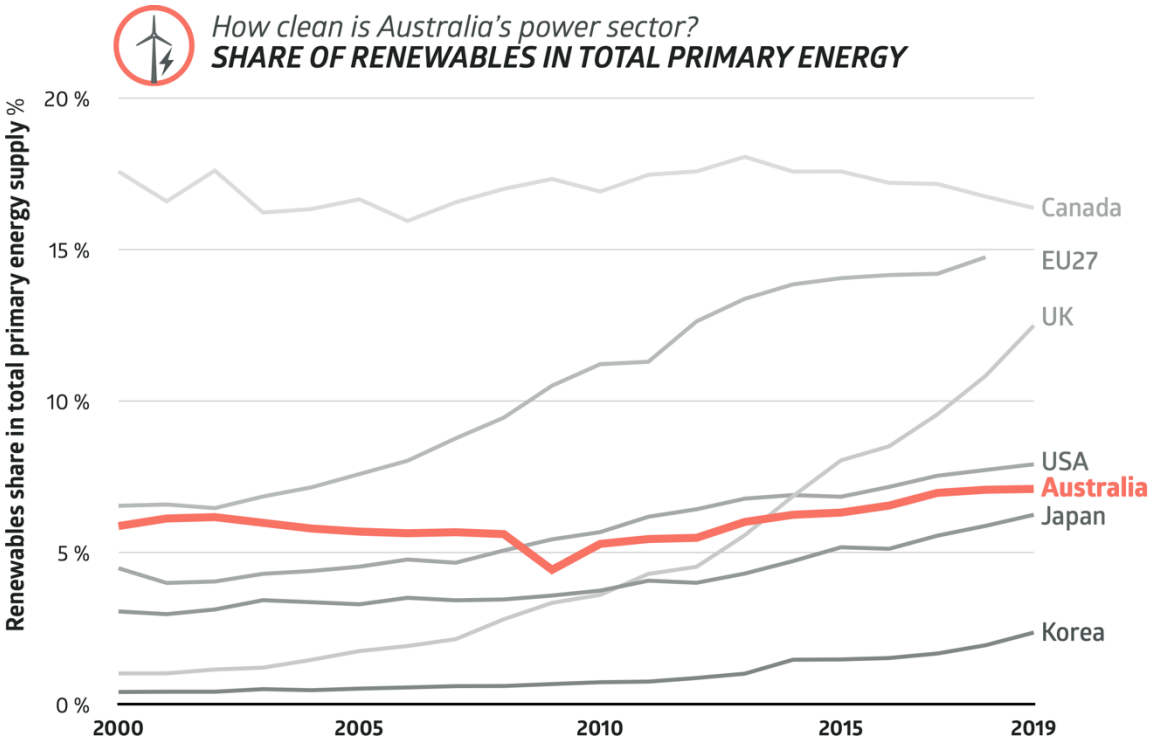

Figure 11 Share of renewables in total primary energy supply (TPES)

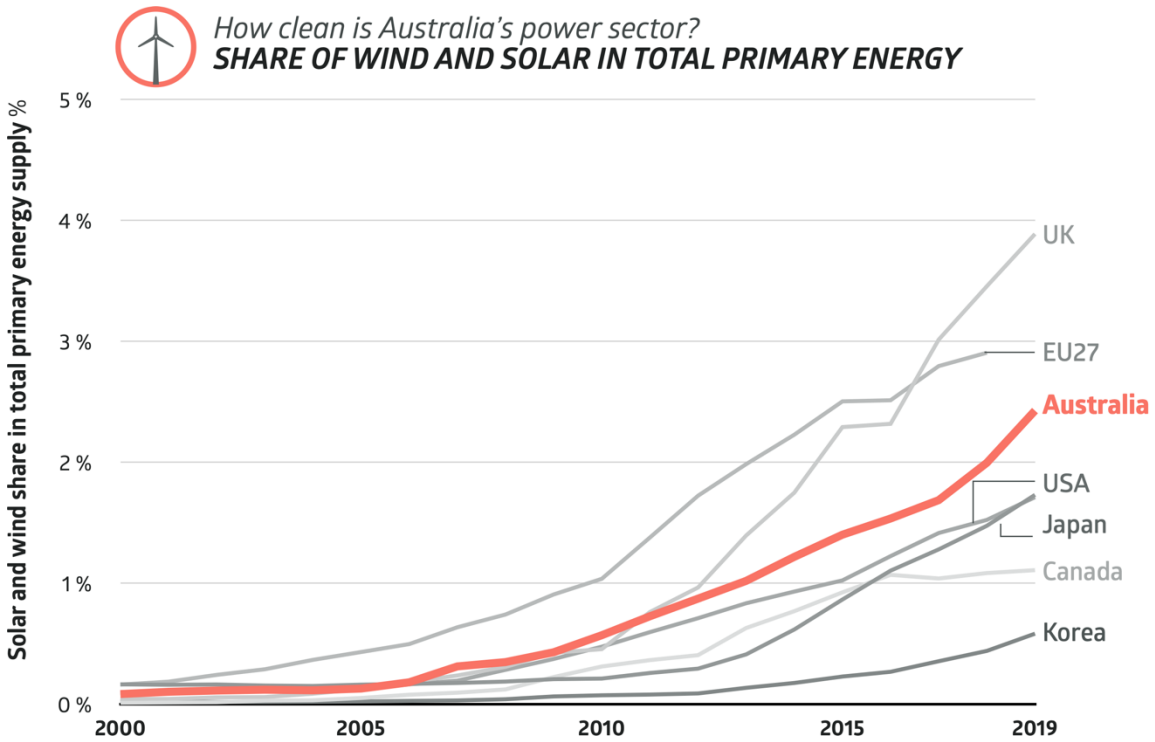

Figure 12 Solar and wind share in total primary energy supply (TPES)

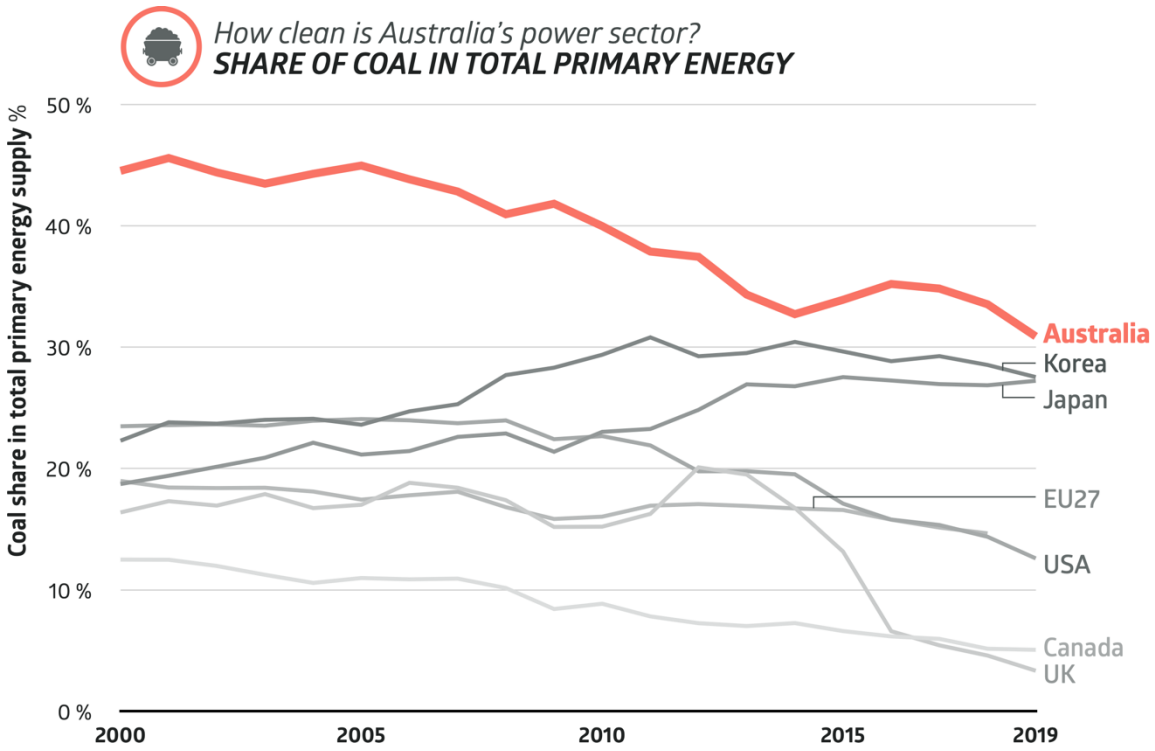

Figure 13 Share of coal in total primary energy supply (TPES)

Scaling up of Electric vehicles (EVs)

Electrification of transport is one of the key modalities for decarbonizing and reaching net zero. The leading edge of this is the electrification of light duty vehicles, which is accelerating globally. Australia is however far behind others in the ramping up of electric vehicles in its overall vehicle stock.

Figure 14 below compares Australia, the USA and China in terms of total number of electric vehicles per thousand people and a more comprehensive picture appears. Figure 15 shows the estimated total fraction of the car market that is electric according to the International Energy Agency's electric vehicle data. In this figure Australia is not just lagging in terms of absolute penetration of electric vehicles into the light duty vehicle market but that it is also lagging seriously in terms of the acceleration of the penetration of electric vehicles into the total car fleet. This reflects the lack of policies at the federal level to encourage the uptake of electric vehicles and their national rollout.

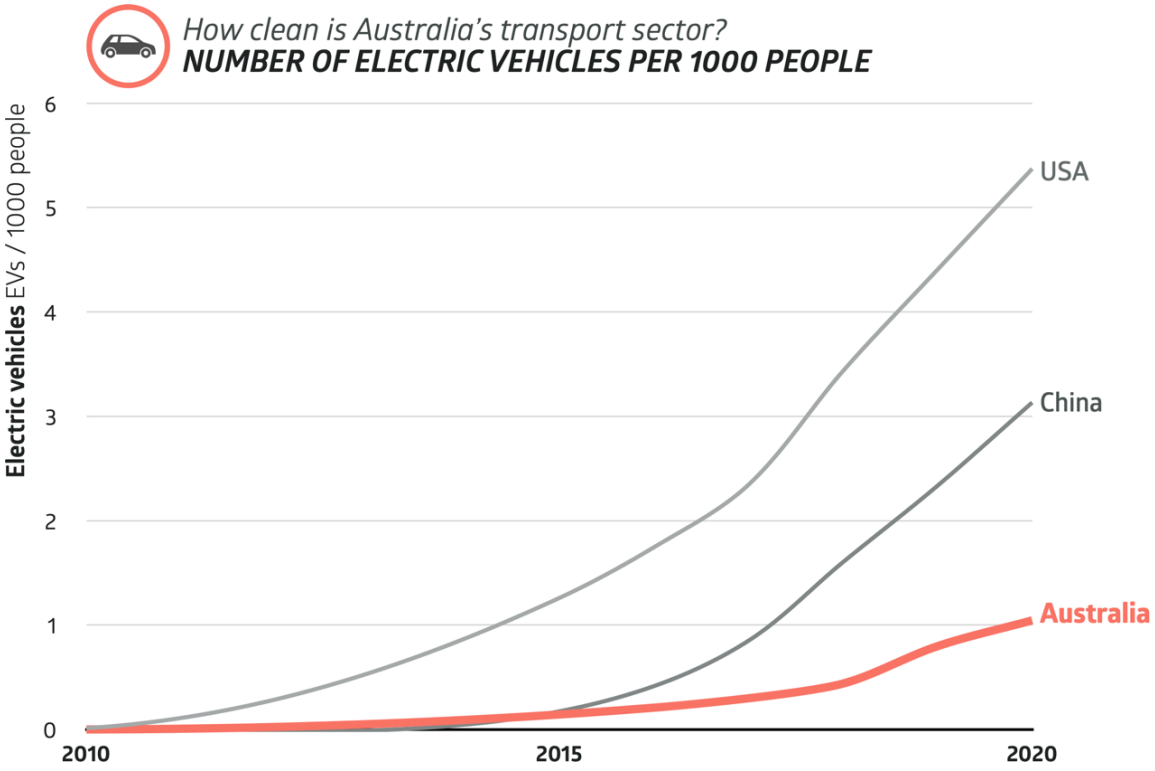

Figure 14 Electric vehicles per thousand people, comparison of Australia, USA and China

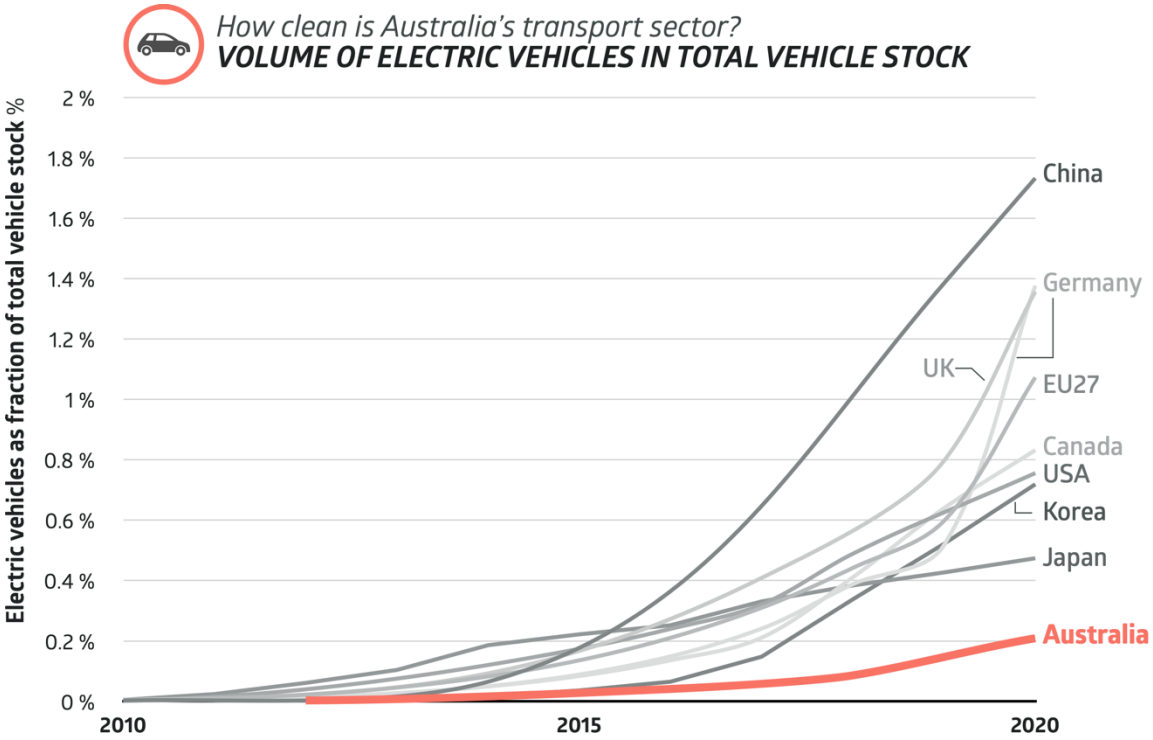

Figure 15 Total market share of electric vehicles

What do state based targets add up to?

Most Australian states and territories have put forward 2030 targets except for WA and the Northern Territory. If WA and NT follow the federal target of 26-28%, the total aggregate national effect is for about a 41.2-42.4% reduction in emissions by 2030 compared to 2005 emission levels. Alternatively, if WA and the NT were not to follow the Australian government 26 - 28% target themselves, and instead set their 2030 emissions targets at close to present levels, this outcome would be seriously degraded towards a 34% reduction.

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Table 3 Shows the increase or decrease in emissions above 2005 levels in each state or territory. Most states and territories have decreased their emissions since 2005, considering land-use change and forestry, the exceptions being Western Australia and the Northern Territory. Results are shown graphically in Figure 16.

Table 3 State and Territory Emissions reductions targets

	Emission reductions or increases with respect to 2005			
	2019 emissions	Lowest 2030 target	Highest 2030 target	WA and NT assumed to limit emissions in 2030 to 2019 levels
WA	21%	No target		21%
VIC	-25%	-45%	-50%	
TAS	-109%	-100%	-100%	
SA	-33%	-50%	-50%	
NT	46%	No target		46%
NSW	-17%	-50%	-50%	
QLD	-14%	-30%	-30%	
ACT	-8%	-70%	-70%	
National aggregate of state and territory targets	-15%	-41%	-42%	-34%
Australian Government target	-15%	-26%	-28%	

Note that Tasmania has a net zero goal which has already been achieved, hence it shows 109% below 2019 levels of emissions indicating that the state is a net sink overall. For the purposes of evaluating the aggregate effect of state targets, it is assumed that the Tasmanian net zero target applies indefinitely, including for 2030.

Overall, this indicates that there would be substantial political support from the states and territories of the Australian federation for a major improvement in the national 2030 target, at least approaching the 40% level.

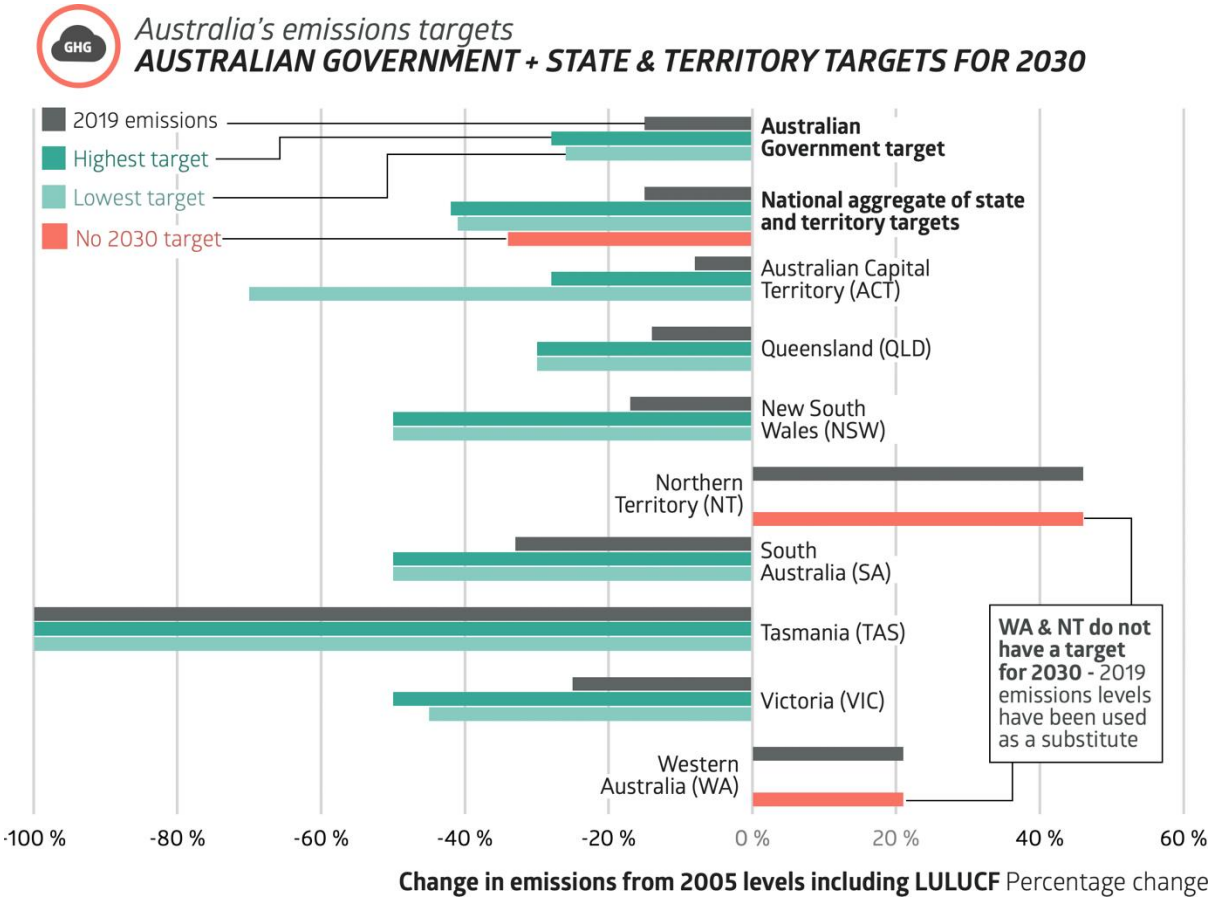

Figure 16 State and territory greenhouse gas reductions targets for 2030 and their aggregated national effect.

All states and territories except Western Australia and the Federal Government have a renewable energy target for 2030, usually for renewable generation within the state. With the Federal Government's current projections showing about a 51% penetration of renewables into electricity generation by 2030, it is also interesting to examine whether the state targets, if fully implemented and which are generally included in the Federal Government projections would result in a different outcome?

Table 4 provides an overview of 2030 renewable generation targets by state and territory and gives an indication of recent renewable generation levels by state, along with each state's share of total national electricity generation.

Present trends in Western Australia would indicate only about 20% renewable generation by 2030 for the whole of the state, which would then set the total renewable outcome for Australia around 53%, not significantly different from the present Federal Government projections. If Western Australia had a 50% renewable target for 2030, comparable to the lowest common denominator of all other states and territories, then the national renewable penetration level would approach 58%.

Table 4 Renewable energy targes of Australian states and territories

State	2020 Share of national generation	Percentage renewables in 2020	2030 Renewables target
WA	16.4%	12%	No Target
VIC	19.1%	28%	50%
TAS	4.2%	99%	100%
SA	5.6%	61%	100%
NT	1.9%	5%	50%
NSW	26.2%	22%	60%
QLD	26.7%	17%	50%
Australian Federal Government	100.0%	25.4%	No Target

Note: In Western Australia, the Southwest interconnected system (SWIS) had a renewal penetration of about 26% in 2020, however the SWIS is only part of the electricity generation in Western Australia the remainder of which is highly carbon intensive. According to Australia's Energy Statistics[17] and data from the OpenNEM[18], the SWIS accounted for about 45% of total generation Western Australia 2020, hence the overall result is that renewables accounted for only 12% of generation in that year.

[17] See Table O in https://www.energy.gov.au/publications/australian-energy-update-2021
[18] https://opennem.org.au/energy/au/?range=all&interval=1y

APPENDIX I: The Government's ever-shifting projections

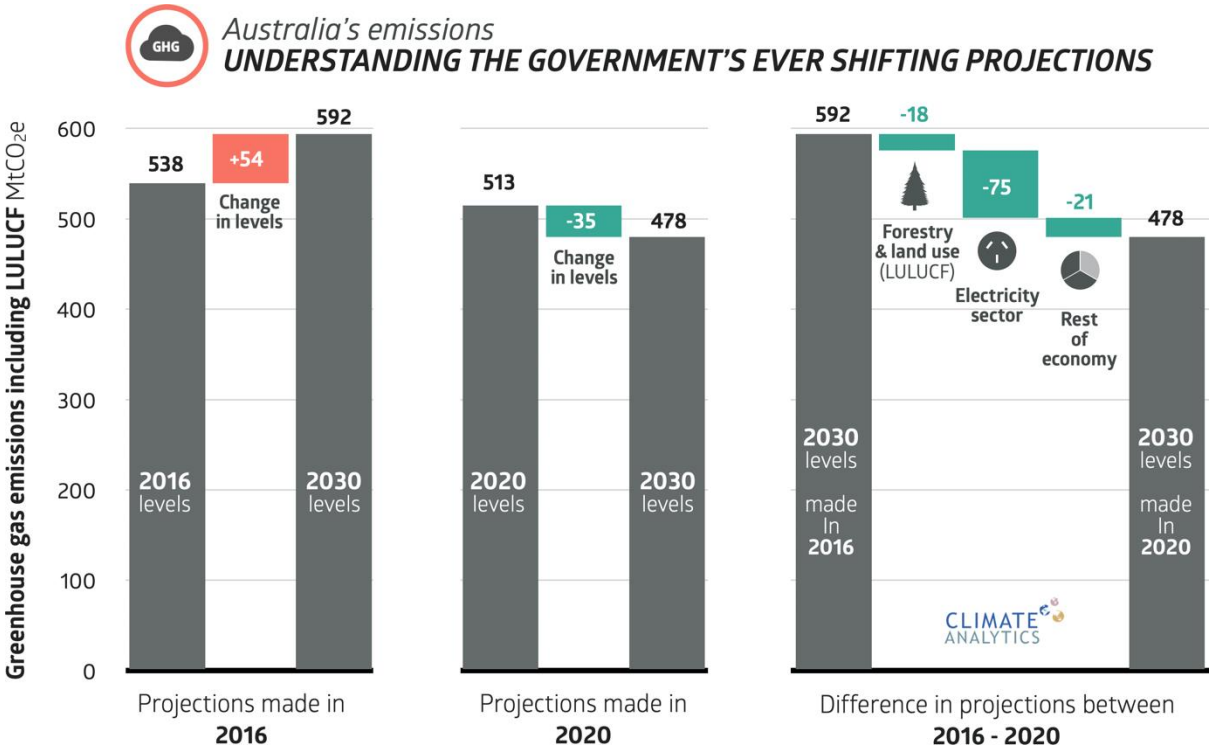

Figure 17 Sources of reductions in 2030 emissions from 2016 to 2020 projections

The Government's emissions projections made between 2016 and 2020 show emissions in 2030 will have declined without there being any real action by the Federal Government.

In addition to the target, the Australian government has defined its objective for the period 2021 to 2030 with respect to the achievement of a GHG emissions budget. This budget has been used to show a rapidly declining "cumulative emission reduction task." It is reported every year and vigorously promoted. Again, in the absence of any relevant policy, it is unclear how such a result could occur.

In addition to the lack of Federal policy impacting the Government's 2030 target and cumulative emissions reduction task, there is also what appears to be an inconsistency in the GHG budget and greenhouse gas inventories used as the basis for progress assessments. In each case, the updated emissions budget and greenhouse gas inventory results in the appearance of greater progress.

For example, the Government's 2030 emissions reduction target is defined with respect to a 5% emissions reduction target in 2020 based on emissions levels in 2000. A straight line from

this emissions level is made to the government's 26%-28% reduction target. However, reduction in this case is based on 2005 emission levels. The emissions budget changes, as does the allowed emission level in 2030 according to the inventory of greenhouse gases in 2000 and 2005. There is a significant pattern of successive greenhouse gas inventories changing these numbers, with the most recent updates tending to increase the budget. They also increase the allowed absolute emission levels in 2030 consistent with 26% emissions reduction – see Table 5.

Table 5 Change in 2030 emission targets levels and 2021-2030 cumulative emission budgets since 2016

	2000 emissions for 2020 budget starting year (5% below 2000) $MtCO_2e$	**2005 Base emissions for 2030 target** $MtCO_2e$	**2021-2030 budget** $MtCO_2e$	**2030 emission levels consistent with 26% reduction from 2005** $MtCO_2e$
2016 Projections	595	595	4,967	440
2020 Projections	544	615	4,832	455
2021 March 2021 Quarterly update of National Greenhouse Gas Inventory[19]	549	617	4,859	456
2021 AGEIS data[20]	556	624	4,915	462

Figure 18 below shows the rapid reduction in cumulative emissions above the emissions budget estimate, which the government terms "abatement task" from 2016 to 2020. The rapid reduction creates a distinct impression that the abatement task is reducing due to government action. Added to this data, and outlined in this report, is a full range of estimates for likely emission reductions absent further action but due to ongoing changes in the economy. These estimates indicate that it is likely the government's next projections will show a further "overachievement" of its targets.

[19] https://www.industry.gov.au/news/australias-greenhouse-gas-emissions-march-2021-quarterly-update with statistical infilling of the final quarter to June 30, 2021

[20] Year 2000 and 2005 data accessed from https://ageis.climatechange.gov.au/ National Greenhouse Gas Inventory – Paris Agreement Inventory

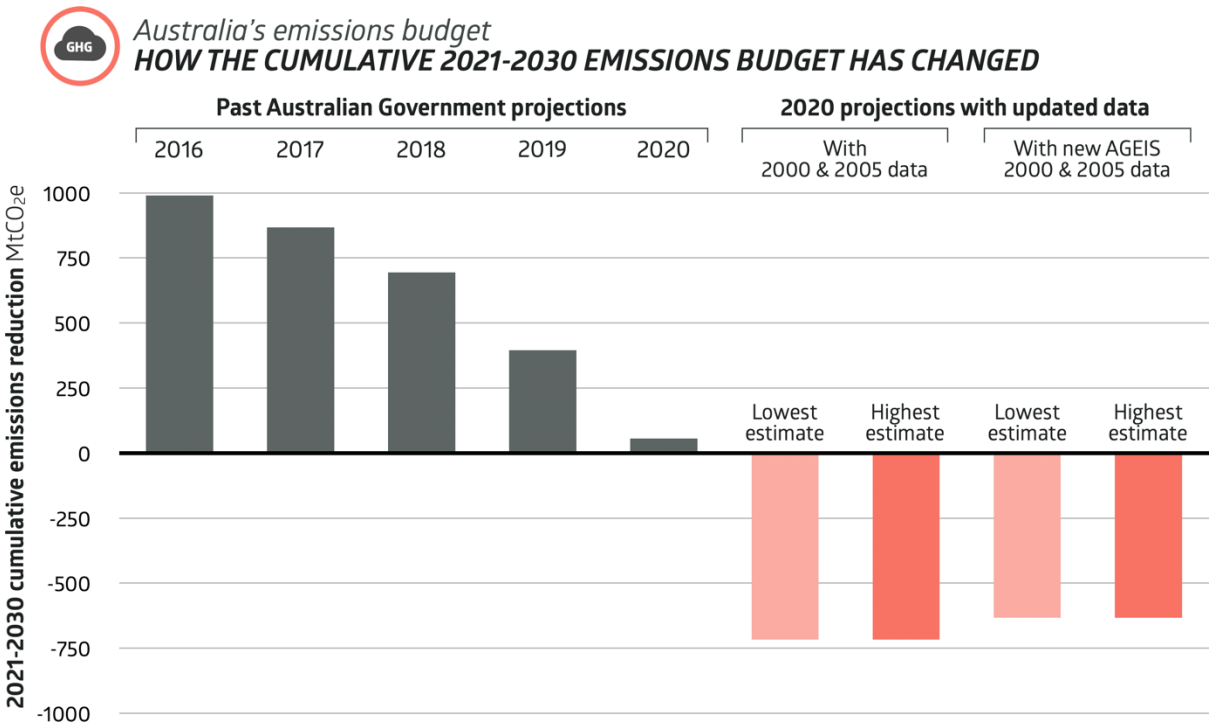

Figure 18 The Federal Government's projected changes in cumulative emission reduction task from 2016-2020 compared to updated estimated reductions to 2030

The cumulative emission reduction task is the total emissions in the period 2021 to 2030 that are above the government's defined cumulative emission budget for that period. If this number is negative, then it indicates that the cumulative emissions are below the budget, and hence that the target has been overachieved. The updated estimated reductions are those estimated in this report to occur due to ongoing changes in the economy independent of the Federal Government's actions by 2030. These estimates are provisional and may be updated with further data, however they give a robust indication that it is likely the next government projections will show "overachievement".

APPENDIX II: Scenarios A-C and 1.5 degree compatible scenario

Scenario A: energy-focused

Scenario A focuses on decarbonising the energy sector. This scenario demonstrates a domestic pathway for Australia's emissions to reach around 50% below 2005 levels by 2030. Decarbonisation efforts are made in the electricity, buildings and transport sectors.

This scenario demonstrates the potential for the electricity sector to rapidly decarbonise as renewable energy is scaled up, and fossil fuel power generation is phased out.

By 2030, mitigation efforts amount to more than 100MtCO_2e in the electricity sector, 13 MtCO_2e in the buildings sector, and 46 MtCO_2e in the transport sector compared to the current development scenario.[21] Overall emissions are reduced by over 150 MtCO_2 in 2030 compared to the Government's 2020 projections, with emissions excluding LULUCF reduced in 2030 by 37% compared to 2005 levels, and total GHG emissions by 52%.

In this scenario renewable penetration of the power sector approaches 95% by 2030.

The Australian Energy Market Operator (AEMO) recently published a Hydrogen (H2) Superpower scenario for the national electricity market (NEM) that covers Australia's east coast grid network[22]. This scenario focuses on hydrogen largely derived from renewable energy. When adding the emissions from this scenario to emissions from the rest of Australia's power sector, it reaches a similar level of emissions in 2030 as the electricity sector in scenario A. Scenario A's electricity sector emissions are from a 1.5C pathway developed by the Climate Action Tracker[23].

The Climate Action Tracker and AEMO H2 Superpower scenario demonstrates there are several methods to achieve the same emissions pathway results for 2030.

The Climate Action Tracker pathway's key assumptions include a renewable energy target of a 95-97% share of total electricity generation by 2030, and electric vehicles representing 38% of the car fleet by 2030. A significant part of the reductions (~45%) in the transport sector comes from EVs – for LDVs this means more than 75% of new vehicles sold in 2030 would be EVs, so that by then around 38% of the fleet would be electric. The share of electric cars in new sales is modelled with an s-curve that reaches 100% by 2035.

The AEMO's H2 scenario assumes strong global actions for decarbonisation, technology breakthroughs and the development of domestic hydrogen production for manufacturing, transport and export markets. In this scenario, hydrogen will play a significant part in the

[21] The current development scenario is from the Climate Action Tracker (2019) Scaling Up Climate Action Australia Report.
[22] AEMO
[23] CAT Scaling Up Australia

Australian economy. (This scenario is for the electricity sector only: other sectors would also need to decarbonise to reach emission reductions of 50% below 2005 levels by 2030). The AEMO report also produced a net-zero by 2050 scenario, and step-change scenarios which are far less ambitious.

Scenario B

Scenario B demonstrates a domestic pathway for Australia's emissions to reach around 50% below 2005 levels by 2030.

In this scenario, mitigation efforts are ramped up in agriculture, waste and industry sectors. However, efforts in these sectors place Australia on a pathway to 40% below 2005 by 2030. Decarbonisation of the power sector is essential for meeting a 50% target. Mitigation efforts in the electricity sector are also ramped up, but to just half of the electricity sector emissions reductions per year compared to Scenario A.

Scenario B demonstrates that if the electricity sector does not rapidly decarbonise to the extent of Scenario A, other sectors are required to increase mitigation efforts to compensate to meet a 50% target.

By 2030, mitigation efforts include around 51 $MtCO_2e$ in the electricity sector, 13 $MtCO_2e$ in the Buildings sector and 18Mt CO_2e in agriculture, 4 $MtCO_2e$ in waste compared to the current development scenario. For industry, coal mining 5 MtCO2e, petroleum refining, oil and gas extraction (excluding LNG) 29 $MtCO_2e$, LNG (including LNG-related fugitives) 29 $MtCO_2e$, and for fugitives (excluding LNG) 15 $MtCO_2e$.

In this scenario renewable penetration of the power sector in the range of 70-75% by 2030.

Overall emissions are reduced by 138 $MtCO_2$ in 2030 compared to the Government's 2020 projections, with emissions excluding LULUCF reduced in 2030 by 34% compared to 2005 levels, and total GHG emissions by 50%.

Scenario C

Scenario C shows an option for further ambition. It provides a domestic pathway for Australia's emissions to reach around 60% below 2005 levels by 2030.

In this scenario, mitigation efforts are ramped up in Australia's most emissions-intensive sectors - energy and industry. The scenario is the same as scenario A, with the addition of industry sectors. Specifically, mitigation efforts are made in the electricity, buildings, transport and industry sectors.

By 2030, mitigation efforts amount to around 103 $MtCO_2e$ in the electricity sector, 13 $MtCO_2e$ in the Buildings sector and 46 MtCO2e in the transport sector compared to the current development scenario. For industry, coal mining 5 MtCO2e, petroleum refining, oil and gas

extraction (excluding LNG) 29 $MtCO_2e$, LNG (including LNG-related fugitives) 29 $MtCO_2e$, and for fugitives (excluding LNG) 15 $MtCO_2e$.

Overall emissions are reduced by about 250 $MtCO_2$ in 2030 compared to the Government's 2020 projections, with emissions excluding LULUCF reduced in 2030 by 50% compared to 2005 levels, and total GHG emissions by about 63%.

A 1.5°C compatible scenario

Scenarios A, B and C do not represent an emissions pathway in line with a 1.5°C long term temperature goal. They would therefore require Australia to increase the ambition of its target in the future to be in line with the Paris Agreement.

To be compatible with Australia's fair share of international efforts under the Paris Agreement to meet the 1.5° limit, its domestic emission actions would need to reduce national emissions to at least 65-75% below 2005 levels by 2030, and support for further substantial emission reductions including by providing substantial increases in international climate finance.

The Climate Action Tracker developed a scenario that would achieve domestic emissions levels in 2030 by about 66% below 2005 levels, including the uncertain and volatile LULUCF sector, (or 50% below excluding LULUCF). This scenario is a domestic pathway, and Australia would also need to provide substantial increases in climate finance to meet its fair share under the Paris Agreement.[24]

The CAT finds that decarbonising the energy system is key for a 1.5C pathway. It would also generate major employment benefits. A renewables-based electricity sector would create 46,000 additional jobs from 2021 to 2030 and combined with manufacturing of wind turbines and solar panels, this could increase to 76,000 jobs.[25]

[24] For further information on a fair share pathway see the latest update from the Climate Action Tracker.
[25] CAT Scaling Up Australia