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Institute of Public Affairs

25 July 2024

Senate Standing Committees on Economics
PO Box 6100
Parliament House
Canberra ACT 2600

Dear Committee Secretary

**A Future Made in Australia is impossible with net zero**

The purpose of this letter is to provide research and analysis conducted by the Institute of Public Affairs ("the IPA") to the Senate Economics Legislation Committee ("the committee") as it conducts its inquiry into the Future Made in Australia Bill 2024 and the Future Made in Australia (Omnibus Amendments No. 1) Bill 2024 ("the bills").

The Future Made in Australia policy plan aims to maximise 'the economic and industrial benefits' of the net zero transformation and to make Australia into a 'renewable energy superpower'.[1] This would require substantial government intervention and $22.7 billion in government spending on what would otherwise be economically unviable manufacturing projects, in the hope of encouraging subsidiary private funding.

Whilst the promotion of domestic Australian manufacturing is critical, support must be based on two clear criteria: that the industries targeted are economically viable and competitive, and must be in promotion of the national interest. Government subsidisation of the manufacturing of renewable technologies fails both criteria.

Further, it is the policy of net zero itself, along with other renewable and emissions mandates, that have dramatically increased the cost of energy, and therefore of production, causing the offshoring of Australian manufacturing and industry.

In addition, the effect of the purusit of net zero is to re-oirent global economic supply chains around China, and away from the West, including Australia. China is the world's dominant producer of wind turbines, solar panels, and of the processing of critical and rare earth minerals.

Analysis of the bills and of 'Future Made in Australia' by the IPA finds:

- The number of jobs created by Future Made in Australia will not come close to replacing the number of jobs destroyed by net zero.
- Future Made in Australia will further erode Australia's economic competitiveness.
- The government should abandon its commitment to net zero and intermittent renewables, and instead remove barriers to the further development of Australia's natural competitive economic advantage in the resources sector.

It is on the basis of this analysis that the IPA recommends that these bills be rejected by the parliament, and that the mandate of net zero emissions by 2050 be repealed and replaced by a policy of encouraging Australian energy independnce, manufacturing, and heavy industry.

[1] Future Made in Australia Bill 2024 (Cth).

**Future Made in Australia can't replace the jobs lost and forgone due to net zero**

When announcing the Future Made in Australia policy at the Queensland Media Club in April 2024, Prime Minister Anthony Albanese referred to the *Inflation Reduction Act* (USA) ("the IRA") as an equivalent policy to model Australian legislation on.[2]

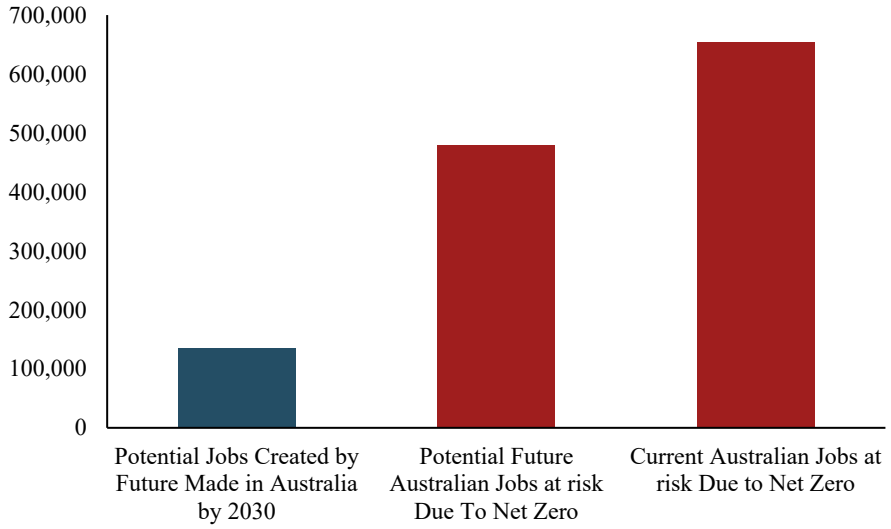
According to the United States government, the IRA created 170,606 jobs in the first twelve months and is slated to create 1.5 million jobs by the end of the decade.[3] After twelve months, this represents 0.1 per cent of total employment in the United States, and the 1.5 million jobs represents 0.9 per cent of current total employment in the United States.[4]

Analysis of jobs created in the US by the end of the decade is likely an optimistic, upper bound estimate of the effects of the IRA. However, even using these figures to assume a similar effect in Australia would find that Future Made in Australia would create only 15,257 jobs in the first year, and 134,143 by the end of the decade.[5]

Both these figures are miniscule compared to the 653,600 existing jobs that have been put at risk by net zero, and the 478,673 potential jobs in the pipeline that are at risk of being permanently cancelled.[6] This means that for every job created by Future Made in Australia, 8.4 jobs are at risk of either being lost or cancelled.

Additionally, the assertion that green jobs can replace jobs in manufacturing specifically is contradicted by the evidence. Analysis by the IPA revealed that for every job created in the renewable industry between 2009 and 2019, five jobs were lost in manufacturing.[7]

*Chart 1: Future Made in Australia Jobs Compared to Jobs at risk due to Net Zero*




[2] Anthony Albanese, 'A Future Made in Australia' (Speech to the Queensland Media Club, 11 April 2024).
[3] The White House, *FACT SHEET: One Year In, President Biden's Inflation Reduction Act is Driving Historic Climate Action and Investing in America to Create Good Paying Jobs and Reduce Costs* (August 2023)
[4] Statista, 'Total employment and the unemployment rate in the United States from 1980 to 2023, with projections until 2029' (April 2024).
[5] Australian Bureau of Statistics, *Labour Force, June 2024* (July 2024).
[6] Cian Hussey and Daniel Wild, *Net Zero Jobs: An Analysis of the Employment Impacts of a Net Zero Target in Australia* (Institute of Public Affairs Research Report, February 2021); Daniel Wild, *The Economic and Employment Consequences of Net Zero Emissions by 2050 in Australia* (Institute of Public Affairs Research Report, April 2022).
[7] Hussey and Wild (February 2021).

**Future Made in Australia will further erode Australia's economic competitiveness**

The Future Made in Australia Bill will put at risk Australia's most competitive industries. Central to the Future Made in Australia is the subsidisation of less competitive industries—renewables technologies—that are not only in direct competition with, but are intended to replace, the industries in which Australia has a natural competitive advantage, such as minerals, agriculture, and oil and gas.

Australia's economic competitiveness has been in decline since the early 2000s. The International Institute for Management Development's World Competitiveness Ranking places Australia 19th overall out of 64 countries surveyed. In 2004, Australia ranked fourth in the world.[8]

Despite the overall decline, Australia has demonstrated strength and resilience in a number of important criteria. Australia has over the last five years ranked first in the world in terms-of-trade, namely the ratio between the prices of exports and the prices of imports. Australia's exemplary terms-of-trade ranking is attributable to the strength and resilience of our resources and agricultural sectors—the sectors the Australian economy relies on to generate export revenue, such as iron ore, oil and gas, coal, grain and meat, and gold and other metals.[9]

IPA research has found that Australia's decline in overall competitiveness has been attributable to key areas of competitive weaknesses, such as red tape and green tape, and the decommissioning of base-load power supply without adequate, like-for-like replacements.[10]

The latter would be accelerated under Future Made in Australia through the funding of solar panel and wind turbine manufacturing intended to displace base-load power, which the government asserts will strengthen 'economic security' for a net zero future.[11] However, a nation cannot attain economic security if it is not economically competitive.

**A competitive manufacturing base is not possible while the policy of net zero by 2050 remains in force**

The key to maintaining a manufacturing base is the availability of cheap and reliable energy. However, the policy of net zero emissions by 2050, and the various associated regulations, are making it increasingly difficult to access Australia's plentiful natural energy resources for domestic use and, in so doing, support a manufacturing base.

Government support for Australia's manufacturing base is not possible without an extension or expansion of Australia's existing base-load power stations. However, the government's emission reduction targets require their continued decommissioning.

Further, the pursuit of net zero will result in global economic supply chains being re-orientated around China. In 2022, China was the biggest exporter of both wind and solar,

[8] Kevin You, *Australia's Economic Competitiveness in Continuing Decline* (Institute of Public Affairs Parliamentary Research Brief, November 2023).
[9] Ibid.
[10] Ibid.
[11] Anthony Albanese, 'A Future Made in Australia' (Speech to the Queensland Media Club, 11 April 2024).

exporting at a value of US$51.8 billion, or 51 per cent of all wind and solar trade worldwide. Australia is not even a minor player in the renewable export trade.[12]

China exports wind and solar products combined at a level over eight times higher than the second largest exporter (Vietnam).[13] The global renewable manufacturing market is simply too concentrated in China for Australia to be competitive.

Australia should accept this reality and, instead, build on its competitive advantage in coal and gas. Australia exports the highest value of coal in the world, whilst also exporting the fifth highest value of petroleum gas in the world. When combined, this makes Australia the highest exporter of these products in the world, with a value of US$146.5 billion. In comparison, China is 25th in petroleum gas export value,12th in coal export value, and 24th in gas and coal exports combined, with a value of US$5.1 billion.[14]

If the government is serious about re-establishing a manufacturing base in Australia, it must first focus on red tape barriers to economic development of Australia's vast base-load energy resources such as coal, gas, and/or nuclear.

**Recommendations**

1. The bills be rejected by parliament.
2. The policy of net zero emissions by 2050 be abandoned, and associated legislation be repealed.
3. The government should maximise our economic competitive advantages by redirecting funds to our competive industries, such as coal, gas, iron ore, and agriculture.
4. The government must not allow for base-load power stations to close until a like-for-like replacement is ready to go online.

I thank the Committee for the opportunity to provide this submission. Please do not hesitate to contact me at sdavidson@ipa.org.au for further consultation or discussion.

Kind regards,

**Saxon Davidson**
**Research Fellow**

**Enclosed IPA Research**

*An Analysis of the Employment Impacts of a Net Zero Target in Australia* (February 2021)

*The Economic and Employment Consequences of Net Zero Emissions by 2050 in Australia* (April 2022)

*Liddell The Line in the Sand* (May 2023)

*Australia's Economic Competitiveness in Continuing Decline* (November 2023)

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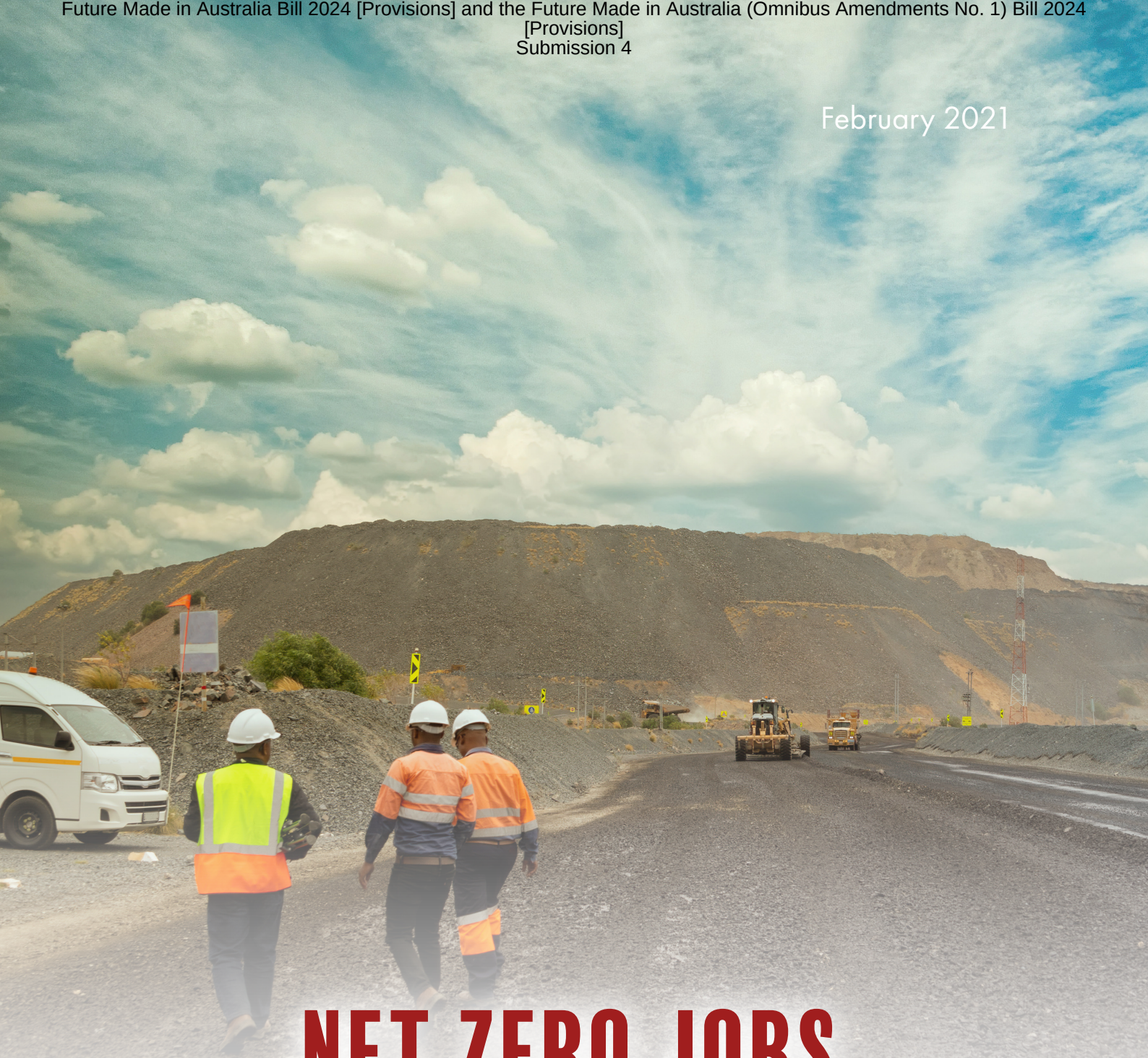
[12] Daniel Workman, *Top Solar Power and Wind Power Exports by Country* (World's Top Exports, April 2024).
[13] Ibid.
[14] Daniel Workman, *Coal Exports by Country* (World's Top Exports, July 2023): archived online at https://web.archive.org/web/20240412153905/https://www.worldstopexports.com/coal-exports-country/; Workman, *Petroleum Gas Exports by Country* (World's Top Exports, May 2024)

February 2021



# NET ZERO JOBS

## AN ANALYSIS OF THE EMPLOYMENT IMPACTS OF A NET ZERO EMISSIONS TARGET IN AUSTRALIA

Cian Hussey, Research Fellow
Daniel Wild, Director of Research

Institute of Public Affairs

# Contents

# Introduction

Australia is facing increased international pressure to adopt a target of achieving net zero carbon equivalent emissions ($CO_2$-e) (hereafter referred to as emissions). With the election of President Joe Biden in the United States, who has re-committed to the Paris Agreement, this pressure will only increase in the lead up to the Glasgow Climate Change Conference in late 2021.

Adopting a net zero emissions target will come at great expense to Australians, who have already seen jobs destroyed and their electricity bills increase as a result of ill-conceived policies aimed at reducing emissions.

The 2019 election provided firm evidence that Australians reject the idea of risking jobs and economic prosperity for the sake of reducing emissions. The election was framed as the 'climate election' by the political left,[1] whose policies were rejected by the Australian people after they failed to give regard to the negative impact those policies would have on the economy and society.

Since 2019, the Coalition government has begun to shift its positioning on emissions. In January 2020, Prime Minister Scott Morrison refused to commit to a net zero emissions target, arguing that people who do so "make a glib promise about that and they can't look Australians in the eye and tell them what it will mean for their electricity prices, what it will mean for their jobs."[2] By early 2021, however, the Prime Minister conceded that the government's goal was to achieve net zero emissions, although there is yet to be a commitment to doing so by 2050.[3]

This report presents an analysis of the effects of a net zero emissions target on jobs. It is broken up into three sections.

The first section finds that a target of net zero emissions would impose significant and irreparable economic and social damage due to the infliction of mass job losses. This report estimates that up to 653,600 jobs would be directly put at risk from a net zero emissions target. This estimate does not include potential indirect job losses which could occur in related industries and the communities where at risk jobs are vital.

Potential job losses are concentrated, in order, in the agricultural sector (306,000 jobs), the primary metal and metal product manufacturing sector (74,100 jobs), the electricity supply sector (64,100 jobs), coal mining (62,000 jobs), and air and space transport sector (38,100 jobs).

1 Adam Morton, "The climate change election: where do the parties stand on the environment?," *The Guardian*, 12 May 2019, https://www.theguardian.com/australia-news/2019/may/12/the-climate-change-election-where-do-the-parties-stand-on-the-environment.

2 Andrew Tillett and Mark Ludlow, "No net zero emissions target if it hurts jobs: PM," *Australian Financial Review*, 20 January 2020, https://www.afr.com/politics/federal/no-net-zero-emissions-target-if-it-hurts-jobs-pm-20200120-p53t18.

3 Greg Brown, "Politics of carbon has ended, Scott Morrison declares," *The Australian*, 22 January 2021, https://www.theaustralian.com.au/nation/politics/politics-of-carbon-has-ended-scott-morrison-declares/news-story/fa662d7b2af40426f852b9f1c18946b8; Phillip Coorey, "PM inches closer to net zero by 2050," *Australian Financial Review*, 1 February 2021, https://www.afr.com/politics/federal/pm-inches-closer-to-net-zero-by-2050-20210201-p56ybg.

The second section provides an analysis of Commonwealth electoral divisions and ranks electorates by those which contain the most jobs put at risk from a net zero emissions target. This report finds that 17 of the top 20 electorates with jobs put at risk by a net zero emissions target are currently held by the Coalition government. Two (Hunter and Lyons) are held by the Labor Party and one is held by Katter's Australian Party (Kennedy). The top 10 seats with jobs at risk are all Coalition-held.

The Coalition is also over-represented in the bottom 20 electorates ranked by at risk jobs, holding a total of 12 seats. This reveals an underlying tension within the Coalition as it relates to their stance on a net zero emissions policy: the Coalition holds the majority of seats which are likely to suffer the most job losses as a result of a net zero emissions target, but it also holds the majority of seats which are least likely to suffer job losses as a result of such a target.

The final section outlines recent changes in the labour force, demonstrating that for each new renewable activity job created between 2009-10 and 2018-19, five manufacturing jobs were destroyed. Renewable activity jobs are those principally engaged in the production of renewable energy, or the design, construction or operation and maintenance of renewable energy infrastructure.[4] The majority of jobs created since the election of the Rudd government in 2007 have been in industries with high public sector employment, and the promise of new, green jobs to replace manufacturing ones has not materialised.

A net zero emissions target would destroy communities where there is a high reliance on relatively more energy-intensive jobs. Adopting such a target in the wake of the largest economic contraction and employment crisis in recent memory, caused by lockdowns implemented in response to COVID-19, would be devastating for Australian workers.

4 Australian Bureau of Statistics, "Employment in Renewable Energy Activities, Australia methodology," April 2020, https://www.abs.gov.au/methodologies/employment-renewable-energy-activities-australia-methodology/2018-19.

# Jobs put at risk by net zero emissions target

This report uses data from the *National Greenhouse Gas Inventory by Economic Sector* report published by the Department of Industry, Science, Energy and Resources, along with industry employment data from the Australian Bureau of Statistics, to estimate how many jobs would be placed at risk from a net zero emissions target.

A net zero emissions target will have the greatest impact on jobs that are relatively more energy intensive. As such, 'at risk' jobs are calculated as the total number of jobs in industries where emissions per job are above the economy-wide average of 0.22 kt $CO_2$. There are 10 industries in Australia where emissions per job are higher than this average, and the jobs in these industries are deemed at risk.

The industries where jobs would be placed at risk by a net zero emissions target are: agriculture; forestry and logging; coal mining; oil and gas extraction; petroleum and coal product manufacturing; non-metallic mineral product manufacturing; primary metal and metal product manufacturing; electricity supply; waste collection, treatment and disposal services; and air and space transport.

Agriculture refers to the growing and cultivation of horticultural and other crops, along with the controlled breeding, raising, or farming of animals. A typical worker in this industry could be employed as a beef cattle or dairy farmer.

Forestry and logging includes logging native or plantation forests, including felling, cutting, and roughly chopping logs into products such as railway sleepers or posts. Also includes cutting trees and scrubs for firewood. A typical worker in this industry could be employed cutting or felling trees.

Coal mining refers to the extraction of coal, and includes underground and open cut mining, along with operations related to mining activities (such as crushing, screening, washing). A typical worker in this industry could be employed as an excavator operator on a coal mine.

Oil and gas extraction refers to producing crude oil, natural gas or condensate through the extraction of oil and gas deposits. This includes activities such as natural gas extraction, petroleum gas extraction, and oil shale mining. A typical worker in this industry could be employed as a drill rig operator on an oil rig.

Petroleum and coal product manufacturing refers to transforming crude petroleum and coal into intermediate and end products, for example petroleum refineries, asphalt paving mixture and block manufacturing, and petroleum lubricating oil and grease manufacturing. A typical worker in this industry could be employed as a mechanical technician in a petroleum refinery.

Non-metallic mineral product manufacturing includes the manufacturing of glass, ceramic, cement, lime, plaster, and other non-metallic mineral products. A typical worker in this industry could be employed as a cement crusher operator in a cement manufacturing plant.

Primary metal and metal product manufacturing includes activities such as iron smelting and steel manufacturing, copper, silver, lead, and zinc smelting and refining, and aluminium smelting. A typical worker in this industry could be employed as a steel cutter in a steel manufacturing plant.

Electricity supply includes electricity generation, transmission, distribution, on selling electricity, and electricity market operation. A typical worker in this industry could be employed as a lineworker maintaining power lines.

Waste collection, treatment and disposal services includes the collection, treatment and disposal of solid, liquid, and other waste types, including hazardous waste; this includes landfills, combustors, incinerators, and compost dumps, but does not include sewage treatment facilities. A typical worker in this industry could be employed as a garbage truck driver.

Air and space transport includes air freight and passenger transport services, along with aircraft charter, lease or rentals with crew. A typical worker in this industry could be employed as a flight attendant.

Table 1 below shows the total number of people employed in each of these industries, and therefore how many jobs are placed at risk by a net zero emissions target.[5] Together, these industries are responsible for 78.3% of total emissions,[6] and employ 653,600 Australians. A list of all industries and the emissions per job is shown in Table 2.

**Table 1: Industries with above average emissions per job**

| Industry | Jobs at risk |
|---|---|
| Agriculture | 306,200 |
| Primary Metal and Metal Product Manufacturing | 74,100 |
| Electricity Supply | 64,100 |
| Coal Mining | 62,000 |
| Air and Space Transport | 38,100 |
| Waste Collection, Treatment and Disposal | 37,800 |
| Oil and Gas Extraction | 32,400 |
| Non-Metallic Mineral Product Manufacturing | 28,900 |
| Petroleum and Coal Product Manufacturing | 6,300 |
| Forestry and Logging | 3,800 |
| Total | 653,600 |

Source: IPA, ABS.

Note: Numbers may not add to the total due to rounding.

5 Australian Bureau of Statistics, "Labour Force, Australia, Detailed, December 2020," January 2021, https://www.abs.gov.au/statistics/labour/employment-and-unemployment/labour-force-australia-detailed/dec-2020.

6 Department of Industry, Science, Energy and Resources, "National Greenhouse Gas Inventory by Economic Sector: 2018," Australian Government, May 2020, https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-by-economic-sector-2018.

**Table 2: Average emissions per job by industry**

| Industry | Emissions per job (kt $CO_2$) |
|---|---|
| Electricity Supply | 2.7205251 |
| Oil and Gas Extraction | 1.4474496 |
| Petroleum and Coal Product Manufacturing | 0.772735 |
| Coal Mining | 0.5702873 |
| Forestry and Logging | 0.3472612 |
| Non-Metallic Mineral Product Manufacturing | 0.3464191 |
| Primary Metal and Metal Product Manufacturing | 0.3440861 |
| Agriculture | 0.338292 |
| Waste Collection, Treatment and Disposal Services | 0.2595126 |
| Air and Space Transport | 0.2369107 |
| AVERAGE | 0.22 |
| Gas Supply | 0.1624972 |
| Chemical, Polymer and Rubber Product Manufacturing | 0.1321899 |
| Aquaculture | 0.1020797 |
| Rail Transport | 0.0786029 |
| Metal Ore & Non-Metallic Mineral Mining & Quarrying | 0.0751363 |
| Water Supply, Sewerage and Drainage Services | 0.0729917 |
| Fishing, Hunting and Trapping | 0.0556844 |
| Road Transport | 0.0474011 |
| Other Transport, Services, Postal and Storage | 0.0301497 |
| Food Product, Beverage and Tobacco Product Manufact. | 0.0189193 |
| Agriculture, Forestry and Fishing Support Services | 0.0144851 |
| Wood, Pulp, Paper and Printing | 0.0134398 |
| Textile, Leather, Clothing and Footwear Manufacturing | 0.0129719 |
| Fabricated Metal Product Manufacturing | 0.0119534 |
| Heavy and Civil Engineering Construction | 0.011543 |
| Construction Services | 0.0104959 |
| Information Media and Telecommunications | 0.0060873 |
| Administration, Public Administration and Services | 0.00592 |
| Building Construction | 0.0032787 |
| Wholesale and Retail Trade | 0.0024282 |
| Finance, Insurance, Rental, Hiring and Real Estate | 0.0024063 |
| Transport and Machinery Equipment Manufacturing | 0.0022129 |
| Other Services | 0.0018086 |
| Accomm., Food Services, Education and Health Services | 0.0010584 |
| Professional, Scientific and Technical Services | 0.0008304 |
| Furniture and Other Manufacturing | 0.0005159 |
| Arts and Recreation Services | -0.0034578 |

Source: IPA, ABS, Department of Industry, Science, Energy and Resources.

Note: This is the most granular breakdown of emissions data by industry/sub-industry available from the Department of Industry, Science, Energy and Resources. As such, not all industries are at the same ANZSIC classification level.

# Electoral analysis of at risk jobs

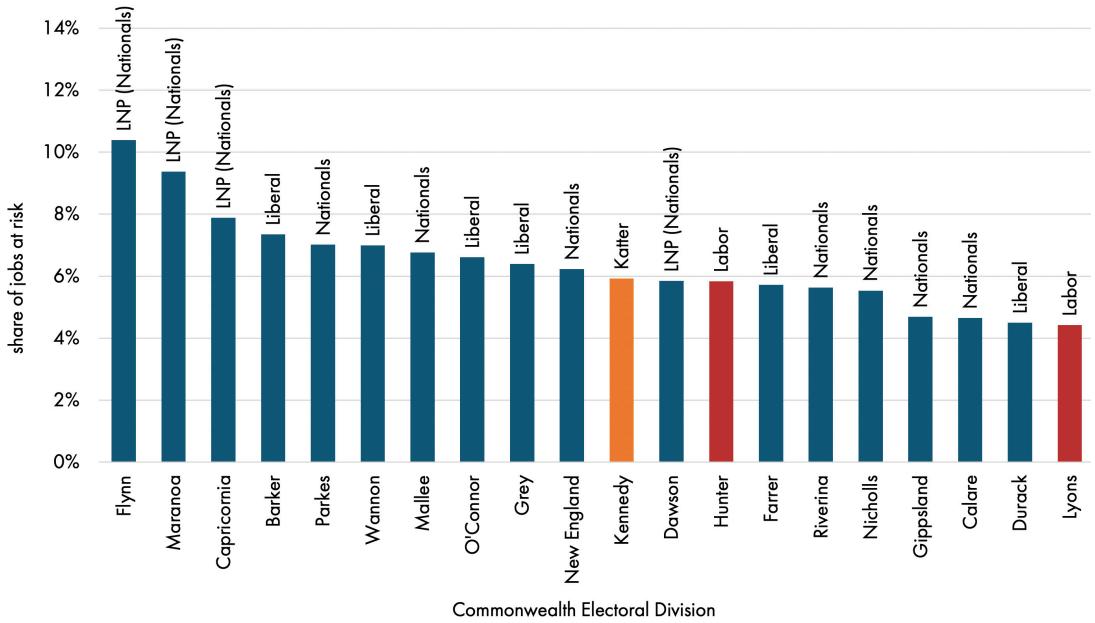
While the 653,600 jobs placed at risk by a net zero emissions target should be concerning for all members of parliament, the burden of these job losses will not fall equally across electorates.

Chart 1 below shows the top 20 electorates ranked by the share of jobs in that electorate which are placed at risk by a net zero emissions target. For example, in Flynn, 10.4% of all employment is in at-risk industries.

Strikingly, 17 of the 20 electorates are Coalition seats, held either by the Liberal Party (Barker, Wannon, O'Connor, Grey, Farrer, Durack), the National Party (Flynn, Parkes, Mallee, New England, Riverina, Nicholls, Gippsland, and Calare), or the Liberal National Party (Maranoa, Capricornia, and Dawson). Only two seats are held by the Labor Party (Hunter and Lyons), and the final seat is held by Katter's Australian Party (Kennedy). All of the top 10 electorates are held by a Coalition party, and while the Coalition have ten electorates where more than 6% of all jobs are at risk, Labor have none. Of these top 10 electorates, six are currently held by the Nationals Party Room. Additionally, 73% of the seats in federal parliament held by the Nationals are 'at risk' seats, compared with just 10% of seats held by the Liberals, and 3% of seats held by the Labor Party.

Of these 20 electorates, six are in New South Wales, five are in Queensland, four are in Victoria, there are two each in South Australia and Western Australia, and one in Tasmania.

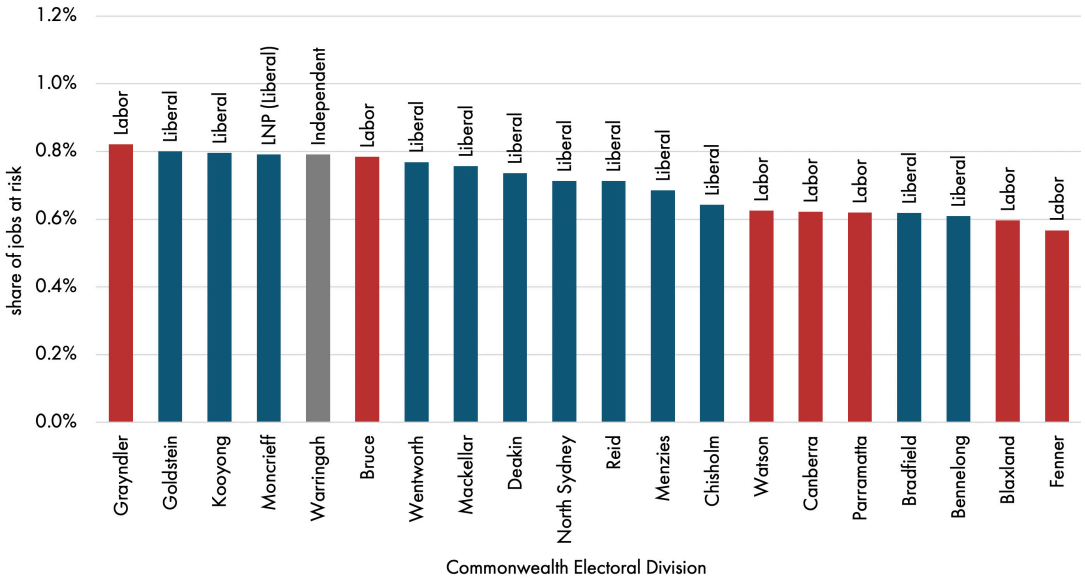
**Chart 1: Top 20 electorates with jobs at risk**




Source: IPA, ABS.

While the Coalition dominates the top 20 electorates ranked by at risk jobs, it is also over-represented in the bottom 20 electorates ranked by at risk jobs, as shown in Chart 2 below. Of these electorates, 12 are Coalition (Goldstein, Kooyong, Moncrieff, Wentworth, Mackellar, Deakin, North Sydney, Reid, Menzies, Chisholm, Bradfield, and Bennelong), seven are Labor (Grayndler, Bruce, Watson, Canberra, Parramatta, Blaxland, and Fenner), and one is independent (Warringah). This reveals an underlying tension within the Coalition as it relates to emissions reduction policies: the Coalition holds the majority of the seats which are likely to suffer the most job losses as a result of a net zero emissions target, but it also holds the majority of seats which are least likely to suffer job losses as a result of such a target.

**Chart 2: Bottom 20 electorates with jobs at risk**




Source: IPA, ABS.

# 'Green' jobs have not offset destruction of manufacturing jobs

Workers are often assured that their livelihoods will not be put at risk by a net zero emissions target because, while such a target will destroy jobs, this will be offset by the creation of new jobs in renewable and related industries. The effort to reduce emissions to date, however, has seen relatively few jobs created in 'renewable activities', as measured by the Australian Bureau of Statistics and shown in Chart 3 below. Renewable activity jobs are those principally engaged in the production of renewable energy, or the design, construction or operation and maintenance of renewable energy infrastructure.[7]

There are two key concerns with the effect that a net zero emissions target will have on jobs.

Firstly, while some jobs may be created by renewable energy activities and other emission reduction efforts, many of these jobs will not go to those who lose their jobs in the agricultural, manufacturing, and other at-risk industries. According to the *Clean Jobs Plan* set out by the Climate Council, for example, 70% of the 76,000 jobs estimated to be created under the plan are in construction and administrative services. Additionally, one-third of the jobs require minimal training, which means they are low-skill and therefore likely low-paying.[8]

Secondly, these new job creations are unlikely to outweigh the job losses seen in at risk industries. There are a range of estimates for how many jobs could be created by a net zero emissions target, however these fail to consider the negative effect such a target would have on the industries identified in this report. For example, the Australian Greens' *Jobs Plan* taken to the 2019 federal election states that 179,770 jobs could be created under their "renewable energy future" policy.[9] Another estimate, found in Beyond Zero Emissions' *The Million Jobs Plan* claims that 207,100 ongoing jobs could be created by investing in a low-carbon economy.[10] Even if all these jobs were created under a net zero emissions target, they would not outweigh the significant job losses likely to occur in at risk industries.

Past experience shows that while the push for emissions reduction may create some jobs, such as in renewable activities, these will not be enough to offset job losses in other, more energy-intensive industries. Between 2009-10 and 2018-19 employment

7 Australian Bureau of Statistics, "Employment in Renewable Energy Activities, Australia methodology," April 2020, https://www.abs.gov.au/methodologies/employment-renewable-energy-activities-australia-methodology/2018-19.

8 AlphaBeta, "Clean Jobs Plan," Climate Council, July 2020, https://www.climatecouncil.org.au/wp-content/uploads/2020/07/Climate-Council_AlphaBeta-Clean-Jobs-Plan-200720.pdf.

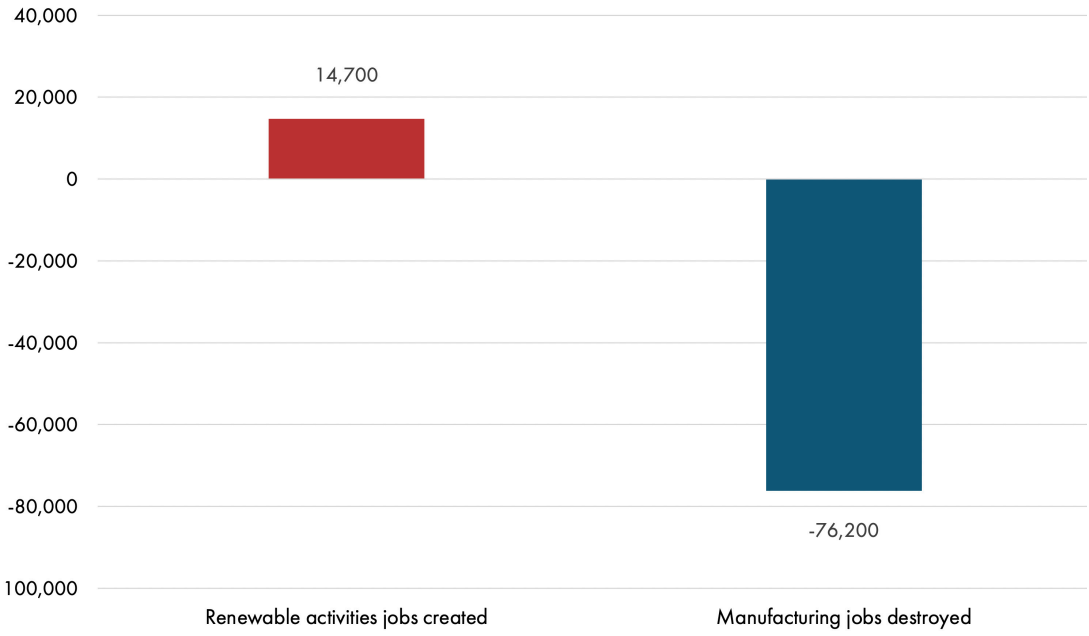
9 The Australian Greens, "Creating the Jobs of the Future: The Greens' Jobs Plan, Election 2019," https://greens.org.au/sites/default/files/2019-05/Greens%202019%20Policy%20Platform%20-Creating%20the%20jobs%20of%20the%20future.pdf.

10 Beyond Zero Emissions, "The Million Jobs Plan," June 2020, https://bze.org.au/wp-content/uploads/2020/11/BZE-The-Million-Jobs-Plan-Full-Report-2020.pdf.

in renewable activities increased by 14,700, but 76,200 manufacturing jobs were destroyed.[11] This means that for every job created in renewable activities over this time, five manufacturing jobs were lost. The period 2009-10 to 2018-19 is used as that is the entire time series available from the Australian Bureau of Statistics.

It is also worth noting that many of the estimates of jobs created under a net zero emissions target would be created directly through government policy and taxpayer support. This indicates that the share of the workforce directly reliant on private sector workers would increase, requiring either higher taxes or fewer government services elsewhere to fund them. By contrast, the industries placed at risk by a net zero emissions target tend to have very high levels of private sector employment, suggesting that these workers are vital contributors to the taxation pool which funds the public sector. For example, 99.6% of jobs in the agriculture, forestry and fishing industry are in the private sector, 100% of mining jobs are in the private sector, and 99.7% of manufacturing jobs are in the private sector.[12]

**Chart 3: Job changes between 2009-10 and 2018-19**




Source: IPA, ABS.

11 Australian Bureau of Statistics, "Employment in Renewable Energy Activities, Australia, 2018-19 Financial Year," April 2020, https://www.abs.gov.au/statistics/labour/employment-and-unemployment/employment-renewable-energy-activities-australia/2018-19; Australian Bureau of Statistics, "Labour Force, Australia, Detailed, December 2020," January 2021, https://www.abs.gov.au/statistics/labour/employment-and-unemployment/labour-force-australia-detailed/dec-2020.

12 Ibid.

# Conclusion

The 2019 federal election delivered a clear message to Australia's political class: mainstream Australians care about their livelihoods and are not willing to risk losing their jobs in pursuit of economically and socially devastating emissions reduction policies.

Despite the clear, democratic mandate to maintain a relatively less-destructive emissions policy, the federal government has changed course since its re-election.

In January 2020 Prime Minister Scott Morrison refused to commit to a net zero emissions target, arguing that people who do so "make a glib promise about that and they can't look Australians in the eye and tell them what it will mean for their electricity prices, what it will mean for their jobs."[13]

One year later, the Prime Minister said that the government's "goal is to reach net zero emissions as soon as possible, and preferably by 2050."[14]

Adopting such a target would be devastating for the Australians whose livelihoods will be placed at risk.

As this report has outlined, a net zero emissions target will directly place up to 653,600 jobs at risk. This does not account for indirect job losses as a result of reduced economic activity.

These job losses would place an enormous strain on mainstream Australians, and as outlined in this report, the electorates which will suffer most are disproportionately held by Coalition parties. At the same time, the majority of the seats which are least likely to suffer job losses as a result of a net zero emissions target are also held by the Coalition, which reveals an internal tension within the government.

It is also unlikely that jobs lost as a result of a net zero emissions target will be replaced by 'green' jobs. As this report highlights, between 2009-10 and 2018-19, five manufacturing jobs were destroyed for each renewable activity job created.

A net zero emissions target would destroy communities where there is a high reliance on relatively more energy-intensive jobs. Adopting such a target in the wake of the largest economic contraction and employment crisis in recent memory, caused by COVID-19 and resulting lockdowns, would be devastating for Australian workers.

13 Andrew Tillett and Mark Ludlow, "No net zero emissions target if it hurts jobs: PM," *Australian Financial Review*, 20 January 2020, https://www.afr.com/politics/federal/no-net-zero-emissions-target-if-it-hurts-jobs-pm-20200120-p53t18.

14 Phillip Coorey, "PM inches closer to net zero by 2050," *Australian Financial Review*, 1 February 2021, https://www.afr.com/politics/federal/pm-inches-closer-to-net-zero-by-2050-20210201-p56ybg.

# NET ZERO JOBS AN ANALYSIS OF THE EMPLOYMENT IMPACTS OF A NET ZERO EMISSIONS TARGET IN AUSTRALIA

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Institute of Public Affairs

# THE ECONOMIC AND EMPLOYMENT CONSEQUENCES OF NET ZERO EMISSIONS BY 2050 IN AUSTRALIA

April 2022

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Institute of Public Affairs

# Contents

# Introduction

In the lead up to the 2021 United Nations Climate Change Conference (COP26) held in Glasgow, Scotland from 31 October to 13 November 2021, the Australian government committed to adopting a target of net zero emissions by the year 2050.

Following the conference, the government published *Australia's Long-Term Emissions Reduction Plan: A whole-of-economy plan to achieve net zero emissions by 2050* which outlined the broad policies the government would implement for Australia to meet the net zero by 2050 target.

Modelling published as a part of the plan claims that meeting the net zero emissions target will increase Gross National Income per capita by $2,000 in the year 2050, with the vast majority of the claimed benefit the result of 'advanced technology'.

However, there has been little analysis or discussion of the costs of a net zero emissions by 2050 target in terms of employment or forgone economic output and growth.

In February 2021 the Institute of Public Affairs (IPA) was among the first organisations to provide an estimate of the potential employment impact of a net zero emissions target, with research finding that up to 653,600 existing jobs would be put at risk. The research report, *Net Zero Jobs: An analysis of the employment impact of a net zero emissions by 2050 target,* also identified that the majority of jobs at risk would be in the agriculture, mining, and manufacturing sectors.

Subsequent research by the IPA, *Net Zero Emissions Will Divide Australians: A state-based electoral analysis of the impact of net zero emissions*, identified the inequitable impact of a net zero emissions target, with a worker in a typical electorate represented by the Nationals being more than three times as likely to lose their job as a result of net zero compared with a worker in a typical electorate represented by the Liberal Party. This is because the overwhelming majority of jobs placed at risk by net zero are located in the regions and outer-metropolitan areas of major cities.

Specifically, that research identified that up to 24% of jobs in the electorate of Flynn, 22% of jobs in Maranoa, and 18% of jobs in Capricornia could be put at risk by a net zero emission by 2050 target - all three of which are represented by the Nationals.

This study builds on previous IPA research by analysing the potential economic and employment impact of a ban on all new coal, gas, and oil projects – which at a minimum would be required for Australia to meet its net zero emissions by 2050 commitment.

The cost estimate is based on the investment value of coal, gas, and oil projects which would be prohibited from proceeding as a result of a ban. The data is drawn from Commonwealth Department of Industry, Science, Energy, and Resource's (DISER's) report: *2021 Resources and Energy Major Projects Report,* which categorises resources and energy projects into four categories: 'publicly announced', 'feasibility', 'committed', and 'completed'. The publicly announced stage refers to projects which

are 'are usually very early in their development, and are typically undergoing an initial feasibility study to assess the commercial aspects of developing an identified resource'. The feasibility stage refers to the stage of the project development cycle when the 'initial feasibility study for a project has been completed and the results support further development.' The committed stage refers to projects which have 'have completed all commercial, engineering and environmental studies, received all necessary government regulatory approvals, and finalised the financing of the project to allow construction.' And the completed stage refers to projects where construction is completed and the operation has reached commercial production.

A ban on all new coal, gas, and oil projects would affect those projects which are in the publicly announced and feasibility stages, and it is the investment values of these projects as identified in the *2021 Resources and Energy Major Projects Report* which are analysed in this study. In addition, this report also utilises the Australian Bureau of Statistics' (ABS') Input-Output Table to estimate the multiplier effects of the economic output and jobs put at risk by the proposed ban.

The economic multiplier refers to the economic activity which is generated as a result of the flow-on effects from another activity (like a coal project), for example through the creation of more jobs and higher wages which generate more consumer spending.

This is a conservative approach to estimating the potential forgone economic output of a ban on new coal, gas, and oil projects, as it doesn't include projects which are in the committed state. As DISER noted, 'Projects at the committed stage have completed all commercial, engineering and environmental studies, received all necessary government regulatory approvals, and finalised the financing of the project to allow construction. Such projects are considered to have received a positive final investment decision from the owner(s).'

While many of these projects will be constructed, some will not. As the department states, 'Most projects that progress to the committed stage will eventually commence production. Nevertheless, post-final investment decision, there are still technical and financial risks that, if realised, can result in delays, scope changes and cost overruns, or even affect the commercial viability of a project and possibly lead to its cancellation.' Policies such as net zero emissions by 2050, by adding to the potential cost of projects, increase the likelihood that 'committed' projects will later be cancelled.

The approach also only includes projects which are *currently* being considered. However, a permanent ban on all new coal, gas, and oil projects would not just affect projects currently being considered, but all future projects that would otherwise have been considered but would not proceed as a result of the ban.[1]

1 Note: "oil projects" are defined as "LNG and petroleum projects" as per the *2021 Resources and Energy Major Project Report*

**Table 1: Summary of economic costs of coal, gas, and oil ban**

| State/Region | Number of Projects | Cost Estimate[1] ($b) | Total Industrial Output Value[2] ($b) | Annual Regional Product[3] ($b) | Cost as % of Annual Regional Product (%) | Total Project Employment Impact[4] (Persons) | Regional Employed[5] (Persons) | Employment Impact as % of Employed Persons (%) |
|---|---|---|---|---|---|---|---|---|
| Australia | 89 | 167.18 | 273.78 | 2030 | 13.49 | 478,673 | 13,255,000 | 3.60 |
| Western Australia | 12 | 75.41 | 114.76 | 320.65 | 35.79 | 186,276 | 1,452,061 | 12.78 |
| Queensland | 45 | 68.30 | 119.61 | 368.98 | 32.42 | 221,916 | 2,647,000 | 8.38 |
| *North Qld* | 23 | 37.46 | 66.58 | 75.88 | 87.74 | 125,005 | 347,948 | 35.93 |
| *Central Qld* | 13 | 10.81 | 19.38 | 22.69 | 85.41 | 36,656 | 115,261 | 31.80 |
| *South-West Qld* | 9 | 20.02 | 33.65 | 20.77 | 162.01 | 60,154 | 135,306 | 44.50 |
| New South Wales | 21 | 13.70 | 23.52 | 633.64 | 3.71 | 42,899 | 4,094,693 | 1.05 |
| *Hunter* | 15 | 6.43 | 11.50 | 59.31 | 20.30 | 21,789 | 324,012 | 6.72 |
| *Other NSW* | 6 | 7.02 | 11.62 | 592.94 | 1.96 | 21,110 | 3,770,681 | 0.54 |
| Other States/ Territories | 11 | 9.78 | 15.89 | 643.45 | 2.47 | 27,532 | 4,712,000 | 0.58 |

*Notes*
*1 DISER Report, mid value estimate used when cost range provided.*
*2 ABS, Australian National Accounts: Input-Output Tables 2018-19, ABS 5209.0.55.001. Simple output multiplier effect.*
*3 REMPLAN, Gross regional product by Statistical Area Level 4, 2020-21.*
*4 NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3. Simple multiplier effect and type 2 consumption effect.*
*5 ABS, Labour Force, detailed, Australia 6291.0.55.001, 6291.0.55.003.*

As summarised in Table 1, the economic cost of a ban on all new coal, gas, and oil projects is immense. The total cost across Australia is estimated to be $273.78 billion in terms of forgone economic output, which is equivalent to 13.5% of annual GDP. This corresponds with an estimated 478,673 forgone jobs, equating to approximately 3.6% of Australia's total workforce.

Detailed analysis was undertaken of the impact of a ban on all new coal, gas, and oil projects by regions that would host the vast majority of those projects. Specifically, the costs would be as follows:

- *North Queensland:* $66.58 billion in foregone economic output which is the equivalent to 87.74% of annual gross regional product. This will prevent the creation of approximately 125,000 jobs, which is the equivalent to around 35.9% of the current local workforce. This is the equivalent to 25 years' worth of job creation.
- *Central Queensland:* $19.38 billion in foregone economic output which is the equivalent to 85.4% of annual gross regional product. This will prevent the creation of approximately 36,650 jobs which is the equivalent to around 31.8% of the current local workforce. This is the equivalent to 18 years' worth of job creation.

- *South-West Queensland:* $33.65 billion in foregone economic output which is the equivalent to 162% of annual gross regional product. This will prevent the creation of approximately 60,154 jobs which is equivalent to around 44.5% of the current local workforce. This is the equivalent to over 50 years' worth of job creation.
- *Hunter-Newcastle:* $11.5 billion in foregone economic output which is the equivalent to 20% of annual gross regional product. This will prevent the creation of approximately 21,800 jobs which is the equivalent to around 6.7% of the current local workforce. This is the equivalent to 4 years' worth of job creation.

The geographic definition of regions is taken from the ABS statistical-area 4 delineations. North Queensland is defined as the regional towns of MacKay (which includes Mackay, Isaac, and Whitsunday), Townsville, and Cairns. Central Queensland takes in the regional towns Rockhampton, Gladstone, and Emerald. South-West Queensland takes in the Darling Downs-Maranoa region (which includes Warwick, Dalby, St. George, and Roma) as well as Toowoomba. And Hunter-Newcastle takes in the Newcastle and Lake Macquarie region.

Analysis was also undertaken of the economic impact of a ban on new coal, gas, and oil projects on the three major resources states: Western Australia, Queensland, and New South Wales (NSW). The estimated costs to these states are as follows:

- *Western Australia:* $114.76 billion in foregone economic output which is the equivalent to 35.8% of annual gross state product. This will prevent the creation of 186,000 jobs which is the equivalent to around 12.8% of Western Australia's current workforce. This is the equivalent to 8.5 years' worth of job creation.
- *Queensland:* $119.61 billion in foregone economic output which is the equivalent to 32.4% of annual gross state product. This will prevent the creation of around 221,900 jobs which is the equivalent to around 8.4% of Queensland's current workforce. This is the equivalent to almost 5 years' worth of job creation.
- *NSW:* $23.52 billion in foregone economic output which is the equivalent to 3.7% of annual gross state product. This will prevent the creation of around 42,900 jobs which is the equivalent to around 1% of NSW's workforce. This is the equivalent to almost a year's worth of job creation.

# The economic impact of a ban on new coal, gas, and oil projects across Australia

This study utilises data provided by DISER's *2021 Resources and Energy Major Projects Report*, which provides the estimated investment values of key projects included in the study. It also utilises the ABS' Input-Output Table to estimate the multiplier effects of the economic output and jobs put at risk by the proposed ban. As noted in the introduction, the department classifies projects as being in one of four stages: 'publicly announced', 'feasibility', 'committed', and 'completed'. Only projects which are in the publicly announced and feasibility stages are considered in this report.

The *2021 Resources and Energy Major Projects Report* details 89 oil, gas, and coal projects currently in the publicly announced and feasibility stages valued at approximately $167 billion.[2]

**Table 2: Coal, gas, and oil projects in Australia in 'publicly announced' and 'feasibility' stages**

| Publicly Announced and Feasibility Stage Projects | NSW | | VIC | | QLD | | SA | |
|---|---|---|---|---|---|---|---|---|
| | Number | Value A$m | Number | Value A$m | Number | Value A$m | Number | Value A$m |
| Coal | 19 | $9,849 | 0 | $0 | 40 | $57,866 | 1 | $3,750 |
| LNG, Gas, Petroleum | 2 | $3,850 | 7 | $1,575 | 5 | $10,425 | 1 | $200 |
| Total | 21 | $13,699 | 7 | $1,575 | 45 | $68,291 | 2 | $3,950 |
| Publicly Announced and Feasibility Stage Projects | WA | | TAS | | NT | | Total National Projects at Risk | |
| | Number | Value A$m | Number | Value A$m | Number | Value A$m | Number | Value A$m |
| Coal | 0 | $0 | 0 | $0 | 0 | $0 | 60 | $71,465 |
| LNG, Gas, Petroleum | 12 | $75,412 | 1 | $500 | 1 | $3,750 | 29 | $95,712 |
| Total | 12 | $75,412 | 1 | $500 | 1 | $3,750 | 89 | $167,177 |

*Data soured from 2021 Resources and Energy Major Projects Report published by DISER.*
*Mid value is used in calculations where a range is provided in the report.*

While thermal coal production remains more controversial than metallurgical coal production - given its perceived contribution to greenhouse gas emissions, particularly carbon dioxide - it is important to clarify that many of the coal projects in the pipeline intend to produce both thermal and metallurgical coal.

The potential investments in coal, gas and petroleum projects all across the nation total $167 billion. But an analysis of the supply and use of goods and services as well as inter-industry flows in the economy suggests a more considerable economic impact. A detailed analysis using simple multipliers derived from the ABS' Input – Output Tables for the Australian economy in 2018-19 estimates the contribution of these investments, including the intermediate transactions and supply linkages between various product

2 Australian Government DISER, 2021, *Resources and Energy Major Projects: 2021*. Available https://www.industry.gov.au/data-and-publications/resources-and-energy-major-projects-2021

categories, to be almost $274 billion in national output excluding taxes. This is equivalent to around 13.5% of Australia's Gross Domestic Product.[3,4]

**Table 3: Economic impact of ban on new coal, gas, and oil projects**

| Resource | Sub-industry | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4) = (2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) |
|---|---|---|---|---|---|---|
| Coal | Coal Mining | 1.00 | 0.37 | 0.42 | 0.79 | 1.79 |
| LNG, Gas, Petroleum | Oil and gas extraction | 1.00 | 0.26 | 0.26 | 0.52 | 1.52 |
| Resource | A$m Value of Publicly Announced and Feasibility Stage Projects | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4) = (2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) |
| Coal | $71,465 | $71,465 | $26,396 | $30,269 | $56,665 | $128,130 |
| LNG, Gas, Petroleum | $95,712 | $95,712 | $24,646 | $25,294 | $49,940 | $145,652 |
| Total Contribution to National output | $167,177 | $167,177 | $51,042 | $55,563 | $106,605 | $273,782 |

*Source: ABS, Australian National Accounts: Input-Output Tables 2018-19, ABS 5209.0.55.001.*
*The output multipliers are derived from the ABS Input-Output Tables of the Australian Economy*
*The initial effect (1) describes relative labour-intensity of the industry.*
*The first-round effect multiplier (2) and the industrial support effect (3) describes the relationship between intermediate cross-industry inputs and final industry outputs.*
*The first-round effect and the industrial support effect (3) together give the production-induced multiplier (4).*
*The initial effect and the production-induced multiplier represent the simple employment multiplier (5).*

An analysis using the NSW Treasury Employment Calculator, which derives employment multipliers from the ABS Input-Output Tables, shows the $167 billion in investment projects is estimated to produce around 294,817 full-time equivalent (FTE) positions comprising 98,328 direct jobs and a further 196,489 indirect jobs from backward linkages of intermediate cross-industry inputs as well as industry support.[5]

The modelling also shows that 183,856 jobs are estimated to be generated from household consumption expenditure resulting in a total of 478,673 new jobs foregone if a ban on new coal, gas and oil projects were implemented.

3 ABS, 2021, *Australian National Accounts, Input-Output Tables, 2018-19*. Available https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-input-output-tables

4 ABS, 2022, *Australian National Accounts: National Income, Expenditure and Product*. Available https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/latest-release#data-download

5 NSW Treasury, 2020, *AUS Input-Output Employment Multipliers*. Available https://www.treasury.nsw.gov.au/sites/default/files/2020-10/AUS%20IO%20Model%2013102020.xlsx

## Table 4: Employment Impact of a ban on new coal, gas, and oil projects

| Resource | Sub-industry | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
|---|---|---|---|---|---|---|---|---|
| Coal | Coal Mining | 0.80 | 0.79 | 0.58 | 1.37 | 2.17 | 1.22 | 3.39 |
| LNG, Gas, Petroleum | Oil and gas extraction | 0.43 | 0.52 | 0.51 | 1.03 | 1.46 | 1.01 | 2.47 |
| Resource | A$m Value of Publicly Announced and Feasibility Stage Projects | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
| Coal | $71,465 | 57,172 | 56,457 | 41,449 | 97,906 | 155,078 | 87,187 | 242,265 |
| LNG, Gas, Petroleum | $95,712 | 41,156 | 49,770 | 48,813 | 98,583 | 139,739 | 96,669 | 236,408 |
| **Total FTE Jobs** | **$167,177** | **98,328** | **106,227** | **90,262** | **196,489** | **294,817** | **183,856** | **478,673** |

Source: NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.

# State and regional economic impact of a ban on new coal, gas, and oil projects

The states where planned investments are most at risk from a ban on coal, gas, and oil projects are Queensland, Western Australia, and NSW.

Queensland has 40 coal projects in the publicly announced and feasibility stages valued at $57.87 billion and 5 oil and gas projects worth $10.43 billion.

Employment associated with the investment projects planned in Queensland includes around 46,300 direct and 79,300 indirect jobs in the coal industry as well as 4,500 direct and 10,700 indirect jobs in the oil and gas industries. Together, this totals around 140,800 FTE positions across the whole sector.

Furthermore, household consumption expenditures generated by these projects in Queensland can be expected to generate an additional 70,600 jobs economy-wide from the coal projects and 10,500 from the oil and gas projects, resulting in a total of approximately 221,900 FTE jobs representing around 8.4% of Queensland's entire labour force.

**Table 5: Employment of a ban on new coal, gas, and oil projects in Queensland**

| Resource | Sub-industry | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
|---|---|---|---|---|---|---|---|---|
| Coal | Coal Mining | 0.80 | 0.79 | 0.58 | 1.37 | 2.17 | 1.22 | 3.39 |
| LNG, Gas, Petroleum | Oil and gas extraction | 0.43 | 0.52 | 0.51 | 1.03 | 1.46 | 1.01 | 2.47 |
| Resource | A$m Value of Publicly Announced and Feasibility Stage Projects | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
| Coal | $57,870 | 46,293 | 45,714 | 33,562 | 79,276 | 125,569 | 70,597 | 196,166 |
| LNG, Gas, Petroleum | $10,425 | 4,483 | 5,421 | 5,317 | 10,738 | 15,221 | 10,529 | 25,750 |
| **Total FTE Jobs** | **$68,295** | **50,776** | **51,135** | **38,879** | **90,014** | **140,790** | **81,126** | **221,916** |

*Source: NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

A breakdown of the coal, oil, and gas projects tabled in the DISER report shows there are 20 coal projects in the publicly announced and feasibility stages in Queensland's northern region which represents half of all coal projects in the state. The estimated $35.33 billion of investments are associated with 119,775 FTE jobs when consumption expenditures are included. There are also 3 gas projects in the northern region worth an estimated $2.13 billion, which is associated with 5,228 FTE jobs. The combined coal, oil and gas projects in northern Queensland are associated with 125,000 FTE jobs (35.9% of total regional jobs).

In Central Queensland, there are 13 coal projects in the publicly announced and feasibility stages worth an estimated $10.81 billion associated with 36,650 FTE positions which is equivalent to 31.8% of jobs in the SA4 region.

There are 7 coal projects in the pipeline in South-West Queensland worth $11.72 billion which are associated with 39,736 jobs across the Darling Downs, Maranoa and Toowoomba regions. There are also 2 oil and gas projects worth $8.3 billion associated with 20,418 FTE jobs.

Together, the $20 billion in coal, oil, and gas projects would attract approximately 60,150 jobs, representing 44.5% of total employed persons across the South-West Queensland region.

**Table 6: Economic cost of ban on new coal, gas, and oil projects in Queensland**

| Queensland Coal, Oil and Gas Projects | Project | Location | | Region | Cost Estimate (A$m) | GVA Produced (A$m) |
|---|---|---|---|---|---|---|
| Thermal coal | Alpha (mine and rail | 120 km SW of Clermont | Feasibility | Northern | $10,800 | $19,363 |
| Thermal and metallurgical coal | Caval Ridge Mine Horse Pit Extension | 155 km SW of Mackay | Publicly announced | Northern | $1,000 | $1,793 |
| Metallurgical coal | Codrilla | 62 km SE of Moranbah | Publicly announced | Northern | $750 | $1,344 |
| Metallurgical coal | Colton | 11 km N of Maryborough | Publicly announced | Northern | $375 | $671 |
| Metallurgical coal | Dysart East | 5 km NE of Dysart | Feasibility | Northern | $200 | $359 |
| Thermal coal | Galilee Coal Project (formerly China First) | 36 km NE of Jericho | Feasibility | Northern | $6,400 | $11,475 |
| Metallurgical coal | Grosvener Phase 2 | 4 k m SE of Moranbah | Feasibility | Northern | $125 | $223 |
| Thermal and metallurgical coal | Ironbank No. 1 | 35 km NE of Moranbah | Feasibility | Northern | $125 | $223 |
| Thermal coal | Kevin's Corner | Galilee Basin | Feasibility | Northern | $5,200 | $9,323 |
| Metallurgical coal | Lake Vermont Extension | 160 km SW of Mackay | Publicly announced | Northern | $100 | $179 |
| Thermal coal | Moorlands | 25 km W of Clermont | Publicly announced | Northern | $148 | $265 |
| Metallurgical coal | Moranbah South | 10 km SE of Moranbah | Feasibility | Northern | $2,000 | $3,586 |
| Thermal and metallurgical coal | New Lenton | 20 km E of Moranbah | Feasibility | Northern | $375 | $671 |
| Metallurgical coal | Olive Downs (Phase 2) | 25 km S of Coppabella | Feasibility | Northern | $587 | $1,052 |
| Metallurgical coal | Red Hill Mining | 20 km N of Moranbah | Feasibility | Northern | $1,250 | $2,240 |
| Metallurgical coal | Saraji East | 30 km N of Dysart | Publicly announced | Northern | $2,400 | $4,303 |
| Thermal and metallurgical coal | Talwood | 35 km N of Moranbah | Publicly announced | Northern | $700 | $1,255 |
| Metallurgical coal | Wards Well | 29 km SW of Glenden | Feasibility | Northern | $1,500 | $2,689 |
| Thermal and metallurgical coal | Willunga/ Vermont East | 75 km NE of Clermont | Feasibility | Northern | $300 | $538 |
| Metallurgical coal | Winchester South | 150 km SW of Mackay | Feasibility | Northern | $1,000 | $1,793 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Gas | Bowen Gas Project | 150 km SW of Mackay | Publicly announced | Northern | $500 | $761 |
| Gas | Glenaras Gas Project | Galilee Basin | Publicly announced | Northern | $1,500 | $2,283 |
| Gas /LNG | Mahalo Gas Project | Bowen Basin | Publicly announced | Northern | $125 | $190 |
| Northern Regions Total | | | | | $37,460 | $66,579 |
| Thermal and metallurgical coal | Belview | 10 km E of Blackwater | Publicly announced | Central | $907 | $1,626 |
| Metallurgical coal | Wilton-Fairhill | 70 km NW of Blackwater | Feasibility | Central | $375 | $671 |
| Metallurgical coal | Washpool | 60 km NE of Emerald | Feasibility | Central | $368 | $660 |
| Thermal and metallurgical coal | Valeria | 27 km NW of Emerald | Feasibility | Central | $1,500 | $2,689 |
| Metallurgical coal | Walton | 20 km E of Bluff | Feasibility | Central | $125 | $223 |
| Thermal coal | Taroborah | 22 km W of Emerald | Feasibility | Central | $560 | $1,004 |
| Thermal and metallurgical coal | Teresa | 17 km N of Emerald | Feasibility | Central | $375 | $671 |
| Thermal coal | South Galilee | 160 km W of Emerald | Feasibility | Central | $4,200 | $7,530 |
| Thermal coal | Springsure Creek | 40 km S of Emerald | Feasibility | Central | $1,250 | $2,240 |
| Thermal and metallurgical coal | Styx (Central Queensland Coal) | 139 km NW of Rockhampton | Feasibility | Central | $240 | $430 |
| Thermal coal | Rolleston (phase 2) | 16 km W of Rolleston | Feasibility | Central | $400 | $717 |
| Thermal coal | Minyango | 3 km S of Blackwater | Publicly announced | Central | $390 | $699 |
| Thermal and metallurgical coal | Comet Ridge | 20 km S of Comet | Feasibility | Central | $125 | $223 |
| Central Regions Total | | | | | $10,815 | $19,383 |
| Thermal coal | The Range | 24 km SE of Wandoan | Feasibility | South-West | $780 | $1,398 |
| Thermal coal | Wandoan | 60 km N of Miles | Publicly announced | South-West | $7,000 | $12,550 |
| Thermal coal | Elimatta | 45 km SW of Taroom | Feasibility | South-West | $750 | $1,344 |
| Thermal coal | New Acland (Stage 3 extension) | 177 km W of Brisbane | Feasibility | South-West | $900 | $1,614 |
| Thermal coal | North Surat - Collingwood | 12 km NE of Wandoan | Publicly announced | South-West | $652 | $1,169 |
| Thermal coal | North Surat - Taroom | 3 km SE of Taroom | Publicly announced | South-West | $1,120 | $2,008 |
| Thermal coal | North Surat - Woori | 19 km S of Wandoan | Publicly announced | South-West | $520 | $932 |
| Gas | Surat Gas Project (Phases 2-5) | 160 km W of Brisbane | Feasibility | South-West | $8,000 | $12,174 |
| Gas | Tipton | 30 km west Dalby, Surat Basin | Feasibility | South-West | $300 | $457 |
| Southern Regions Total | | | | | $20,022 | $33,646 |

*Source: 2021 Resources and Energy Major Projects Report published by DISER.*
*ABS, Australian National Accounts: Input-Output Tables 2018-19, ABS 5209.0.55.001.*
*NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

Western Australia has 12 oil and gas projects in the publicly announced and feasibility stages worth around $75.41 billion. Industry employment associated with Western Australia's planned oil and gas projects is estimated to be around 110,100 FTE jobs comprising 32,430 direct and 76,670 indirect jobs, with household consumption expenditures expected to generate an additional 76,170 jobs across the broader economy - taking the total to approximately 186,500 FTE positions.

### Table 7: Employment impact of ban on new coal, gas, and oil projects in Western Australia

| Resource | Sub-industry | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
|---|---|---|---|---|---|---|---|---|
| Coal | Coal Mining | 0.80 | 0.79 | 0.58 | 1.37 | 2.17 | 1.22 | 3.39 |
| LNG, Gas, Petroleum | Oil and gas extraction | 0.43 | 0.52 | 0.51 | 1.03 | 1.46 | 1.01 | 2.47 |
| Resource | A$m Value of Publicly Announced and Feasibility Stage Projects | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
| Coal | $0 | - | - | - | - | - | - | - |
| LNG, Gas, Petroleum | $75,412 | 32,427 | 39,214 | 38,460 | 77,674 | 110,101 | 76,166 | 186,267 |
| **Total FTE Jobs** | **$75,412** | **32,427** | **39,214** | **38,460** | **77,674** | **110,101** | **76,166** | **186,267** |

*NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

### Table 8: Economic Cost of ban on new coal, gas, and oil projects in Western Australia

| West Australia LNG, Oil and Gas Projects | Project | Location | | Cost Estimate (A$m) | GVA Produced (A$m) |
|---|---|---|---|---|---|
| Gas/LNG/condensate/ LPG | Browse to North West Shelf | Browse Basin | Feasibility | $30,000 | $45,653 |
| Oil | Buffalo | Bonaparte Basin | Publicly Announced | $53 | $81 |
| LNG | Cash Maple Development | Timor Sea | Publicly Announced | $10,000 | $15,218 |
| LNG | Clio-Acme | Browse Basin | Publicly Announced | $3,800 | $5,783 |
| LNG | Crux LNG | 700 km W of Darwin | Feasibility | $3,750 | $5,707 |
| Oil | Dorado | Carnarvon Basin | Feasibility | $3,750 | $5,707 |
| Gas/LNG/condensate | Equus | 200 km NW Onslow, WA | Publicly Announced | $6,000 | $9,131 |
| LNG | Pluto Expansion (Train 2) | 190 km NW of Karratha | Feasibility | $8,400 | $12,783 |
| Oil | Pyrenees Infill (Phase 4) | Northern Carnarvon Basin | Publicly Announced | $334 | $508 |

| | | | | | |
|---|---|---|---|---|---|
| Gas/LNG | Scarborough | 220 km NW of Exmouth | Feasibility | $7,600 | $11,565 |
| Gas/LNG | Transborders Energy's Generic FLNG Solution | n/a | Feasibility | $1,600 | $2,435 |
| Gas | West Erregulia (Phase 1) | Perth Basin | Feasibility | $125 | $190 |
| Total WA | | | | $75,412 | $114,761 |

*Source: 2021 Resources and Energy Major Projects Report published by DISER.*
*ABS, Australian National Accounts: Input-Output Tables 2018-19, ABS 5209.0.55.001.*
*NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

NSW has 19 coal projects in the publicly announced and feasibility stages worth around $9.85 billion as well as 2 oil and gas projects worth around $3.85 billion. Industry employment associated with NSW's planned coal, oil and gas projects is estimated to be around 42,900, comprising 9,540 direct and 17,460 indirect jobs, with household consumption expenditures expected to generate an additional 15,900 jobs across the broader economy.

**Table 9: Employment impact of ban on new coal, gas, and oil projects in NSW**

| Resource | Sub-industry | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
|---|---|---|---|---|---|---|---|---|
| Coal | Coal Mining | 0.80 | 0.79 | 0.58 | 1.37 | 2.17 | 1.22 | 3.39 |
| LNG, Gas, Petroleum | Oil and gas extraction | 0.43 | 0.52 | 0.51 | 1.03 | 1.46 | 1.01 | 2.47 |
| Resource | A$m Value of Publicly Announced and Feasibility Stage Projects | Initial Effect (1) | First-round Effect Multiplier (2) | Output Multipliers Industrial Support Effect (3) | Production-induced effect (4)=(2)+(3) | Simple Multiplier (5)=(1)+(2)+(3) | Consumption Multiplier (6) | Total Employment Multiplier (7)=(5)+(6) |
| Coal | $9,849 | 7,879 | 7,781 | 5,712 | 13,493 | 21,372 | 12,016 | 33,388 |
| LNG, Gas, Petroleum | $3,850 | 1,656 | 2,002 | 1,964 | 3,966 | 5,622 | 3,889 | 9,511 |
| **Total FTE Jobs** | **$13,699** | **9,535** | **9,783** | **7,676** | **17,459** | **26,994** | **15,905** | **42,899** |

Investments in NSW's Hunter region are expected to produce a total of 21,789 jobs representing 6.7% of the total labour force of the Hunter and Newcastle SA4 regions. The $11.5 billion total industrial output value of proposed projects in the regions is equivalent to 20% of the combined $59.31 billion of gross regional product.

## Table 10: Economic Cost of ban on new coal, gas, and oil projects in NSW

| NSW Coal Projects | Project | Location | | Region | Cost Estimate (A$m) | GVA Produced (A$m) |
|---|---|---|---|---|---|---|
| Metallurgical Coal | Ashton South East opencut | 14 km NW of Singleton | Feasibility | Upper Hunter Region | $125 | $223 |
| Thermal and Metallurgical Coal | Bulga Optimisation Project mod 3 | 15 km SW of Singleton | Feasibility | Upper Hunter Region | $657 | $1,178 |
| Thermal Coal | Dartbrook | 6 km NW of Muswellbrook | Publicly Announced | Upper Hunter Region | $750 | $1,344 |
| Thermal and Metallurgical Coal | Glendell Continued Operations | 20 km N of Singleton | Feasibility | Upper Hunter Region | $125 | $223 |
| Thermal Coal | Mangoola Continued Operations | 20 km W of Muswellbrook | Publicly Announced | Upper Hunter Region | $150 | $269 |
| Metallurgical Coal | Maxwell Underground Mine | 15 km SW of Muswellbrook | Publicly Announced | Upper Hunter Region | $509 | $913 |
| Thermal Coal | Mt Pleasant Optimisation Project | 3 km NW of Muswellbrook | Feasibility | Upper Hunter Region | $750 | $1,344 |
| Thermal and Metallurgical Coal | Spur Hill | 15 km SW of Muswellbrook | Feasibility | Upper Hunter Region | $750 | $1,344 |
| Thermal Coal | Chain Valley Extension | 40 km S of Newcastle | Publicly Announced | Hunter Region | $125 | $223 |
| Thermal and Metallurgical Coal | HVO Continuation | 90 km NW of Newcastle | Publicly Announced | Hunter Region | $500 | $896 |
| Thermal and Metallurgical Coal | Mt Arthur | 105 km NW of Newcastle | Publicly Announced | Hunter Region | $750 | $1,344 |
| Thermal and Metallurgical Coal | Mt Thorley | 73 km NW of Newcastle | Feasibility | Hunter Region | $125 | $223 |
| Thermal and Metallurgical Coal | Newstan Mine Extension | 20 km SW of Newcastle | Publicly Announced | Hunter Region | $170 | $305 |
| Thermal Coal | Wallarah 2 | 30 km SW of Newcastle | Feasibility | Hunter Region | $945 | $1,694 |
| Hunter Region Total | | | | | $6,431 | $11,523 |
| Thermal and Metallurgical Coal | Narrabri (Stage 3) | 70 km W of Gunnedah | Feasibility | North West Slopes | $1,250 | $2,240 |
| Thermal and Metallurgical Coal | Vickery | 22 km N of Gunnedah | Feasibility | North West Slopes | $700 | $1,255 |
| Thermal and Metallurgical Coal | Boggabri Coal Extension | Gunnedah | Publicly Announced | North West Slopes | $513 | $920 |
| Thermal and Metallurgical Coal | Dendrobium Extension | 13 km SW of Wollongong | Feasibility | Illawara | $750 | $1,344 |
| Thermal Coal | Angus Place West | 15 km NW of Lithgow | Publicly Announced | Central Tablelands | $210 | $377 |
| Other Regions Total | | | | | $3,423 | $6,136 |
| NSW Gas Projects | | | | | | |
| Gas | LMG import terminal - Newcastle GasDock | Newcastle | Feasibility | Hunter Region | $250 | $380 |
| Gas | Narrabri coal steam gas project | Narrabri | Feasibility | North West Slopes | $3,600 | $5,478 |
| All Regions Total | | | | | $3,850 | $5,858 |
| All NSW Projects Total | | | | | $13,704 | $23,517 |

*Source: 2021 Resources and Energy Major Projects Report published by DISER.*
*ABS, Australian National Accounts: Input-Output Tables 2018-19, ABS 5209.0.55.001.*
*NSW Treasury Employment Calculator, NSW Treasury analysis based on ABS 5209.0, 5246.0, TPP09-7 and TRP09-3.*

# Conclusion

The economic consequences of a ban on new coal, gas, and oil projects in Australia would be immense, with the total cost across Australia estimated at approximately $274 billion, which is the equivalent to 13.5% of Australia's annual GDP. This corresponds to an estimated 478,673 jobs put at risk, equating to approximately 3.6% of Australia's total workforce.

The impact of a ban on new coal, gas, and oil projects would be most heavily concentrated in the major resources states of Queensland, Western Australian, and NSW - especially in the northern, central, and south-western parts of Queensland as well as NSW's Hunter region. Specifically, the economic and job implications are as follows:

- *North Queensland:* $66.58 billion in foregone economic output which is the equivalent to 87.74% of annual gross regional product. This will prevent the creation of approximately 125,000 jobs, which is the equivalent to around 35.9% of the current local workforce. This is the equivalent to 25 years' worth of job creation.
- *Central Queensland:* $19.38 billion in foregone economic output which is the equivalent to 85.4% of annual gross regional product. This will prevent the creation of approximately 36,650 jobs which is the equivalent to around 31.8% of the current local workforce. This is the equivalent to 18 years' worth of job creation.
- *South-West Queensland:* $33.65 billion in foregone economic output which is the equivalent to 162% of annual gross regional product. This will prevent the creation of approximately 60,154 jobs which is equivalent to around 44.5% of the current local workforce. This is the equivalent to over 50 years' worth of job creation.
- *Hunter-Newcastle:* $11.5 billion in foregone economic output which is the equivalent to 20% of annual gross regional product. This will prevent the creation of approximately 21,800 jobs which is the equivalent to around 6.7% of the current local workforce. This is the equivalent to 4 years' worth of job creation.

Analysis was also undertaken of the economic impact of a ban on new coal, gas, and oil projects on the three major resources states: Western Australia, Queensland, and NSW. The cost estimates are as follows:

- *Western Australia:* $114.76 billion in foregone economic output which is the equivalent to 35.8% of annual gross state product. This will prevent the creation of 186,000 jobs which is the equivalent to around 12.8% of Western Australia's current workforce. This is the equivalent to 8.5 years' worth of job creation.
- *Queensland:* $119.61 billion economic in foregone economic output which is the equivalent to 32.4% of annual gross state product. This will prevent the creation of around 221,900 jobs which is the equivalent to around 8.4% of Queensland's current workforce. This is the equivalent to almost 5 years' worth of job creation.
- *NSW:* $23.52 billion in foregone economic output which is the equivalent to 3.7% of annual gross state product. This will prevent the creation of around 42,900 jobs which is the equivalent to around 1% of NSW's workforce. This is the equivalent to almost a years' worth of job creation.

# THE ECONOMIC AND EMPLOYMENT CONSEQUENCES OF NET ZERO EMISSIONS BY 2050 IN AUSTRALIA

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**Daniel Wild** is the Director of Research at the Institute of Public Affairs. He specialises in red tape, regulation, economic policy, the philosophy of free enterprise, and criminal justice. Daniel has authored research papers on economic policy, environmental regulation, and criminal justice reform. Daniel frequently appears in the media, and has published a number of opinion pieces in The Australian, The Daily Telegraph, The Sydney Morning Herald, The Courier Mail, and The Spectator. Daniel has also made a number of radio and television appearances, including on 2GB, 3AW, Sky News, and Channel 7 News. Daniel previously worked at the Commonwealth Department of the Prime Minister and Cabinet where he analysed global and domestic macroeconomic policy. Prior to that he worked at the Commonwealth Department of Finance where he worked on regulatory reform. Daniel holds an honours qualification in economics and a degree in international studies from the University of Adelaide.

Institute of Public Affairs

May 2023

# LIDDELL THE LINE IN THE SAND

## WHY IT'S TIME TO HIT PAUSE ON THE CLOSURE OF COAL-FIRED BASELOAD POWER STATIONS IN THE NEM


Scott Hargreaves, Executive Director
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Kevin You, Research Fellow

Institute of Public Affairs

Cover Image: Mark Baker, AP

# Contents

# Executive Summary

With the recent closure of Liddell Power Station, the electricity system is on a knife's edge. It is time for energy policy makers to take stock – and focus on energy security – before it is too late.

Australia can continue down the path of closing what have been reliable low-cost baseload power stations without adequate replacements being available.

Or it can do what should be obvious to all elected officials – keep the lights on while building new power stations that are able to meet the real-world energy needs of Australian households and industry.

This IPA Research Paper demonstrates that energy security has been given insufficient attention by energy policy makers. It should in fact be the priority of all governments. We can no longer afford the luxury of pretending otherwise.

The recent announcement by Origin Energy's new owner, Canadian private equity fund Brookfield, that it is prepared to entertain discussions about keeping open Eraring power station (Australia's largest baseload plant) rather than closing it in 2025, should be welcomed by the New South Wales government.

At the very least, this is a victory for the real world over ideologically driven theoretical energy-market models that promise a high level of certainty while failing to explain why power prices and the risk of blackouts keep increasing.

While previous closures of baseload plants in New South Wales and South Australia were effectively offset by the shutdown of energy intensive aluminium smelters in New South Wales and Victoria, and by the shutdown of the car industry, Hazelwood's closure in May 2017 provided an insight into what awaits Australia.

Wholesale prices jumped more than 70 per cent compared with the previous year. Over the following three years, the average wholesale electricity price was 135 per cent higher than the average over the previous decade. All the while, threats to system reliability became more acute.

Yet, between 2011 and 2021, wind turbine capacity in Australia increased more than 320 per cent to 8,951 MW. Solar capacity increased 672 per cent to more than 19,000 MW.

To put this in context, Hazelwood power station produced 1,600 MW.

But what is occurring in Australia has already been tried, and has failed, elsewhere. Germany and California offer sobering lessons for Australia on the risks of moving towards a high level of dependence on renewable energy.

Germany's electricity costs 50 per cent more than France, yet produces 8 times the $CO_2$ emissions. Californian households now pay 66 per cent more compared with the rest of the US.

But unlike Germany and California, Australia cannot rely on electricity supplies from neighbours. As an electricity system that is literally an island, the proportion of variable renewable energy in the energy grid, at 21.7 per cent (in 2021), already makes Australia the world leader by that measure.

The Albanese government's push to increase renewable energy to 82 per cent by 2030 will only result in higher prices and lower reliability. No feasible or affordable combination of intermittent renewables, batteries, pumped hydro and grid extensions can substitute for the reliable and affordable power provided by the proven technology of existing baseload power stations.

The strains on the system will be made worse by the push to electrify everything, especially motor vehicles and industrial processes like steel smelting and minerals processing. Electricity demand is set to increase significantly. Critical international lessons have been ignored by Australian policy makers.

While Australia and other developed countries off-shored their energy intensive manufacturing to China, India and South East Asia, this was achieved by large-scale investment in new coal and gas fired power stations.

This explains why worldwide generation of electricity using fossil fuels is actually rising. In 2021, wind and solar only contributed 10 per cent of global electricity supplies. Fossil fuels still generate more than 80 per cent.

Promised and widely promoted, the global energy transition is not happening at anywhere near the pace politicians and renewable advocates are suggesting.

The inconvenient truth is that no major industrialised country has successfully decarbonised its electricity sector through large-scale investment in renewable energy.

Yet against all the international evidence, Australian governments – federal and state – insist they can deliver lower electricity prices, while electrifying everything and keeping the lights on.

The continuing refusal of the Federal Government to consider nuclear energy as an option means that it has in effect placed a desire to promote renewable energy above the stated policy objective of reducing emissions. Given the confusion of such a stance, it is legitimate now to prioritise energy security as the overriding objective – providing a stable national electricity grid and removing the source of upward pressure on wholesale prices.

The IPA concludes that in New South Wales and across Australia more generally, it is time for elected officials to do their job and focus on energy security and affordability – keeping the lights on and ensuring the remaining fleet of baseload power stations continues to operate for as long as is necessary.

No baseload power station should be allowed to close unless and until a like for like baseload replacement – be it coal-fired or nuclear – is ready to come online. For most operators, this will mean pushing out closure dates well beyond those promised in the rush to meet the Federal Government's unrealistic plans for net zero and increased renewable energy.

# Introduction

Australia, like all modern economies, relies on electricity to power its economy and provide the living standards its citizens have all come to enjoy.

For decades, our electricity networks and markets worked cohesively to supply the energy needs of Australian households and businesses. Demand increased in line with population and economic activity, but the electricity market attracted new investment when it was needed (though much of it was publicly funded).

The priority for policy makers was to ensure security of supply, including regulating regional monopolies on network infrastructure, and subsequently electricity price increases tended to be in line with inflation.

But Australians now face a different paradigm with regard to energy. The push for a zero carbon future has led to a surge in intermittent energy sources which while capable of providing energy, do not necessarily do so when it is needed or in a form compatible with the electricity system. This paradigm shift has upended the electricity market.

Australia is following the path taken by many other nations which have adopted the policy-led approach to renewable energy investment; but it is doing so blindly, and without properly assessing the likely outcomes of such an approach.

This IPA Research Paper examines international energy trends and the lessons to be learned from fellow OECD nations which have implemented energy policies similar to Australia's.

Unfortunately, the lessons are not positive and to date they have not been learned.

Among OECD nations, electricity and broader energy demand is stagnating. The policy-mandated pursuit of variable renewable energy has led to higher electricity prices, increased supply risks, falling consumption and less-competitive domestic local industry in most jurisdictions.

However, with the push to electrify everything, especially motor vehicles and industrial processes like steel smelting and minerals processing, electricity demand could increase significantly.

The experience of other energy markets, especially those which have pursued aggressive decarbonisation strategies like Germany and California, demonstrates the real-world consequences of higher prices and lower reliability when traditional energy sources such as baseload power stations are closed without adequate replacements being in place.

But unlike Germany and California, Australia cannot rely on electricity supplies from neighbours.

As an electricity system that is literally an island, the proportion of variable renewable energy in the energy grid, at 21.7 per cent (in 2021), already makes Australia the world leader by that measure.

This research paper examines the effect of successive closures of baseload power stations in New South Wales, South Australia and Victoria. Put simply, whatever spare capacity there was in the system has gone.

The closure of large energy users like the Kurri Kurri and Point Henry aluminium smelters over the past decade, along with the shutdown of the Australian automobile industry, mitigated the impact of power station closures.

In contrast, the closure of Hazelwood Power Station in 2017 gave a taste of what can happen when additional large baseload plants close. Wholesale power prices jumped more than 80 per cent, and the threats to system reliability became more acute.

The recent closure of Liddell Power Station has placed the system on a knife-edge.

It is not too late for Australia to learn from experience. We must not forgo energy security and expose our economy to the cascading effect of higher energy prices by forcing the early retirement of our dispatchable electricity generators.

The announcement that the new owners of Eraring Power Station – Australia's largest – are prepared to delay its previously announced closure in 2025 should be welcomed. Likewise, other power stations slated to close over the next decade should not be allowed to close until adequate replacement capacity is available.

But instead of acknowledging the central role fossil fuel baseload power stations play in providing low cost and reliable power, the Albanese government continues to maintain against all evidence that pursuing a renewable energy future (82 per cent by 2030) is not only achievable but will reduce energy costs.

All this at a time when government policy is simultaneously aiming to increase the use of electric vehicles, support greater electrification in households, and re-invest in energy intensive manufacturing.

The outcome of this wishful thinking is unlikely to be efficacious. And, as always, it will be Australian households and businesses that pay the cost – not the policy makers.

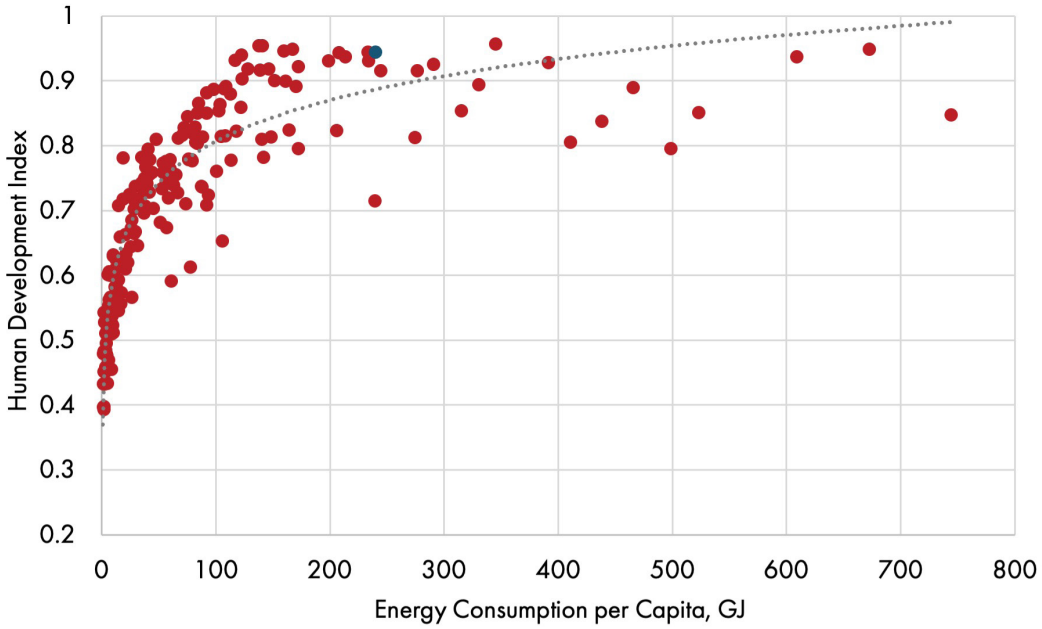
# World electricity trends

## The importance of energy

Energy is essential in a modern society and advanced economy such as Australia.

As shown below, countries with high levels of per capita energy consumption tend to rate higher on the United Nation's human development index. Rising energy consumption per capita produces significant gains in prosperity but, as with many economic variables, eventually diminishing returns set in. This point of diminishing returns may move further out in the future if increased autonomous manufacturing and advanced IT systems play an increasingly important role in a nation's economic development and prosperity.

**Figure 1: The relationship between human development and energy consumption.**




Source: United Nations Development Program, website; Our World In Data, website.

Electricity is just one form of energy, but an important one. Worldwide, it accounts for around a quarter of total energy consumed. Though usually unseen, and for the main part unappreciated until we don't have it, electricity is literally everywhere in our lives. It powers nearly all the things we use daily – the lights in our homes, our mobile devices, our televisions, refrigerators, air conditioning and cooking appliances.

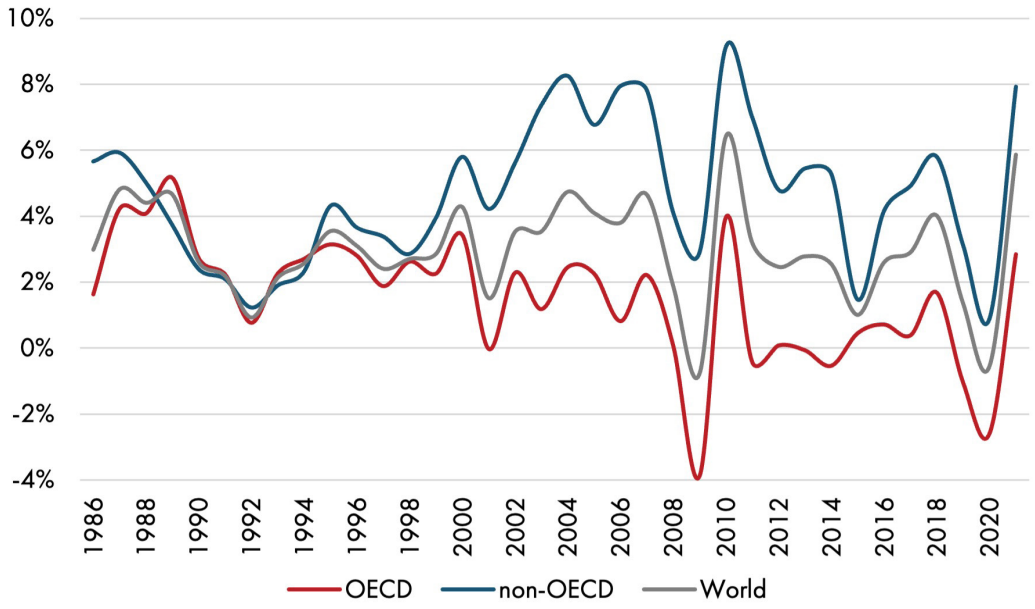
Without electricity, our economy as we know it would simply not function. Industries such as manufacturing, mining and healthcare all rely heavily on it. In particular, the IT industry depends heavily on electricity. The network of servers, data storage sites and computers that make up the internet, support the cloud and let us work from home are heavily energy-intensive and require an uninterrupted supply of electricity to function.

## World electricity trends

While world electricity generation has been rising steadily in the 21st century, the distribution of this growth has been uneven. Total world electricity generation increased 83 per cent in the period 2000 to 2021, but the vast majority of this growth has been in non-OECD nations.

As can be seen in figure 2 below, at the macro-level OECD and non-OECD electricity generation growth tend to move together over time. However, since the start of the 21st century there has been a noticeable divergence between the two. Electricity generation growth in the non-OECD has been considerably higher than the OECD as a greater share of energy-intensive manufacturing has shifted to nations such as China, India and those in South-East Asia.

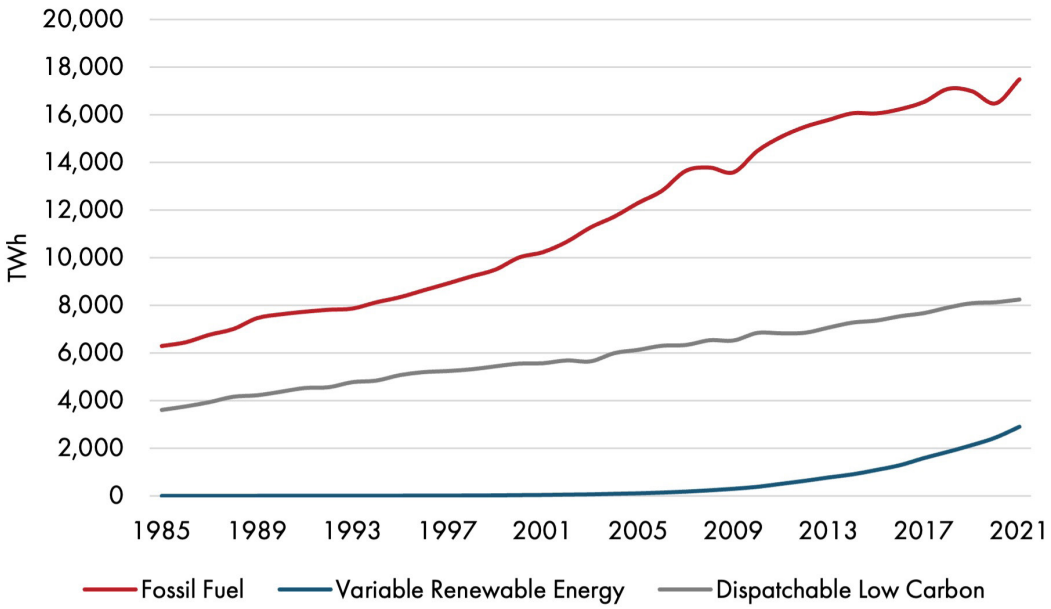
**Figure 2: OECD and non-OECD electricity generation growth.**




Source: BP, Statistical Review of World Energy.

There is another noticeable difference between OECD and non-OECD nations. Whereas OECD nations are making commitments to reducing their reliance on fossil fuels, non-OECD countries are consuming electricity sourced from coal, gas and oil at record and still rising levels. So much so that growth in coal and gas fired electricity in the non-OECD has more than offset any declines in the OECD in recent years.

**Figure 3: Rising world use of fossil fuel-powered electricity.**




Source: BP, Statistical Review of World Energy.

It may be an inconvenient truth, but world generation of electricity using fossil fuels is actually *rising* – even since the Paris Treaty was signed in 2015. With China, India and South-East Asian nations continuing to invest in new coal-fired power stations, this trend seems unlikely to change any time soon.[1]

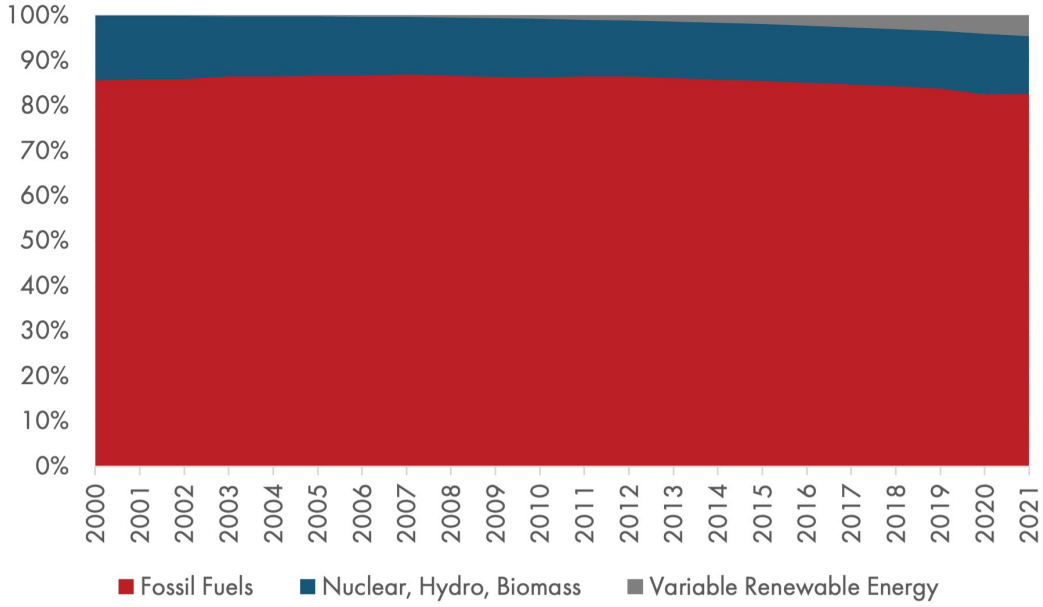
Despite billions of dollars of annual investment subsidies, Variable Renewable Energy (VRE), which includes solar, and wind generated electricity that is reliant on the weather and therefore not dispatchable, is not even growing at a rate that covers incremental annual increases in electricity demand – let alone offsets the effects of closing existing coal and gas fired power plants.

In 2021, electricity sourced from wind and solar accounted for 10 per cent of global electricity generation. When considered in the broader context of total energy use (that includes transportation fuels and industrial heat sources), VRE was just 4.6 per cent of total energy consumption in 2021 – up from 1 per cent in 2011.

The promised and widely promoted global energy transition is just not happening at anywhere near the pace politicians and renewable advocates are suggesting.

1 Bloomberg News, *China to Speed Up Construction of Coal Power Plants This Year*, Bloomberg, 20 January 2023.

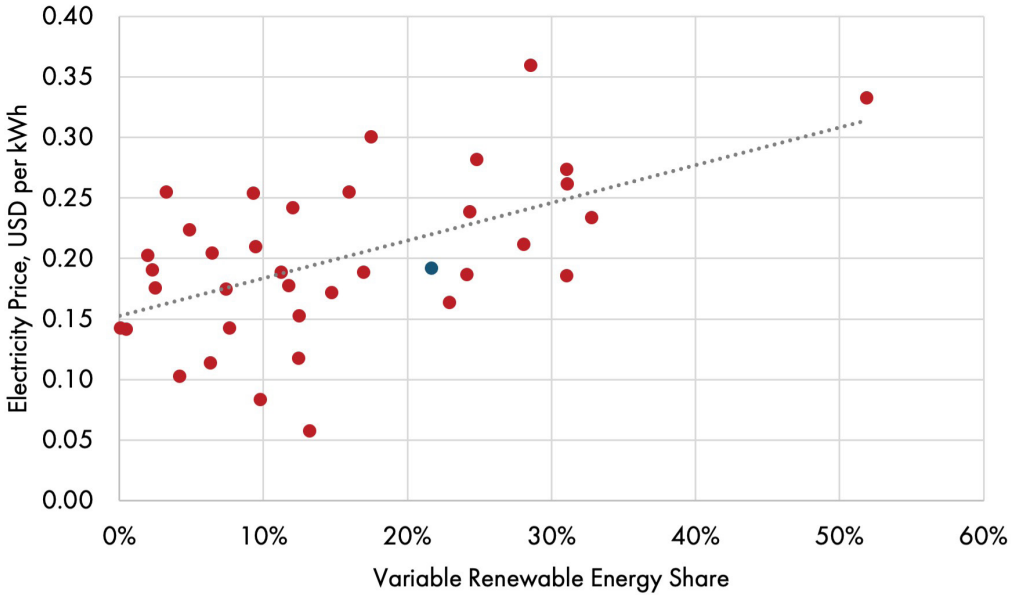
**Figure 4: The global energy mix is far from shifting to 100 per cent variable renewable energy.**




Source: BP, Statistical Review of World Energy 2022.

Policy makers in governments around the world, including Australia, need to become more realistic about what can and cannot be achieved with wind and solar energy. Moreover, there must be a greater focus on the economic impacts of the rapid deployment of VRE. The experience of OECD nations demonstrates definitively that replacing dispatchable electricity generators with VRE correlates closely with rising retail electricity prices, debunking the policy makers' promises that renewable energy is cheap.

**Figure 5: Variable renewable energy correlates with higher electricity prices in OECD nations.**



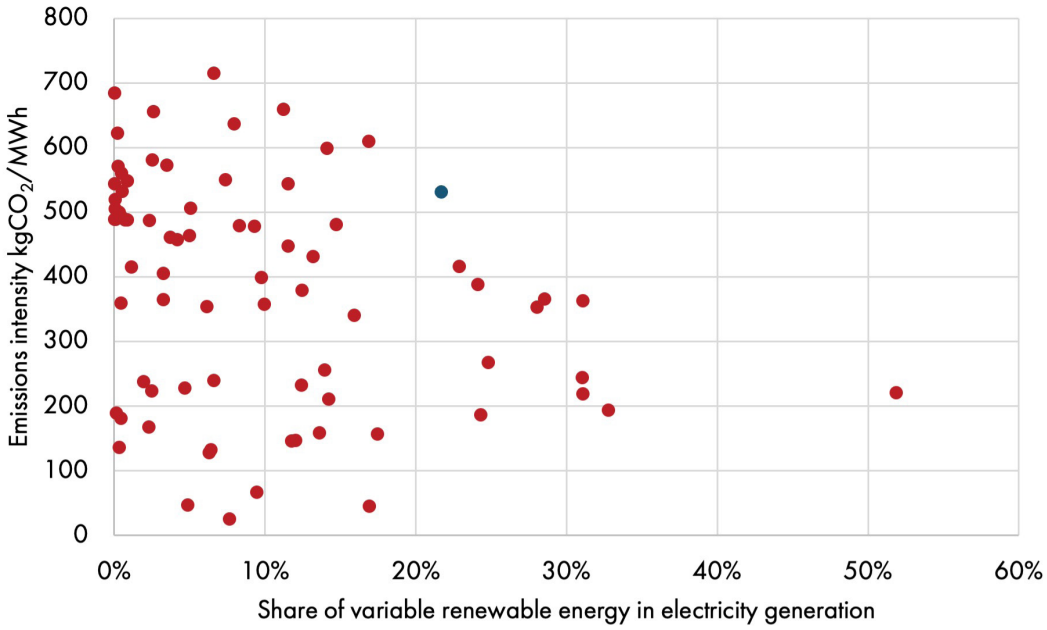

Sources: Australian Energy Council; BP.

The problem is not that the generation of electricity via a solar PV cell or wind turbine is expensive – indeed the shift to mass manufacturing of these items in China has delivered substantial cost reductions over the last decade. But prices are set by markets and not just the cost of equipment.

Markets dominated by VRE are regularly exposed to prolonged periods in which solar and wind generators produce well-below their theoretical maximum potential. Gaps in supply and the resulting tight market set electricity prices (usually delivered by the highest cost, but flexible sources of generation) at higher levels in order to reduce demand.

No major industrialised nation has yet successfully decarbonised its electricity sector through large-scale investment in renewable energy. In fact, nations with the lowest emissions intensity for electricity generation are those with high shares of nuclear, hydroelectricity and geothermal energy – all of which are dispatchable sources of electricity.

**Figure 6: There is no correlation between variable renewable energy and electricity emissions.**




Source: Our World In Data; BP, Statistical Review of World Energy 2022.

The experience of electricity markets that are closing down reliable, low-cost baseload generators has not been positive. The intended policy outcome of low carbon emissions is only being achieved in part, and many markets are experiencing a series of unintended consequences – higher electricity prices and reduced grid reliability (often culminating in energy shortages).

Germany and California provide telling examples of these unintended consequences.

## Case Study 1: Germany's Energiewende – billions spent to be worse off

Germany's Energiewende policy has been held up as the wunderkind of the bold transition to renewable energy. But instead of being the inspiration for a global renewable energy movement, Germany serves as the perfect example of problematic policy-led energy systems.

The cracks in Germany's energy transition had started to appear long before Russia invaded Ukraine, causing a spike in gas prices. Experts at McKinsey reported on the progress of Energiewende in 2019:

> *Germany has been a leader in the transition toward a low-carbon-energy system, but it will still miss most of its energy-transition targets for 2020.*
>
> *...Today's necessary message is clear: the country misses key targets... problems are emerging in all three dimensions of the "energy triangle." These recent struggles in Germany illustrate the potential pitfalls of a fast energy transition, but they can provide important lessons for other countries endeavoring on their energy transition.*
>
> *On the core issue of environmental sustainability, the energy transition is lagging far behind its 2020 targets. In 2018, 866 million tons of $CO_2$ equivalents ($CO_2e$) in emissions were released. While this amount represents a 4.5 percent drop from the previous year, it was still 116 million tons above the target of 750 million tons for 2020.*
>
> ***Security of supply under pressure***
>
> *... Germany has enjoyed a highly secure electricity supply for decades, but the tide is beginning to turn. The German power grid repeatedly faced critical situations in June of this year: significant shortfalls in available power were detected on three separate days. At its peak, the gap between supply and demand reached six gigawatts—equivalent to the output of six major power plants. Imports arranged on short notice from surrounding countries were required to stabilize the grid. Also, the price for balancing energy jumped to €37,856 per megawatt-hour in one instance. In 2017, the price for balancing energy averaged €63.90 per megawatt-hour.*
>
> *....The supply situation will become even more challenging in the future. The phaseout of nuclear power until the end of 2022, and the planned reduction of coal-fired generation, will gradually shut down further secured capacity. If new generation facilities are not added, the reserve margin will tumble, with consequences that vary considerably from one region to the next. Industrial areas in western and southern Germany will be hit especially hard, as large drains on capacity exist in these regions and high rates of renewable expansion are unlikely there. Furthermore, the shift from dispatchable capacity to fluctuating renewable sources could also lead to problems in situations when demand is high but supply from renewable energy is low...*

***Electricity costs remain high***

> Economic development and growth have long constituted a problematic area for energy transition—especially when it comes to electricity-price development. For years, German consumers have paid more for their electricity than their European neighbors do. Today the electricity price for households is still about 45 percent above the European average.[2]

The risks forecast by McKinsey have not only been realised but accelerated by the Russian invasion of Ukraine. But, as distinguished American environmentalist and energy author Michael Shellenberger highlighted in 2022, this was still a situation created entirely by bad German energy policy:

> *Green campaigns have succeeded in destroying German energy independence—they call it Energiewende, or "energy turnaround"—by successfully selling policymakers on a peculiar version of environmentalism. It calls climate change a near-term apocalyptic threat to human survival while turning up its nose at the technologies that can help address climate change most and soonest: nuclear and natural gas.*
>
> *At the turn of the millennium, Germany's electricity was around 30 percent nuclear-powered. But Germany has been sacking its reliable, inexpensive nuclear plants.*
>
> *...Germany has also spent lavishly on weather-dependent renewables—to the tune of $36 billion a year—mainly solar panels and industrial wind turbines. But those have their problems. Solar panels have to go somewhere, and a solar plant in Europe needs 400 to 800 times more land than natural gas or nuclear plants to make the same amount of power. Farmland has to be cut apart to host solar. And solar energy is getting cheaper these days mainly because Europe's supply of solar panels is produced by slave labor in concentration camps as part of China's genocide against Uighur Muslims.*
>
> *The upshot here is that you can't spend enough on climate initiatives to fix things if you ignore nuclear and gas. Between 2015 and 2025, Germany's efforts to green its energy production will have cost $580 billion. Yet despite this enormous investment, German electricity still costs 50 percent more than nuclear-friendly France's, and generating it produces eight times more carbon emissions per unit. Plus, Germany is getting over a third of its energy from Russia.*
>
> *Germany has trapped itself. It could burn more coal and undermine its commitment to reducing carbon emissions. Or it could use more natural gas, which generates half the carbon emissions of coal, but at the cost of dependence on imported Russian gas. Berlin was faced with a choice between unleashing the wrath of Putin on neighboring countries or inviting the wrath of Greta Thunberg. They chose Putin.*[3]

---

2 Fridolin Pflugmann, Ingmar Ritzenhofen, Fabian Stockhausen, and Thomas Vahlenkamp, *Germany's energy transition at a crossroads*, McKinsey website, 21 November 2019.

3 Michael Shellenberger, *The West's Green Energy Delusions Empowered Putin*, 4 March 2022.

Germany's energy policy has been an expensive exercise in replacing what worked with what people hoped would work. The outcome has been higher prices, reduced economic growth and increased risk to the nation's energy security.

As noted in a 2019 article in Der Spiegel, one outcome Energiewende has delivered is an increase in government waste:

> *In the Economics Ministry alone, 287 officials are working on the issue, divided into four divisions and 34 departments. There are at least 45 additional bodies at the federal and state levels, full of people who also want to move the project forward. They collect vast quantities of data and come up with complicated incentives -- a huge effort that has produced only modest results.*[4]

## Case Study 2: California dreaming

American author and journalist Robert Bryce has written extensively on the energy policy failings of the state of California. The state has followed Germany down a path of setting renewable energy mandates that force the closure of large baseload generators – nuclear power plants in their case.

The results have been similar to those in Germany – less reliable supply, higher prices and minimal environmental benefit:

> *Perhaps the most obvious casualty of California's climate policies is the state's tattered electric grid. Blackouts in the state have become so common, particularly in the Bay Area, that media outlets have largely quit reporting on them. Nearly every day, maps of Pacific Gas & Electric's service territory show outages across wide swaths of central California. The state's increased blackouts are coinciding with skyrocketing electricity prices. And those skyrocketing electricity prices are coinciding with the implementation of some of America's most-aggressive renewable-energy mandates.*
>
> *In 2008, Governor Arnold Schwarzenegger signed an executive order that required the state's utilities to obtain a third of the electricity they sell from renewables by 2020. In 2015, Governor Jerry Brown signed a law that boosted the mandate to 50 percent by 2030. In 2018, California lawmakers imposed yet another mandate that requires the state's electric utilities to procure at least 60 percent of their electricity from renewables by 2030 and to be producing 100 percent "zero-carbon" electricity by 2045.*
>
> *What has happened since The Terminator signed that executive order? Between 2008 and 2021, the all-sector price of electricity in California increased five times faster than rates in the rest of the continental United States. Last year alone, the all-sector price of electricity in California jumped by 9.8 percent to 19.8 cents per kilowatt-hour. Residential prices increased even more, jumping by*

4 Frank Dohmen, Alexander Jung, Stefan Schultz und Gerald Traufetter, *German Failure on the Road to a Renewable Future*, Spiegel International website, 13 May 2019.

> *11.7 percent to an average of 22.8 cents per kilowatt-hour. California residential users are now paying about 66 percent more for electricity than homeowners in the rest of the US.*[5]

Renewable energy has promised much, with multiple studies claiming solar and wind have the lowest cost of electricity generation of all possible sources. Nevertheless, the experience of energy markets around the world has shown otherwise. The promised price reductions do not occur, and there is a strong positive correlation between the share of intermittent electricity generation in a market and electricity prices..

Empirical studies of the impact of renewable energy on electricity prices are beginning to tell a different story from the forward-looking thought pieces that have to date dominated the political and economic landscape.

A 2020 paper by Michael Greenstone and Ishan Nath at the University of Chicago demonstrated that renewable energy mandates in the United States have caused retail electricity prices to be 11-17 per cent higher than they would otherwise have been. While these policies delivered carbon abatement, it came at a cost ranging from $60 to $300 per tonne of $CO_2$.[6]

The authors attributed this higher cost, which contradicts many of the theoretical findings on renewable energy deployment, to "indirect grid integration costs such as transmission and intermittency".

These are the very costs that have been broadly overlooked in the race to replace dispatchable generation with intermittent renewables. Yet, there have been studies warning of this emerging issue for some time.

The Nuclear Energy Agency first released its studies on the total system cost impacts of variable renewable energy in 2012 and provided an update in 2019. This study not only showed that there are additional costs associated with managing high shares of variable renewable energy but also that dispatchable energy sources become more costly due to the additional requirement to flex around the often policy-prioritised renewable energy sources:

> *Profile costs (or utilisation costs) refer to the increase in the generation cost of the overall electricity system in response to the variability of VRE output. They are thus at the heart of the notion of system effects. They capture, in particular, the fact that in most of the cases it is more expensive to provide the residual load in a system with VRE than in an equivalent system where VRE are replaced by dispatchable plants... the presence of VRE generation generally increases the variability of the residual load, which exhibits steeper and more frequent ramps. This causes an additional burden, also called the flexibility effect, to other dispatchable plants in terms of more start-ups and shutdowns, more frequent cycling and steeper ramping requirements, leading to lower levels of efficiency, an increase in the wear and tear of equipment and higher generation costs.*[7]

5 Robert Bryce, *California's Energy War on the Poor*, Quillette, 11 July 2022.

6 M. Greenstone and I. Nath, *Do Renewable Portfolio Standards Deliver Cost-Effective Carbon Abatement?*, 2020, University of Chicago.

7 OECD Nuclear Energy Agency, The Costs of Decarbonisation: System Costs with High Shares of Nuclear and

While this report focused on striking a balance between nuclear energy and variable renewable energy, the lessons are relevant to any electricity grid undertaking a shift from large "baseload" generators to variable renewable energy-based systems. In their modelling of the system costs under scenarios based on increasing shares of variable renewable energy, the study found:

> *System costs vary between less than USD 10 per MWh of VRE for a share of 10% of wind and solar PV to more than USD 50 per MWh of VRE for a share of 75% of wind and solar PV. Almost as important is the increase of USD 28 per MWh of VRE to almost USD 50 per MWh of VRE, both at a share of 50% of wind and solar PV, as a function of the availability of flexibility in the system in the form of interconnections with neighbouring countries and flexible hydroelectric resources. While such estimates come with some degree of uncertainty, the order of magnitude provides clear indications for policy choices.*[8]

These system costs are only an additional cost to an existing system using dispatchable sources of electricity in a base case scenario. In the scenario with a high share of variable renewable energy the impact on total electricity provision costs is severe – yet consistent with the international experience:

> *Reaching a 75% VRE target finally implies almost doubling the costs for electricity provision to almost USD 70 billion per year, representing more than USD 33 billion above the base case.*[9]

Australia is on the path to this scenario – we are following Germany and California.

The federal Labor government's energy policy is directing an 82 per cent share for variable renewable energy in Australia by 2030. But the international experience and studies are now clear: closing down our existing dispatchable generators will lead to even higher electricity prices.

Renewables, 2019, p.16.

8 Ibid., p.20.

9 Ibid., p.21.

# The Australian experience mirrors the rest of the OECD

## More renewable energy = higher prices

Australia has long been considered the lucky country. When it comes to energy, we certainly are. We have abundant sources of energy and have been notably successful in using low cost electricity to grow the economy and improve the lives of our people over the last century.

Our electricity grids are marvels of modern engineering that often go unnoticed. The east coast National Electricity Market has over 40,000 kilometres of transmission lines connecting 65 gigawatts of generators to more than 10 million daily consumers.

It is remarkable that this complex network of individual customers and multiple suppliers can operate every second of every day within some remarkably narrow engineering parameters. At every moment, demand in the grid must be met almost exactly by generation. The tolerance of differences between the two is minimal.

Too much demand, and the drain on the grid would at best cause our lights to flicker and at worst go off altogether.

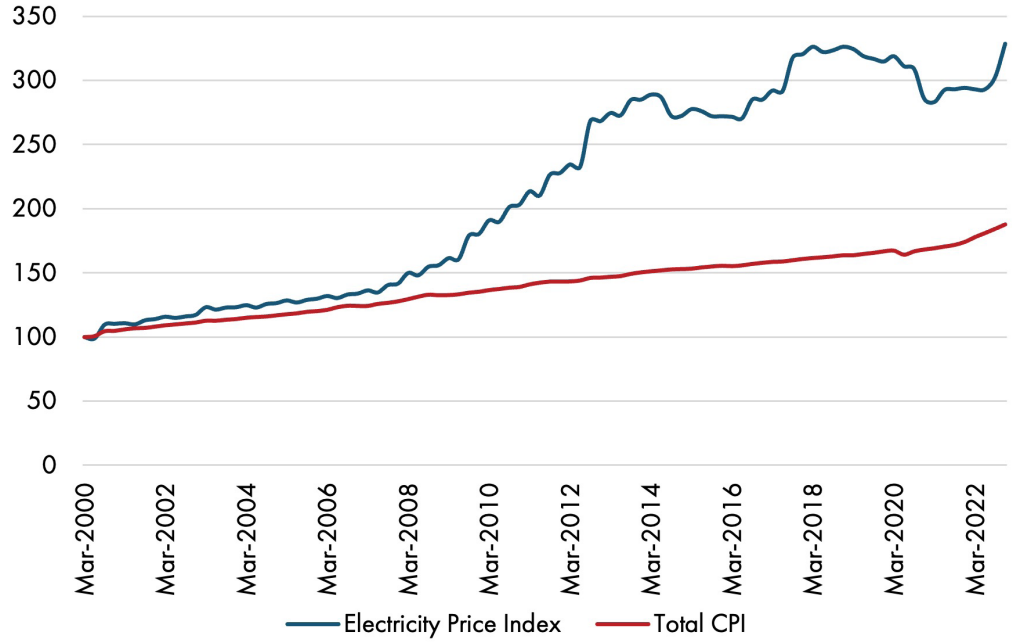
Too much supply can overload the grid, with the surge in electrical energy potentially damaging key infrastructure and maybe even the electrical appliances in our homes if appropriate safeguards are not in place.

This is the great strength of dispatchable and controllable energy in our electricity network. The system we built over a century was based on coal, gas and hydroelectricity generators that system operators and engineers had control over. Coupled with a well-designed market, the grid worked.

But in the last decade, something has gone awry in our electricity markets. The proven engineering and economic imperatives that once guided them have been supplanted by the wishful thinking of central policy makers.

As a result, our electricity prices have skyrocketed, with the electricity prices for households rising at more than double the rate of inflation.

**Figure 7: Electricity has outstripped inflation in the calculation of CPI.**




Source: Australian Bureau of Statistics.

Despite higher prices, there has been minimal investment in new reliable dispatchable sources of electricity. Instead, the lion's share of electricity investment has been directed towards variable renewable energy projects.

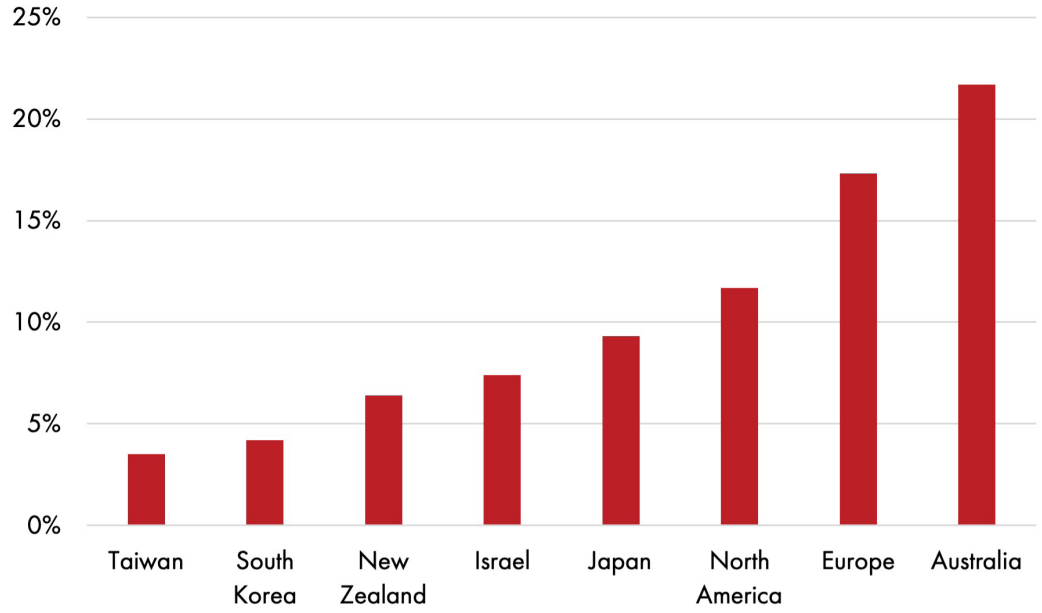
The extensive commentary about a decade of inaction in addressing climate change, and government holding back investment in renewables, could not be further from the truth. Renewable energy capacity and generation have surged in Australia.

From 2011 to 2021 wind turbine generating capacity increased 321 per cent to 8,951 megawatts. In the same period solar capacity, including both rooftop installation on houses and purpose-built solar farms, increased a staggering 672 per cent to 19,074 megawatts.

Australia is not a laggard in variable renewable energy – in fact for a nation with no imports or exports of electricity (often known as an 'islanded grid') we have the highest share of variable renewable energy generation in the world. When compared to the continental-scale electricity systems in Europe and North America, Australia's share of variable renewable energy is actually higher (see Figure 8).

Countries including Denmark, Germany and the UK all have higher individual shares, but their electricity grid connections to France, Norway and other European nations provide them with opportunities to import and export their intermittent energy sources and balance them with dispatchable nuclear and hydro energy when required.

**Figure 8: Australia leads the world in variable renewable energy.**




Source: BP, Statistical Review of World Energy 2022.

The issues for Australia relating to high variable renewable energy reliance are already starting to emerge. We simultaneously have low hydroelectric, nuclear and geothermal power while government policy is requiring our economy to lessen the carbon footprint of its electricity supplies.

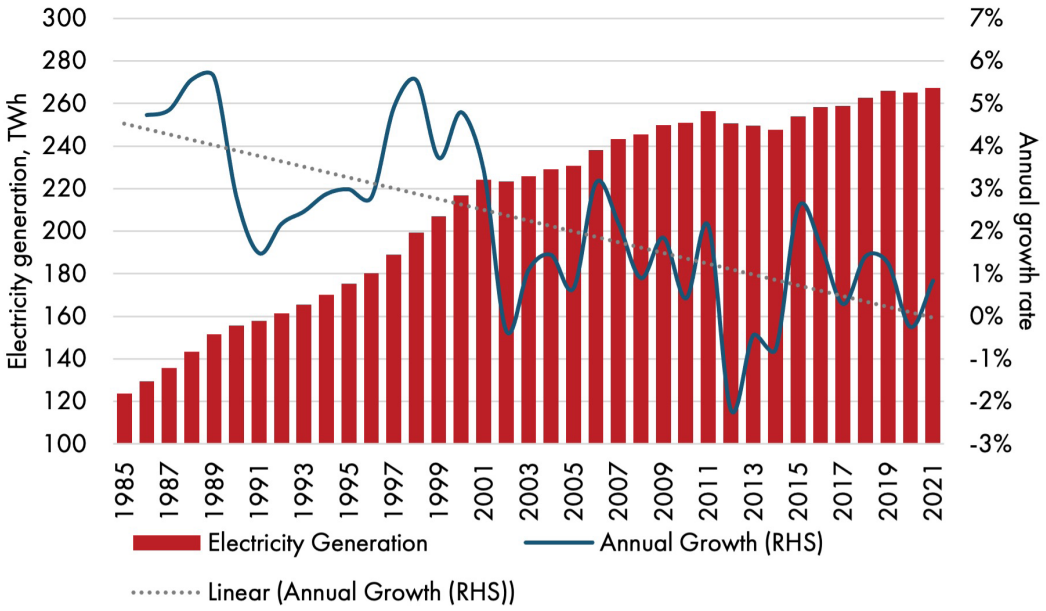
The result is consistent with the international experience – higher electricity prices. And unfortunately, we can expect more price rises to come if our existing dispatchable generators are rapidly closed to meet the government's mandated energy targets.

## The impact of rising electricity prices

Higher electricity prices are weighing down the Australian economy and hurting households. Electricity consumption in Australia has barely changed since 2015-16 and has only grown at an annual average rate of 0.4 per cent in the last decade.[10]

Against a backdrop of rising population and a growing economy, this is not an indicator of a functioning energy market or prospering economy. The stagnant growth in electricity consumption is not the outcome of significant investment in energy efficiency, but rather a reflection of the decline in manufacturing activity in Australia which, since the GFC, has seen a 10 per cent decrease in Industry Gross Value Added.[11] In particular, Australia has experienced the closure of some of its most energy intensive businesses, such as aluminium smelting and car manufacturing.

**Figure 9: Growth in Australia's electricity generation growth has plummeted.**




Source: BP, Statistical Review of World Energy.

Worse still, on a per capita basis, both electricity consumption and total energy consumption in Australia peaked over 15 years ago and have been declining ever since.[12] If electricity consumption is an indicator of progress and economic development, this country is not on the path to prosperity.

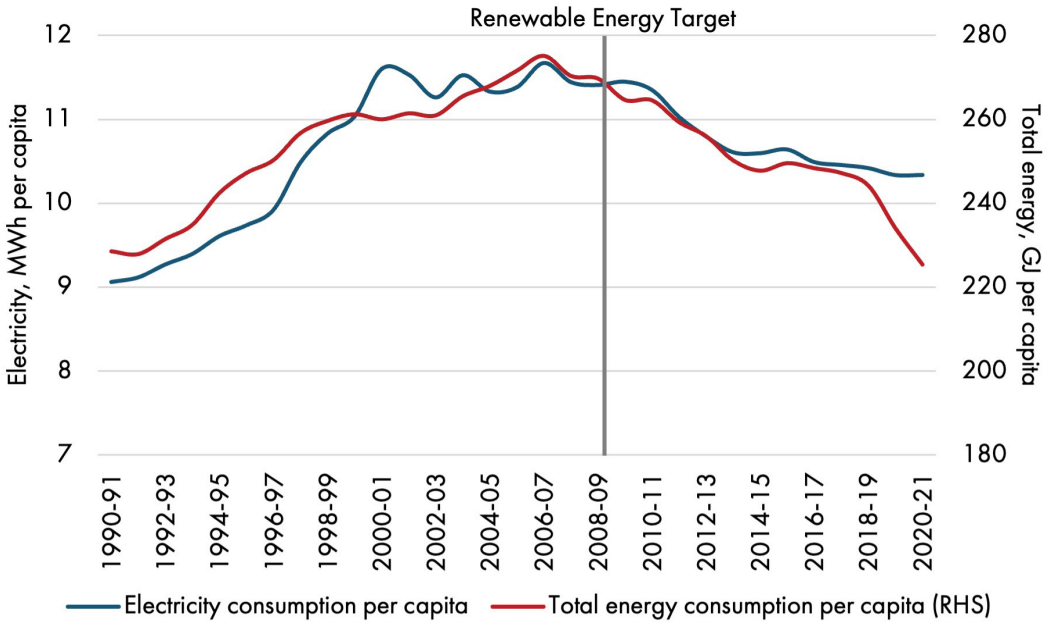
As can be seen in figure 10, it is also noticeable that the peak in Australia's per capita electricity and energy consumption coincided with the boosted Renewable Energy Target policy put in place by the Rudd government in 2007.

10 Department of Climate Change, Energy, the Environment and water, *Australian Energy Statistics*; BP, Statistical Review of World Energy 2022.

11 Australian Bureau of Statistics, *Australian System of National Accounts*, 2021-22 financial year, table 5.

12 Department of Climate Change, Energy, the Environment and Water, *Australian Energy Statistics*, Table B1.

**Figure 10: The rise and decline in per capita electricity and energy consumption in Australia.**




Source: Department of Climate Change, Energy, the Environment and Water, Australian Energy Statistics 2022.

## What happened?

To paraphrase the distinguished American economist Thomas Sowell, when it comes to our electricity supplies, in Australia we have spent the last 20 years replacing what worked with what sounded good.

Whereas Australia previously had an electricity system based on dispatchable power sources including coal, gas and hydroelectricity, we have rapidly pivoted towards intermittent wind and solar energy sources.

In an attempt to decarbonise Australia's electricity system, policy makers across the country and at all levels of government took the nation down the same path several OECD nations have taken and mandated large increases in renewable energy sources (particularly wind and solar) at the expense of dispatchable sources – including the zero carbon nuclear energy.

Unfortunately, as previously highlighted, there have been few, if any, success stories in this space.

In Australia, the multitude of studies predicting lower costs of electricity arising from the mass deployment of variable renewable energy have often been compromised by assumptions that overlooked the strict operating parameters of the electricity grid. They ignored the total system cost approach in favour of a narrow focus on the cost of creating energy at a single site.

The much vaunted and publicised levelised cost of electricity (LCOE) that assesses the financial cost of an independent generating asset became the preferred metric of policy makers and politicians alike.

William Pentland of Genbright best described the misunderstanding and misuse of LCOE in a 2014 Forbes article:

> *The LCOE is like a bad line of code in a software program used to develop other software programs. It has dangerously skewed investors' understanding of the economics of generating electricity from renewable energy resources. It has also had perverse and difficult to undo impacts on local, state and federal energy policies.*[13]

This affect is more technically outlined in the 2021 book *Decarbonised Electricity – The Lowest Cost Path to Net Zero Emissions* by Australian energy experts Geoff Bongers, Andy Boston, Stephanie Bryom and Nathan Bongers, who summarised it superbly:

> *A major, albeit not publicly well-appreciated, risk of this transformation is that far-reaching and expensive decisions may be made – and may already have been made – on incorrect or misleading information flowing from conventional modelling approaches. Metrics widely in use at present, it is argued here, are simplistic and no longer appropriate for supporting key decision-making.*
>
> *...Changes in the market's mix of generation, plus the public and political focus on the need to maintain a fit-for purpose system, mean that cost comparison metrics used in the past have become less useful today.*[14]

Bongers et al consider an approach similar to the OECD Nuclear Energy Agency report on evaluating total system costs of the electricity grid to be a superior approach to simply identifying the stand-alone measurement of costs of an individual asset (such as a wind or solar farm):

> *A fundamental flaw in much of the existing modelling is the mindset that assesses the cost (to consumers) of deploying a particular generation technology independently of the grid in which it must be integrated, and that assesses the only useful output from the technology as electricity. This is of importance as the currently dominant approach to grid transition involves adding technologies that cannot be measured via levelised cost of energy (LCOE), such as synchronous condensers and battery storage.*
>
> *... LCOE, as a guide for policy, planning and development in the NEM, has significant shortcomings and in a diversifying system, its applicability has become increasingly limited. Critically, the use of LCOE in a market pursuing large-scale decarbonization can deliver very inaccurate and misleading signals for investors.*[15]

13 William Pentland, Levelized Cost Of Electricity: Renewable Energy's Ticking Time Bomb?, Forbes, 29 November 2014.

14 Geoff Bongers, Andy Boston, Stephanie Byrom & Nathan Bongers. Decarbonised Electricity. The Lowest Cost Path to Net Zero Emissions. Gamma Energy Technology P/L, Brisbane, Australia, February 2021.

15 Ibid., p.9.

It was only in 2022 that the CSIRO began to consider the total system cost in its flagship Gencost study. Even then the results seem to significantly underestimate the total system costs for integrating high levels of variable renewable energy in Australian electricity markets. Unfortunately, as William Pentland highlighted, there is often a contagion effect of using LCOE estimates. In Australia's case it is that the Australian Energy Market Operators grand visions for our future grid, the Integrated System Plan, draws heavily on the LCOE figures produced in the Gencost study.

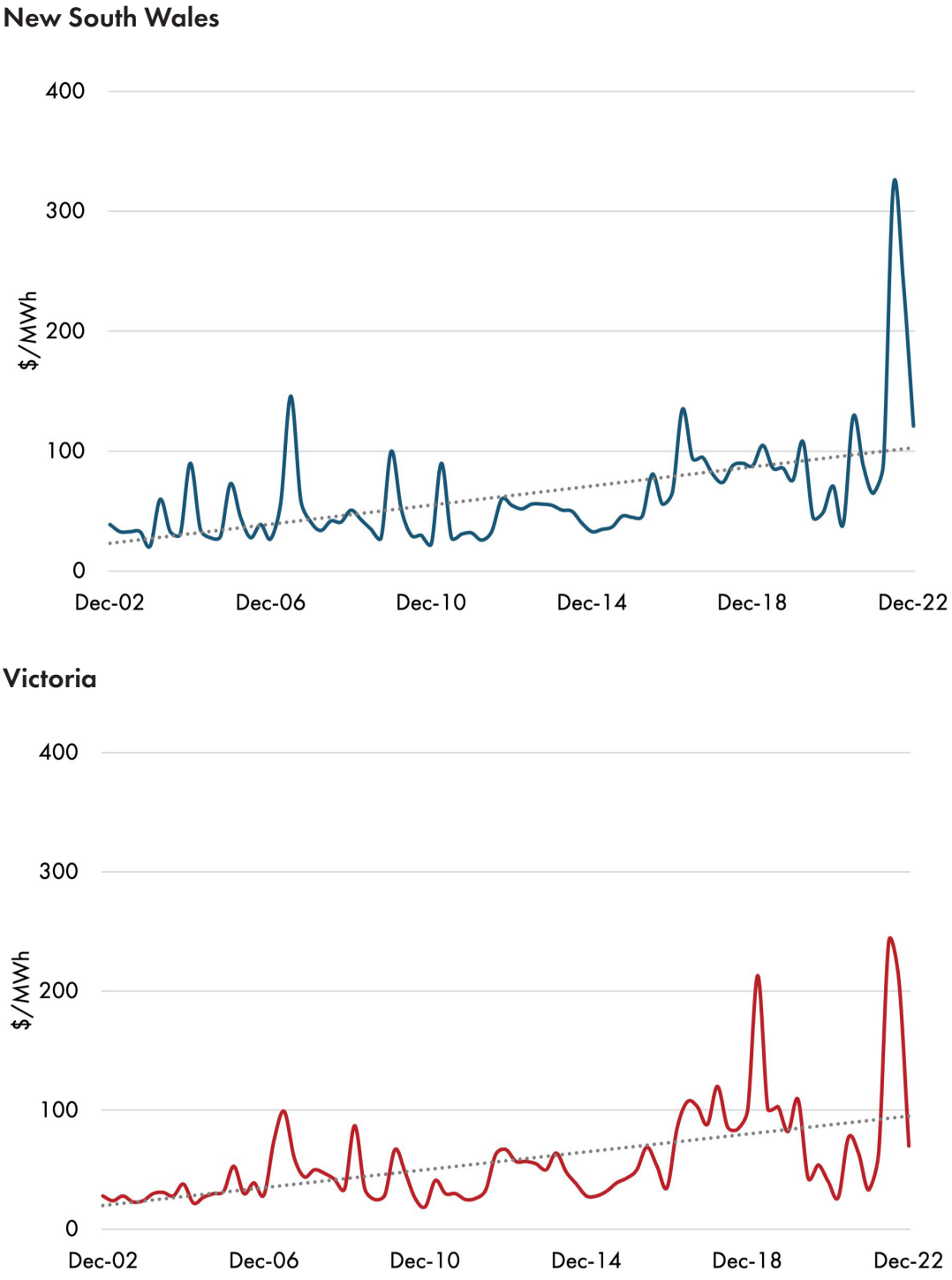
Pro-renewable energy policy is delivering an electricity market that is coming under increasing stress – higher prices and supply that is unable to respond to market signals.

Despite the claims that renewable energy would reduce energy prices in Australia, we have seen the opposite. COVID-19 managed to moderate price hikes for a while due to the reduced demand for electricity in 2020 and 2021, but since the economy re-opened, demand has grown again and electricity prices are now rapidly rising. The trend of rising wholesale electricity prices across the NEM is captured in Figure 11.

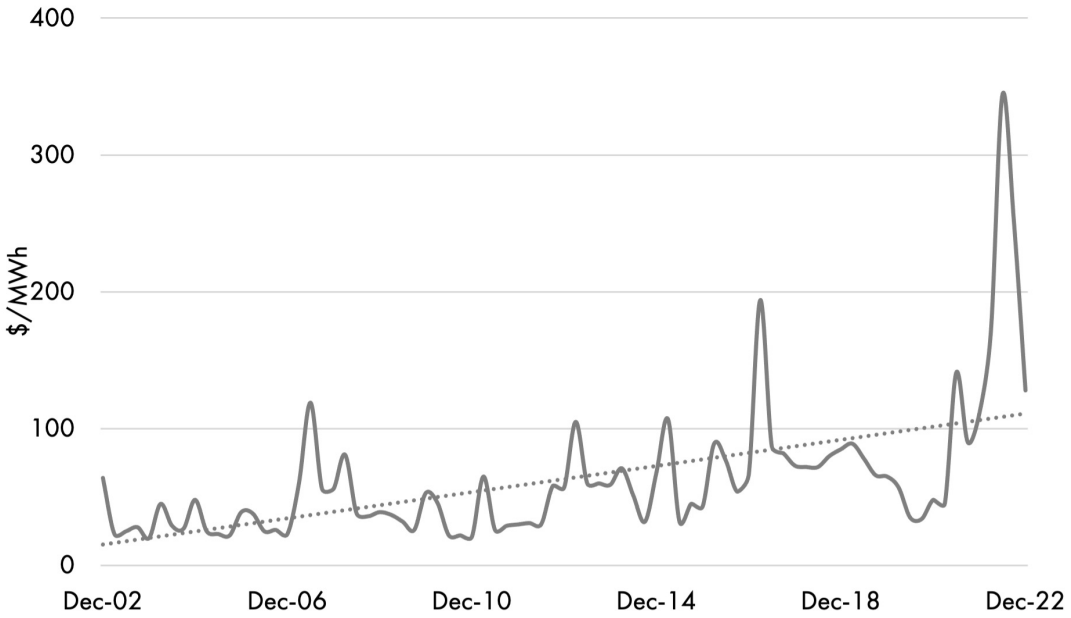
In 2022 we glimpsed the future as disruptions at several power stations across eastern Australia removed nearly 8 gigawatts of dispatchable generators from the market during winter. As figure 11 also shows, the resulting price spike was extraordinary. Even though there is an abundance of renewable energy capacity, it was incapable of supplying the market at this time – winter is typically a low period for solar generation and wind droughts are common.

The resulting undersupply and lack of competition pushed wholesale electricity prices to historical highs in every state connected to the NEM, and eventually led the AER to take the extraordinary measure of suspending the market – albeit at a market price of $300 per MWh.

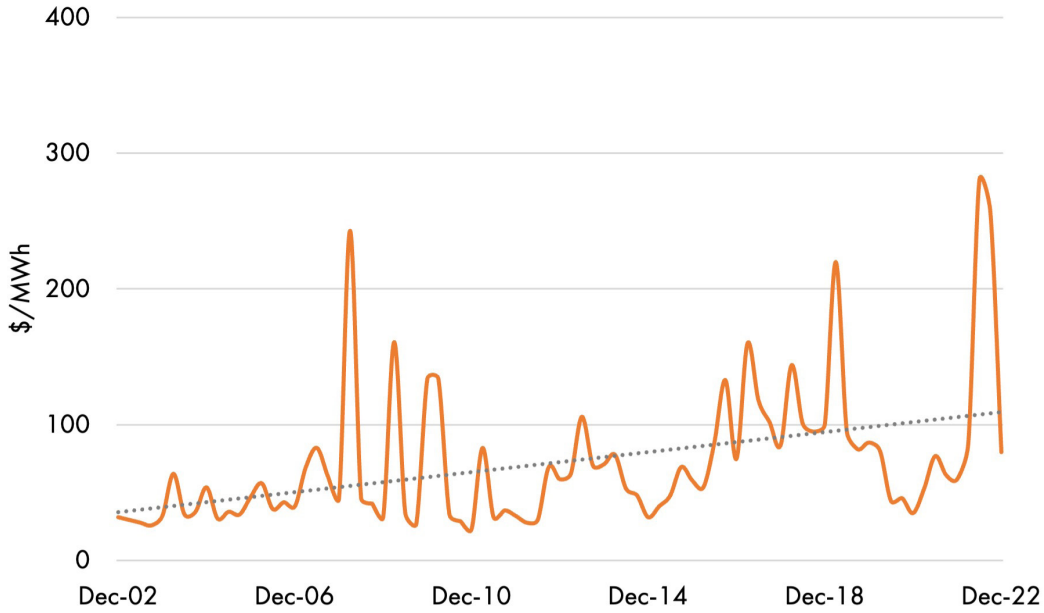
**Figure 11: Rising wholesale electricity prices across the NEM.**



**Queensland**




**South Australia**




Source: Australian Energy Regulator.

# The outlook for Australia's electricity market

There is ample evidence of policy failure in overseas energy markets from which Australia can and should learn. But we can also see the impact of events playing out in our own energy markets. In the last decade around 4 gigawatts of dispatchable generator capacity have closed in Australia.

A review of these closures provides ample insight into the challenges the nation faces as it rushes to close more than 20 gigawatts of capacity by 2035.

Australia has been sleepwalking into the energy crisis for over a decade.

## Part 1: Wallerawang and Munmorah power station closures

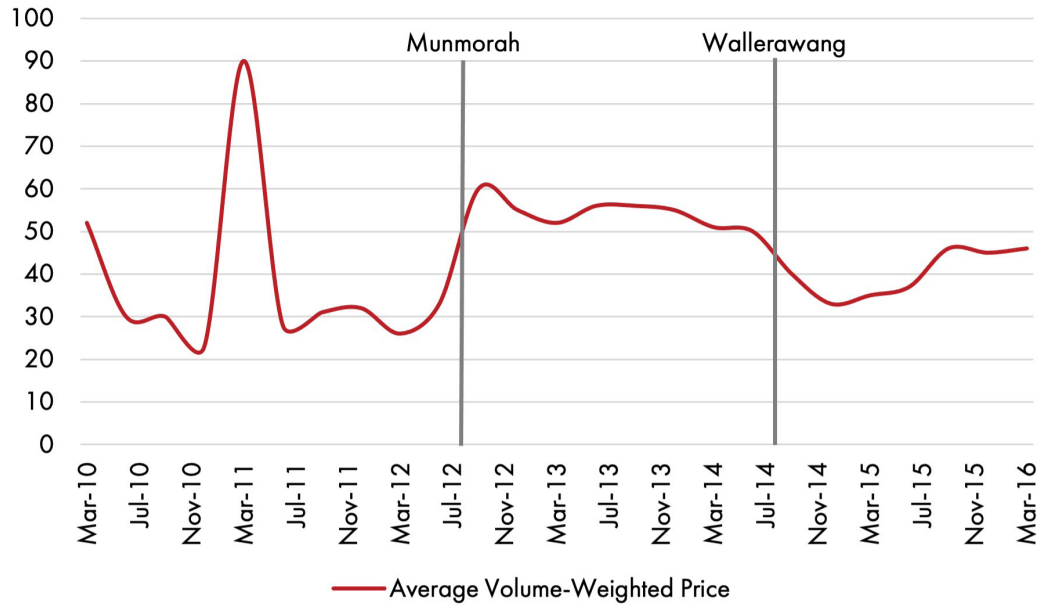
In a short space of time, the New South Wales electricity market experienced the closure of two power plants. Delta Electricity's Munmorah power station near Lake Macquarie shut down in 2012, just prior to the privatisation of Delta Electricity. This removed 1,400 megawatts of capacity from the market – although half of this capacity had already been mothballed since 2010.

Shortly after, Delta Electricity sold the Wallerawang power station to Energy Australia along with the nearby Mt Piper plant. In November 2014, the new owners permanently closed the Wallerawang asset down, removing another 1,000 megawatts of capacity from New South Wales' electricity market.

Faced with dwindling demand and increased competition from lower-cost electricity imports from Queensland, it was simply market forces at work that closed Munmorah and Wallerawang. New South Wales at the time had an oversupplied electricity market and no growth in demand.

The impact of the two power stations closures can be seen in Figure 12. Whereas Munmorah's closure tightened the electricity market and caused an immediate doubling of wholesale prices in New South Wales, Wallerawang's closure was accompanied by the closure of the Kurri Kurri aluminium smelter – one of the largest electricity consumers in the state. The subsequent drop in demand led electricity prices lower even with Wallerawang's closure.

**Figure 12: New South Wales wholesale electricity prices after the closure of the Munmorah and Wallerawang power stations.**




Source: Australian Energy Regulator

There have been no additional power station closures in New South Wales since Wallerawang shut down. Nevertheless, electricity supplied from its dispatchable coal and gas generators has decreased nearly 14 per cent, or 9,000 gigawatt hours, since then. This has been more than offset by variable renewable energy generation increasing by more than 11,000 gigawatt hours by 2021-22.

Despite the appearance of abundant electricity supply, this period again shows that the market conditions created by rising wind and solar energy generation do not deliver the promised lower prices. New South Wales' average wholesale electricity price increased by 170 per cent.

## Part 2: Closing the last coal-fired power station in South Australia

Of all the states in Australia, South Australia is leading the charge to replicate Germany's energy policy. And it is experiencing similar challenges.

The Australian Capital Territory may claim to be powered by 100 per cent renewable energy, but this is mainly supported by a series of contractual arrangements it has with several wind farms in Victoria that offset its total electricity consumption.

The national capital is instead a small part of the New South Wales electricity market, which gets around 80 per cent of its electricity from fossil fuels.

South Australia is therefore the undisputed king of renewable energy in Australia. Wind and solar energy account already account for over 60 per cent of the state's electricity generation (higher than Germany and Denmark), up from 20 per cent 10 years ago – a fact the state government is volubly proud of.

It may not be as proud of the fact it also has the highest retail electricity prices in Australia, as well as the highest proportion of electricity customers on hardship programs.[16] It would seem the rising number of negative wholesale price periods often attributed to renewable energy has had little beneficial impact on the electricity consumer's experience in South Australia.

**Figure 13: Residential electricity median market and standing offer prices.**


Source: Australian Energy Regulator, Annual retail markets report 2021–22, figure 2.3.

South Australia's misadventures in energy policy can be traced back to the closure of the Northern power station in Port Augusta. In response to the government mandated rise in variable renewable energy generation, Alinta permanently shut down the Northern power station in May 2016. The average wholesale electricity price more than doubled within 3 months and higher prices were locked in for the state until the COVID-19 pandemic created softer demand conditions in the market.

16 Australian Energy Regulator, Annual retail markets report 2021–22.

**Figure 14: Rising wholesale electricity prices in South Australia after the closure of the Northern power station.**


Source: Australian Energy Regulator

In addition to higher prices, South Australia is facing rising challenges in managing its grid. As noted in the 2020 AEMO Electricity Statement of Opportunities report, this isn't being solved exclusively by adding new battery storage and building more interconnection to New South Wales.

The 2020 ESOO modelling includes 86 MW of committed VRE generation as well as 50 MW of additional battery storage capacity, 15 MW of gas generator upgrades, and 123 MW of additional liquid-fuelled generation in South Australia.[17]

Significantly, "liquid-fuelled generation" refers to a set of leased diesel generators that were required to meet demand at peak times.[18] South Australia also increased its use of these generators during the winter of 2022 when gas supply was tight and prices high.

These diesel generators are set to continue operating because, as noted by the Australian Energy Regulator in the 2022 edition of its *State of the Energy Market* report:

> *both South Australia and Victoria could breach the Interim Reliability Standard in 2023–24.*[19]

The report also succinctly highlights the rising risks associated with the increased deployment of variable renewable energy across the NEM – particularly in South Australia:

> *The wind and solar generators entering the market are less able to support system security. For this reason, the rising proportion of renewable plant in the*

17 Australian Energy Market Operator, *Electricity Statement of Opportunities*, 2020, p124.

18 https://www.abc.net.au/news/2019-08-28/back-up-power-generators-leased-to-private-companies/11457824

19 Australian Energy Regulator, State of the Energy Market, 2022, p.53.

> *NEM's generation portfolio will mean more periods of low inertia, weak system strength, more volatile frequency and voltage instability. It also raises challenges to the generation fleet's ability to ramp (adjust) quickly to sudden changes in renewable output.*
>
> *AEMO is more frequently relying on directions to keep the system secure. Directions for system security are intended a last resort intervention, when the market has not delivered the necessary requirements. In South Australia, directions to market participants to take action to maintain or restore power system security have been in place for a substantial amount of time in the past 2 years at a substantial cost. In 2021 total costs for directing South Australian generators for system strength reached $94 million – almost double those costs in 2020.*[20]

To South Australia's credit, the AEMO report acknowledges that actions are underway to address its grid reliability issues:

> *In South Australia, 4 synchronous condensers, installed by ElectraNet, started operating in October 2021 to provide system strength and inertia. Each has a flywheel with a large amount of momentum. In the event of a disturbance on the network, these provide the electrical inertia to power through the fault. They have reduced the number and cost of market interventions, relaxed constraints on wind and solar output and reduced the amount of gas generation required down to 2 units. Directions in South Australia fell from being in place over 80% of the time in the last quarter of 2021 to below 20% of the time in the first quarter of 2022.*[21]

Further investment is likely to be required to boost South Australia's grid reliability. In late 2022 the system was again exposed when storm damage to a transmission tower cut an interconnector to Victoria.[22] Despite the investment in reliability management, the state faced a dual challenge of too much electricity from strong solar PV output at times (which would normally be exported to Victoria) and insufficient generation in other periods to operate the grid within the strict engineering parameters.

This was not the first time South Australia had faced transmission issues – in November 2016 the entire state endured a blackout. According to the Australian Energy Regulator:

> *The state-wide blackout on 28 September 2016 resulted from unprecedented circumstances. It was triggered by severe weather that damaged transmission and distribution assets, which was followed by reduced wind farm output and a loss of synchronism that caused the loss of the Heywood Interconnector. The subsequent imbalance in supply and demand resulted in the remaining electricity generation in SA shutting down. Most supplies were restored in 8 hours, however the wholesale market in SA was suspended for 13 days.*[23]

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20 Ibid., p.53.

21 Ibid., p.53.

22 AEMO, South Australia disconnected from the National Electricity Market, Media release issued 13 November 2022.

23 Australian Energy Regulator, The Black System Event Compliance Report, 2018, p.5.

There is no disputing the trigger of the event was weather-related; however, South Australia's reliance on variable renewable energy contributed to the problem. Media reports and political statements have often overlooked the inquiry report's detail on wind generation and its role in the tripping of the interconnector. But the inquiry report clearly shows that in the space of just 9 minutes, from 15.42 to 15.51, generation from wind farms fell 21 per cent. The resulting increased reliance on the Heywood interconnector from Victoria exceeded its operating thresholds causing it to disconnect South Australia.[24]

South Australia's electricity policies and experiences provide valuable insights into the challenges associated with high shares of variable renewable energy in a grid at the expense of dispatchable generation. Households and businesses in the state are experiencing rising electricity bills in direct contradiction of the claim that renewable energy is cheap and even forces wholesale prices down.

Renewable energy from wind and solar may be low cost, but the market conditions they produce create significant risks that must be mitigated by expensive investments in additional grid connections, energy storage and back up. Often this increases reliance on fast-response dispatchable generators, such as diesel and gas peakers, which are among the most expensive sources of electricity available.

Yet, even at higher prices and with more investment to come, reliability continues to be a problem. The latest Electricity Statement of Opportunities from AEMO still forecasts significant risks for South Australia, and it seems each successive report revises this risk up and brings it forward.

Rather than learning from the South Australian experience, other states in Australia are going down the same path. They too are closing their dispatchable generators and replacing them with variable renewable energy sources.

## Part 3: The closure of Hazelwood

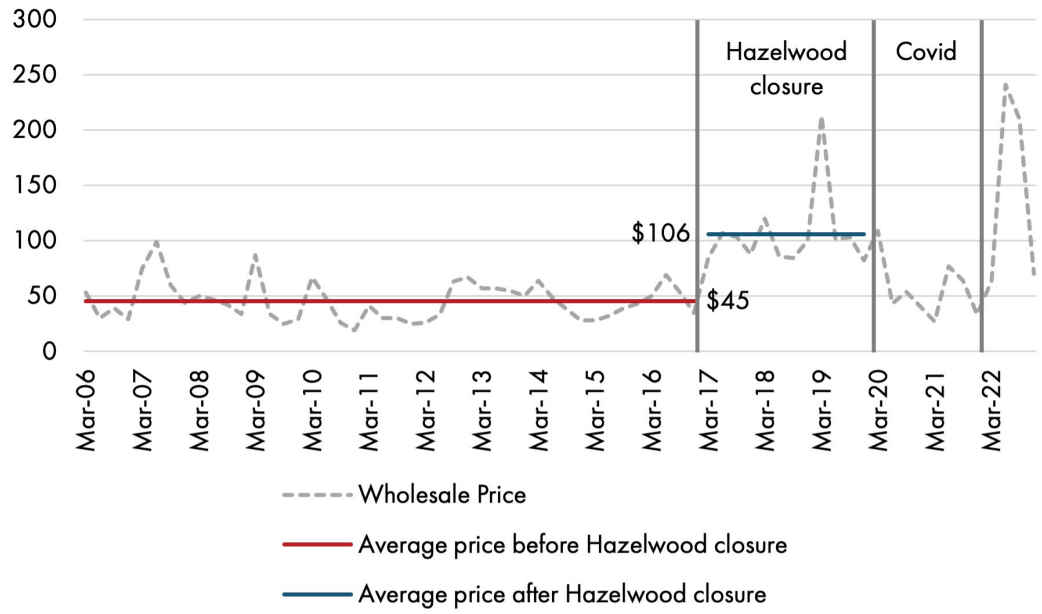
With a capacity of 1,600 megawatts, the Hazelwood power station was a critical piece of Victoria's energy infrastructure. For more than 50 years the plant delivered reliable, dispatchable electricity into the NEM using brown coal sourced from the adjacent mine.

Victoria's energy market was up-ended on 3 November 2016 by the announcement the Hazelwood power station would close. Hazelwood was an aging asset, but still produced 10,000 gigawatt hours of electricity in 2015-16 – around 20 per cent of Victoria's electricity supply.

As can be seen in figure 15 below, the impact on wholesale electricity prices in Victoria was severe. The average price in the March quarter of 2017 was $85 per MWh – up 70 per cent from the same period twelve months earlier, and the power station did not go fully offline until 29 March 2017.

24 Australian Energy Regulator, The Black System Event Compliance Report, 2018, p.41.

**Figure 15: Impact of Hazelwood closure on Victorian wholesale electricity prices.**




Source: Australian Energy Regulator

The following quarter delivered extreme price increases for Victorians, due to a shortage in dispatchable supply. The wholesale electricity price increased further and averaged $107 per MWh in the June quarter 2017.

Higher electricity prices became a feature of the Victorian economy for the next three years – averaging $106 per MWh. In the ten years prior to Hazelwood's closure, electricity price averaged just $45 per MWh. This was despite renewable energy generation in Victoria rising 27 per cent, or 2,200 gigawatt hours, from 2015-16 to 2018-19.

The broader problem was that the NEM is an interconnected electricity grid. The shortfalls and higher prices in Victoria were exported to other states, which also experienced higher electricity prices. This increase became locked in until weaker demand during COVID-19 pandemic eased prices.

**Table 1: Average annual wholesale prices before and after the Hazelwood closure.**

| State | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
|---|---|---|---|---|---|
| NSW | $36 | $54 | $88 | $85 | $92 |
| QLD | $61 | $64 | $103 | $75 | $83 |
| SA | $42 | $67 | $123 | $109 | $128 |
| TAS[25] | $37 | $97 | $76 | $88 | $88 |

Source: Australian Energy Regulator

25 Tasmania's 2015-16 price spike pre-dated the Hazelwood closure and was the result of low water flow into its hydroelectric power stations. Technical problems also prevented electricity imports via the Basslink interconnector from Victoria. Diesel generators were used more often but caused higher prices throughout 2015-16.

The closure of Hazelwood not only caught the Australian Energy Market Operator off guard, but also immediately created a significant shift in their future risk assessments for the stability of the NEM.

Here is their assessment of risks in the NEM just three months prior to the announced closure of Hazelwood:

> *Under a neutral economic and consumer outlook – and in the absence of new generation, network or non-network development – coal-fired generation withdrawals at the levels assumed may lead to reliability standard breaches.*[26]

The next report, released in September 2017, provided a significant shift in the assessed risks:

> *AEMO's 2017 Electricity Statement of Opportunities (ESOO) modelling shows reserves have reduced to the extent that there is a heightened risk of significant unserved energy (USE) over the next 10 years, compared with recent levels.*
>
> *AEMO's analysis shows a heightened risk that the current NEM reliability standard will not be met, and confirms that for peak summer periods, targeted actions to provide additional firming capability are necessary to reduce risks of supply interruptions.*
>
> *... The highest forecast USE risk in the 10-year outlook is in 2017–18 in South Australia and Victoria. This risk is being addressed by the South Australian Government's Energy Plan developing additional diesel generation and battery storage, and AEMO pursuing supply and demand response through the Reliability and Emergency Reserve Trader (RERT) provisions.*[27]

As previously highlighted, this assessment came at a time when electricity demand growth was stagnant and renewable energy investment was surging. Yet, the closure of just one major coal-fired power station with a capacity of 1,600 megawatts created significant reliability risks and higher prices in the NEM.

The question now is, how will the government's plan to close the next 20,000 megawatts in the next seven years affect the NEM, electricity consumers and the Australian economy?

26 Australian Energy Market Operator, Electricity Statement of Opportunities, 2016.

27 Australian Energy Market Operator, Electricity Statement of Opportunities, 2017.

# Where to from here - the closures still to come

Australia's energy market and policy making is now at a crucial point. Government policy is mandating a fundamental shift in the nation's electricity supply while simultaneously aiming to stimulate greater demand through industrial policy, increased immigration and electrification.

The cracks are already appearing.

On 31 August 2022 AEMO released its 2022 edition of the Electricity Statement of Opportunities. A key finding of the report was that reliability gaps are forecast in all mainland NEM regions in the next decade, based on existing and committed developments only. Furthermore, the report noted; *"Since the 2021 ESOO, potential retirements and commissioning delays to committed projects have also influenced the reliability forecast".*[28]

This includes reliability gaps forecast in South Australia (from 2023-24), Victoria (2024-25) and New South Wales (2025-26).

While the report noted the large and still growing capacity of variable renewable energy, it also signalled this warning:

> *there is enough resource potential to approach and on occasion reach 100% instantaneous supply from renewable resources.... A high proportion of this renewable generation is from inverter-based resources (IBR, meaning wind and solar generation, including distributed PV). With AEMO's current operating toolkit, it would not be possible to maintain the power system securely under these conditions.*[29]

AEMO subsequently released a report titled Engineering Roadmap to 100% Renewables in December 2022. While it is admirable that AEMO is finally adopting the total system approach advocated by numerous energy experts around the world, it also confirms that Australia is on the path to incurring the additional costs associated with high variable renewable energy shares in a grid's electricity mix. Costs inevitably borne by households and businesses.

Notably, the roadmap is a document rich in engineering and policy action items – but it provides no cost information or economic assessment of its planned 100 per cent renewable future.

On 21 February 2022 AEMO released an update to its 2022 Electricity Statement of Opportunities report "due to material changes affecting available generation capacity in the National Electricity Market from that set out in the 2022 Electricity Statement of Opportunities".[30]

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28 Ibid., p11.

29 Ibid., p14.

30 Australian Energy Market Operator, Update to 2022 Electricity Statement of Opportunities, 2023.

The key findings of this update were that recent government actions to invest in energy storage had delayed, but not solved the looming reliability problems facing the NEM. But delays to Snowy 2.0 and the Kurri Kurri gas project (both government-led initiatives) were still putting New South Wales' energy security at risk.

## More bad news for New South Wales

New South Wales now finds itself at the forefront of energy market risks. The permanent closure of the Liddell power station at the end of April 2023 is likely to create similar market issues to those caused by the closure of Hazelwood.

Recent experience in Australia and around the world highlights why the occasion of Liddell's closure should mark a line in the sand for the close of baseload power plants.

Liddell was a coal-fired power plant with a capacity of 2,000 megawatts. It had been operating well below its potential due mainly to its age – its generators were first commissioned in 1971. Nevertheless, it had still been producing around 10 per cent of New South Wales' electricity supply.

The surge in variable renewable energy output in New South Wales in recent years (tripling in the last five) is not enough to offset this closure. Clearly, if it were, New South Wales would have been spared the electricity market crunch that came in the winter of 2022.

It wasn't.

New South Wales can instead expect to experience greater price variability in the future. During periods of high renewable energy output, warm sunny days with lots of wind, wholesale prices will be low reflecting strong supply availability and the near zero marginal cost of renewable energy projects.

(It is worth noting that this abundance of renewables is also contributing to their own commercial challenges. The low prices when renewables are abundant reduce the financial returns on wind and solar projects, making them almost un-investable. It is no surprise, though concerning, that the Clean Energy Finance Corporation has returned to offering financing deals for wind and solar farms in Australia.[31])

But when less than ideal conditions prevail, such as wind droughts at night, tight supply conditions will leave a market more reliant on flexible generators such as gas turbines to set wholesale electricity prices.

In the past this may have been manageable, but with Liddell's closure New South Wales can expect to experience even tighter market conditions, with higher price volatility, increased risks of load shedding (the favoured euphemism for brownouts) and demand response (also known as paying large energy consumers to not use energy).

31 Australian Financial Review, Energy prices are soaring, so why are taxpayers helping out new solar?, 15 November 2022.

New South Wales' electricity supply is clearly at risk. Despite its age, Liddell still produced 8,000 gigawatt hours of dispatchable electricity in 2021-22. In comparison, the state's entire network of large-scale wind and solar projects provided about the same amount of electricity that year.

The Kurri Kurri gas power station offered some hope for managing New South Wales' electricity market risks, but it is now delayed at least a year as the result of an ill-conceived policy to have it run partly on hydrogen from day one.

New South Wales' only option is to rely on its network connections to Queensland and Victoria to import even more electricity. But as Hazelwood's closure showed, the integrated NEM also allows the export of reliability risks and higher prices to other states.

Liddell's closure will not only create sustained higher prices for New South Wales households and businesses, but the contagion effect will increase demand and prices in Queensland in particular. Unfortunately, this winter Queensland also finds itself with the prospect of a tighter electricity market, with the Callide coal-fired power station still partly offline for maintenance and repairs.

New South Wales cannot continue down the path of closing reliable, low-cost baseload generators without adequate replacements being available.

Unfortunately, it is.

## It gets worse

In February 2022 Origin Energy announced it was bringing forward the closure of the Eraring power station from 2032 to 2025.

Eraring is the largest power station in Australia, with a capacity of 2,800 megawatts. Like Liddell, it has been operating well below its potential, but its output of around 12,000 gigawatt hours represents around 15 per cent of New South Wales' electricity.

The Perrottet government response to the announcement was typical of the head-in-the-sand political approach to energy policy:

> *NSW energy supply will remain secure after the closure of the Eraring Power Station following the NSW Government's announcement that it will move to accelerate transmission upgrades and the construction of new electricity generation.*
>
> *To ensure energy reliability, the NSW Government will work with industry partners to install the Waratah Super Battery, a 700MW/1400MWh grid battery, by 2025 to release grid capacity so Sydney, Newcastle and Wollongong consumers can access more energy from existing electricity generation.*

> *"New South Wales has the strongest reliability standard in the country – the Energy Security Target – which aims to have sufficient firm capacity to keep the lights on even if the State's 2 largest generating units are offline during a one-in-10 year peak demand event," Mr Kean said.*[32]

The Waratah Super Battery, though large, provides no new energy into the New South Wales electricity grid. At best, at any given time it can deliver 25 per cent of Eraring's maximum output – for just two hours before recharging. The government's own project website describes the battery more as a "shock absorber" than a source of new energy.[33]

For the new state government, there is still the potential to avoid the worst of the electricity market problems it has inherited.

On 27 March 2023 private equity fund Brookfield Asset Management signed a deal to finalise the purchase of Origin Energy. A government-led deal with the new owners to delay the closure of Eraring is possible, with Brookfield previously indicating it was open to extending Eraring's operating life to maintain market stability.[34] This would not only be a major political achievement, it would save the state millions in unnecessary electricity bill increases.

## Over 20 gigawatts of dispatchable capacity are still scheduled to close by 2035

The federal government's energy policy is clear, albeit problematic. Renewable energy is to account for 82 per cent of Australia's electricity by 2030. This comes despite the mounting empirical evidence that such mandates elevate electricity prices.

But the energy sector is following this lead, with several companies announcing earlier retirement for their assets over the last year.

This disruption will not go unnoticed in electricity markets. Australians should be bracing for higher prices in the future, as more than 20 gigawatts of dispatchable, reliable coal and gas fired power stations are set to close by 2035. The power stations scheduled to close produced around 40 per cent of Australia's electricity in 2021-22.

32 New South Wales Government, NSW response to the closure of the Eraring Power Station.

33 EnergyCo website, Waratah Super Battery, viewed 5 April 2023.

34 Angela MacDonald-Smith and Samantha Hutchison, Brookfield open to talks with NSW on Eraring sale, Australian Financial Review, 28 March 2023.

**Table 2: Australia power station closures to 2035.**

| Power Station | State | Fuel | Expected Closure | Capacity MW | Generation GWh |
|---|---|---|---|---|---|
| Liddell | NSW | Coal | 2023 | 2,000 | 8,106 |
| Eraring | NSW | Coal | 2025 | 2,880 | 12,012 |
| Torrens Island B | SA | Gas | 2026 | 800 | 1,074 |
| Collie | WA | Coal | 2027 | 340 | 1,248 |
| Callide B | QLD | Coal | 2028 | 700 | 4,293 |
| Yallourn | VIC | Coal | 2028 | 1,450 | 8,363 |
| Bluewaters | WA | Coal | 2029* | 400 | 1,636 |
| Muja | WA | Coal | 2029 | 1,094 | 4,113 |
| Vales Point B | NSW | Coal | 2029 | 1,300 | 6,278 |
| Bayswater | NSW | Coal | 2033 | 2,600 | 14,861 |
| Callide C | QLD | Coal | 2035 | 825 | 2,570 |
| Gladstone | QLD | Coal | 2035 | 1,680 | 5,911 |
| Kogan Creek | QLD | Coal | 2035 | 750 | 5,541 |
| Loy Yang A | VIC | Coal | 2035 | 2,200 | 15,143 |
| Stanwell | QLD | Coal | 2035 | 1,400 | 8,616 |
| Tarong & North | QLD | Coal | 2035 | 1,840 | 11,095 |
| Total | | | | 22,259 | 110,860 |

Notes: Expected closure date for Bluewaters based on AEMO forecast.

Queensland government owned generators expected to close by 2035 to achieve the state's 80 per cent renewable energy target.

Source: AEMO, Clean Energy Regulator, company reports.

To accommodate the federal government's renewable energy target, several of the power stations shown in table 2, plus those not listed (Mt Piper, Millmerran and Loy Yang B) may need to close sooner or at least significantly curtail their output.

The federal government has already opted against the advice of the Energy Security Board in its announced version of a capacity mechanism scheme. Instead of delivering a program of incentives to keep some of these dispatchable generators online and capable of delivering energy or grid management services in times of generation shortfalls, the government has created another channel for funding variable renewable energy projects with its Capacity Investment Scheme.[35]

The Capacity Investment Scheme is the antithesis of the dispatchable generation the NEM needs to replace the lost output from the power stations listed above.

35 Australian Financial Review, *Coal and gas cut out of capacity mechanism*, 8 December 2022.

Replacing this output with variable renewable energy projects and the associated network, storage and frequency management projects in the timeframe required is not only challenging, recent experience in Australia with delays and cost blow outs on projects including Snowy 2.0 and the Western Renewables Link/VNI West project, suggest it is completely unrealistic.

Not only will projects not be built in time, they will be increasingly expensive which will simply add to energy consumer pain.

And, with their high usage of variable renewable energy, these are the very projects that advocates of the total systems cost approach to modelling energy markets suggest are driving energy prices higher.

# Conclusion

The Australian energy market is an experiment being keenly watched by international observers. For some, Australia's continuing push to increase the proportion of variable renewables in its energy markets provides a counter-narrative to the obvious energy market failures in Europe and North America.

In reality, pursuing the renewables dream has little to do with economics; it is more about ideological purity. But it's Australian households and industry that will pay the price for this ideological experiment, not those in Europe and North America looking for vindication despite their own failures.

Australia faces an inflection point.

It can continue down the path of closing what have been reliable low-cost baseload power stations without adequate replacement being available.

Or it can do what should be obvious to all elected officials – keep the lights on while planning to build new plant that is actually capable of meeting the real world energy needs of Australian households and industry.

Liddell's closure means the system is now on a knife's edge. Until new replacement capacity is built that can meet what dispatchable power stations actually provide, Australia is at serious risks of energy shortages.

Variable renewable energy has proven to be an unsuitable substitute when dispatchable generators close down, and a growing body of evidence shows it is also an expensive one.

At the very least, policy makers should halt the premature closure of baseload power stations.

# LIDDELL THE LINE IN THE SAND: WHY IT'S TIME TO HIT PAUSE ON THE CLOSURE OF COAL-FIRED BASE LOAD POWER STATIONS IN THE NEM

## About the Institute of Public Affairs

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November 2023 Dr Kevin You, Senior Research Fellow

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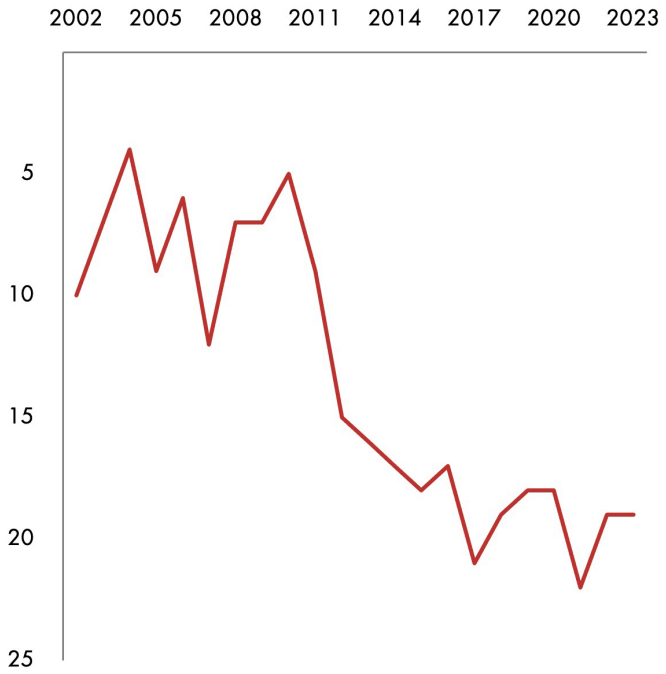
# AUSTRALIA'S ECONOMIC COMPETITIVENESS IN CONTINUING DECLINE

In the 2000s, Australia consistently ranked as one of the most competitive economies in the world. But in recent years, Australia's economic competitiveness has fallen behind.

The International Institute for Management Development (IMD) published its latest World Competitiveness Ranking in June 2023. The Ranking is a comparative assessment of 64 of the world's major economies, published annually in the IMD's World Competitiveness Yearbook.

In 2023, Australia ranked 19th, just behind the Czech Republic and Saudi Arabia—and far behind regional trading partners such as Singapore, Taiwan, and the United States (US).[1]

**Chart 1: Australia's competitiveness ranking**




Source: IMD

A country's overall competitiveness ranking is based on 256 criteria, which are in turn derived from statistical measures or surveys of experts. Economies with better competitiveness rankings typically have greater per capita economic output, higher business investment rates, and higher economic growth rates.

## Australia's economic competitiveness is falling faster than comparable nations

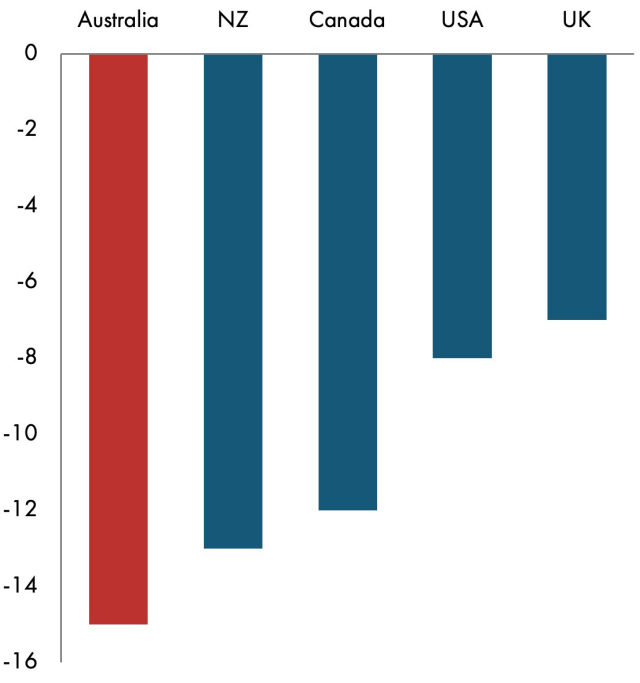
Australia has seen a significant drop in its World Competitiveness Ranking since the 2000s. In 2004, Australia was ranked the 4th most competitive economy in the world, behind only the US, Singapore and Canada.

Australia is now ranked 19th overall.

Over the last 20 years, the rankings of several other advanced economies have also worsened. But Australia's decline from 4th to 19th has been more severe than the decline of comparable nations. Since 2004:

- Canada's ranking has slipped 12 places, from 3rd to 15th;
- New Zealand's ranking has slipped 13 places, from 18th to 31st;
- Britain's ranking has slipped 7 places, from 22nd to 29th; and
- The US' ranking has slipped 8 places, from 1st to 9th.

**Chart 2: Decline in ranking 2004 to 2023**




Source: IMD

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## Australia's competitiveness is in freefall on key economic criteria

Among a selection of key criteria, which are critical to economic competitiveness and dynamism, Australia's standing in the world has undergone a significant twenty-year decline.

**Table 1: Australia's 20-year decline in key criteria**

| Competitiveness criteria | Ranking in 2004 | Ranking in 2023 |
|---|---|---|
| Entrepreneurship | 11th | 62nd |
| Energy infrastructure | 21st | 52nd |
| Economic resilience | 1st | 20th |
| Public policy adapts to changes in the economy | 4th | 20th |
| Regulatory framework encourages competition | 3rd | 19th |

Source: IMD

## Australia's competitive strengths are under threat

Despite the overall decline, Australia has demonstrated strength and resilience in a number of important criteria. Australia ranks 1st in the world in terms-of-trade, namely the ratio between the prices of exports and the prices of imports. Australia has consistently topped the ranking for this criterion over the course of the last five years.

Australia's exemplary terms-of-trade ranking is attributable to the strength and resilience of our resources and agricultural sectors. More specifically, the sectors on which the Australian economy rely to generate export revenue are:

1. Iron ore, with export value totalling $157 billion per annum in 2023;
2. Oil and gas, with export value totalling $141 billion per annum;
3. Coal, with export value totalling $92 billion per annum;
4. Grain and meat, with export value totalling $42 billion per annum; and
5. Processed gold and other metals, with export value totalling $35 billion per annum.[2]

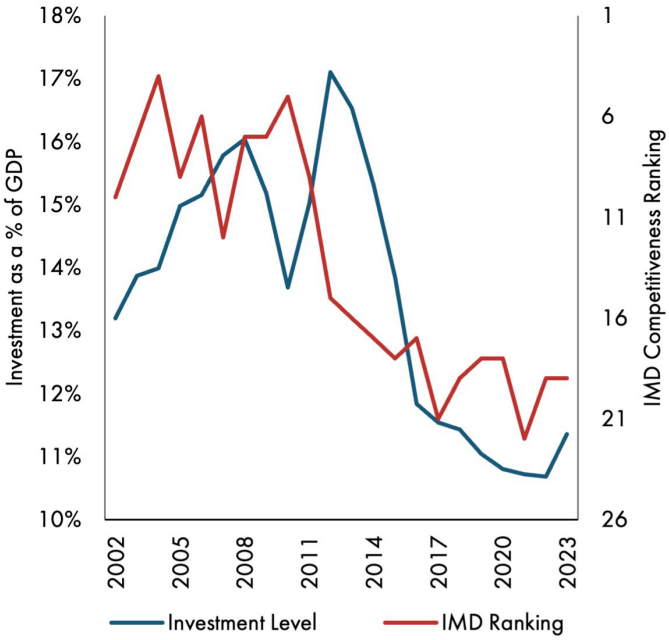
Over the last decade, Australia's has consistently ranked in the top 10 worldwide for agricultural productivity, and is ranked 4th in 2023. But overregulation of farmers and graziers puts productivity in the sector further at risk.[3]

## Lack of competitiveness deters private sector investment

Australia's continuing decline in overall competitiveness is a key reason why business investment has been floundering in recent years.

Since 2017, private investment in Australia has been stuck below 12 per cent of GDP, hovering just above its historic low of 10.15 per cent in the September quarter of 1992. The change in Australia's level of private business investment has tracked consistently with its declining competitiveness ranking over the same period.[4]

**Chart 3: Investment vs competitiveness ranking**




Source: IMD, ABS, IPA

Economic competitiveness needs to improve before investors are once again willing to build wealth and prosperity in Australia.

## Red tape, tax, and industrial relations are key areas of competitive weakness

Factors that contribute to Australia's competitiveness are under threat by red and green tape, a burdensome tax regime, and laws restricting labour productivity.

This has contributed to Australia's declining competitiveness ranking in the twenty years since the early 2000s.

### Red tape and green tape

Australia's economic competitiveness has declined considerably because of the imposition of red tape and government overregulation.[5] In the 2023 IMD Report, Australia ranked:

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- 19th best for legal and regulatory framework encouraging the competitiveness of enterprises. In 2004, Australia ranked 3rd.
- 20th best in terms of the bureaucracy not hindering economic activity. In 2004, Australia ranked 6th.
- 26th best for legislation supporting the creation of new firms. In 2004 Australia ranked 7th.

Australia's weak performance in energy infrastructure (ranked 52nd) is an outcome of the rapid decommissioning of base-load power supply without adequate, like-for-like replacement.[6]

### Taxation

The high taxes that individuals and companies are required to pay amount to lost investment and foregone economic activities.

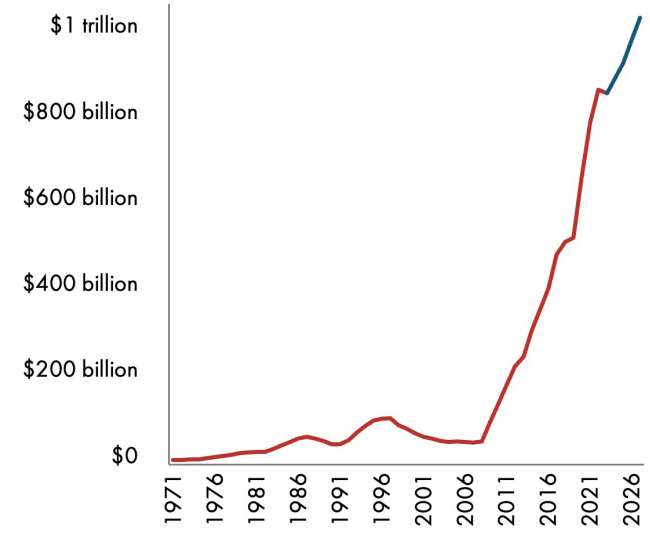
Of the countries surveyed in the 2023 IMD Report, Australia ranked:

- 57th for individual tax burden. In 2004, Australia ranked 52nd.
- 56th for company tax burden. In 2004, Australia ranked 54th.

The rankings demonstrate that, compared to most other nations, Australian families and businesses are still burdened by too much tax.

Despite high levels of taxation, debt remains a significant and growing problem. Federal government debt alone is estimated to sit at $923 billion this financial year. It is expected to reach $1 trillion by the financial year ending 2026.[7]

**Chart 4: Gross Federal Government debt**




Source: Federal Budget

According to the IMD's latest data, Australia ranked 30th for general government debt as a percentage of GDP (at 56.40 per cent) and 47th for growth in government debt (at 2.02 per cent). Both ranked 8th in 2004.

### Industrial relations policy

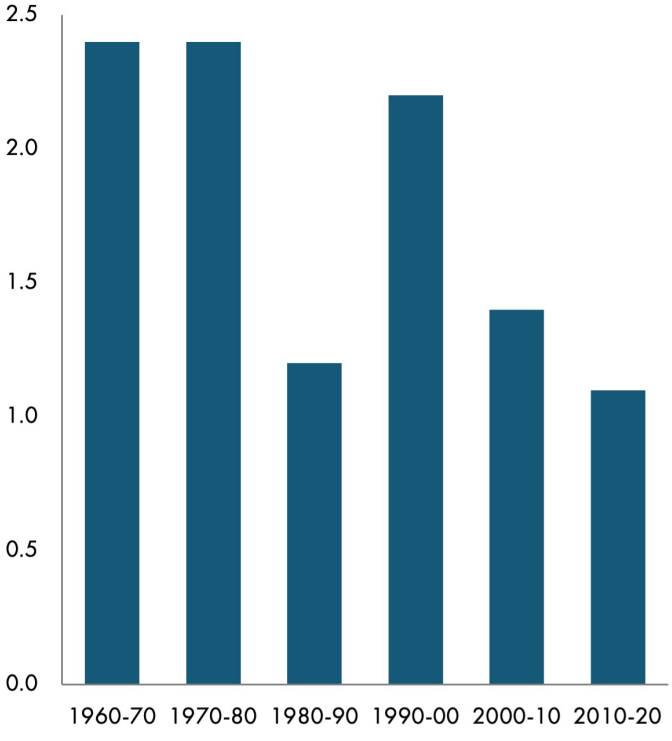
Australia has long had one of the most rigid and complex industrial relations systems in the world. In 2023 Australia ranked:

- 39th for labour regulation not hindering business activities. In 2004, just prior to the introduction of the *WorkChoices Act 2005*, Australia ranked 22nd.
- 46th for workforce productivity. In 2004, Australia ranked 49th, suggesting that workforce productivity is a chronic problem.

These low rankings are consistent with a recent study by the Productivity Commission, which found labour productivity in Australia having decreased by 4.6 per cent between April 2022 and March 2023.[8]

To put this into context, annual labour productivity growth in the two decades between 1960 and 1980 was positive 2.4 per cent per annum. In the 1990s, it averaged positive 2.2 per cent per annum. Between 2010 and 2020, labour productivity averaged positive 1.1 per cent per annum.

**Chart 5: Average Annual growth in labour productivity (%)**




Source: Productivity Commission

## Australia's competitiveness is vulnerable to restrictive industrial relations laws

Recent industrial relations legislation has added and will continue to add employment red tape that will have a further negative impact on labour productivity and deter investment.

For instance, under the *Secure Jobs Better Pay Act 2022*, an employer risks being forced by a union to bargain for a multi-enterprise agreement with other employers including their competitors.[9]

The *Closing Loopholes Bill 2023* will delegitimise flexible forms of work such as casual, independent, and labour-hire contracting. Employment law expert Dr Mark Mourell notes the bill will result in greater uncertainty and more litigation—thus increasing costs, reducing productivity and further jeopardising Australia's economic competitiveness well into the future.[10]

## Governments must reform policy to improve Australia's competitiveness

The IMD's report should serve as a wake-up call for Australian policy makers to address the systemic economic problems causing declining competitiveness by:

- Cutting red and green tape by implementing mechanisms such as requiring two regulations be removed for every new regulation added, and repealing the policy of net zero emissions by 2050;[11]
- Lowering tax and committing to fiscal restraint by reducing spending, and returning duplicated responsibilities such as health, education and environmental protection to state governments;[12]
- Rejecting legislative changes which will make the labour market less flexible and addressing worker shortages by removing unfair rules deterring Australians from entering the workforce.[13]

## End Notes

1. International Institute for Management Development (IMD), *IMD World Competitiveness Centre* (2023) Available from: https://www.imd.org/centers/wcc/world-competitiveness-center/rankings/world-competitiveness-ranking/2023/.
2. IBISWorld, 'Biggest Exporting Industries in Australia in 2023' (2023) Available from: https://www.ibisworld.com/australia/industry-trends/biggest-exporting-industries/.
3. Daniel Wild and Kevin You, *Australia's Green Tape Army: An Analysis of the Growth of the Environmental Bureaucracy and Agricultural Sector* (Institute of Public Affairs Research Report, September 2022).
4. Australian Bureau of Statistics, *Australian National Accounts: National Income, Expenditure and Product: June 2023* (6 September 2023) Available from: https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-national-income-expenditure-and-product/latest-release.
5. Daniel Wild, *Australia's Declining Economic Competitiveness* (Institute of Public Affairs Parliamentary Research Brief, 2017).
6. IMD, *IMD World Competitiveness Centre* (2023); Scott Hargreaves, Daniel Wild and Kevin You, *Liddell The Line In The Sand: Why It's Time to Hit Pause on the Closure of Coal-Fired Baseload Power Stations in the NEM* (Institute of Public Affairs Research Report, 2023) 1-44.
7. Treasury, *Budget 2023-24 Budget Paper No. 1* (9 May 2023) 7.
8. Productivity Commission, *PC Productivity Insights: Bulletin 2023* (July 2023) 4.
9. Section 243(2) of the *Fair Work Act 2009* gives examples under which employers can be brought together in multi-enterprise agreements.
10. Mark Mourell, *IR Bill a Deal Breaker* (2023) Vol 75, Issue 3 *IPA Review* 40-45.
11. See Daniel Wild, *Reducing Red Tape in Australia: One-in-two-out Rule* (Institute of Public Affairs Research Report, May 2017); Kevin You, *Submission to the Inquiry into Promoting Economic Dynamism, Competition, and Business Formation* (Institute of Public Affairs, March 2023).
12. See Kevin You and Morgan Begg, *Australia's Spending Crisis* (Institute of Public Affairs Research Report, May 2023); Daniel Wild and Darcy Allen, *Five Principles of Red Tape Reduction* (Institute of Public Affairs Research Report, April 2018).
13. See Saxon Davidson, *Unprecedented Nation-wide Jobs Crunch: Geographic Analysis of Worker Shortages in Australia* (Institute of Public Affairs Research Report, September 2023).

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