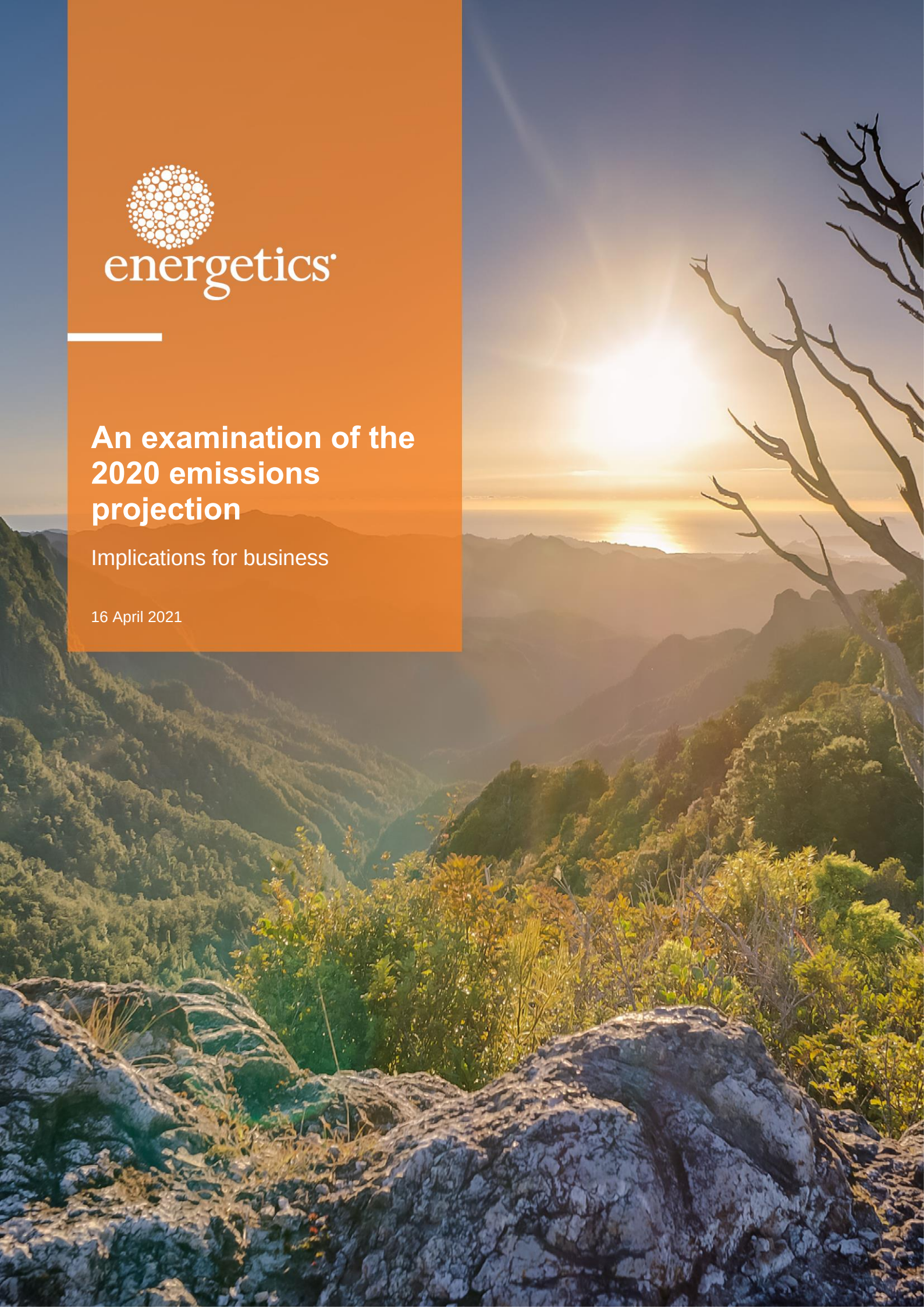

energetics

An examination of the 2020 emissions projection

Implications for business

16 April 2021

1. Overview

Observers of Australia's climate change policy agree that the Government has all but accepted that Australia must achieve net zero emissions by 2050. However, the 2020 Emissions Projection (the Projection), published in December[1], shows that while Australia is broadly on track to reach its emissions reduction goals as set out in the Paris Agreement, the 26% to 28% national target for 2030 does not position Australia well in the quest for net zero by 2050.

Yet the history of Australia's meeting of the Kyoto target suggest that innovation will allow us to meet a deeper 2030 reduction, one that is more aligned with net zero by 2050. Certainly all Australian states and territories and many major Australian businesses have already committed to net zero by 2050.

In this paper we consider what the current national trajectory means for business: where opportunities may lie and where advocacy should be pursued to strengthen climate policy settings. It is Energetics' position that the Australian Government should be in step with the ambitions of business, the investment community and state governments, and formalise a net zero target for 2050 and, in turn, reflect that goal in its suite of climate policies.

1.1. Key findings

Of all the trends seen in the 2020 Projection, growth in renewable energy and the productivity of electricity show the greatest difference between business-as-usual (Energetics' projection) and the Government's projection. The Government is anticipating a greater penetration of renewable generation than is implied by the trends of the past two decades. The Projection also sees an uplift in the historical rate of improvement in energy productivity (GDP divided by energy use) in the electricity and transport sectors. This has the following implications for businesses:

- Governments will seek low-cost measures to firm the variable renewable generators. Energetics expects that demand response measures that provide firming capacity will be supported. Businesses with a robust understanding of their own power demands should look to take advantage of any policy measures that support firming
- Policy measures to support energy productivity growth may help businesses that wish to reduce their electricity consumption
- Australia's energy markets are continuing the transition to renewable energy. While the amount of firming capacity in the market is increasing as seen in ***Energetics' Large-scale Storage Tracker***, businesses should prepare for future price volatility. A sound understanding of the electricity market and hedging strategies are needed if businesses are to successfully navigate periods of volatile power prices. Businesses investigating corporate renewable power purchase agreements should also speak to retailers about options available for firming.
- Businesses should look out for policy measures that support improvements in the energy productivity or the emissions intensity of transport. An example could be efforts to promote the uptake of electric vehicles
- The Australian Government sees emerging low emissions technologies as providing some of the abatement needed if Australia is to meet its Paris Agreement targets. Policy measures to support the low emissions technologies may assist businesses on their own pathways to net zero emissions

[1] Department of Industry, Science, Energy and Resources, ***Australia's emissions projections 2020***

- The Safeguard Mechanism (SGM) may still have a role in driving reductions in Australia's emissions and business that have a potential liability under the SGM should track Australia's progress towards its 2030 target to understand their likely SGM liabilities.

In outlining the potential opportunities that may arise with Government support for either uplifts in energy productivity, the growing amount of renewable energy or low emissions technologies, we note that the support is currently ill defined. Business should consider advocating for policy measures that can assist with the achievement of their net zero targets.

2. Background

The latest revision to Australia's greenhouse gas projection to 2030 [**2020 Emissions Projection**][2] was published in December 2020. The Australian Government found that the 2020 Emissions Projection saw a downward revision in the 2020 projections compared to earlier projections. This was attributed to:

- The inclusion of new measures to accelerate the development and deployment of low emissions technologies in the Australian Government's 2020-21 Budget. These include the provision of $1.9 billion over 12 years to support research, development and investment in the priority technologies of clean hydrogen, energy storage, both low-emissions steel and aluminium, carbon capture and storage and soil carbon
- A further reduction in projected emissions from the electricity sector due to continued strong renewables uptake by households and businesses. The ***Energetics Corporate Renewable PPA Tracker*** shows the accelerating uptake of corporate PPAs
- The temporary effect of COVID-related restrictions on the Australian economy, with the projected impact of the pandemic on future emissions largely limited to an acceleration of pre-existing trends.

The revision downwards of Australia's emissions projection is clearly visible in Figure 1 which displays some of the key trends from the 2020 Emissions Projection. Emissions are expected to lie below the Paris Agreement targets in the first part of the decade to 2030 before rising above the target trajectories. In total, Australia's projected cumulative emissions in the period to 2030 exceeded the Paris Agreement target by 56 MT CO_2-e (26% reduction target) or 123 MT CO_2-e (28% reduction target).

The 2020 Emissions Projection reported that "*Emissions in 2030 are projected to be 478 Mt CO_2-e, 33 Mt CO_2-e lower than the 2019 estimate for 2030 of 511 Mt CO_2-e. Under a scenario aligned with the Technology Investment Roadmap, Australia's emissions are projected to be 29 per cent below 2005 levels by 2030.*" This means that the Australian Government expects that the deployment of the priority technologies identified in the Government's Technology Investment Roadmap will see Australia will overachieve on its 2030 target by 145 Mt CO_2-e.

[2] Department of Industry, Science, Energy and Resources, ***Australia's emissions projection 2020***

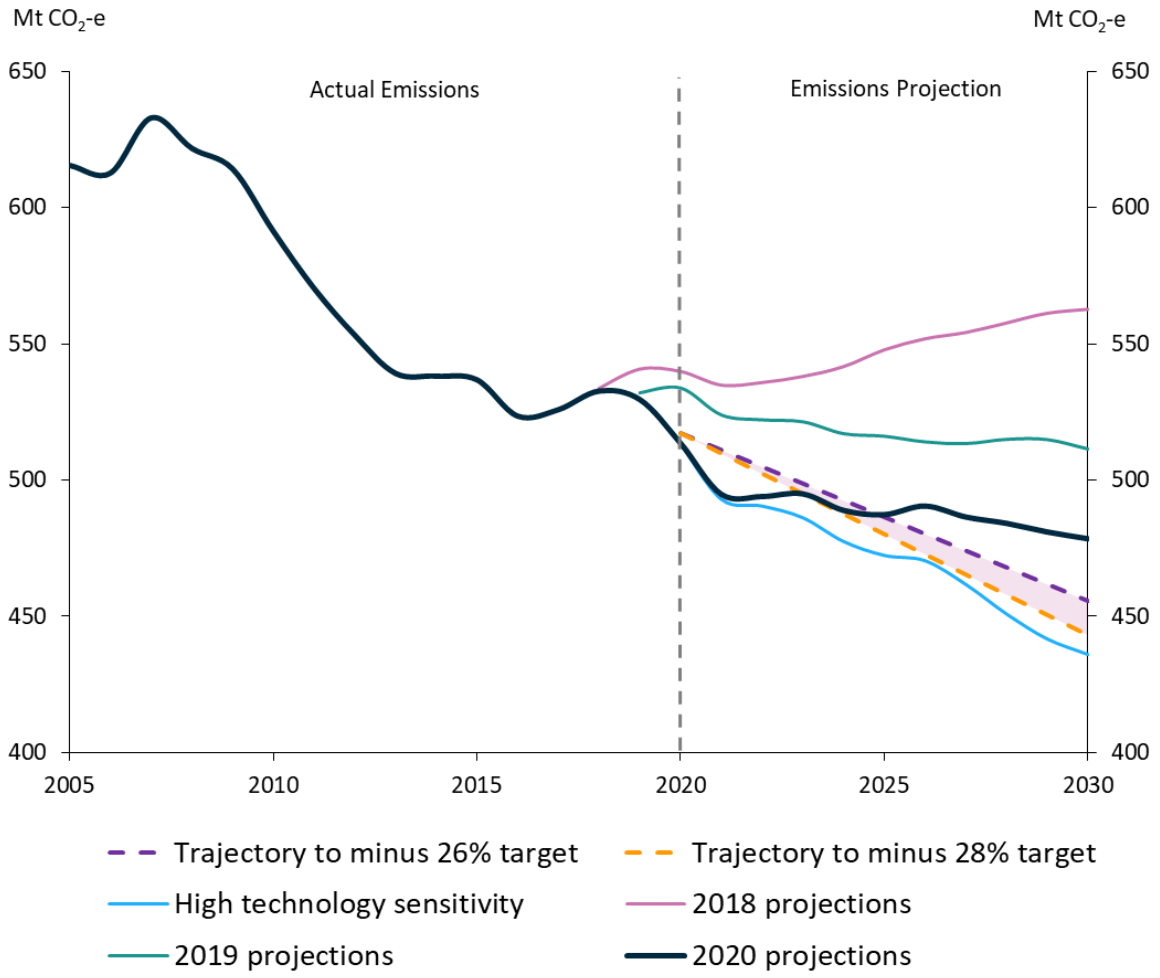

Figure 1: Key trends from the 2020 Emissions Projection[3]

Energetics' own projection of Australia's emissions to 2030 builds on the projection of relevant trends in Australia's economic, energy and emissions data since 1990. Examples are the change in electricity use per unit of GDP over time and stationary energy use in industry per unit of industrial GDP over time. Emissions based on the projection of these trends can be adjusted for 'disruptions' that are beyond the impact of economic and technology upsets that are captured in the trends since 1990.

Our projection of emissions to 2030 based on the extrapolation of historical trends, is shown in Figure 2. It suggests that emissions will rise in the short term, on the back of an economic rebound before settling into a slow downward trend. The cumulative gap relative to the 28% reduction target is 660 Mt CO_2-e.

In this report, we examine the factors that have contributed to the differences between the two projections. While there is a disconnect as business commitments to net zero targets grow while the Government refuses to set a national net zero target, we highlight the areas where the Australian Government sees policy interventions and technology disruptions as driving emissions reductions. Businesses need to understand these disruptions within the context of their own net

[3] Department of Industry, Science, Energy and Resources, ***Australia's emissions projection 2020***

zero targets and more broadly for the potential they represent to change the economic and business landscape in Australia.

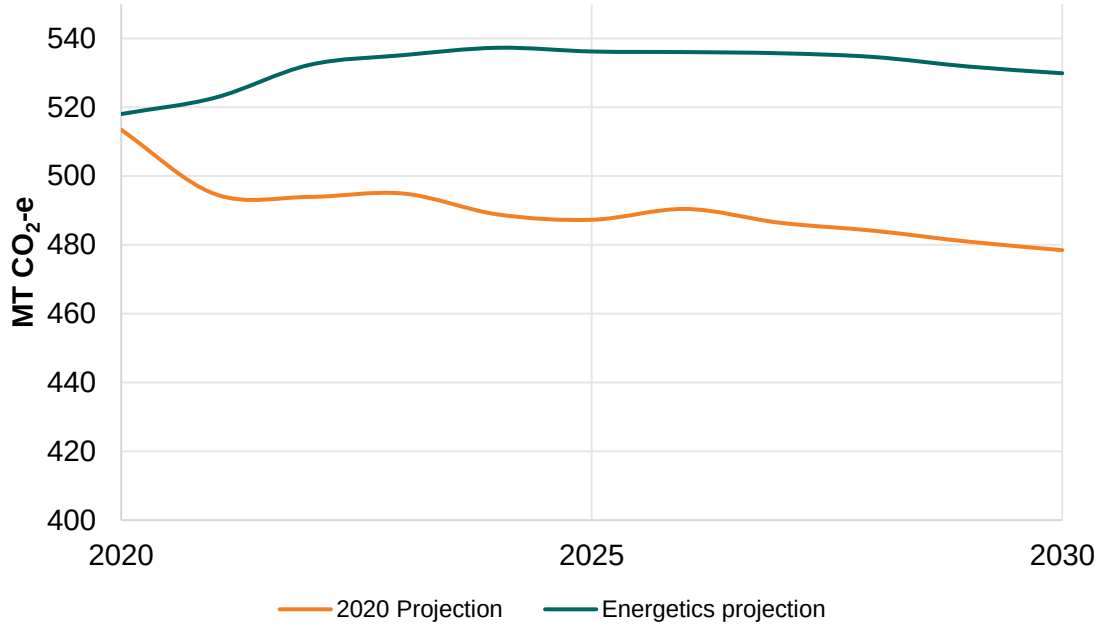

Figure 2: Comparison of the 2020 Emissions Projection of the Australian Government and Energetics' projection based on historical trends[4]

3. Emissions from electricity - projecting an improvement in the productive use of electricity and more renewable generation

If the historical trend for electricity productivity is maintained to 2030 and if the factors that drive the changes in the emissions intensity of electricity are also maintained, then the cumulative emissions from the electricity sector are projected to be the order of 1730 Mt CO_2-e. The 2020 Emissions Projection reported that the cumulative emissions from electricity for the same period are around 1310 Mt CO_2-e. Here we look at the disruptions that the Australian Government expects will drive down emissions from the generation of electricity.

Emissions due to the generation of electricity make up one third of Australia's emissions. The factors that contribute to the emissions from electricity generation are:

- the total consumption of electricity, which is linked to GDP growth and electricity productivity (the ratio between GDP and electricity consumption)
- the emissions intensity of electricity generation – a function of the generation mix.

[4] 2020 Emissions Projection, Energetics analysis

Each of these items is examined below.

3.1. Governments in Australia will seek an acceleration in the growth of electricity productivity

Since 2000, there has been a steady increase in electricity productivity. This is the ratio between national economic output measured as GDP and total national consumption of electricity. The electricity productivity since 1990 is shown in Figure 3 below. Here we see that Australia's electricity productivity has been rising since 2000, and the annual improvement has been consistent. The figure shows the projection of that trend to 2030, and this represents the electricity productivity used in the Energetics forecast of emissions to 2030. The figure also shows the electricity productivity values from the 2020 Emissions Projection.

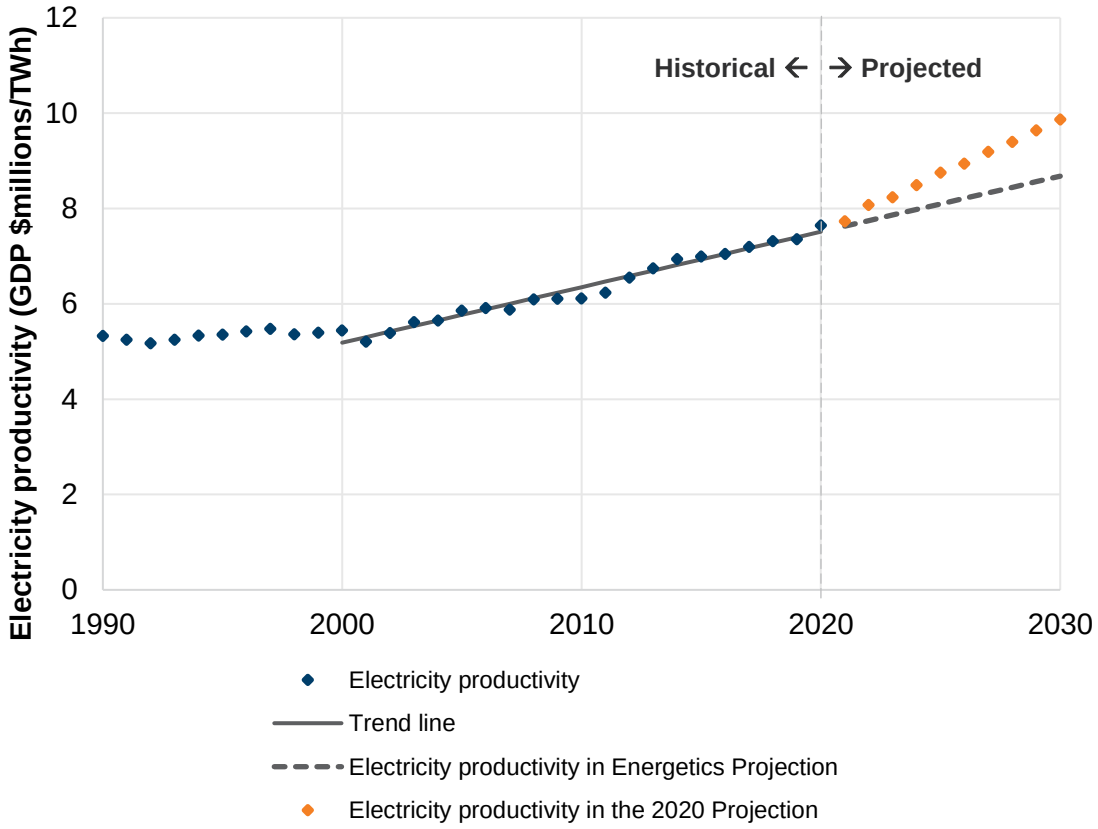

Figure 3: Trends in electricity productivity[5]

The Australian Government is forecasting a significant increase in the annual improvement in electricity productivity compared to the actual performance over the past two decades. In the 2020 Projection, a 42% increase in electricity productivity in 2030 relative to 2015 is needed to explain the projected electricity consumption. This improvement is consistent with the objectives of the National Energy Productivity Plan (NEPP).[6] However, while the NEPP included a range of policy

[5] Sources: Historical data from ABS and Australian Energy Statistics. Projected productivity from analysis of the 2020 Emissions Projection
[6] Department of Industry, Science, Energy and Resources, ***National Energy Productivity Plan***

measures to drive the improvement in energy productivity, it is not clear which of these policies will be implemented and when that would occur.

As the projected increase in rate of improvement of electricity productivity underpins the projection of emissions from electricity in the 2020 Emissions Projection, businesses should look for measures that will drive this increase in electricity productivity. It also implies that the Australian Government sees improvements to Australia's energy productivity as a precursor to meeting our commitments under the Paris Agreement.

3.2. The deployment of renewable generation will accelerate

The acceleration in the annual improvement in electricity productivity explains only 16% of the difference between electricity emissions in the 2020 Emissions Projection and emissions forecast as seen through a simple projection of historical trends. Explaining the rest requires a look at the emissions intensity of electricity in Australia. The next figure shows the fraction of electricity generated by renewable sources.

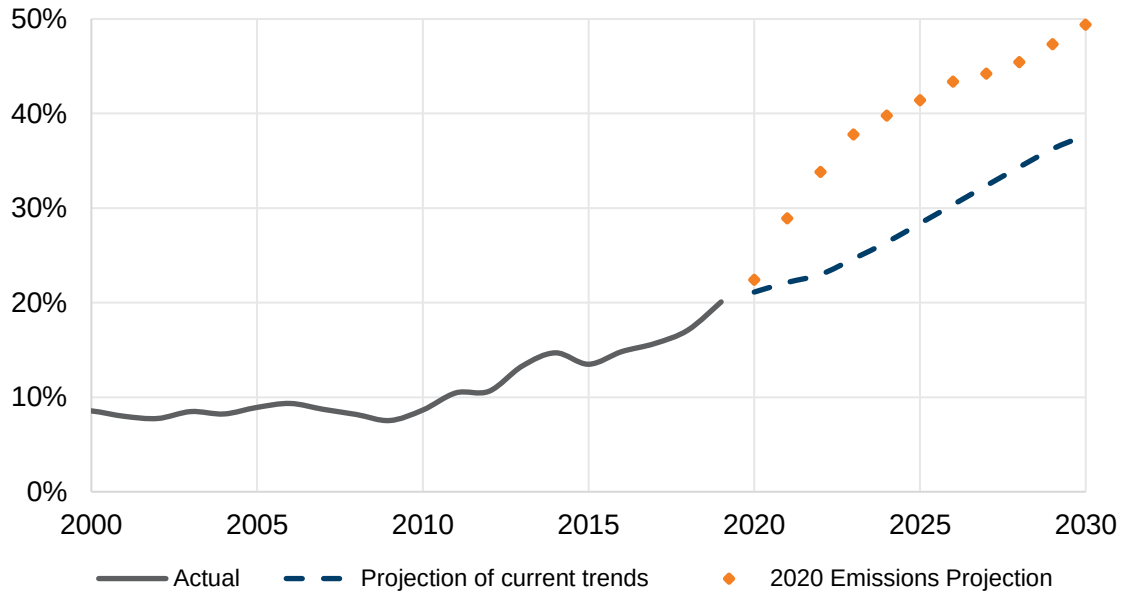

Figure 4: The renewable fraction of Australia's electricity supply[7]

Prior to 2009, renewable electricity generation was dominated by hydro such as the Snowy Mountains Scheme. Since that time, renewable generation has increased, driven by the RET and cost effective behind-the-meter solar PV. In the period from 2010 to 2020, total electricity demand only rose by 5% and so the addition of renewable generation to meet the requirements of the RET came at the expense of existing generators.

Figure 4 shows how the Energetics projection forecasts a slow rise in the renewable energy percentage to 38% in 2030. The 2020 Emissions Projection has the renewable energy percentage reaching 49% by 2030.

[7] Sources: Historical data from Australian Energy Statistics. Projected productivity from analysis of the 2020 Emissions Projection.

We now explore the factors that have contributed to these outcomes and what it potentially means for business.

The RET has been achieved, and in the absence of any other similar scheme in the period to 2030, new renewable generation entering the market must either meet a long-term shortfall in generation capacity or displace existing generators.

The projected total demand for electricity and the generation sources for the Energetics projection and the 2020 Emissions Projection are in Table 1. (The differences in the figures for 2020 are due to different approaches to converting the known NEM demand to national electricity demand.) Beyond 2020, Energetics is projecting a 16% increase in electricity demand compared to only 3% in the 2020 Emissions Projection. This gap is due to different assumptions in the Energetics projection regarding the rise in electricity productivity compared to those in the 2020 Emissions Projection. This was discussed in the previous section.

Table 1: Projected electricity generation to 2030

Generation	Energetics' projection			2020 Emissions Projection		
	2020	2025	2030	2020	2025	2030
Coal	144	154	146	135	107	89
Gas	51	36	34	46	30	31
Other non-renewable	6	5	4	10	10	9
Hydroelectric	16	16	16	15	15	15
Other renewables	38	62	96	40	88	110
Total	255	273	296	247	250	254

In the period from 2020 to 2030, Energetics sees the increasing demand for electricity being met by new renewable generation. Some pressure will be placed on gas generators and some gas fired generation will be removed from the market. The amount of electricity from the coal-fired generators remains largely constant. We note that some coal-fired generators are scheduled to close in the period. However, there is sufficient unused capacity in the remaining coal-fired fleet to fill the gap left by the retiring generators. Investments in renewable generation capacity will continue due to on-going deployment of behind-the-meter solar PV and the rise of the corporate power purchase agreement (CPPA), particularly as corporates seek renewable electricity and associated large-scale generation certificates (LGCs) to meet their net zero emissions reduction commitments.

The 2020 Emissions Projection has only a minor increase in total electricity demand but a 70 TWh or 175% increase in renewable electricity which is achieved by displacing 46 TWh of electricity from coal-fired power stations and 15 TWh from gas-fired generators. The 34% reduction in electricity from coal can only be realised through the withdrawal of several coal-fired power stations. The 2020 Emissions Projection suggests that around 18% of Australia's coal-fired generators will be closed by 2030. We also note that this 18% reduction in capacity is less than the 34% reduction in output and so the remaining coal-fired generators will be placed under greater financial stress which may see more than 18% of the fleet closing. The early closure of the

Yallourn power station announced in March 2021[8] is an example of what is likely to occur (noting the closure was announced together with plans to construct a 350MW battery).

The volume of coal-fired generation that the 2020 Emissions Projection expects to withdraw is greater than that implied by the 50-year rule i.e., that power stations close after 50 years of operation. Early closure of power stations could lead to an increase in price volatility. Wholesale electricity prices rose sharply after the sudden closure of the Hazelwood power station.[9] That said, Hazelwood closed in 2017 and since then, more firming capacity has entered the market.

Businesses can expect price volatility during the anticipated rapid evolution of the generation fleet. Businesses should seek advice on hedging strategies and the role of firming in an energy procurement strategy.

Figure 4 also shows that the 2020 Emissions Projection expects the fraction of renewable generation to rise rapidly.

We will now consider the growing role of firming.

3.3. Firming will be a key part of Australia's electricity market

The 49% renewable energy fraction that is expected to be seen in 2030 is an average across Australia's electricity systems (including off-grid and behind-the-meter systems) and averaged over the entire year. It includes a fraction that is dispatchable in the form of conventional and pumped hydro, and battery storage. However, we can expect that at many times of the year and within certain jurisdictions, the variable renewable fraction could significantly exceed 50% and could be 100%.

These high levels of variable renewable generation will require firming. The 2020 Emissions Projection include some batteries and pumped hydro. However, as discussed previously more will be needed[10] and can be expected, as seen in ***Energetics' Large-scale Storage Tracker***.[11] In fact, the tracker shows that AEMO's Central Scenario appears to be on track to becoming obsolete given the number of battery storage developments that have been announced. The current announced total of circa 22GW is close to where AEMO forecasts Australia to be by 2040 under the High DER Scenario. This highlights the immense interest in storage[12]. In favour of batteries, the Clean Energy Council recently released a report, *Battery Storage – The New, Clean Peaker*, stating, "The paper compares a new 250 MW gas peaker with a 250 MW four-hour grid-scale battery, finding that the battery provides cost savings of more than 30 per cent while offering greater flexibility and significantly reducing emissions intensity."

Clearly firming will play a bigger role in Australia's electricity market. In addition to following market developments, businesses can investigate firming options to help manage price and supply risks through the market's transition. Firstly, firmed renewable power purchase agreements are increasingly being offered by retailers in the market. Secondly, opportunities will also emerge for firming through investment in behind the meter, demand

[8] ABC: "***Energy Australia to close Yallourn power station early and build 350 megawatt battery***"
[9] Australian Energy Regulator (AER), ***AER electricity wholesale performance monitoring, Hazelwood advice***
[10] AER, ***The electricity market in transition***
[11] ***Energetics' Large-scale Storage Tracker***
[12] It should be noted that with so many new project announcements, not all will be delivered.

response (DR) measures. These measures can include batteries, load shifting or high efficiency equipment. Two changes to the Australian National Electricity Rules that are scheduled to come into effect in the next two years may have large impacts on the uptake and efficacy of DR programs. These are the introduction of a Wholesale Demand Response Mechanism (WDRM) which will allow large electricity users to 'bid' DR into the electricity market and be paid as if they were supplying an equivalent volume of electricity from a generator, and switching to five minute settlements in the NEM, which will provide a better price signal for investment in fast response technologies, such as batteries, new gas peaking generation and DR. **Therefore, businesses should understand the market for DR and consider participating in the market.**

4. Emissions from transport - an improvement in energy productivity or lots more electric vehicles

Projection of the historical trends suggests a 12% increase in emissions due to transport. One of the major uncertainties in projecting transport emissions is the impact of electric vehicles, and the 12% projection uses the estimates of EV uptake from the 2020 Emissions Projection – 7% of the light vehicle fleet will be EVs and one in four new cars sold will be electric.

The 2020 Emissions Projection has the emissions for transport rising by 6%. This outcome requires an increase in the improvement in the energy productivity of transport compared to the historical trend. We found that the average annual rate of improvement in transport productivity will need to increase by 60% to contain the increase in emissions from transport in 2030 relative to 2020, to 6%. Again, this is consistent with the objective of the NEPP. The NEPP workplan proposed a range of measures to raise energy productivity in the transport sector.

One of the measures in the NEPP is aimed at improving light vehicle (LV) efficiency. Studies have confirmed that Australia lags other developed countries with respect to the average emissions intensity of its light vehicle fleet. For instance, in 2015 the Climate Change Authority[13] found that the emissions intensity of Australia's LV fleet was projected to be double that of the LV fleet of Europe in 2025 and around 50% high than that of the USA.

One option to reduce the emissions from transport is through the greater adoption of electric vehicles. The 2020 Emission Projection reported that 7% of the LV fleet will be electric in 2030. The most recent estimate for the uptake of EVs from AEMO[14] suggests that 14% of the LV fleet will be EVs and that every second new car will be an EV. The impact of this greater uptake of EVs is equivalent to the 160% increase in the rate of improvement of energy productivity in the transport sector.

The trends in transport technology suggest that EVs are the future of LV transport and so the efforts required to hold the rise in transport emissions to the 6% in the 2030 Emissions Projection may be better directed towards increasing the uptake of EVs along the lines of the AEMO forecast rather than targeting improvements in the performance of internal combustion engine vehicles.

[13] Climate Change Authority: ***Light vehicle emissions standards for Australia – research report***
[14] Australian Energy Market Operator (AEMO), ***Distributed energy resources and electric vehicle forecasts***

Whether they are measures that support the uptake of electric vehicles or measures to improve broader vehicle productivity, businesses should look for policies that aim to reduce emissions from vehicles and other transport modes.

5. Emissions from other sectors – not much to see except for agriculture

Figure 5 compares the sum of projected emissions from sectors other than electricity generation and transport as reported in the 2020 Emissions Projection and as estimated by Energetics by extrapolating historical trends. Energetics found that the emissions from these sectors will be steady in the decade to 2030. The 2020 Emissions Projection found that these emissions will rise by 10 MT CO_2-e over the period. This difference can be largely attributed to the 2020 Emissions Projection finding that emissions from agriculture will rise by 8 MT CO_2-e over the period.

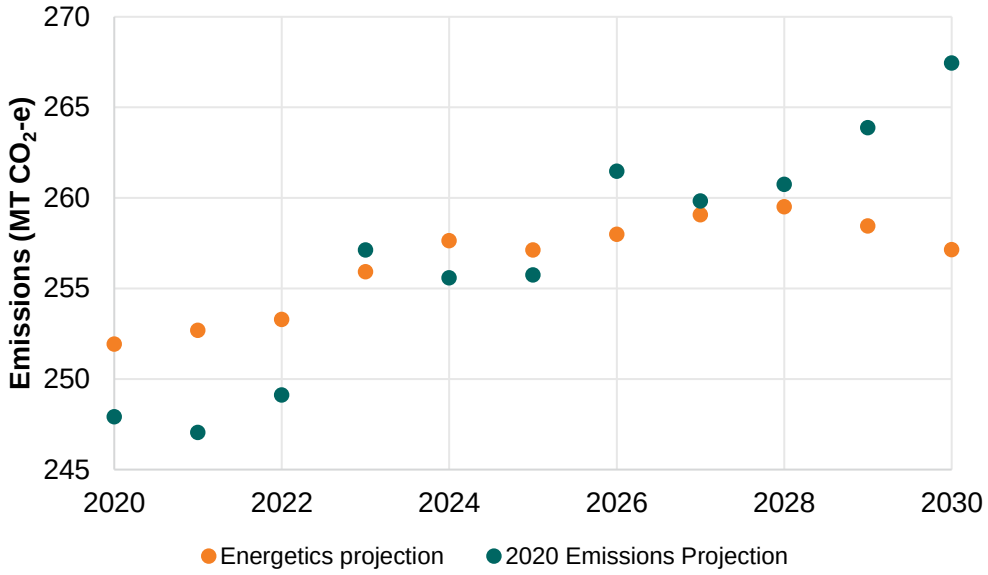

Figure 5: Total emissions for other sectors[15]

5.1. Two questions must be considered

What to do about agriculture? Agriculture currently contributes 13% of Australia's emissions and is the largest of the non-energy related sources. Agricultural emissions are also projected to rise by 12% between 2020 and 2030 which is the largest relative sectoral increase. The 2020 Emissions Projection models the impact of some abatement measures such as beef cattle herd management and destruction of methane generated from manure in piggeries. However, it also notes that some changes in agricultural practices will increase emissions. For instance, the trend towards grain-fed beef cattle in response to droughts can result in additional enteric emissions. Tackling emissions from agriculture is a challenge and fortunately one that does not need to be addressed in the period to 2030.[16]

[15] The other sectors are stationary energy, fugitive emissions from fuels, industrial processes, agriculture, waste and emissions linked to land use change.
[16] Energetics, ***An examination of the 2019 emissions projection***

Is it enough to hold stationary emissions steady? The 2020 Emissions Projection has electricity productivity rising by 42% between 2015 and 2030 and transport energy productivity[17] increasing by 35%. The 2030 Emissions Projection also reported that emissions due to stationary energy are constant in the period from 2020 to 2030, and this will result in a rise in stationary energy productivity (as measured by the associated emissions) of 23%, well short of the values for the other energy related sectors and the NEPP target of 40%. Achieving a 40% improvement in stationary energy productivity will reduce emissions due to stationary energy by 12 MT CO_2-e in 2030 and the cumulative reductions in stationary energy emissions in the decade to 2030 could close most to the gap to the 28% reduction target that the Australian Government is forecasting. **Policy makers will need to decide whether it is better to chase new technologies ahead of promoting improvements in stationary energy use in business.**

6. What about new technologies?

The 2020 Emissions Projection's cumulative emissions exceed the 2030 Paris Agreement targets by 56 MT CO_2-e in the case of the 26% reduction target and around 120 MT CO_2-e in the case of the 28% reduction target. The Australian Government included the 'high technology' projection which anticipated sufficient uptake of the emerging low emissions technologies (clean hydrogen, energy storage, low carbon materials (steel and aluminium), carbon capture and storage, soil carbon measurement) to close the gap between the projected emissions and the 28% reduction target. Since the Australian Government has flagged the importance of low emissions technologies, businesses can expect policy measures to support them. Indeed, the Government's first Low Emissions Technology Statement[18] noted a range of initiatives including more flexible funding to be offered by ARENA and the CEFC, supported by expected Government investment of $18 billion in low emissions technologies over the decade to 2030. **Businesses should better understand how this funding could assist their own pathways to net zero emissions.**

7. Some final words

7.1. The role of the Safeguard Mechanism

The Minister for Energy and Emissions Reduction, Angus Taylor sees "technology not taxes" at the core of the Government's climate change policy[19]. The targeting of low emissions technologies is consistent with that theme. However, the Coalition Government also legislated the Safeguard Mechanism (SGM) which requires large emitters to acquire and acquit to the Government Australian Carbon Credit Units (ACCUs) if their reported emissions exceed an emissions baseline. This potentially provides a price signal to businesses to reduce emissions as they search for the lowest cost option for acquiring ACCUs. The SGM Regulations allow the Minister to reduce the baselines which would increase demand for ACCUs and send a stronger price signal to the market.

[17] We use emissions from transport as a proxy for fuel used in transport as the emissions intensity of transport has not changed significantly since 1990.
[18] Australian Government Department of Industry, Science, Energy and Resources: ***First low emissions technology statement***
[19] Taylor, The Hon Angus, Minister for Energy and Emissions Reduction: "***Harnessing new technology to grow jobs and the economy and lower emissions***"

Whether the Minister will reduce the SGM baselines to drive additional abatement will most likely depend upon the success of other policy measures at achieving the desired abatement outcomes. The analysis presented above highlights the role of improvements in energy productivity and further decarbonising of electricity in reducing Australia's emissions towards the Paris Agreement goals. Both of these changes are potentially low or zero cost, and could deliver the necessary abatement without requiring a strong price signal. In such circumstances, the Australian Government would not need to call on the SGM to deliver additional abatement. However, if additional funding is required to drive the required emissions reduction, the Australian Government may look to at reducing the SGM baselines as an option for increasing the demand for ACCUs and hence encouraging more abatement through measures that create ACCUs. **Businesses that are covered by the SGM should track Australia's progress towards the 2030 targets to understand the potential impact of the SGM on their operations.**

7.2. Net zero by 2050 and the 2030 target

Many countries, global organisations, Australian states and territories, and businesses have committed to being net zero by 2050 . Figure 6 compares the pathway to net zero at 2050 via the current (28%) reduction target and a straight path to zero emissions in 2050. The current 26% to 28% reduction target does not position Australia well to pursue net zero by 2050 in the two decades that follow 2030. The 2030 target on the straight-line pathway is 354 MT CO2-e or a 44% reduction on the 2005 figure.

The highlighted cumulative gap between the two pathways in the period to 2030 is 540 MT CO2-e. Therefore, Australia would need to find an additional 540 MT CO2-e of abatement to 2030 to meet a 44% reduction target. The benefit is a reduction in the volume of abatement needed after 2030 of 935 MT CO2-e. The difference between the two figures reflects the value of early abatement.

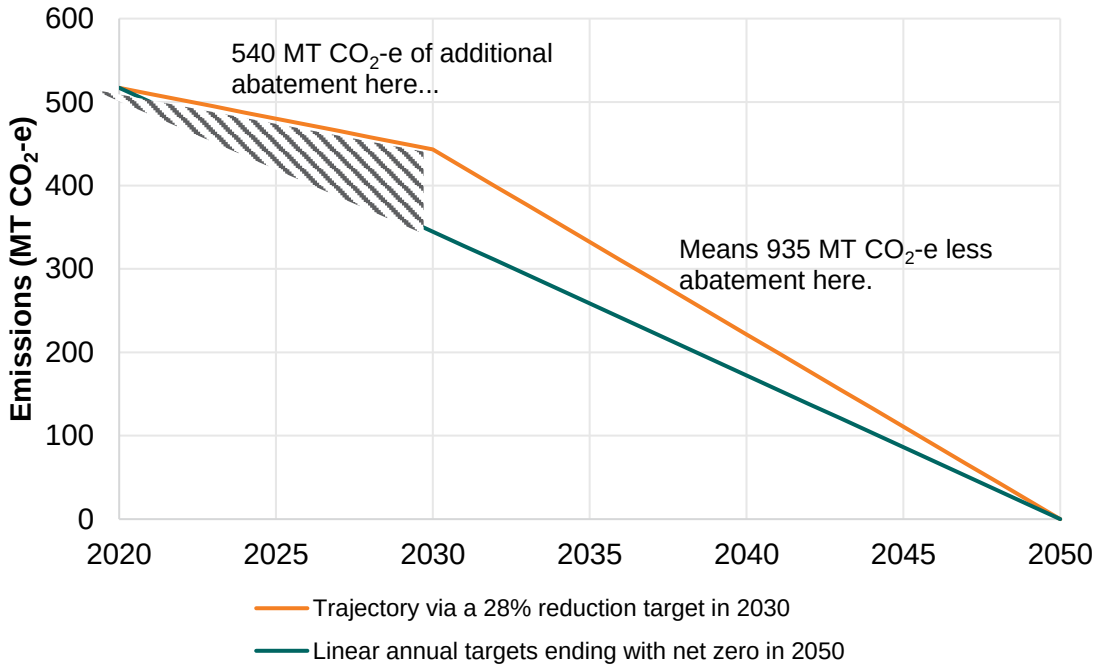

Figure 6: Trajectories to net zero by 2050

The Australian Government has held the position that it is reluctant to set abatement targets without understanding the implications of the target i.e., is the target achievable and at what cost, and it is not clear whether the nation could reduce emissions to meet a 44% reduction target. But in dwelling on this question, it is worth reflecting on the following figure from the 2030 Emissions Projection.

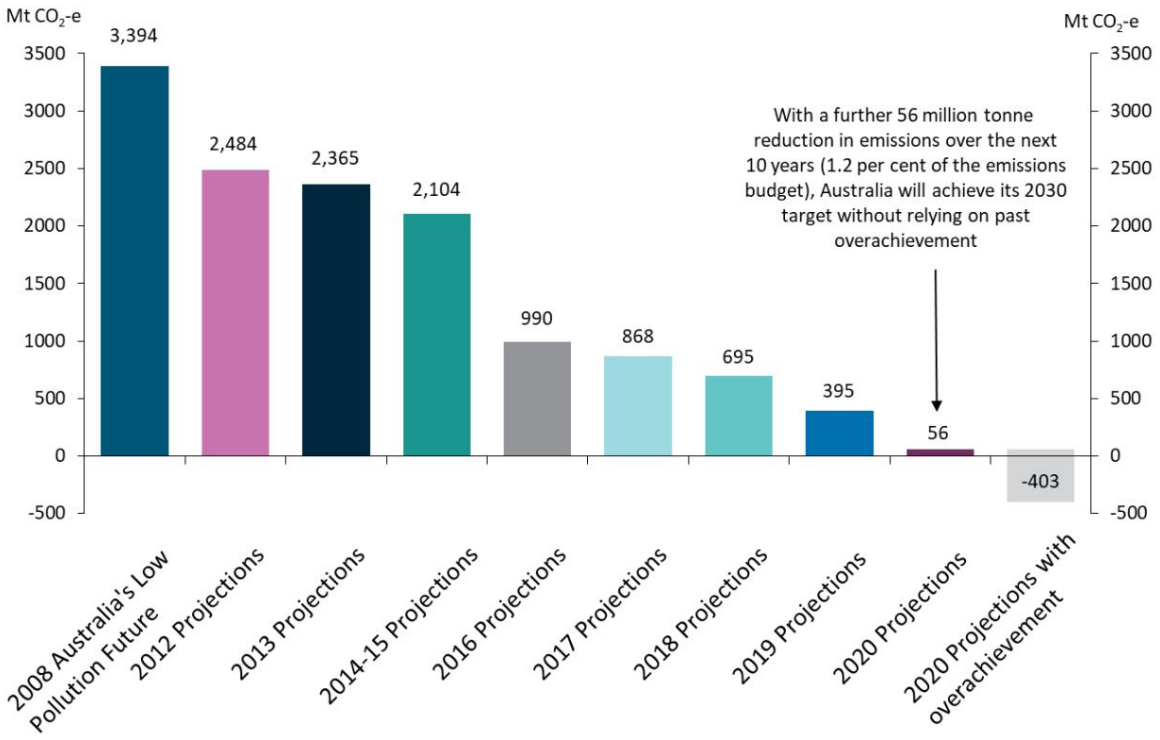

Figure 7: Change in the cumulative emissions reduction task over time, 2030 target

It shows how in the period from 2008 to 2020, the cumulative abatement task to meet the 2030 target dropped from 3294 MT CO_2-e to essentially zero. This reflected the penetration of low-cost abatement measures such as renewable power generation. The question for Australia (and the Australian Government) is whether it has enough confidence in innovation and in market forces to anticipate the continuation of the trend shown in Figure 7, and that between now and 2030 new low-cost abatement technologies will emerge to allow the nation to meet a 44% reduction target. The pursuit of the national emissions target has implications for businesses through the potential impact on energy prices and the policy measures needed to achieve the target.

Energetics recommends that businesses, especially those with net zero ambitions, should participate in the debate about the national emissions reduction target to ensure that Australia is made aware of the role of business in achieving the target.

About Energetics

Working with ASX200 and all levels of government, Energetics is a specialist energy and climate change risk management consultancy.

We're more than carbon neutral. Sustainability is core to Energetics' business.
We became a 'Climate Active' certified organisation in 2019, and in 2021 we verified our SBT through the SBTi.

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