



Institute for International Trade

POST-COVID 19: BACK TO THE PAST OR THE START OF A GREENER FUTURE?

Executive Summary

The measures taken by the Australian Government to prevent the spread of COVID-19 resulted in a rapid reversal of 29 years of economic growth. I argue that the vast resources required to bring about a reboot of the economy provides an opportunity for policy makers to focus on supporting the already emerging opportunities for addressing Australia's growing climate crisis by implementing policies that will enable Australia to move away from its current carbon dependency. This reform away from carbon will prove to be as dramatic as the earlier reforms undertaken by the Hawke and Keating governments. A dramatic shift away from carbon will form the basis for Australia's next decades of economic growth. It will also require the development of Australian technology and innovations that will be world-leading, and therefore provide new export opportunities for Australia.

Background

As is the case with most governments world-wide, the Australian government's concern regarding the recovery from the economic impacts of the COVID-19 crisis has been how to reboot the domestic economy and international trade as rapidly as possible. Understandably this has focussed on short-term interventions so that once the worst dangers to the population's health have passed, the country can quickly return to normal. Yet the vast resources required to bring about a reboot of the economy provides an opportunity for policy makers to focus on supporting the already emerging opportunities for addressing the growing climate crisis and diminish Australia's current carbon dependency.

This move away from carbon will require a new period of economic structural reform equivalent to the Hawke/Keating reforms during the 1980s and early 1990s¹, but could lay the basis for further decades of economic growth. Whereas, simply reverting to pre-COVID-19 'business as usual' could solve the immediate economic crisis, but would miss the opportunity for fundamental economic

reform.

“A recent IPSOS-Mori poll shows that support for a fundamental change in economic direction is gaining popularity in Australia, with 57% of Australians interviewed believing that the Australian government should focus on climate change mitigation in its post-COVID reboot of the economy, and only 34% disagreeing or strongly disagreeing.”

The latest Lowy Poll³ shows a slightly higher result for climate change as a major threat to Australia in the next 10 years (59% of respondents), with 31% seeing climate change as an 'important but not critical threat', and only 10% seeing climate change as 'not an important threat at all'.

Impacts of Climate Change/ Global Warming on Australia

The scientific evidence of the world-wide climate warming effects of man-made carbon emissions are clear. A recently completed National Aeronautics and Space Administration (NASA) study asserts that: 'The 10 warmest years in the 140-year record all have occurred since 2005, with the six warmest years being the six most recent years.'⁴ Australia's Bureau of Metrology (BOM) tracked similar temperature patterns for Australia – based on their figures, ABC News reported that 'Australia's annual mean temperature was 1.52 degrees Celsius above the 1961-90 average of 21.8C – well above the previous hottest year (2013) at 1.33C ... [while] the national area average rainfall [in 2019] was the lowest on record going all the way back to 1900.'⁵ This has resulted in consecutive droughts in many parts of the country over the past decade, and the worst bush fire season in living memory in 2019/20. The medium-term health impacts on people living for



weeks in smoke enveloped cities such as Sydney, Melbourne and Canberra are yet to emerge. While rising sea temperatures, growing acidification, extreme weather events and mass coral bleaching have impacted severely on the Great Barrier Reef, Australia's premier tourist attraction.⁶

While we know that carbon stays in the environment for hundreds of years, current COVID-19 induced economic shutdowns have shown the very rapid impact on carbon generated pollution that a dramatic shift from carbon emissions can have. Major Australian cities such as Sydney and Brisbane (but not Newcastle or Melbourne) have had dramatic reductions in air pollution as a result of these shutdowns.⁷

Growing Impacts of Climate Change Awareness on Carbon Intensive Industries

Coal plays an important part in Australia's economy. It is Australia's second most valuable export after iron ore, increasing from AU\$ 54.2 billion in FY 2017 to AU\$ 69.6 billion in FY 2019.⁸ While employment in this sector has been declining (dropping from 45,016 in FY 2012 to 35,638 in FY 2018),⁹ wages and salaries amounted to nearly AU\$ 5.3 billion in FY 2018.¹⁰

“The socio-economic importance of coal means that transitioning to a post-coal economy will require policy interventions that facilitate the employment of redundant coal miners in other sectors of the economy through retraining.”

Furthermore, the balance of payments will have to adjust to a relatively rapid decline in the international market for thermal coal, and a less rapid decline in the market for metallurgical coal, through a targeted export drive in services and other high value exports with a long-term future. This requires a clear national energy policy that reflects the government's commitment to phasing out coal generated electricity within a clearly defined roadmap, including rapid phasing out of tax payer funded subsidies and other incentives for the development of any new coal mines, or the expansion of existing mines, and strengthening of public bodies tasked with ensuring that environmental restoration of closed coal mines are fully funded by the owners of those mines.

Constructing new coal-fired electricity generation capacity is already more expensive than building new renewable capacity¹¹, while the cost of electricity generated by coal plants is expected to be higher in all major markets (including Australia) within a decade.¹² As a result of the world-wide COVID-19 shutdowns, in the first quarter of 2020 '...demand for coal dropped by 8% and oil by 5%, compared to the same period in 2019.'¹³ The world-wide recession resulting from the COVID-19 shutdowns will mean a further reduction in demand for electricity and oil. The International Energy Agency estimates that overall energy demand may be down by 6% compared to 2019 – the biggest recorded drop.¹⁴ This will make many coal-fired power-stations even less economically viable than they were before COVID-19.

The growth in the construction of non-oil and coal electricity generation plants has further undermined the viability of many coal- and oil-fired power stations. According to the International Energy Agency 'The combined share of total primary energy supply in the OECD for liquid biofuels, wind, solar, biogases, renewable municipal waste, and tidal represented 3.1% in 1990, 7.6% in 2000, 23.2% in 2010 and 37.2% in 2019.'¹⁵ In 2018 19% of Australia's electricity was generated by renewables (hydro 7%, wind 6%, solar 5%, other 1%), natural gas 19%, with 60% coal fired.¹⁶ Reputex¹⁷ predicts that 'Even without ... [a coherent Federal energy] policy, renewable energy generation is forecast to grow to 75 per cent of ...[the national energy market] by 2040, with more than 18 GW (53 per cent of Australia's thermal capacity) modelled to exit the market by 2040.'¹⁸ A report by PriceWaterhouseCoopers (PWC) in 2019 predicted that if Australia accelerates its transition from coal fired-power generation to a 90% renewable power system by 2040 this would add '...\$15 billion to GDP enabling increased spending by Australians of \$11b.'¹⁹ This accelerated transition to renewables would also reduce Australia's carbon emissions from power generation (35% of total emissions) by 84% using 2005 as the baseline.²⁰

Supporters of natural gas as an alternative to coal argue that natural gas has a lower carbon footprint. If true, is natural gas the logical 'transition fuel' for Australia's move away from coal to renewables? Firstly, natural gas is not renewable²¹ and so replacing coal with gas would delay the transition to renewables, not facilitate it. Secondly, the commercial production of natural gas has other undesirable environmental impacts. Natural gas occurs in many regions of the globe in various geological formations including coal seams, limestones, sandstone and shale. Wells are drilled into

these formations and the gas generally flows up through the wells to the surface. In the USA, in some parts of Australia and in other countries, the gas bearing sedimentary rock (such as shale) is hydraulically fractured (or ‘fracked’) to release the gas. This fracturing process involves forcing various chemicals, water and sand into the well at high pressure, which can have serious environmental impacts including contaminated ground water and methane emissions. These methane emissions occur while the wells are operating and after they are abandoned – in the USA this is the source of about 32% of total U.S. methane emissions.²² The production and export of liquefied natural gas (LNG) is an increasingly important industry in Australia, with a production growth rate of 10.2% pa between 2007 and 2017 (and a further 15.3% increase from 2017 to 2018) accounting for 3.4% of global production in 2018.²³ LNG production was the main reason Australia’s carbon emissions rose by 6.8 million tonnes in the year to March 2018.²⁴

The recent fracking boom²⁵ has resulted in a significant oil supply boost over the past decade, making the US (at least temporarily) independent of Middle East suppliers and curtailing rising oil prices. However, the collapse in demand that occurred in response to COVID-19 economic lockdowns showed that the lower-cost Middle Eastern suppliers²⁶ remained significantly more cost-effective than US producers of petroleum products. Yet *The Economist* claims that oil’s future looks ‘...murky, depending as it does on a gallimaufry of newly questionable assumptions about commuting, airline routes, government intervention, capital spending and price recovery.’²⁷

“The PRI projects that demand for oil will start to decline from 2026-8 as road transport adopts alternative fuel, but will still be significant in 2050 due to demand from aviation, shipping and petrochemicals.”²⁸

BP’s 2019 Energy Outlook²⁹ assumes a doubling of world GDP by 2040 driven largely by fast growing developing countries. It therefore projects an initial growth in oil demand and then a plateau, with around 25% of passenger vehicles powered by electricity by 2040.

The inevitable transition to electric powered vehicles could be fast-tracked in Australia through 0 rated import tariffs on electric vehicles (regardless of source³⁰) and halving of annual registration fees compared with comparable diesel/petrol vehicles. This will boost the anticipated fall in domestic prices resulting from major international

vehicle manufacturers intensifying their transition to electric vehicles for the larger markets (such as China, the EU and North America). Currently Australia’s passenger and goods vehicle emission standards are based on Euro 5 and Euro V respectively. In order to facilitate the transition to electric vehicles, the government should adopt the latest Euro 6 and Euro VI standards for light and heavy vehicles which have more stringent emission standards.

Renewables

The most significant sources of renewable energy in Australia include hydropower (dams plus tidal), wind, solar and bioenergy. These are proven technologies, and as their uptake increases their cost will fall. Investment in new renewable energy capacity continues to grow. For instance, the Federal Clean Energy Regulator³¹ reported that the 2020 Large-scale Renewable Energy Target [33,000 gigawatt hours of additional capacity] had been achieved in 2019, with a further six gigawatts currently being tracked. PWC notes that Australia has ‘... the highest uptake per capita of small-scale solar PV anywhere in the world.’³² It points out that the uptake of private battery storage is also dramatically increasing, and consequently Australia will soon have the highest proportion of distributed energy resources globally. In order to cope with this increase in renewable energy there is an urgent need to stabilise the national electricity grid through a combination of enhanced storage capacity (large batteries and pumped hydro), improved demand management and the strengthening of interstate high voltage transmission lines (to ensure continuous interconnection during localised weather events).³³

In order to support this transition from coal fired electricity to renewables, the Australian Federal government should also work with the various states and territories to undertake an extensive review of current building regulations to ensure that new Australian homes and commercial buildings are much more energy efficient. As part of the post-COVID-19 economic recovery program, the government should also provide incentives to retrofit existing buildings/homes to be better insulated against both heat and cold and to be more energy efficient. Implementing this recommendation will also reduce carbon emissions, improve energy affordability for households and businesses and create jobs³⁴.

None of these renewable energy sources are without problems: large dams can impact negatively on downstream ecosystems and communities dependent on the river, and increase earthquakes as well as flooding risks; wind only generates electricity when it is blowing, while solar power is only available when the sun is shining, so neither of these can provide dependable base-load power³⁵; used solar panels



Photo by Science in HD on Unsplash

and wind generators will become a serious waste problem at the end of their expected usable life-span³⁶; bio fuels require significant amounts of energy to produce, and clearing forest to plant trees for later burning as fuel to generate electricity has major environmental consequences, while biogas produced from plant and animal waste is only suitable for small communities as it is not easily up-scaled.

And what of nuclear power as a source of reduced carbon energy transmission? Italy phased out its nuclear power plants in 1990³⁷ and Germany will complete the phasing out of its 17 nuclear power plants by 2022.³⁸ However, France³⁹ and the United Kingdom⁴⁰ consider their nuclear electricity generation plants as part of their respective commitments under the 2015 Paris Climate Agreement. Prior to the Fukushima disaster Japan's 54 nuclear plants generated nearly 30% of the country's electricity. In response to the disaster all these plants were shut down by May 2012, resulting in major electricity cost increases. The government responded by restarting two plants in late 2015, seven more are restarting and 18 awaiting approval to restart so that by 2030 at least 20% of Japan's electricity will be from nuclear power plants. A total of 39 other countries also have nuclear powered generation plants.⁴¹

Australia has one operational nuclear reactor – the OPAL research reactor – which meets most of the country's nuclear medical requirements, but does not generate any of the economy's electricity.

“The 1999 Environment Protection and Biodiversity Conservation Act specifically bans the development of nuclear power plants in Australia. Some very powerful lobby groups in Australia, such as the Minerals Council of Australia (MCA), believe that this ban should be over-turned.”⁴²

The MCA gives seven reasons why this should be the case: they claim that nuclear power (i) is reliable (ii) has close to zero carbon emissions (iii) is a proven technology (iv) is affordable (v) is safe (vi) produces a low volume of waste that can be managed safely and (vii) has attracted a surge in innovative nuclear technologies.

The main reason why the 1999 Environment Protection and Biodiversity Conservation Act should not be changed to allow the development nuclear power plants in Australia is that in fact they are not safe. This is despite what the MCA and other pro-nuclear lobbyists claim – for instance a study by Richie⁴³ examines various other studies looking at death rates caused by various forms of power generation and concludes that ‘Both nuclear and renewable energy sources have death rates hundreds of times lower than coal and oil, and are tens to hundreds of times safer than gas’. The problem with her analysis of the safety of nuclear power generation is that she bases her conclusions on the number of deaths per terawatt-hour of energy produced by various energy sources, but this ignores the fact that the environmental damage caused by nuclear accidents lasts for centuries.

Various national lobby groups oppose nuclear energy expansion in Australia. One of these is the Climate Council, an independent community funded organisation that was established after the Abbot government abolished the publicly funded Australian Climate Commission in 2013. It opposes nuclear power plants because (i) while no greenhouse gas is produced in the operation of a nuclear reactor, all the other steps in producing nuclear power do – uranium mining, plant construction, plant decommissioning and waste management (ii) nuclear energy is not renewable – uranium is a finite resource like coal and gas (iii) nuclear power presents significant challenges in terms of the storage and transport of nuclear waste, site remediation and use of water (iv) nuclear plants are extremely expensive to build and take on average 9.4 years to build (v) nuclear generation is not flexible and so is not well suited to modern power grids with large amounts of pumped hydro, wind and solar input.⁴⁴

Agriculture

“In 2017 the agricultural sector produced 13% of Australia's greenhouse gas emissions, making it the economy's fourth largest sectoral producer of greenhouse gas”⁴⁵

While this sector's emissions decreased by 6.3% between 2005 and 2017, most of this reduction was the result of reduced agricultural activity caused by drought.⁴⁶ In the year to December 2019 emissions from the sector declined by a further 5.8%, further reducing its contribution to 12.9% of Australia's total greenhouse gas emissions.⁴⁷ The main greenhouse gas emissions produced by the agricultural sector are methane (produced by livestock food digestion and manure management), nitrous oxide (produced by fertilising soils) and carbon dioxide (from lime and urea application). The estimates for greenhouse gas emissions in 2019 indicate that 77.5% of total gas emissions from the agricultural sector was Methane, 18.7% nitrous oxide and 3.7% carbon dioxide.⁴⁸ In terms of their global warming potential, ‘... 1 tonne of methane is equivalent to 25 tonnes of carbon dioxide; 1 tonne of nitrous oxide is equivalent to 298 tonnes of carbon dioxide.’⁴⁹

The agricultural sector is a key component of Australia's domestic food security, as well as a significant contributor to the country's exports. Given that the major source of greenhouse gas from the agricultural sector is produced by livestock, increased public sector support for research into the reduction of methane from stock-feed should be an important component of the country's post-COVID-19 recovery plans. Similarly, the post-COVID-19 recovery program should also include increased financial support for research into alternative fertilisers for field crops that do not produce nitrous oxide (or other greenhouse gasses). As already noted, methane and nitrous oxide constituted over 96% of the sector's greenhouse gas emissions in 2019, therefore research resulting in their significant reduction would dramatically enhance the environmental sustainability of Australian agriculture. This research could also form the basis of a significant new export of Australian agricultural expertise and services to agricultural producers in other countries. As the Climate Council has pointed out, failure to address this issue will mean that ‘... Australia is unlikely to achieve [its Paris Agreement commitments of] a 26% reduction below 2005 levels in emissions in the agriculture sector by 2030.’⁵⁰

Recommendations:

The following recommendations are intended to contribute to the debate about how Australia can take advantage of the need to reboot the economy post-COVID-19. By transitioning the economy away from its current carbon dependency, Australia can undertake the kind of fundamental economic restructuring and reform which is required to lay the basis for sustainable growth over the next few decades. This reform away from carbon will prove to be as dramatic as the earlier reforms undertaken by the Hawke and Keating governments. It will require the development of Australian technology and innovations that will be world-leading, and therefore provide new export opportunities for Australia.

Transition away from coal – This requires a clear national energy policy that includes the rapid phasing out of tax payer funded subsidies and incentives for the development of new coal mines, or the expansion of existing mines, and strengthening of public bodies tasked with ensuring that environmental restoration of closed coal mines is fully funded by the owners of those mines. This policy would also include a clear roadmap and timeframe for phasing out coal generated electricity.

Continue to ban nuclear power – There should be no change to the ban on nuclear power plants under the 1999 Environment Protection and Biodiversity Conservation Act.

Stabilise the national power grid – This requires enhanced storage capacity (large batteries and pumped hydro), improved demand management and strengthening of interstate high voltage transmission lines.

Transition to energy efficient buildings – Review of current domestic and commercial building regulations to ensure that new buildings are much more energy efficient. Provide incentives to retrofit existing buildings/homes to be more energy efficient. Implementing this recommendation will reduce carbon emissions, improve energy affordability for households and businesses and create jobs.

Promote the uptake of electric vehicles – This can be facilitated through charging 0 duty on imported electric vehicles, halving registration fees on electric vehicles and adopting stricter Euro 6 and VI emissions standards for petrol and diesel vehicles.

Increase agricultural sustainability and food security – Boost public financial support for research, innovation and services to the agricultural sector that reduces its environmental impact (such as additives to stockfeed that reduces their methane emissions, and alternative fertilisers). This will have the potential to expand existing export markets, and generate new export opportunities, for Australian expertise and providers of agricultural services.

Intensify support for international initiatives on climate policy – Under the 2015 Paris Climate Agreement Australia committed to reducing its 2005 levels of greenhouse gas emissions by 26-28% by 2030. According to the Climate Council, ‘...Australia will not [even] meet its woefully inadequate 26-28% emissions reduction target [by 2030].’⁵¹ In 2019 Australia was the world’s 14th largest economy in terms of its nominal GDP, however, it only accounted for 1.7% of the global economy.⁵² Therefore, Australian initiatives aimed at reducing its own carbon footprint will not be enough in themselves to bring about the changes needed to impact the world’s growing climate crisis. Nevertheless, such actions will show global leadership.

References

¹ These dismantled high protective tariffs and implemented other policies designed to promote domestically oriented industrialisation, replacing them with policies promoting greater export orientation of supply chains, population growth underpinned by relatively high levels of immigration, and liberalisation of the domestic market. Consequently, the manufacturing sector dramatically declined while the services, construction and mining sectors became increasingly important.

² ‘Earth Day 2020’ Ipsos-Mori April 2020 <https://www.ipsos.com/en/two-thirds-citizens-around-world-agree-climate-change-serious-crisis-coronavirus> (accessed 29/5/2020)

³ ‘Australia’s shifting mood on climate change’ Lowy Institute June 2020 <https://www.lowyinstitute.org/the-interpretor/australia-s-shifting-mood-climate-change> (accessed 25 June 2020)

⁴ Ibid.

⁵ ABC News 2/1/2020 <https://www.abc.net.au/news/2020-01-02/2019-was-australias-hottest-and-driest-year-on-record/11837312> (accessed 29/5/2020)

⁶ See for instance <https://www.barrierreef.org/the-reef/threats/Cyclones%20and%20extreme%20weather> (accessed 29/5/2020)

⁷ See <https://theconversation.com/these-5-images-show-how-air-pollution-changed-over-australias-major-cities-before-and-after-lockdown-136723> (accessed 29/5/2020)

⁸ Department of Industry, Science, Energy and Resources (2020) ‘Resources and Energy Quarterly March 2020’ <https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2020/index.html> (accessed 25/6/2020)

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He ran the EU support program for the seven SADC countries negotiating an Economic Partnership Agreement with the EU for over 5 years, was a full-time trade advisor to the Government of Swaziland during 2009 and 2010, has been actively involved in supporting both the African Tripartite and the Continental Free Trade Area trade negotiations, and has provided capacity building support to the AU, COMESA, EAC, and SADC Secretariats. He has worked as an advisor to most governments in Eastern and Southern Africa, and with a number of private-sector organisations and their members. He also ran a series of workshops on the EU rules of origin for the private sector in six South Asian countries.

⁹ Statista October 2019 <https://www.statista.com/statistics/692159/australia-employment-in-coal-mining-industry/> (accessed 29/5/2020)

¹⁰ Statista October 2019 <https://www.statista.com/statistics/692262/australia-earnings-in-coal-mining-industry/> (accessed 29/5/2020)

¹¹ See joint CSIRO and AEMO Generation Cost Report (2018) <https://arena.gov.au/blog/aemo-and-csiro-report-finds-renewables-cheapest/> (accessed 25/6/2020)

¹² The Guardian- Australian Edition 12 March 2020 <https://www.theguardian.com/environment/2020/mar/12/wind-and-solar-plants-will-soon-be-cheaper-than-coal-in-all-big-markets-around-world-analysis-finds>

¹³ ‘Can COVID help flatten the climate curve?’ The Economist 21 May 2020

¹⁴ Ibid.

¹⁵ <https://www.iea.org/reports/renewables-information-overview> (accessed 25/6/2020)

¹⁶ ‘Australian Energy Update 2019’ P.3 Australian Department of the Environment and Energy Sept. 2019

¹⁷ RepuTex is a provider of modelling services for the Australian electricity, renewable energy and emissions markets.

¹⁸ RepuTex ‘OUTLOOK: NEM wholesale electricity and LGC price forecast 2020-40 (Q3 FY20)’ <https://www.reputex.com/research-insights/outlook-wholesale-electricity-and-lgc-price-forecast-for-the-nem-2020-40-q3-fy19-20/> (accessed 29/5/2020)

- ¹⁹ “The Future of Energy, Australia’s Energy Choice” PWC 2019 P.6 <https://www.pwc.com.au/power-utilities/future-of-energy/future-of-energy.pdf> (accessed 29/5/2020)
- ²⁰ Ibid P.21
- ²¹ BP’s annual review of the world’s energy estimated that proven global reserves of natural gas in 2018 will last for 50.9 years at the production levels at that time. ‘BP Statistical Review of World Energy 2019’ P.31 <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-natural-gas.pdf> (accessed 25/6/2020)
- ²² US Energy Information Administration <https://www.eia.gov/energyexplained/natural-gas/natural-gas-and-the-environment.php> (accessed 25/6/2020)
- ²³ Ibid P.33
- ²⁴ The Australian Guardian 14 November 2018 <https://www.theguardian.com/environment/2018/nov/14/half-of-australias-emissions-increase-linked-to-was-gorgon-lng-plant> (accessed 25/6/2020)
- ²⁵ Fracking also produces oil, and (from a very low base in 2000) by 2015 oil from fracking accounted for 51% of total US oil output. <https://www.eia.gov/todayinenergy/detail.php?id=25372> (accessed 25/6/2020)
- ²⁶ By 2019 OPEC still accounted for 79.4% of proven oil reserves with 64.5% of this in the Middle East. https://www.opec.org/opec_web/en/data_graphs/330.htm (accessed 25/6/2020)
- ²⁷ The Economist op. cit. 21 May 2020
- ²⁸ The PRI op. cit. P.16-23
- ²⁹ BP Energy Outlook (2019 Edition) <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019.pdf> (accessed 25/6/2020)
- ³⁰ Currently passenger and goods vehicles have 5% duty if sourced from countries without an FTA with Australia.
- ³¹ <http://cleanenergyregulator.gov.au/About/Pages/News%20and%20updates/NewsItem.aspx?ListId=19b4efbb-6f5d-4637-94c4-121c1f96fcfe&ItemId=786> (Accessed 25/6/2020)
- ³² PWC 2019 op. cit. P.12
- ³³ See for instance A.Blakers, M.Stocks and B.Lu “Australia: the renewable energy superstar” A.N.U. P.3 <http://re100.eng.anu.edu.au/publications/assets/100renewables.pdf> (accessed 29/5/2020)
- ³⁴ Many countries are implementing such policies. See for instance Simona et al “Increasing the energy efficiency of buildings by thermal insulation” <https://www.sciencedirect.com/science/article/pii/S1876610217338882> (accessed 25/6/2020)
- ³⁵ While increasingly better electricity storage technology and equipment will contribute towards solving the supply constraints of solar and wind generated energy, these will significantly increase costs and the environmental impact of producing massive ancillary systems to store energy, e.g. batteries, and transmissions lines.
- ³⁶ ‘By 2050, which is the rough expiration date of solar panels manufactured today, the technology is estimated to produce some 80 percent more than the total annual waste from all combined technologies today.’ <https://foreignpolicy.com/2020/06/18/green-energy-dirty-side-effects-renewable-transition-climate-change-cobalt-mining-human-rights-inequality/> (Accessed 25/6/2020)
- ³⁷ While it had closed the last of its four plants in 1990, it still continues to import nuclear generated electricity from France. <https://www.world-nuclear.org/information-library/country-profiles/countries-g-n/italy.aspx>
- ³⁸ Deutsche Welle <https://www.dw.com/en/germany-shuts-down-atomic-plant-as-nuclear-phase-out-enters-final-stretch/a-51845616> (accessed 25/6/2020)
- ³⁹ <https://www.loc.gov/law/foreign-news/article/france-law-on-energy-and-climate-adopted/>
- ⁴⁰ 21% of UK electricity is from nuclear power plants (including imports from France) <https://www.energy-uk.org.uk/our-work/generation/electricity-generation.html> In June 2019 the UK passed a law which committed it to bringing all greenhouse gas emissions to net zero <https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law> (both links accessed 25/6/2020)
- ⁴¹ <https://www.world-nuclear.org/information-library/facts-and-figures/world-nuclear-power-reactors-and-uranium-requireme.aspx> (accessed 25/6/2020)
- ⁴² See for instance <https://minerals.org.au/sites/default/files/180605%20Removing%20the%20prohibition%20on%20nuclear%20power.pdf> (accessed 25/6/2020)
- ⁴³ For example, H.Ritchie “What are the safest sources of energy?” February 2020 <https://ourworldindata.org/safest-sources-of-energy> (accessed 25/6/2020)
- ⁴⁴ <https://www.climatecouncil.org.au/nuclear-power-stations-are-not-appropriate-for-australia-and-probably-never-will-be/> (accessed 25/6/2020)
- ⁴⁵ Climate Council 2018 ‘Australia’s Rising Greenhouse Gas Emissions’ P. 21
- ⁴⁶ *ibid*
- ⁴⁷ Department of Industry, Science, Energy and Natural Resources (2020) “Quarterly Update of Australia’s National Greenhouse Gas Inventory: December 2019” P.15 <https://www.industry.gov.au/sites/default/files/2020-05/nggi-quarterly-update-dec-2019.pdf> (accessed 25/6/2020)
- ⁴⁸ Department of Industry, Science, Energy and National Resources (2020) ‘National Inventory Report 2018 Volume 1’ P.283 <https://www.industry.gov.au/sites/default/files/2020-05/nga-national-inventory-report-2018-volume-1.pdf> (accessed 25/6/2020)
- ⁴⁹ Western Australia Department of Primary Industries and Regional Development <https://www.agric.wa.gov.au/climate-change/how-australia-accounts-agricultural-greenhouse-gas-emissions> (accessed 25/6/2020)
- ⁵⁰ Climate Council 2018 op. cit. P. 22
- ⁵¹ *Ibid*. P.1
- ⁵² Austrade 2020 see <https://www.austrade.gov.au/International/Invest/Why-Australia/robust-economy> (accessed 25/6/2020)

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