Logistics and costs for Australia to achieve net-zero carbon dioxide emissions by 2050

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Foreword

Across the world, politicians are going out of their way to promise fantastically expensive climate policies. US President Joe Biden has promised to spend $US500bn ($648bn) each year on climate — about 13 per cent of the entire federal revenue. The EU will spend 25 per cent of its budget on climate.

Most rich countries, stampeded by climate activists and peer pressure now promise to go carbon neutral by mid-century.

Surprisingly very few countries have made a serious independent estimate of the cost.

In this study, I estimate the total cost to Australia of achieving net-zero carbon dioxide emissions by 2050 to be approximately $1.4 trillion.

Any country aiming to achieve net-zero carbon dioxide emissions must replace all fossil fuel burning equipment with carbon-free equipment and generators. Where that is not possible, carbon offsets must be employed.

The Australian Labor Party has pledged to commit Australia to net-zero carbon dioxide emissions by 2050 if it wins government.

With the Northern Territory signing up for net-zero in July 2020, every state and territory has now adopted a net-zero target.

"Every state and territory has now adopted a net-zero target, meaning Australia now has a de facto national net-zero target," Climate Council CEO Amanda McKenzie said in a July 10, 2020 statement.

"The national net-zero target is a message to all investors. Australia will be out of fossil fuels by 2050."

The Prime Minister has been moving towards such a commitment for some months. "Our goal is to reach zero emissions as soon as possible, and preferably by 2050", said Mr Morrison in a speech on February 1, 2021.

So now it is imperative to closely examine what such a commitment really means for Australia.

In this report, I'll present what net-zero carbon dioxide emissions for 2050 means for Australia in terms of cost and the rate of deployment of carbon-free energy and the coincident decommissioning of fossil fuel infrastructure.

To conduct the analysis I used data from the federal government report **'Australian Energy Update, Commonwealth of Australia 2020 – Guide to the Australian Energy Statistics 2020'**[1], as well as other sources quoted in the endnotes.

Contents

Executive summary

This study will show that to achieve net-zero carbon dioxide emissions by 2050, Australia will need to:

1. Decommission an amount of fossil fuel-burning generators, vehicles and equipment that collectively consume 1,085,000 gigawatt-hours of fossil fuel annually and replace with zero-emission equipment.
2. Install 119,000 wind turbines over an area of 60,000 square kilometres, an area as large as the area of 3 million MCG stadiums. Construction and installation of the turbines will consume 36 million tonnes of steel and 145 million tonnes of concrete.
3. Install 6 million rooftop solar systems.
4. Build 22,000 solar farms.
5. For the 516,000 gigawatt-hours of fossil fuel-burning equipment that cannot be replaced, provide carbon offsets by planting 17 billion trees for a total cost of $53 billion.
6. Build 25 new baseload power stations utilising small nuclear reactors at an estimated cost of $33 billion
7. Spend an estimated total of $850 billion on infrastructure
8. Take an estimated $540 billion hit to the economy, bringing the total cost to $1.4 trillion.

This infrastructure requirement may be tweaked with more of some items and less of others but it will still need to add up to the total number of gigawatt hours to replace or offset.

The total gigawatt-hours are based on Australia's current energy usage, derived from the Australian government report **'Australian Energy Update, Commonwealth of Australia 2020 – Guide to the Australian Energy Statistics 2020'**.

If construction started on 1st January 2022, a total of 354 wind turbines would need to be installed every month, or 11.8 every day, until 2050, at a total cost of $476 billion.

In the same time frame, 18,000 solar rooftop systems would need to be installed every month together with 67 solar farms at a total cost of $326 billion.

The total infrastructure cost would run out at $850 billion, not including ancillary costs such as the construction of power lines connecting remote wind and solar farms to the main power grids.

For all the massive costs and societal disruptions, the impact on global temperatures would be, in the words of Australia's chief scientist, "virtually nothing".

1. Definitions

To those not familiar with the subject I will give a brief explanation of the terms and units used in this analysis.

A watt is a unit of power and is used to quantify the rate of energy transfer.

Units: 1 kilowatt (KW) is a thousand watts

1 megawatt (MW) is 1,000 kilowatts = 1 million watts

1 gigawatt (GW) is 1,000 megawatts = 1 billion watts

Electrical generating plants are often designated as having a capacity of so many Megawatts or even Gigawatts, but this is not very helpful as it doesn't specify how much electricity it can actually generate over a specified time period.

A more useful unit is the megawatt-hour (MWh) or gigawatt-hour (GWh), which is the actual amount of electricity generated over one hour. For example, an electricity generator supplying one megawatt of energy for one hour will generate one megawatt-hour (MWh) of electricity. For generators operating 24 hours per day, such as coal or nuclear plants, a one-megawatt plant can generate 8,760 megawatt-hours (MWh) in one year, where 8,760 is the number of hours in one year. For a solar farm where the solar panels can only gather energy five hours per day, the multiplier becomes 8760 x 5/24.

A further complication is that the Australian Energy Update Report specified above quotes most energy consumed or generated in another unit, petajoules (PJ). For this analysis, I have converted petajoules to gigawatt-hours, where one petajoule is equal to 277.778 gigawatt-hours.

I added an extra column to the tables derived from the above report showing energy also in gigawatt hours, which makes it easier to follow examples later.

2. Energy consumption per annum

The relevant figures for energy consumption are shown in Table 1:

Table 1 - Australian Energy Consumption by Energy Type - 2019

	PJ	GWH	Share (per cent)
Oil	2,402.1	667,250.5	38.8
Coal	1,801.6	500,444.8	29.1
Gas	1,592.7	442,417.0	25.7
Total Fossil	**5,796.4**	**1,601,112.3**	**93.6**
Renewables	399.6	110,000.0	6.4
Total	**6,196.0**	**1,711,112.3**	**100**

PJ is energy in petajoules
GWH is energy in gigawatt hours
1 petajoule = 277.778 gigawatt hours
Source: Australian Energy Update, Commonwealth of Australia 2020

The figures include not only electricity generation but fuels consumed by industry, aircraft, passenger vehicles, trucks, mining equipment and heavy machinery. With over 2 million rooftop solar systems, a number of solar farms and wind turbines, renewables provide only 6.4 per cent of Australia's energy needs.

The problem of looking to renewables to supply all of Australia's energy needs by 2050 is the difficulty of scaling up. Some 20 per cent of all residences, mainly the more affluent, already have rooftop solar. This relatively high figure was achieved mainly because of large taxpayer-funded subsidies. Under this scheme, the less wealthy homeowners are often subsidising the more wealthy homeowners who can afford to install solar.

3. Replacing fossil fuels with renewables

For Australia to reach its net zero target with renewables, it will have to decommission 1,601,112 GWh of fossil fuel generators and devices (Table 1) and replace them with a combination of solar and wind turbines. Where they can't be decommissioned, carbon offsets will have to be deployed.

Not all fossil fuel devices can be decommissioned. A problem arises with converting large trucks and industrial machinery to electric.

For example, the Caterpillar 797F dump truck is powered by a 4,000 horsepower turbocharged diesel engine. At full power it will require 2.98 megawatts of energy. Assume the truck runs at 50 per cent of maximum power for an eight-hour shift. It would consume around 12 megawatt-hours of electricity. It would need 120 of Tesla's latest automotive batteries to power it. The batteries would weigh 64 tonnes

This is just an example of the impossibility of converting large machinery to electric. Not to mention converting a Boeing 787.

The following table lists energy consumed by sectors that can only be partially converted.

Table 2 -Australian Energy Type by Sector

	PJ	GWH
Transport	1,748.4	485,667.0
Manufacturing	1,050.2	291,722.4
Mining	812.4	225,666.8
Agriculture	103.1	28,638.9
TOTAL	**3,714.1**	**1,031,695.1**

PJ is energy in petajoules
GWH is energy in gigawatt hours
1 petajoule = 277.778 gigawatt hours
Source: Australian Energy Update, Commonwealth of Australia 2020 Page 11

Let's assume that 50 per cent of the vehicles and equipment in these sectors can be converted to electric. That amounts to 515,847 GWH to be subtracted from the total fossil fuel amount of 1,601,112 GWH (Table 1), leaving 1,085,265 GWH to be replaced by renewables. The other 515,847 GWH will need to be dealt with by carbon offsets, which we will come to.

The following table lists the sources of renewable energy in Australia for the 2019 year. The only renewables with expansion capability are wind and solar PV, the other sources are mostly static.

Wind and solar make up just 32,633 gigawatt-hours of the total.

Table 3 - Australian Renewable Energy Consumption by Fuel Type For 2019 year			
	PJ	GWH	Share (per cent)
Biomass	179.1	49,750.0	44.8
Biogas	16.3	4,527.8	4.1
Biofuels	7.4	2,055.6	1.9
Other	4.6	1,277.8	1.2
Hydro	57.5	15,972.2	14.4
Wind	63.8	17,772.2	16.0
Solar PV	53.5	14,861.1	13.4
Solar hot water	17.5	4,861.0	4.4
TOTAL	**399.7**	**111,027.9**	**100.0**

PJ is energy in petajoules
GWH is energy in gigawatt hours
1 petajoule = 277.778 gigawatt hours
Source: Australian Energy Update, Commonwealth of Australia 2020

4. The task

And therein lies the problem. How do we scale up some 33,000 GWH of wind and solar to 1.085 million GWH, a factor of 33?

Iced-up solar panels Germany February 2021

A large amount of baseload power will still be needed when the wind stops blowing and the sun stops shining. Storage batteries will offset some of the baseload needs. But without being recharged during prolonged rainy and cloudy periods or wind-free periods, the batteries will run down. Commercial and industrial buildings could not afford to be without power and would still stay connected to the grid.

But wind turbines and solar panels will not cut it, even with backup batteries. They require baseload power and the only means of providing such carbon-free baseload power is by way of nuclear power generation.

Nuclear produced energy is clean, green, reliable baseload electricity. Australian politicians will have to get their heads around the fact that nuclear power is essential in meeting their net-zero targets. There is simply no other way to do it. (See nuclear power generation below)

Let's assume that around 6.5 per cent of total electricity generation needs to be baseload power to ensure continuity in adverse weather conditions. To generate this amount of CO_2-free baseload power it would be necessary to install 25 small modular nuclear plants, each of 300-megawatt capacity, across the six mainland states. These nuclear plants will jointly provide 65,000 gigawatt-hours per annum. As calculated below:

25 nuclear plants x 300 MW x 8760 (hours in 1 year)
= 65,700,000 MWh
= 65,700 GWh

That leaves a balance of 1,085,000 hours (rounded to the nearest thousand) to be shared between wind and solar. Table 4 shows the split between wind, solar and nuclear.

Table 4 - Fossil fuel replacements and offsets

	Gigawatt hours per annum	GWh/unit	Total units
Total fossil fuel emissions	1,601,112		
less carbon offsets	516,000		
Net replacement	1,085,112		
25 Nuclear plants	65,000	2600	25
Balance - wind and solar	1,020,112		
70% wind	714,078	6	119,013
10% rooftop solar	102,011	0.017	6,000,659
20% solar farms	204,022	9.12	22,371

If the split is 70 per cent wind and 30 per cent solar it equates to 713,000 GWh for wind, 203,822 GWh for solar farms and 101,911 GWh for rooftop solar, which will require 6 million installations (there is a total of 9 million dwellings in Australia and around 2 million rooftops already have solar.)

One wind turbine can generate on average 6 gigawatt-hours of electricity per annum. In a windfarm, the generally accepted minimum area required for each turbine is 0.5 square kilometres. This is to take into account topography and to ensure minimum air turbulence between turbines.

Wind turbines chop up a large number of birds and bats each year. Figures are hard to come by, but the US Fish and Wildlife Service estimate America's 67,000 wind turbines kill up to up to 500,000 birds and 888,000 bats each year.[2] Based on the US figures, the required 119,000 turbines could kill around one million birds, including the iconic wedge-tailed eagle, and 1.6 million bats annually.

The cost of an average wind turbine of 3 Mw capacity is about $4 million. The cost of installing 119,000 wind turbines in Australia will run out at around $476 billion. In addition, maintenance, estimated at $45,000 per unit will cost an additional $5.35 billion per annum.[3]

Materials required

Material requirements of a modern wind turbine have been reviewed by the United States Geological Survey. On average 1 MW of wind capacity requires 103 tonnes of stainless steel, 402 tonnes of concrete, 6.8 tonnes of fibreglass, 3 tonnes of copper and 20 tonnes of cast iron. The elegant blades are made of fibreglass, the skyscraper-sized tower of steel, and the base of concrete.[4]

5. Carbon footprints

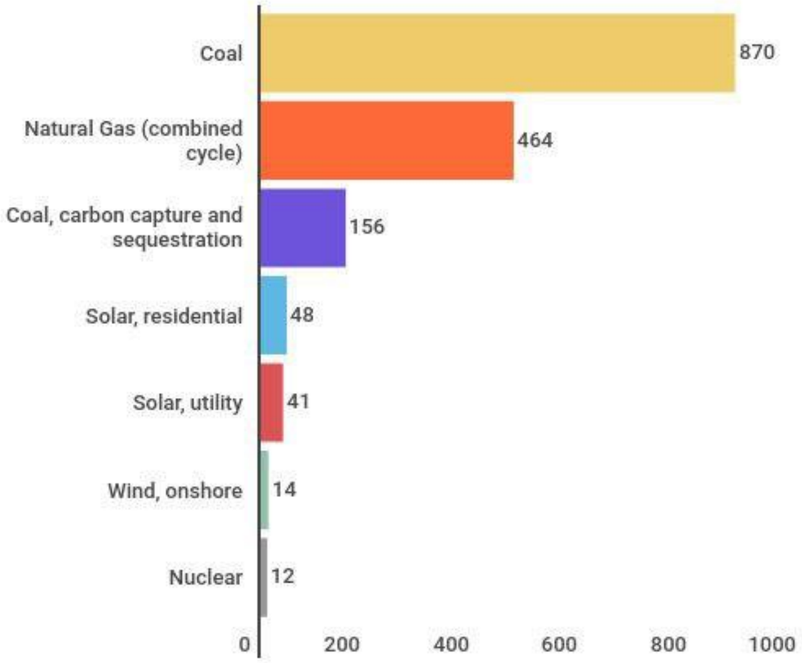
All types of electricity generators have a carbon footprint, which is the amount of CO2 generated over its lifecycle, from mining its constituent minerals, to the construction, maintenance and decommissioning of the generator.

Figures vary from researcher to researcher, but I have taken the figures of the 2017 report from the University of Texas as being the most authoritative[5].

The University of Texas carbon footprint figures for various forms of electricity generation are shown in the chart below.

One gram of CO2 per KWh equates to one tonne of CO2 per GWh.

Table 5 Estimated Carbon Footprints



grams of CO2 per kilowatt of electricity produced

Source: Joshua D. Rhodes, University of Texas at Austin, Energy Institute, 2017

6. Solar farms

Many solar farms are being built around Australia but they still account for a small percentage of renewables generation. I used a December 2019 report by MCG Quantity Surveyors[6] to arrive at a cost of building a 5-megawatt solar farm. The average cost from the two case studies is $11.9 million. Assuming an area of 20 acres is required for a solar farm of this size, gives a total space requirement of 1,810 square kilometres.

7. Nuclear power plants

Currently, there are 440 nuclear reactors in thirty countries in operation around the world. As of April 2020, 55 reactors were under construction, including 4 in the US and 12 in China.

A small modular nuclear power plant rated at 300 MW can generate 2,600-gigawatt-hours per annum (assuming continuous operation). It is assumed 25 such units producing a total of 65,000 GWh per annum would be required to produce sufficient backup energy. This is about 6.5 per cent of total energy requirements.

In its 2019 submission to the federal government **Inquiry into the Prerequisites for Nuclear Energy in Australia,** GE-Hitachi estimated the overnight capital cost of its BWRX-300 modular reactor at one billion dollars, where the overnight cost is the cost of the units without finance costs. Taking the worst case, the total finance costs could be as high as 30 per cent over the time taken to build and install such a plant.

This would bring the cost to $1.3 billion per unit and $32.5 billion for the 25 units.

Based on a study by the University of California, Berkeley, building such a plant requires approximately 8,000 tonnes of steel and 55,000 tonnes of concrete[7]

The practicalities for Australia are that after overcoming massive environmental hurdles, placing orders, training technicians and incurring long construction times, the first nuclear power plant would not be commissioned before 2030. That time frame is optimistic considering the time allocated to build Australia's next-generation submarine fleet. That leaves just 240 months to build 25 nuclear plants, or one plant every ten months.

Australia has by far the largest identified uranium resources in the world[8]

8. Cost comparisons

One way of comparing the costs of different energy producers is known as the levelised cost of energy (LCOE) which includes the lifetime costs of building, operating, maintaining and fuelling a power plant. The LCOE is calculated as the ratio between all the discounted costs over the lifetime of an electricity generating plant divided by a discounted sum of the actual energy amounts delivered.

Table 6

Levelized cost of electricity

Based on 5% WACC

Generator type	Median cost 5% WACC USD/MWh
Coal	61
Gas - Combined Cycle	71
Biomass - Dedicated	130
Geothermal	130
Hydropower	22
Nuclear	65
Concentrated Solar Power	150
Solar PV - rooftop	150
Solar PV - utility	110
Wind onshore	59
Wind offshore	120

Source: IPCC wg3 ar5 Table A.111.1 Page 1333

9. Carbon offset calculations:

Finally, let's deal with the matter of carbon offsets. Rounding out the calculation above we had an estimated 500,000 GWH that cannot be replaced with renewables. We must instead use carbon offsets by the planting of trees. To prevent fraud, the trees must be planted in Australia, where they can be monitored.

One kilowatt-hour of fossil fuel burning generates 0.707 kilograms of CO2[9]

According to the US Department of Agriculture, one mature tree can absorb 21 Kg of CO2 per annum.[10] However, for the carbon offset calculations below, I have chosen Pinus Radiata because it is one of the fastest growing trees. The information on sequestration of Pinus Radiata is sketchy, but it appears to be about 10 Kg per annum.

The table below calculates the total number of trees to be planted at 35 billion.

Table 7 - Carbon Offset Calculation

Units	Quantity	CO2 emitted (Kg)
Fossil fuel emissions/KWH	1	0.707
Emissions per gigawatt hour	1	707,000
		CO2 absorbed (Kg)
Tree	1	10
Trees/Gigawatt hour	70,700	
Total Gigawatt hours P/A	500,000	
Total tree required	35,350,000,000	
Carbon sequestered P/A (tonnes)	353,500,000	
Total cost @ $1.50/tree	$53,025,000,000	
Total are (Hectares)	35,350,000	

Number of trees to be planted to offset burning of fossil for equipment that can't be converted to electric
The 515.847 GWh to be offset annually is calculated on page 6.
The trees will take 20-30 years to reach maturity before they can sequesture this amount of CO2
Area required is based on 1,000 trees per hectare

The trees will take 20-30 years to reach maturity before they can absorb their full 10 kilograms of CO2 so there will be a constant backlog. A dog chasing its tail comes to mind.

It is difficult to get an estimate of tree planting costs, but let's assume the cost of each plant, together with labour, roads, firebreaks, maintenance, and management amounts to $1.50 per tree. That amounts to $53 billion in total.

It does not take into account the acquisition of land.

10. The global warming hypothesis

All of this economic pain and industrial disruption over an unverified hypothesis about the impact of carbon dioxide on global temperatures. Looking at the climate change subject rationally, it is quite bizarre that a colourless, odourless trace gas comprising just 0.04 per cent of the earth's atmosphere and essential to all life on the planet can be routinely described by governments and the media as a "pollutant." All life is carbon-based, and the primary source of this carbon is the CO2 in the global atmosphere.

There is no scientific evidence the planet is in any danger from runaway global warming. A "consensus" between a select group of "scientists" is not science. Science does not depend on consensus. It depends on testable hypotheses. We have a hypothesis that fossil fuels may be responsible for the very small increase in temperature over the last century. But such a hypothesis can only be tested over a very long period of time. All we have so far are predictive models. These have already been shown to be grossly inaccurate.

As there has been no discernible increase in earth's temperature for the past twenty years, the term "global warming" has quietly been abandoned in favour of an all-encompassing "climate change". Now every anomaly, whether it be drought or floods, can be attributed to the nebulous "climate change".

There is no evidence that hurricanes and cyclones are increasing in frequency and intensity. In fact, the reverse is the case.[11]

Studies by reputable institutions including the CSIRO, have concluded the average sea level rise between 1992 and 2016 is a minuscule 3.31 millimetres annually,[12] nothing like the six metres claimed by Al Gore.

The one indisputable fact about CO2 is that it is essential for all life on earth. Without it, there would be no life on earth for two very good reasons.

Firstly, CO2 is plant food. All plant life depends upon CO2. No CO2 means no plant life and hence no life on earth.

Secondly, the so-called greenhouse gases, of which carbon dioxide is just one, combine to make the planet habitable by raising the average temperature of the earth by some 20 degrees Celsius.

Without this greenhouse effect, the planet would largely be an uninhabitable ice sheet.

Carbon dioxide should be revered, not demonised.

Statement from Australia's Chief Scientist, Alan Finkel:

"On 1 June 2017 I attended a Senate Estimates hearing where Senator Ian Macdonald asked if the world was to reduce its carbon emissions by 1.3 per cent, which is approximately Australia's rate of emissions, what impact would that make on the changing climate of the world. My response was that the impact would be virtually nothing".[13]

Embarrassed, Finkel quickly put out a media statement trying to cover his tracks, but he did not deny his statement.

11. Summary

In section 4, I asked the question, how do we scale up from the current 33,000 gigawatt-hours of wind and solar to 1.085 million GWh, a factor of 33?

Together with the proposed nuclear plants and the carbon offsets (table 7), this is what is required for Australia to achieve its target of net-zero carbon dioxide emissions by 2050.

Table 8 reveals Australia must install 354 wind turbines per month, or 12 every day, as well as 17,842 rooftop solar systems and 72 solar farms every month until 2050, a logistically impossible task.

Table 8 - Rate of deployment

	Wind turbines	Solar rooftop	Solar farms	Nuclear
Total units required	119,013	5,994,765	22,371	25
Deploymant annually	4,250	214,099	799	10
Deployment/month	354	17,842	67	
Total area required (sq. km.)	60,000	n/a	1,810	85

It is assumed wind and solar will commence 1/1/2022
It is assumed deployment of nuclear plants will commence in 2030 and continue to 2050
It is assumed each wind turbine wil require 0.5 square kilometres of space
It is assumed each solar farm will occupy 20 acres. 1 Sq. kilometre = 247.1 acres
Based on total US nuclear plants, each plant requires 3.4 sq. km per Gw

Material requirements of a modern wind turbine have been reviewed by the United States Geological Survey. On average, 1 MW of wind capacity requires 103 tonnes of stainless steel, 402 tonnes of concrete, 6.8 tonnes of fibreglass, 3 tonnes of copper and 20 tonnes of cast iron. The elegant blades are made of fibreglass, the skyscraper-sized tower of steel, and the base of concrete.[14]

As a guide for material requirements for a nuclear plant, three academics from the University of Berkeley, California, produced a report showing the GT-MHR 286 MW nuclear plant requires 21,816 cubic metres of concrete (1 cubic metre weighs 2.4 tonnes) and 7,707 tonnes of total metal per plant.[15]

Table 9 - Total materials required in the manufacture of wind turbines and nuclear plants		
	Wind turbines	**Nuclear plant**
Total units	119,000	25
Average megawatt capacity	3	300
Total megawatts	357,000	7,500
Stainless Steel (tonnes)	36,771,000	192,675
Concrete (tonnes)	143,514,000	1,308,960
Fibreglass (tonnes)	2,427,600	
Copper (tonnes)	1,071,000	
Cast iron (tonnes)	7,140,000	

Estimated cost of Net-Zero infrastructure

Table 10 - Estimated infrastructure costs of net zero emissions by 2050

	Wind	Solar rooftop	Solar farms	Nuclear	Total
GWh per annum	713,378	101,911	203,822	65,000	1,084,111
Per unit GWh P/A	6	0.017	9.120	2,600	
Total units	118,896	5,994,765	22,349	25	
Cost/unit	4,000,000	10,000	11,900,000	1,300,000,000	
Cost/ GWh	666,667	588,235	1,304,825	500,000	
Cost - renewables $ billion	**476**	**60**	**266**		**801**
Cost = nuclear $ billion				**33**	**33**
Cost - carbon offsets $ billion					**53**
Total costs $ billion					**854**

One rooftop solar unit is defined as 20 x 300 watt solar panels plus one battery. The cost is before subsidies.
Costs do not include transmission lines, which can be considerable when connecting remote locations to power grids.
The cost/GWh provides an interesting comparison between the different types of electricity generators.
The carbon offsets figure is derived from Table 7.

Costs to the economy

In addition to the infrastructure costs, net-zero will inflict a considerable cost on the economy. Dr Brian Fisher is Managing Director of BAEconomics Pty Ltd. Dr Fisher has been involved in climate policy research since 1992 and has participated as a lead or convening lead author in three IPCC climate assessments.

In 2019, his firm, BAEconomics, carried out an analysis of the Labor Party proposal which it was taking to the 2019 federal election, to reduce emissions by 45 per cent by 2030, together with a target of 50 per cent renewables.

The report produced four different scenarios, depending on the level of abatement up to 45 per cent and the amount of international trade in abatement permits.

In the worst-case scenario, the report concluded that Labor's plan would result in:

- The NPV cumulative loss to the GNP by 2030 of $542 billion
- The wholesale price of electricity to rise 85% from $69/MWH to $128/MWH
- Real wages to fall by 8 per cent
- The loss of 167,000 jobs by 2030[16]

NPV (net present value) is the calculation of future cash flows at current values.

Although the above is the worst-case scenario, it still only represents 45 per cent CO2 emission reductions. Net-zero will almost certainly take a much larger toll on the economy and jobs, but as I can find no modelling of such a scenario, I will take GNP's $542 billion loss into account in my overall summary.

Table 11- Estimated total costs of net-zero emissions by 2050	
	$ Billion
Wind	**476**
Solar rooftop	**60**
Solar farms	**266**
Nuclear	**33**
Carbon offsets	**53**
Loss of GNP	**542**
TOTAL $ BILLION	**1,430**

The total cost would run out at approximately 1.4 trillion dollars, not including ancillary costs such as the construction of power lines connecting remote wind and solar farms to the main power grids."

By comparison, the federal government's annual total revenue pre-Covid was $493 billion.

One country that has not bought into the climate change lunacy is China. Chinese President Xi Jinping must be sitting back smugly watching the Western nation lemmings racing to the economic cliff.

Communist China, in 2020, built over three times as much new coal power capacity as all other countries in the world combined -- the equivalent of more than one large coal plant per week. In addition, over 73 gigawatts (GW) of new coal power projects were initiated in China, five times as much as in all other countries, while construction permits for new coal projects also accelerated.[17]

Also, in 2020, China's CO2 emissions rose by 1.5% while those of most other countries fell. Although in 2020, the world retreated from coal, these retirements were eclipsed by China's new coal plants.[18]

Even before China built those new plants, it was already the world's biggest emitter of fossil fuel carbon dioxide (CO2): In 2019, China was responsible for almost 30% of CO2 emissions -- roughly twice the amount emitted by the US, then the second-largest emitter.[19] China, the planet's primary coal consumer, already has the largest concentration of coal plants globally;[20] in 2020, it produced 3.84 billion tons of coal, its highest output since 2015. In addition, China, in 2020, imported 304 million tons of coal, up 4 million tons from 2019.[21]

12. Conclusion

And there you have it.

Massive industrial and economic disruption. Unreliable energy. Higher energy prices reducing Australia's international competitiveness.

Deployment targets that will be logistically impossible to achieve in the time frame.

A gargantuan total cost of 1.4 trillion dollars.

And in the words of Australia's Chief Scientist, virtually no impact on the world's climate.

It begs the question, why would any political party want to condemn Australia to such an ill-conceived scheme that would decimate our economy.

Meanwhile China happily continues building dozens of new coal-fired power stations, using its cheap electricity to manufacture goods cheaper than competitors in the Western world. It utilises the hundreds of billions of dollars profit from this unfair trading practice to buy up assets around the world as well as building up an already menacing military presence.

Xi Jinping must be laughing all the way to the bank.

13. Endnotes
14.

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