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AEMO Draft 2022 Integrated System Plan
December 2021

Submission

Contents

1 Executive Summary

AEMO's 2022 ISP is a very important document as it will be a roadmap for the generation of electricity in Australia for the next several decades. The generation of electricity is a cornerstone of the welfare, health and prosperity of our nation.

The ISP must be robust, accurate and based on factual information and provide a way forward which is deliverable.

Page 8 of the ISP promotes transformation by "replacing legacy assets with 'low-cost renewables, adding batteries and other forms of firming capacity …. while continuing to provide reliable, secure, and affordable electricity to consumers".

With respect to electricity supply security, one of the stated operational requirements on page 19 of the ISP is to "provide sufficient supply to match demand from consumers at least 99.988% of the time". This percentage covers 8759 hours of the 8760 hours in a year.

It is then somewhat perplexing that page 46 of Section 4.2 needs to state "the willingness of consumers to lower their consumption during high price periods will also have an important role to maintain reliability and avoid involuntary load shedding". It would appear that the ISP is admitting it cannot meet one of its stated requirements and an analytical review of the ISP has led to the same conclusion.

This submission will consider the possible:-

- use of total consumption figures rather than the quoted operational consumption figures in the draft ISP;
- an overestimation of the amount of rooftop PV generation in 2050
- annual shortfall of 105 TWh by 2032 - this amount is 40% of the expected demand in 2032;
- under estimation of the 45 GW of storage proposed by the ISP as the amount needs to be closer to 590 GW;
- under estimation of the amount of 9 GW of gas-fired generation for peak loads and firming proposed by the ISP;
- actual need to reduce carbon dioxide emissions

2 AEMO's Current And Future Electricity Demand

Page 9 of the draft ISP predicts that AEMO delivery of electricity will increase from the current amount of 180TWh (which is the operational total) to 330 TWh in 2050. It would be more appropriate for the ISP to refer to the total consumption amount which currently is 208 TWh and predicted to increase to 470 TWh – see Figure 1. The main contributing generator to total consumption above operational consumption is Rooftop PV which according to Figure 1 is currently 17 TWh.

Figure 1 – AEMO's Total and Operational Consumption Predictions 2022 to 2050

AEMO Electricity Consumption Projections (TWh)

Year	2022	2030	2040	2050
Total	**207.5**	**254.9**	**347.5**	**472.2**
Energy Eff	4.4	21.5	42.1	55.1
Small NS Gen	6.2	12.5	22.0	32.4
Rooftop PV	17.2	36.5	53.0	64.9
Operational Total	**179.6**	**184.4**	**230.5**	**319.7**
Losses	10.0	10.8	13.8	17.4
Hydrogen	0.0	0.1	13.6	57.7
Electrification	11.5	31.2	52.9	76.5
Electric Veh	0.1	6.8	37.3	67.0
Residential	37.3	23.0	13.8	12.7
Business	120.7	112.5	99.2	88.4

Since page 10 (see Figure 2) of the ISP predicts that by 2050 Rooftop PVs will meet nearly one fifth of NEM's demand, it is considered important that the ISP refers to total consumption.

However, there is a concern regarding the prediction that one fifth of demand will be met by Rooftop PVs. Page 10 states that currently 30% of detached homes have rooftop PVs with a combined capacity of 15 GW and that by 2050, 65% of homes with have rooftop PVs with a capacity of 69 GW.

Further, the 30% of detached homes (being 2.7 million out of the 9 million homes in the NEM states) with rooftop PVs currently produce 17 TWh (see Figure 1). Page 10 predicts that by 2050, 65% of homes will have rooftop PVs and will generate 90 TWh. With the predicted population increase to 32 million over the next 30 years in the NEM states by 2050, 65% of the then number of homes will be 8.3 million.

If 2.7 million homes generate 17 TWh then 8.3 million homes would generate 52 TWh and not 90 TWh.

This discrepancy appears to be a significant short coming in the draft ISP's predicted future generation sources. Instead of rooftop PVs producing one fifth (20%) of NEM's demand (as predicted by the ISP), the rooftop PVs will produce only one eighth (12%) of NEM's demand. It must be noted that the current generation percentage of rooftop PV is 8% to the NEM. It is concerning that rooftop PVs' predicted contribution to consumption will only increase to 12%.

Figure 2 – Extract from Page 10 of the draft ISP

Executive summary

- **Nearly five times the distributed PV capacity, and substantial growth in distributed storage.** The NEM's transformation includes the generation and feed-in capability of millions of individual consumer-owned solar power plants. Today, ~30% of detached homes in the NEM have rooftop PV, their ~15 GW capacity meeting their owners' energy needs and exporting surplus back into the grid. By 2032, over half of the homes in the NEM will do so, rising to 65% with 69 GW capacity by 2050, with most systems complemented by battery energy storage. Their 90 TWh of electricity will then meet nearly one fifth of the NEM's total underlying demand.

3 The Prediction of the Closure of Coal Plants by 2032

The draft ISP (page 9) suggests that it is highly probable that by 2032, all brown coal generation & two-thirds of black coal generation will be removed from the market.

With reference to NEM data, the annual generation by all brown coal plants & two-thirds of the black coal plants was 104 TWh in 2019 which is 75% of the coal generation capacity in the NEM states.

Let's consider the quantum of wind & solar farms that would need to be built over the next 10 years to replace the 104 TWh.

The number of operating wind farms in AEMO's five states is 65 with an average generation capacity of 130 MW and an average output of 350GWh. If half of the 104 TWh (52 TWh), was to be generated from wind farms, then 150 average sized wind farms would have to be built over the next 10 years.

The AEMO states have 52 operating solar farms with an average generation capacity of 94MW and an average annual output of 170 GWh. To produce a further 52 TWh another 305 average sized solar farms need to be built during the next 10 years.

It has taken 20 years to build 65 wind farms and 52 solar farms. It is highly improbable for 15 wind farms and 30 solar farms to be built each year for the next 10 years as this is the rate of construction required to replace the predicted coal plant closures.

At present, the Australian Energy Infrastructure Commissioner's website predicts that between now and 2032 new wind & solar projects with the capacity to produce 34 TWh annually will be built.

Page 10 of the draft ISP suggests that by 2032, 50% of the then total number of households with have rooftop solar systems. A similar calculation to that in Section 2 above, suggests that an additional 15 TWh will be available from rooftop PV's by 2032.

Of the 104 TWh which must be replaced due to the predicted coal plant closures, only 49 TWh of renewables are planned to be built leaving a deficit 55 TWh.

Furthermore by 2032 an additional 50 TWh of electricity will be required (see Figure 1). The total deficit will be approximately 105 TWh. No doubt the number of new wind & solar projects built by 2032 will produce more than the predicted 34 TWh annually but the number the of projects would have to triple to meet the predicted power demand in 2032. Such a scenario is highly unlikely.

The draft ISP needs further development so that "energy resources provide sufficient supply to match demand from consumers at least 98.998% of the time.

4 Solar and Wind Droughts and Battery Storage

The provision of enough wind and solar power by 2032 is one very significant issue while another such issue is the intermittency of wind & solar power.

Page 10 refers to long 'dark and still' weather periods and page 98 of the draft ISP refers to wind or solar droughts and the consequent need for battery storage and peaking plants.

Section 4 of the draft ISP predicts that 9,000 MW of peaking gas plants and 45,000 MW of new battery and hydro storage are required to meet the power demand during these 'low generation' periods. This prediction is an under estimation of the energy supply required to satisfy demand during 'dark and still' weather periods and wind and/or solar droughts

Here is an example of what could be called a solar and wind drought. Figure 3 below was taken from a live website, which monitors the sources of generation of electricity for each state, at 5:40pm on August 26, 2021 and Figure 4 shows the generation statistics about 12 hours later at 6am on August 27, 2021. Of the 300,000 MWh consumed in the AEMO states during this 12-hour period coal produced around 200,000 MWh. Also, during most of the winter months not a great deal of solar power is generated between 6am & 9am or between 3pm and 6pm. Often coal is required to produce about 60,000 MWh during these 6 hours. In total, during this 18-hour period (3pm -9am), coal produces up to 260,000 MWh.

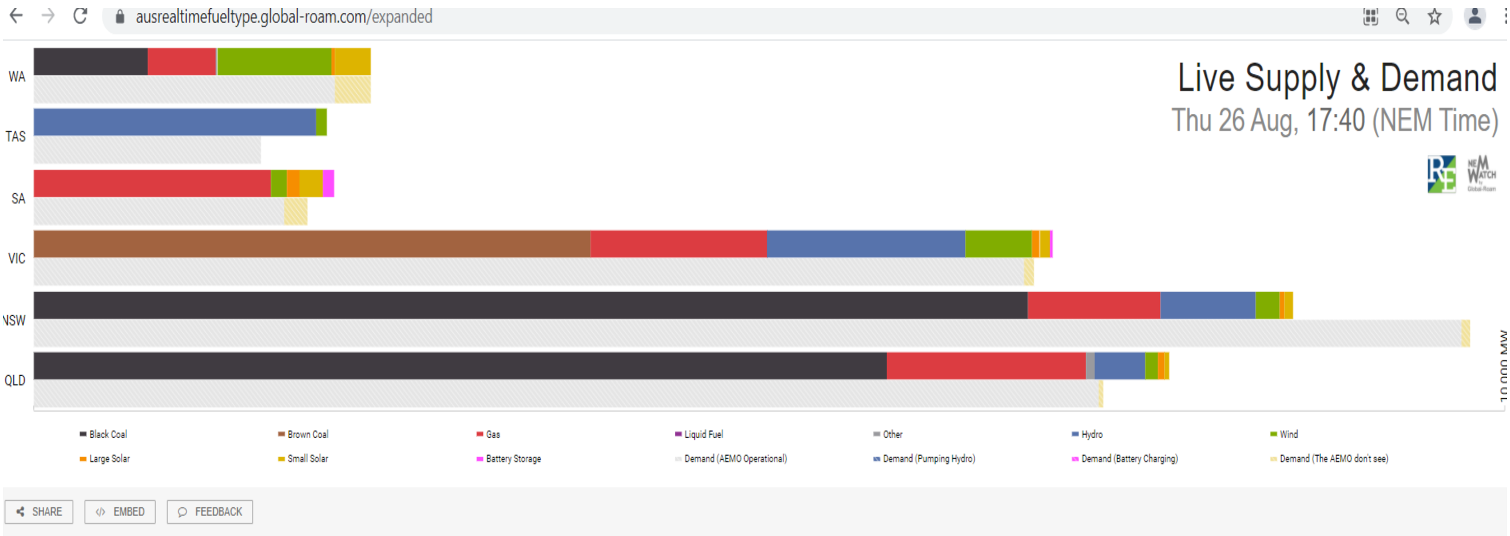
With the predicted increase in electricity consumption (see Figure 1), by 2032, AEMO will need about 320,000 MW of utility battery storage at a cost of $320 billion to provide a secure power supply during wind & solar droughts.

By 2050, during this same 18-hour period, the demand will be 590,000 MWh (see Figure 1). With the planned demise of all coal fired power stations about 590,000 MW of storage will be needed at a cost in the vicinity of $590 billion.

The proposed 9000 MW of gas peaking plants will be inadequate as gas peaking plants are not designed to run for 12 to 18 hours a day and on a daily basis as would be required.

With respect to the predicted demise of most of the coal plants by 2032, it is noted that the 2000 MW Snowy Hydro 2.0 is the only current pumped hydro project with Kidston (250MW) being the only proposed pumped hydro project in the AEMO jurisdiction. Taking into consideration the lead-in time for such projects, it will be more than a decade before any other project is commissioned.

Figure 3 – Electricity Generation by Source for Each State – Live Website 26 August 5:40pm



Generation

Region	Black Coal	Brown Coal	Gas	Liquid Fuel	Other	Hydro	Wind	Large Solar	Small Solar	Battery Storage	Total
Western Australia	775	-	462	0	11	-	776	23	246	-	2,292
Tasmania	-	-	0	-	0	1,922	71	-	1	-	1,993
South Australia	-	-	1,610	0	0	-	108	89	158	78	2,044
Victoria	-	3,783	1,203	-	0	1,348	454	52	70	19	6,928
New South Wales	6,759	-	900	0	0	648	164	32	60	-	8,562
Queensland	5,800	-	1,353	0	58	342	87	46	33	0	7,720
Total	13,334	3,783	5,529	0	69	4,259	1,659	242	568	97	29,539

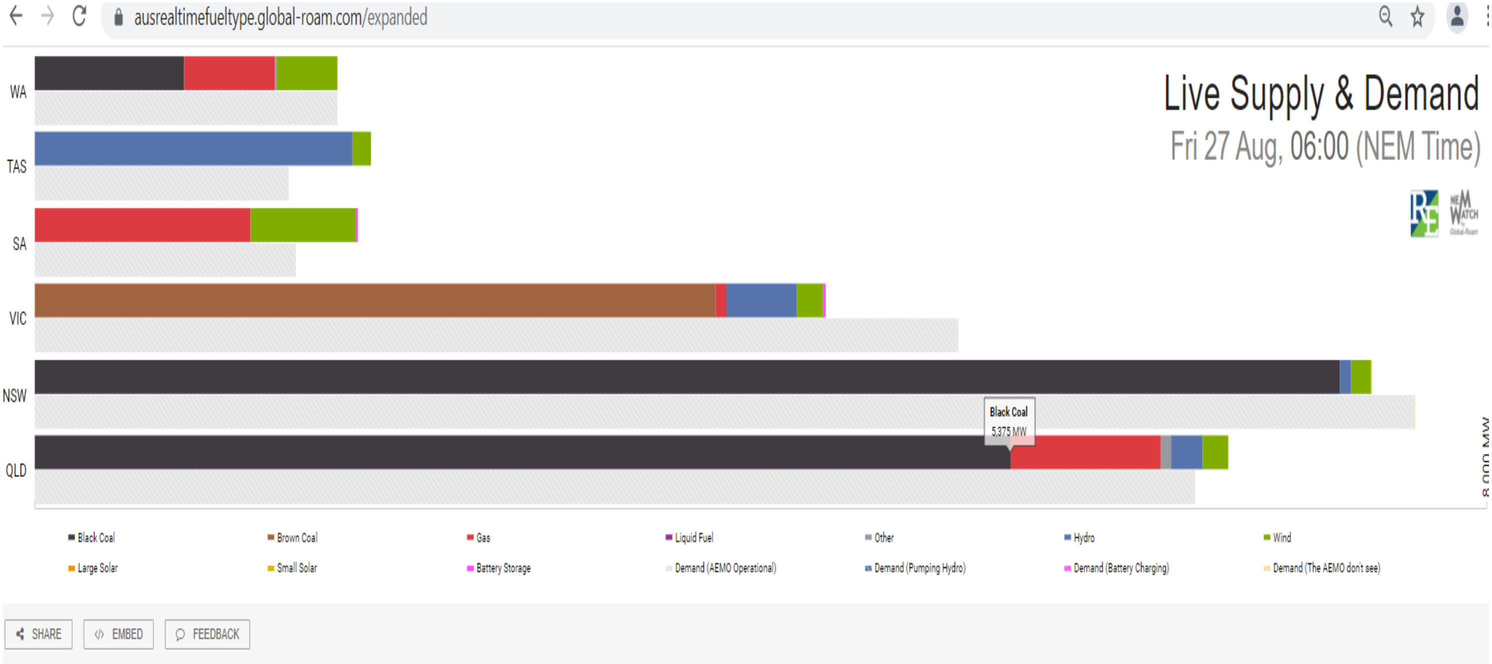
Demand

Table 1 – Percentages of Generation Sources on 26 August June 5:40pm

Generation Source	AEMO States
Renewables	5%
Hydro	15%
Fossil Fuels	80%

Coal and gas generators provide 58% of NEM's capacity but as Table 1 shows, on 26 August at 5:40pm, they were providing 80% of generation while wind & solar which provide 27% of NEM's capacity were providing 5% of generation.

Figure 4 – Electricity Generation by Source for Each State – Live Website 27 August 6am



Generation

Region	Black Coal	Brown Coal	Gas	Liquid Fuel	Other	Hydro	Wind	Large Solar	Small Solar	Battery Storage	Total
Western Australia	824	-	498	0	11	-	333	0	0	-	1,666
Tasmania	-	-	0	-	0	1,749	102	-	0	-	1,851
South Australia	-	-	1,187	0	0	-	580	0	0	13	1,780
Victoria	-	3,751	59	-	0	388	145	0	0	15	4,359
New South Wales	7,191	-	0	0	0	63	107	0	2	-	7,363
Queensland	5,375	-	827	0	60	172	141	0	0	0	6,575
Total	13,390	3,751	2,572	0	71	2,373	1,408	0	2	27	23,595

Table 2 – Percentages of Generation Sources on 27 August 6am

Generation Source	AEMO States
Renewables	5%
Hydro	10%
Fossil Fuels	85%

Table 2 shows, on 27 August at 6am, coal & gas were providing 85% of generation while wind & solar were providing 5% of generation.

The windless night illustrated in Figures 3 and 4 is not an isolated occurrence. Table 3 below lists the 106 days in 2021 when wind power contributed 5% or less of the overnight generation of electricity.

On these 106 nights solar was producing no electricity and wind power could manage only 5% of the total generation capacity. It would seem that a solar and wind drought occurred on each of these 106 nights.

Table 3 – Dates in 2021 When Wind Power Contributed Less Than 5% Overnight

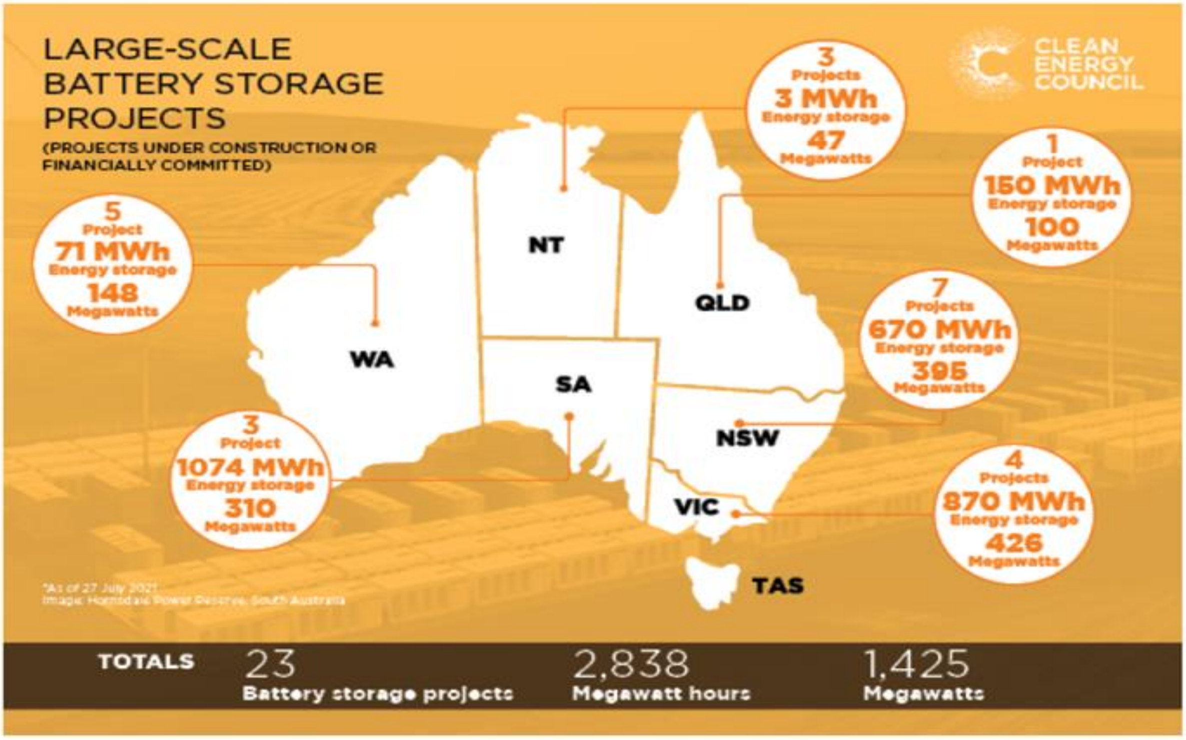
Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
9	20	6	1	3	2	3	8	14	2	1	1
10	21	7	2	7	3	7	17	15	8	7	14
12	24	8	7	8	12	8	18	16	11	8	15
13	25	10	8	9	13	9	26	22	14	9	16
14	26	15	12	12	14	12	27	26	17	16	21
20	27	27	16	17	15	17	29		22	17	22
21	28	28	18	18	20	18			25	19	23
22		29	21	21	27	21			26	20	24
23		30	24	30		30			30	24	30
24		31	25						31	29	
			26							30	
			28								

The Snowy Hydro 2.0 and Kidston projects mentioned above have a combined output capacity of 2250MW. As shown in Figures 3 & 4 the overnight consumption is between 20,000 & 20,000 MWh so these two hydro projects will meet about 10% of demand.

Figure 5 below is from the Clean Energy Council website which indicates that the proposed battery projects have a total storage capacity of 2838 MWh. For the next 10 years Australia needs to be building 30,000MW of battery storage capacity each year.

It would appear that the amount of utility battery storage proposed is inadequate to service the AEMO states.

Figure 5 – Proposed Large Scale Battery Storage Projects



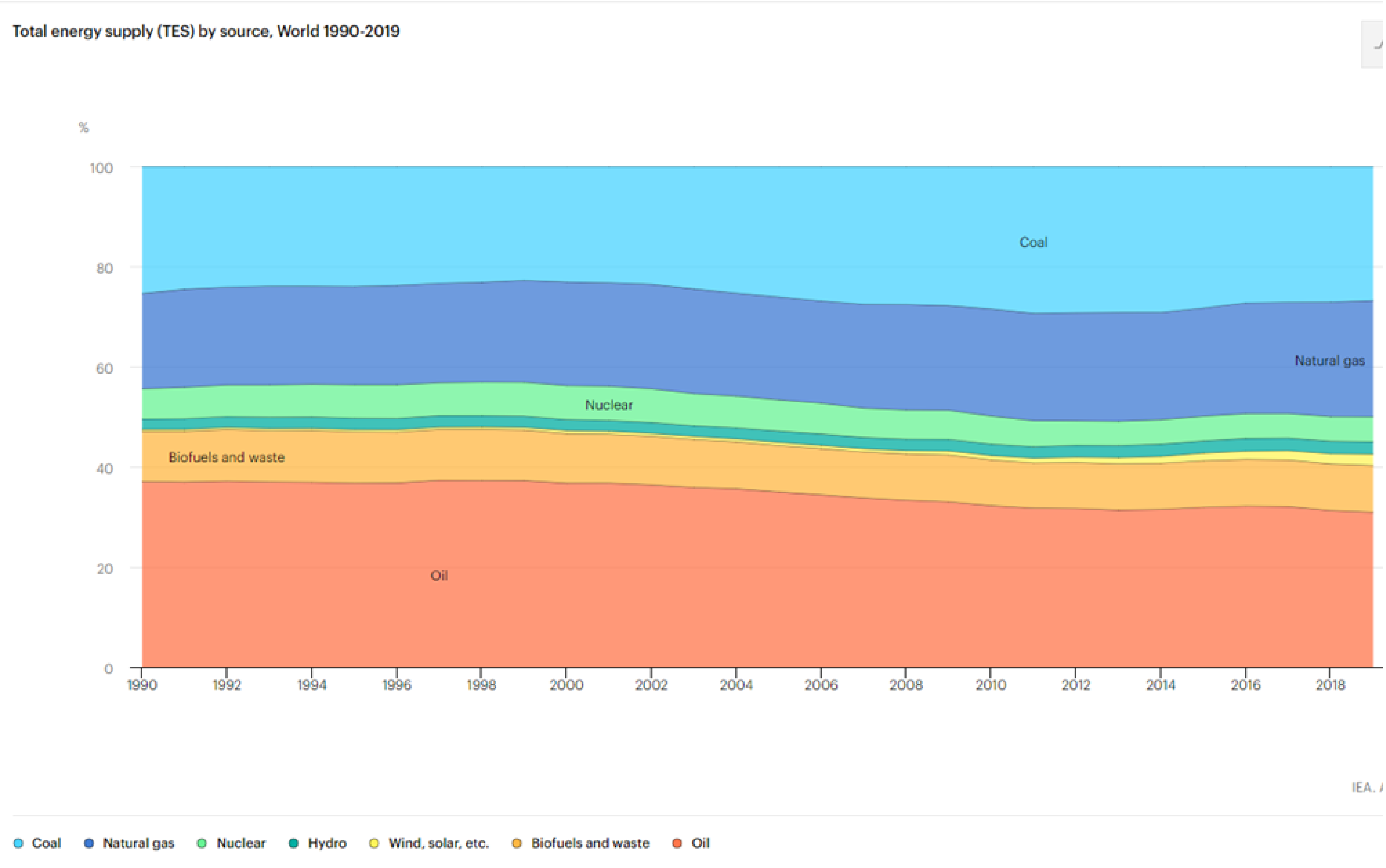
5 Is Net Zero Emissions by 2050 Achievable

The Inter-governmental Panel on Climate Change (IPCC) and the United Nations have been encouraging countries around the world to adopt a ‘net zero emissions by 2050’ policy by removing fossil fuels from generating all types of energy. Australia has adopted such a policy.

AEMO’s draft ISP is highly influenced by this policy as the ISP attempts to plan how the electricity generation sector can achieve ‘net zero emissions by 2050’ by relying nearly solely on wind and solar power. As discussed above this objective is not achievable.

Figure 6 below is the International Energy Agency's (IEA) graph showing the percentages of the various sources of the world's total energy generation (electricity, transport, heating, manufacturing etc) since 1990. 30 years ago, fossil fuels generated 82% of the world's energy and wind & solar 0.5%. In 2019 fossil fuels generated 81% of the world's energy and wind & solar 2%. The respective percentages have hardly changed in the last 30 years. It seems quite improbable that these percentages will change by the very significant amount required to achieve net zero emissions in another 30 years.

Figure 6 – International Energy Agency's Graph Showing the Percentages of Sources of all Global Energy



The initial promotion of 'net zero emissions by 2050' by the IPCC & the UN was not supported by a technical 'global road map' document showing how this goal could be achieved. Subsequently the IEA has produced a 'global road map' stating what changes to the generation of electricity would be required in order to achieve net zero emissions by 2050.

Figure 7 is an extract from the IEA report and predicts that global electricity consumption will double by 2050 from the current amount of 26,800 TWh and that wind and solar power would then have to account for half (26,800 TWh) of the supply.

Figure 7 – Extract from the IEA Net Zero Emissions by 2050 Report

1.4.4 Electricity generation

Global electricity generation nearly doubles during the next three decades in the APC, rising from about 26 800 terawatt-hours (TWh) in 2020 to over 50 000 TWh in 2050, some 4 000 TWh higher than in the STEPS. Low-emissions energy sources provide all the increase. The share of renewables in electricity generation rises from 29% in 2020 to nearly 70% in 2050, compared with about 55% in the STEPS, as solar PV and wind race ahead of all other sources of generation (Figure 1.14). By 2050, solar PV and wind together account for almost half of electricity supply. Hydropower also continues to expand, emerging as the third-largest energy source in the electricity mix by 2050. Nuclear power increases steadily too, maintaining its global market share of about 10%, led by increases in China. Natural gas use in electricity increases slightly to the mid-2020s before starting to fall back, while coal's share of electricity generation falls from around 35% in 2020 to below 10% in 2050. At that point, 20% of the remaining coal-fired output comes from plants equipped with CCUS.

Hydrogen and ammonia start to emerge as fuel inputs to electricity generation by around 2030, used largely in combination with natural gas in gas turbines and with coal in coal-fired power plants. This extends the life of existing assets, contributes to electricity system adequacy and reduces the overall costs of transforming the electricity sectors in many countries. Total battery capacity also rises substantially, reaching 1 600 gigawatts (GW) in 2050, 70% more than in the STEPS.

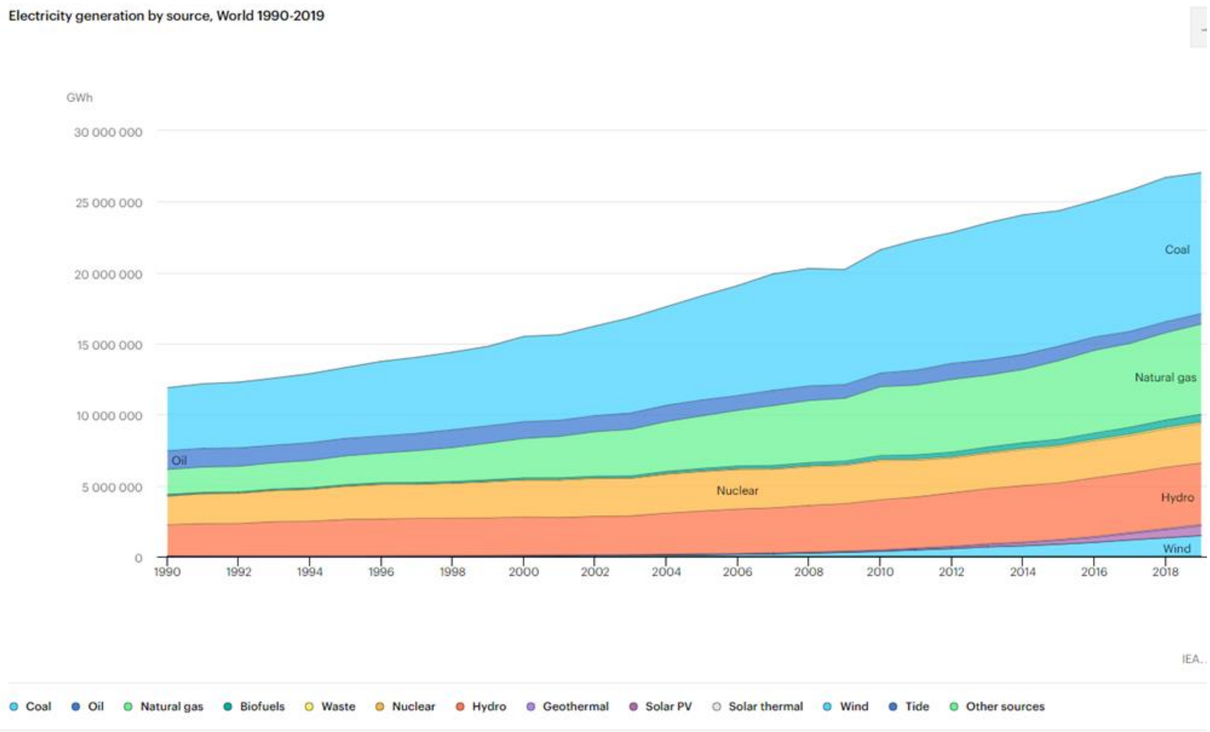
Chapter 1 | Announced net zero pledges and the energy sector 45

As is illustrated in Figure 8 below the growth rate in global wind and solar power has averaged 173 TWh per year over the last 10 years. To achieve net zero emissions by 2050 the average annual growth rate for wind and solar would have to increase nearly 5-fold to be 830 TWh a year for the next 30 years.

It needs to be acknowledged by AEMO that this increase in growth rate is not achievable.

The prediction of half of the world's electricity being generated by wind and solar is a cornerstone of IEA's net zero emissions by 2050 program. With this prediction unattainable, the whole concept of the world achieving net zero emissions by 2050 needs to be reconsidered.

Figure 8 – IEA's Graph Showing the Contributions Made by the Various Generation Sources of Global Electricity



6 ISP Re-Think

The discussion above has shown that over the next 30 years, Australia cannot transition solely to renewable electricity generation. Such a transition may occur later in the 21st Century but not in the foreseeable future.

To put it succinctly, Australians are entitled to 24/7 power so Australia must have a system that generates power 24/7. Wind and Solar power are technically called 'intermittent' sources of energy and, over the next 30 years we cannot build wind and solar farms as well as utility battery storage quickly enough to fill the void left by the retirement of our ageing coal power plants.

Australia must do what other developed or developing countries in the world are doing, and that is building baseload, dispatchable power plants. If we do not, the economic, social and welfare standards that Australians enjoy will decline very significantly. Australians enjoy a very high standard of health welfare and education services, transport systems. There is a constant availability of food, goods & other services and Australia has low levels of unemployment. On average, just like in many other developed countries, each Australian consumes 10,000 KWh of electricity each year. Wind and solar currently produce only 1,600 KWh per person per year. If we do not maintain a reliable form of electricity generation the fabric of our society will collapse.

Figure 9 is an extract from an IEA December 2021 report which states that the world consumption of coal is at a record high. As discussed in the extract, Australia cannot ignore the recent experiences of Europe & the US where the use of coal has rebounded due to the unreliability of wind & solar and the high price of gas. The price of gas has risen substantially because Europe & the US have been trying to wean themselves off the other reliable dispatchable forms of generation such as coal & nuclear. Current levels of gas production cannot meet consumption requirements, so coal is being used again to meet the growing demand. As shown in the Figure 6 the percentage of coal used in the world has not changed in the past 30 years despite all the focus and efforts during this time to reduce its use.

The building of wind & solar farms, at a cost of billions of dollars has been occurring in Australia for over 20 years. Yet only 16% of our electricity comes from wind and solar. Australia is ill advised to assume that wind & solar can be producing 95% of our electricity in 30 years' time.

Figure 9 – Extract from IEA Coal 2021 Report

Coal 2021 Demand

Coal-fired power generation reaches all-time high in 2021

In 2020, the decline in worldwide electricity consumption (-0.5%) and low natural gas prices caused coal-fired generation to drop 3.8% (-380 TWh), which reduced consumption of both steam coal (-3.6% to 5 735 Mt) and lignite (-13% to 621 Mt).

Global electricity consumption is expected to rebound 6% in 2021, exceeding the 2019 level, as economic recovery around the globe and adverse weather conditions boost demand at the same time as renewable power generation is lower than expected due to meagre rainfall and weak wind in some regions. China's electricity demand growth for 2021 is estimated at 10%, reflecting the country's strong economic recovery as well as a cold snap in the north and a warmer-than-average summer.

Renewable energy and nuclear power generation are expected to meet ~39% of the increase in electricity demand in 2021, while residual growth of more than 800 TWh will be covered by coal and gas. A gas supply shortage and resulting record-high gas prices support a rebound in coal-based power generation, especially in the United States and the European Union, where shares of coal in power generation have been declining for years. Consequently, global coal-fired power generation is expected to increase 9% in 2021, recovering to above 2019 levels.

For 2022-2024, global power demand is expected to increase ~2 099 TWh (annual average growth of 2.4%), of which a large share (91%) will be covered by additional renewable electricity generation. We expect a gap of more than 220 TWh to be filled by coal- and gas-fired power generation. With forward prices pointing to a gas price drop, we expect gas to meet most of the remaining demand while coal-fired power generation stays stable over the period.

As coal is the cornerstone of the electricity supplies of India, China and some Southeast Asian countries, we estimate coal-fired power generation during 2021-2024 to increase 4.1% in China, 11% in India and 12% in Southeast Asia.

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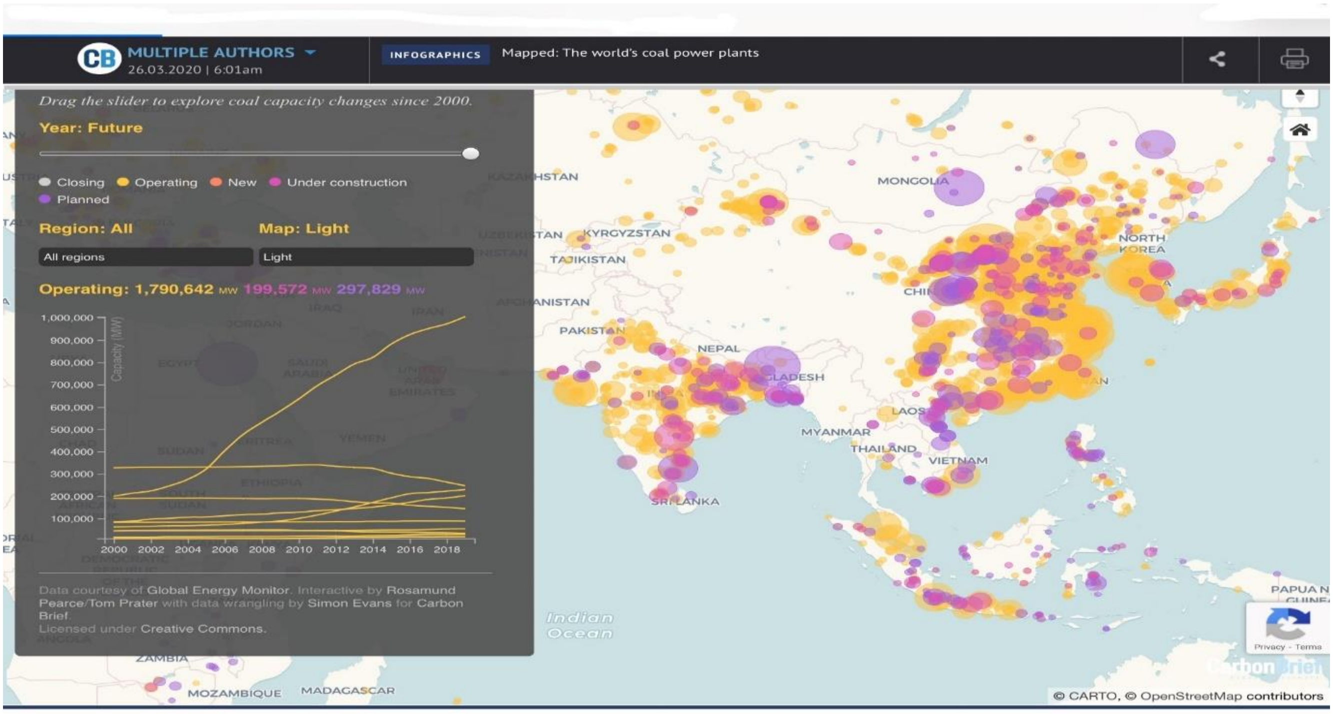
As mentioned in Figure 9, Australia's northerly neighbours are carrying out a massive coal plant building program. Figure 10 depicts the location of the 600 or so high efficiency low emission (HELE) coal power plants which are either under construction or planned in Asia with a total generation capacity of nearly 500,000 MW. As a comparison the 16 coal power plants in AEMO's jurisdiction have a current total generation capacity of 23,000 MW.

As their name suggests, HELE coal power plants are far more efficient and are far less polluting than the Australian power plants which are up to 50 years old. If Australia is to survive as a dynamic developed country, it must have reliable 24/7 baseload power generation which HELE plants can provide.

Figure 10 – Showing the Location of the 600 Coal Fired Power Plants under construction or planned to be built in Asia



7 Carbon Dioxide Emissions Have Some Benefits

It is acknowledged that carbon dioxide emissions make a contribution to global warming. In 1990 the carbon dioxide content in the atmosphere was 360 parts per million or 0.036%. In 2020 the level of carbon dioxide had increased to 410 parts per million or 0.041%.

Carbon dioxide is a very essential gas for life on earth. If carbon dioxide was removed from our atmosphere, life would cease to exist on our planet. Carbon dioxide is essential for plants to grow & flourish. The flowers we buy from a florist shop are grown in glasshouses where the carbon dioxide level is artificially elevated to 1200 parts per million to improve and quicken the growth process.

The 'greening' of the planet would be a great benefit to all forms of life on Earth and in particular it will benefit agricultural crop production. This 'greening' is happening.

Research carried out by the CSIRO in conjunction with Australian National University determined that between 1982 & 2010 the ‘greening’ in the world’s major arid regions increased by 11%. See Figure 11.

Figure 11 – Showing Results of CSIRO’s Research on Global Increase in Plant Life over the past 30 Years

3 JULY 2013 • NEWS RELEASE

1 Photo 1 Audio

In findings based on satellite observations, CSIRO, in collaboration with the Australian National University (ANU), found that this CO_2 fertilisation correlated with an 11 per cent increase in foliage cover from 1982-2010 across parts of the arid areas studied in Australia, North America, the Middle East and Africa, according to CSIRO research scientist, Dr Randall Donohue.

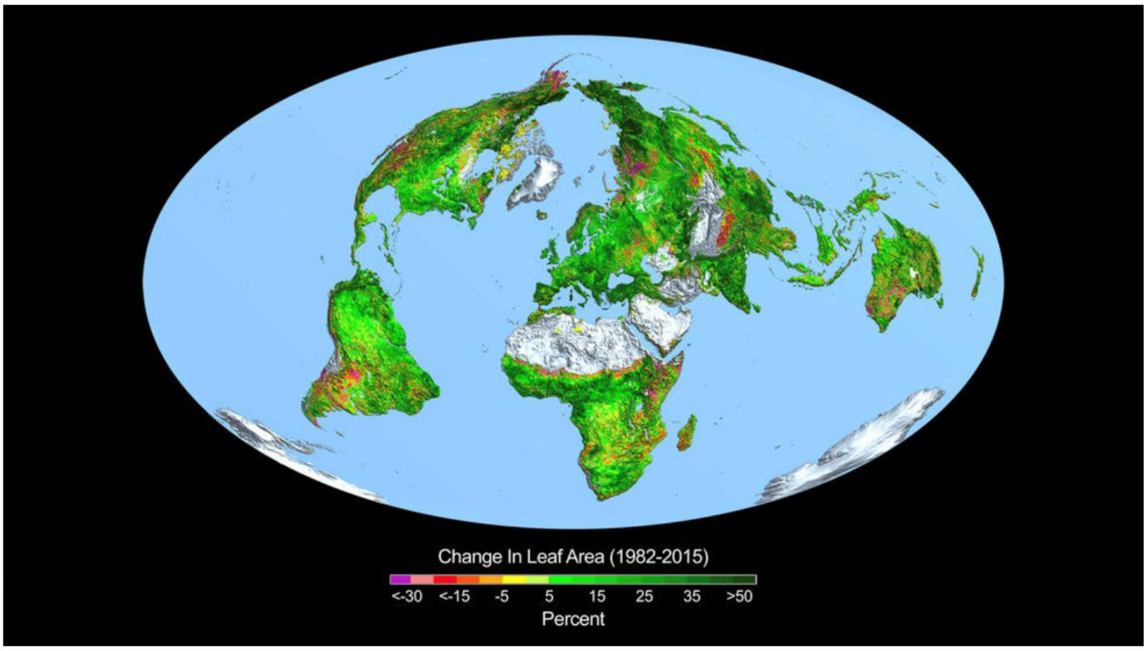
Using NASA satellite data, it has been calculated that from 1982 to 2015 the amount of foliage in the world has increased by 20 million square kilometres which is a 13% increase over the Earth's total land mass due to the increase of carbon dioxide in the atmosphere. See Figure 12.

Figure 12 – Showing Results of NASA's Research on Global Increase in Plant Life from 1982 to 2015

Carbon Dioxide Fertilization Greening Earth, Study Finds

From a quarter to half of Earth's vegetated lands has shown significant greening over the last 35 years largely due to rising levels of atmospheric carbon dioxide, according to a new study published in the journal *Nature Climate Change* on April 25.

An international team of 32 authors from 24 institutions in eight countries led the effort, which involved using satellite data from NASA's Moderate Resolution Imaging Spectrometer and the National Oceanic and Atmospheric Administration's Advanced Very High Resolution Radiometer instruments to help determine the leaf area index, or amount of leaf cover, over the planet's vegetated regions. The greening represents an increase in leaves on plants and trees equivalent in area to two times the continental United States.



Carbon dioxide emissions are not as devastating to the Earth as many say they are. It must be recognised that carbon dioxide is essential for the continuing existence of life on Earth. Increasing the amount of carbon dioxide in the atmosphere increases the amount of life on Earth.

8 Global Warming/Change

Are carbon dioxide emissions the main cause of global warming?

The impact of the Sun on climate change needs to be recognised as the Sun has dominated the Earth's climate for millions of years.

Figure 13 below is a CSIRO graph showing the increase in Australia's annual medium temperature over the last century. The notation below the graph states that 'the recent warming can only be explained by human-caused emissions. What caused the warming which is 'not recent', let's say in the first half of the 20th century?

Figure 13 – CSIRO's Graph of Australia's Temperature Rise Since 1910

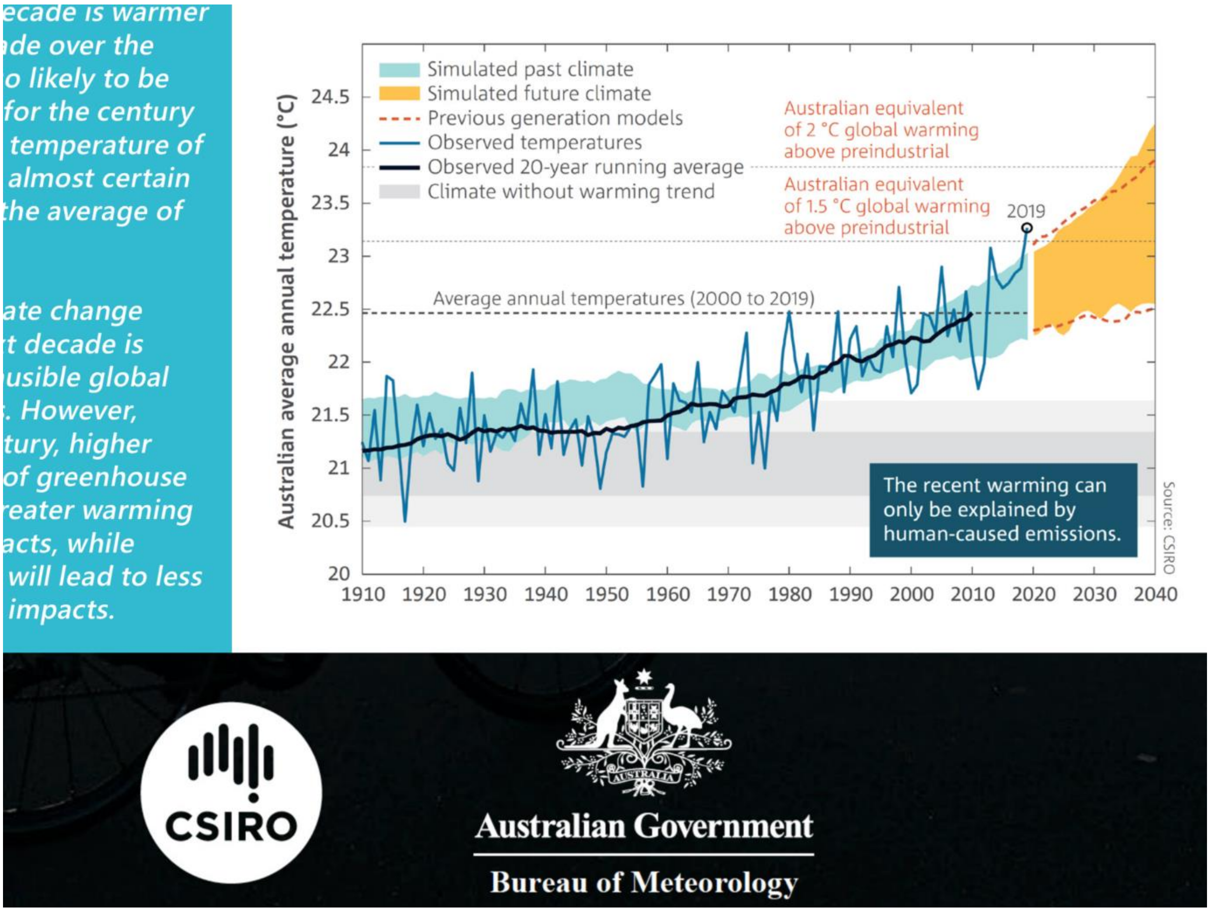
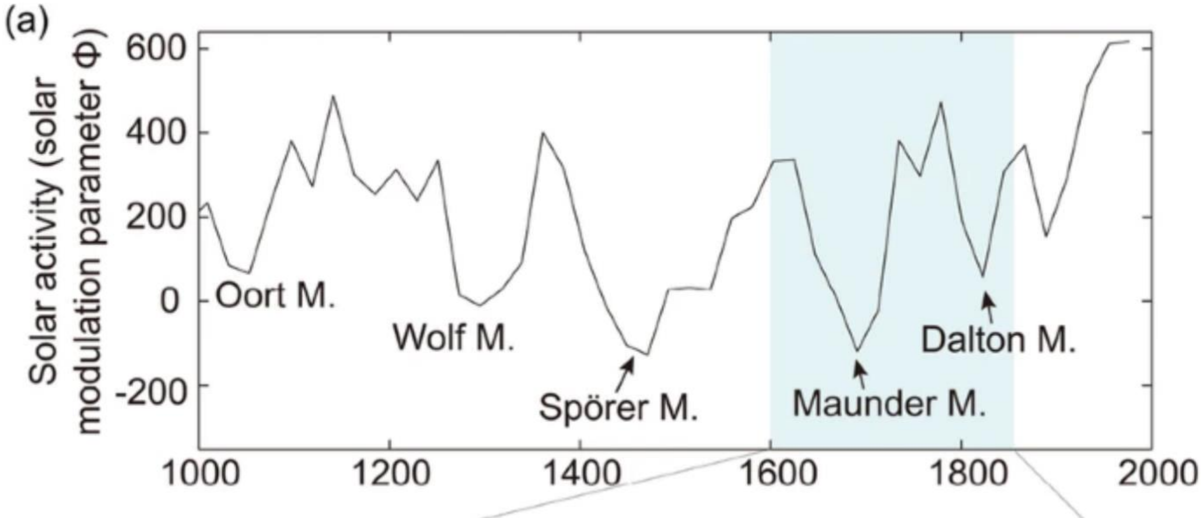


Figure 14 shows the activity of the Sun's solar flares and sunspots between 1000AD and 2000AD. It is worth noting that the low level of sun activity between 1650 and 1750 (known as the Little Ice Age) led to weather records in London stating that the Thames River regularly froze over in winter. The Baltic Sea and many other rivers in Europe would also freeze over during these winters.

The Sun's activity started increasing in 1900 and Australia's temperature started increasing at the same time as shown in Figure 13. At present the Sun's activity is at its highest in over 1000 years. It is not inconceivable that some if not most of the Earth's warming is a result of the Sun's increased activity and that carbon dioxide emissions only make a small contribution to global warming.

Figure 14 – Graph of the Sunspots & Solar Flare Activity over the last 1000 years



However, the IPCC 2021 report claims that, since 1750 solar activity has had a negligible influence as a driver of climate change. See Figures 15 & 16 below. Such a claim seems extraordinary particularly when considering the activity of Sun has been subject to many scientific studies for over one hundred years.

Figure 15 – Title Page of the IPCC Report

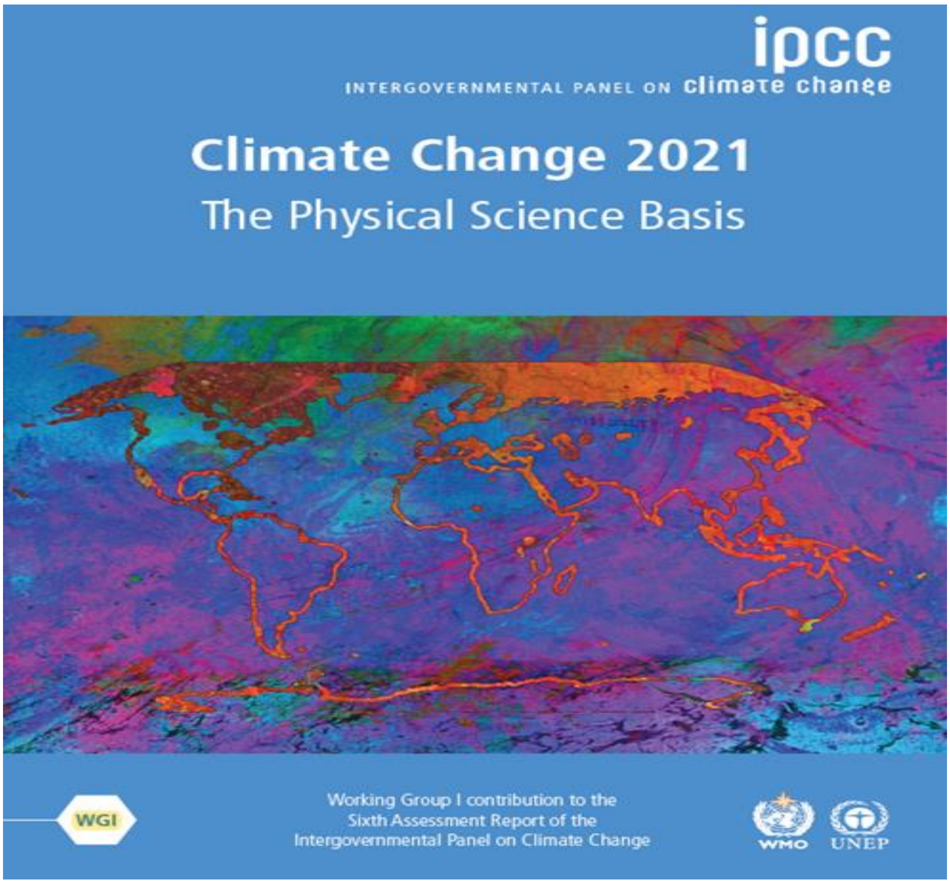


Figure 16 Extract from IPCC Report's chapter on "Drivers of the Climate System"

Final Government Distribution Technical Summary IPCC AR6 WGI

TS.2.2 Changes in the Drivers of the Climate System

Since 1750, changes in the drivers of the climate system are dominated by the warming influence of increases in atmospheric GHG concentrations and a cooling influence from aerosols, both resulting from human activities. In comparison there has been negligible long-term influence from solar activity and volcanoes. Concentrations of CO_2, CH_4, and N_2O have increased to levels unprecedented in at least 800,000 years, and there is *high confidence* that current CO_2 concentrations have not been experienced for at least 2 million years. Global mean concentrations of anthropogenic aerosols peaked in the late 20th century and have slowly declined since in northern mid-latitudes, although they continue to increase in South Asia and East Africa (*high confidence*). The total anthropogenic effective radiative forcing (ERF) in 2019, relative to 1750, was 2.72 [1.96 to 3.48] W m^{-2} (*medium confidence*) and has *likely* been growing at an increasing rate since the 1970s. {2.2, 6.4, 7.2, 7.3}

The Sun has had and continues to have a very dominant influence on the Earth's climate. Over 100,000's of years and prior to human occupation of Earth, the planet has experienced a series of ice ages which have been followed by warm or even hot periods.

9 Conclusion

It is easy to be influenced by social media as well as much of the mainstream media regarding climate change and the need to 'decarbonise' the world. However, it is possible to take an objective and analytical approach to this issue. In doing so the findings are significantly different than those promoted by many parts of the media, many politicians as well as alarmists.

A 'fear' mentality of an uninhabitable planet has pervaded the thought process regarding carbon dioxide emissions and the desperate need to decarbonise the world. Most of the Australian population is living under the false pretence that wind and solar power can and will replace our reliable base load power stations over the next 30 years.

This submission has shown that it is not possible to decarbonise Australia in the next 30 years. AEMO has the responsibility to advise the Australian and state governments that renewables cannot replace the baseload fleet of dispatchable power stations and that each jurisdiction needs to quickly re-assess their strategies for the future provision of reliable secure electricity supplies.

At present and for the foreseeable future there are only three natural sources of reliable 24/7 secure power and they are coal, gas and nuclear.