

PROJECT ENERGY CONNECT (NSW - EASTERN SECTION)

GROUNDS OF OBJECTION

I object to the abovementioned project for the reasons set out below.

Introduction

1. The objective of the NSW Electricity Strategy (**the Strategy**) is to provide “a reliable, affordable and sustainable electricity future that supports a growing economy”¹. “Sustainability” encompasses protection of the environment².
2. The essence of the Strategy is to achieve that objective by providing electricity in a manner which reduces emissions of carbon dioxide and other pollutants. That is to be done by generating electricity primarily using solar power, supported by wind power and natural gas³.
3. The Strategy is based on GenCost 2018 and GenCost 2019-20. Those policy documents are based on a number of key assumptions. They include:
 - a. The use of renewables produce zero emissions of carbon dioxide.
 - b. The use of renewables is good for the environment.
 - c. Use of renewables has been a success in Australia and internationally.
 - d. Electricity blackouts and/or limitation on the use of electricity when relying on renewable are acceptable.
4. Each of those assumptions is fundamentally flawed. For that reason, the Strategy is fundamentally flawed and so, therefore is the development proposal which seeks to implement the Strategy.

Solar power

5. Transitioning to solar and wind power, firmed by natural gas and pumped hydro, is based on a perceived environmental threat.
6. However, moving to solar power on the large scale proposed will not only be futile but will also be disastrous for the environment, Australia’s energy security and the economy for the following reasons.

Environmentally disastrous

7. Solar power is not carbon neutral and environmentally neutral. It has a massive environmental footprint.

¹ NSW Electricity Strategy, 2019, p 1.

² NSW Electricity Strategy, 2019, p 24.

³ See paragraphs 5 and 15 of the **attached** paper entitled *The Current NSW Electricity Strategy*.

- a. Large scale solar farms require millions of solar panels – in the order of 4 million per 850 MW based on solar farms in China and India⁴. The 3,000 MW pilot solar farm in the Central West of NSW on that basis is likely to require 14,117,647 solar panels. Alternatively, in the order of 39,705,882 “solar PV modules” will be required based on the 102 MW Nyngan solar plant⁵. The manufacture of solar panels requires significant natural resources including quartz, coal, silver, copper and highly toxic rare earth elements⁶. They also require aluminium and steel for structural components. Mining those resources is damaging to the environment and uses scarce resources which are required for modern electronic communication. Processing those natural resources requires generation of significant amounts of electricity⁷. In particular, construction of photovoltaic (PV) cells (i.e. solar cells) requires the extraction of silicon from quartz (i.e. silicon oxide) using carbon. “The first step of solar PV production is gathering, transporting and burning millions of tons of coal, coke and petroleum coke – along with charcoal and wood chips made from hardwood trees – to smelt > 97% pure mg-Si from quartz”⁸. Large quantities of coal, coke, charcoal and woodchips must be burnt, with a consequential substantial release of CO₂ into the atmosphere⁹. A “vast amount of deforestation [is] necessary for solar PV production”¹⁰. In addition, “Throughout the solar PV manufacturing process all of the materials and products must be shipped to and from more than a dozen countries around the world in large barges, container ships, trains or trucks – all powered by non-renewable oil”¹¹.
- b. Solar farms require vast areas of land to generate power. For example, 25 square kilometres has been required to generate 850 MW in China¹² and 52.5 square kilometres to generate 2,050 MW in India¹³. The enormity of damage to fauna, flora and the landscape is self-evident from those statistics. Damage of that scale would be a cultural affront to both the first peoples, the traditional custodians of the land, and today’s non-indigenous citizens. It would be inconsistent with maintaining natural carbon capture by the maintenance of our trees and crops and increasing that capture by planting millions of trees.
- c. The land required for the solar farms in many instances is agricultural land¹⁴. The agricultural output of that land will be lost.

⁴ For example, the 850 MW capacity Longyangxia Dam Solar Park, China, has 4 million panels.

⁵ The Nyngan solar plant has 1,350,000 “solar PV modules”. That equates to 13,235 “solar PV modules” per 1 MW. 13,235 x 3,000 MW = 39,705,882 “solar PV modules”.

⁶ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, para 11; *Planet of the Humans*, 2020, produced by Michael Moore.

⁷ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, paras 2, 8, 9, 12 and 14.

⁸ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, para 2.

⁹ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, para 4.

¹⁰ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, paras 3 and 15 and reference notes [14] to [16].

¹¹ *Why Do We Burn Coal and Trees to Make Solar Panels?*, Thomas Troszak, 14 November 2019, para 13.

¹² Longyangxia Dam Solar Park, China.

¹³ Pavagada Solar Park, India.

¹⁴ For example, the 102 MW Nyngan solar plant is located on 2.5 square kilometres of an agricultural property.

- d. Solar panels have high disposal or recycling costs because of their sheer number, size, weight and the materials from which they are constructed (namely, lead, copper, silicon, carcinogenic cadmium, plastic and aluminium)¹⁵. If recycled, separating and purifying the waste materials will require significant electrical power and use of chemicals¹⁶. The cost of recycling may exceed the value of the material recovered, thereby meaning the panels will be disposed of in landfill or possibly sold to poor third world countries which will be left to dispose of the toxic waste¹⁷. Used solar panels have traditionally been placed in landfill in California¹⁸. Now concern is being raised in California about the risk of toxic materials in the discarded solar panels leaching into the soil and groundwater¹⁹. Furthermore, the public, via the government, would be left with the disposal cost if the solar farm operator went into liquidation.
8. Acting in accordance with GenCost 2018 and GenCost 2019-20 will involve destroying significant parts of the environment of NSW. It will be a case of “Destroying the Environment to Save It”, to adopt the title to the chapter on renewables in Michael Shellenberger’s *Apocalypse Never – Why Environmental Alarmism Hurts Us All*. That title is reminiscent of the infamous “We had to destroy the village to save it” statement of an unnamed US Army officer to AP correspondent Peter Arnett following a devastating aerial attack on the village by the US Air Force during the Vietnam War.
9. There is an awakening to the unacceptable environmental damage caused by renewables. That is illustrated by the fact that local opposition to the destruction caused, and to be caused, by the planned 7,700 kilometres of transmission lines in Germany has meant that less than 15% of the transmission lines has been able to be constructed as at 2020²⁰.

Strategically disastrous

10. Electricity is the life blood of the Australian economy and the Australian way of life. It is fundamental to our national security, the functioning of our economy and to daily life. It is as vital to citizens as food and water. Energy security must be a paramount consideration for all levels of government. It is essential that all levels of government ensure, to the extent possible, that the generation and transmission of electricity in NSW not be dependent upon a foreign controlled supply chain. The coronavirus pandemic has highlighted the importance of that.

¹⁵ In Europe alone, it is estimated that by 2020, that solar panels will generate 35,000 metric tonnes of waste per year. Worldwide it is estimated there will be tens of millions of metric tonnes of solar panel waste by 2050: *The First Recycling Plant in Europe for Solar Panels*, <https://www.livingcircular.veolia.com/en/industry/first-recycling-plant-europe-solar-panels>, 26 March 2019; *China’s Ageing Solar Panels are going to be a Big Environmental Problem*, 30 July 2017; and www.forbes.com/ Michael Shellenberger, *If Solar Panels Are So Clean, Why Do They Produce So Much Toxic Waste?*, Michael Shellenberger, Environmentalist, 23 May 2018.

¹⁶ *China’s Ageing Solar Panels are going to be a Big Environmental Problem*, 30 July 2017.

¹⁷ www.forbes.com/ Michael Shellenberger, *If Solar Panels Are So Clean, Why Do They Produce So Much Toxic Waste?*, Michael Shellenberger, Environmentalist, 23 May 2018.

¹⁸ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p189.

¹⁹ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p189 and 190 and the references cited therein.

²⁰ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p185 and p 198 the references cited therein.

11. The reality is solar panels will have to be manufactured overseas and imported into Australia²¹. They will have to be imported in vast numbers every 20 to 25 years, or more frequently if damaged by severe weather. A critical essential service will therefore be at the mercy of a foreign controlled supply chain. Strategically, use of solar panels is therefore not in Australia's interest. Australia, and therefore NSW, must generate electricity using local resources to the fullest extent possible. Furthermore, if the solar panels are imported from China, which manufactures approximately 50% of the world's solar panels and has the 5 largest solar panel manufacturers in the world, it will increase, not reduce, Australia's dependence on China. It is accepted now that Australia must wind back its dependence on China which is rapidly providing a strategic threat to Australia and its allies in North Asia, South-East Asia and the sub-continent and to Australia's major ally, the United States of America.

12. Senator Molan, formerly Major General Molan, defines failure in national security as including having "an incomplete manufacturing base to support the people and a war effort"²². He has observed that a regional conflict between China and the USA would mean that sea and air transport in our region would cease for an indefinite period of time. That would mean that "critical spare parts for our national energy grid" would not be able to be obtained²³. The significance of that is self-evident given that electricity is an essential service which is the life blood of our society, our way of life and ultimately life itself. The significance of the electricity grid is made clear by the fact that USA strategic policy provides that a cyber-attack on its electricity grid would warrant a nuclear response²⁴ whilst in Australia the Director-General, Defence Signals Directorate, recently stated that a cyber-attack on Australia's internet would warrant a cyber counter-attack²⁵. The Director-General recently stated "The threat to our way of life is more real today than at any time I have known in my career"²⁶.

13. NSW is abandoning its strategic advantage in being able to generate electricity using coal-fired power stations for no benefit because:
 - a. It is now clear from China's increasingly forceful China First policies that there is no realistic hope that China will reduce its carbon emissions in a meaningful way in the foreseeable future.

 - b. If NSW closed all its coal-fired power stations it would reduce the world's annual carbon dioxide emissions as a result of human activities by 0.195%²⁷, which would have virtually no impact on climate change²⁸, particularly given the increasing emissions by China alone. The absence of impact is not surprising given 100% of the carbon dioxide in the

²¹ Technology Investment Roadmap Discussion Paper, May 2020, p 25.

²² *National Security – The Solution*, Senator Jim Molan, 25 September 2020, pp 2-3.

²³ *Australia's Lack of Self-Reliance*, Senator Jim Molan, 27 August 2020, p 2.

²⁴ *The Australian*, 28 August 2020.

²⁵ *The Australian*, 1 September 2020.

²⁶ Speech to the National Security College, Australian Signals Directorate, 1 September 2020.

²⁷ Australia's contribution, from all sources, to the world's annual carbon dioxide emissions is approximately 1.3% [Statement of Prime Minister Morrison to the UN General Assembly on 25 September 2019]. Electricity generation constitutes about 30% of that 1.3% [Report of the Expert Panel examining additional sources of low cost abatement, 14 February 2020, Figure 2.3, p 23]. 30% of 1.3% = 0.39%. NSW coal-fired power stations contribute about 50% of that 0.39% = 0.195%.

²⁸ Alan Finkel, Australia's Chief Scientist in a statement to a Senate Hearing in June 2017.

Earth's atmosphere, from all sources, constitutes 0.0407% of the Earth's atmosphere²⁹. 47% of that carbon dioxide is stated by the IPCC to be "primarily" caused by human activity³⁰. 47% of 0.0407% = 0.0191% of the Earth's atmosphere. The contribution of NSW coal fired power stations to carbon dioxide in the Earth's atmosphere is therefore 0.195% of 0.0191% = 0.0000382%.

- c. David Crisp, atmospheric scientist of NASA's Jet Propulsion Laboratory, states the increase in carbon dioxide in the atmosphere since the beginning of the Industrial Age "is not going to lead to a runaway greenhouse effect or something like that"³¹.
- d. NSW will have less chance of reversing the decline in manufacturing in Australia since 2010 of 5% in both real and absolute terms³². When electricity was generated in NSW overwhelmingly by coal-fired power stations, as was the case between 2002 and 2007, NSW enjoyed amongst the lowest electricity prices in the world. In particular, Australian prices were competitive with those of Canada, the USA, Japan and the EU³³. That gave businesses operating in NSW a competitive advantage and helped contain the cost of living to residents and, in particular, increased the quality of life to the poorer members of society who would otherwise not have been able to afford to use electricity as much as they required.

Economically disastrous

- 14. Solar power requires substantial, costly storage capacity as backup, due to its intermittent nature³⁴. "Achieving 99.97% reliability with a system consisting solely of solar and wind generation ...would require a storage capacity equivalent to several weeks of average demand"³⁵. That "would appear to be economically destructive, for industry in particular"³⁶.
- 15. Solar farms involve integration costs and risks that do not arise with coal-fired power stations or nuclear power stations.

²⁹ Earth's atmosphere comprises Nitrogen (78.08%), Oxygen (20.95%), Argon (0.93%), Carbon Dioxide (0.0407%), Neon (0.0018%), Helium (0.0005%), Methan (0.00018%), Krypton (0.00011%) and Hydrogen (0.00005%), The Atmosphere: Getting a Handle on Carbon Dioxide, Alan Buis, NASA's Jet Propulsion Laboratory, 9 October 2019, p 1.

³⁰ Climate Change 2013: the Physical Science Basis. Contribution of Working Group 1 to the Fifth Assessment Report of the IPCC, p 467 and p 470; The Atmosphere: Getting a Handle on Carbon Dioxide, Alan Buis, NASA's Jet Propulsion Laboratory, 9 October 2019, p 2.

³¹ The Atmosphere: Getting a Handle on Carbon Dioxide, Alan Buis, NASA's Jet Propulsion Laboratory, 9 October 2019, p 1

³² Media Release of 27 May 2020 of Senator Canavan, Federal Minister for Resources and Northern Territory for 2.5 years ending 3 February 2020.

³³ Electricity Prices in Australia: An International Comparison, Bruce Mountain, CME, March 2012, pp10 and 14; Report 46: Uranium Mining and Nuclear Facilities (Prohibitions) Repeal Bill, Standing Committee on State Development, Legislative Council NSW, para 1.9.

³⁴ Minister Angus Taylor, Federal Minister for Energy and Emissions Reductions, in a Coalition for Conservation web seminar on 2 June 2020.

³⁵ *Geophysical Constraints on the Reliability of Solar and Wind Power in the United States*, Energy & Environmental Science 11, No 4 (2018), 914-025.

³⁶ Report 46: Uranium Mining and Nuclear Facilities (Prohibitions) Repeal Bill, Standing Committee on State Development, Legislative Council NSW, March 2020 (**Report 46: Uranium Mining and Nuclear Facilities, March 2020**), paras 3.63, 4.73 to 4.77.

- a. “Renewables are often best located at the remote edge of the grid and new transmission needs to be built to connect these generators into the system”³⁷. The existing grid was “primarily designed to connect coal-fired generators and the Snowy Hydro Scheme. To connect the scale of new generation required to meet NSW’s future energy needs, it will be critical to efficiently develop transmission to these new locations”³⁸. It is a technology not yet developed!³⁹
 - b. New generators connecting to the grid are causing increasing congestion in the electricity system which reduces the scope for new generation to connect to the system and increases transmission loss and ultimately causes higher wholesale energy prices⁴⁰.
 - c. Provision for customers with solar panels to become suppliers of electricity has created “network challenges” as the network was designed to be a one way grid, not a two way grid.⁴¹ Coordinating the integration of these energy sources is “a major challenge”⁴².
 - d. Coordination of generation and network investment without further change “is likely resulting in higher overall system costs, and ultimately elevated consumer bills”⁴³.
16. The assertion that solar farms provide the cheapest power appears partly to be founded on a false premise as to the operational life of solar farms, coal-fired power stations and nuclear power stations. The operational life of solar panels is assumed in the Australian Power Generation Technology Report of 16 November 2015 to be 30 years⁴⁴. In fact, the operational life is more likely to be 20 to 25 years, with decreasing efficiency of the solar panels over the term of their life. In stark contrast, coal-fired power stations have an operational life of 50 years⁴⁵, as do nuclear power stations.
17. The life of solar panels is also subject to shortening because they are susceptible to significant damage by severe storms, with or without hail. In January 2020, golf ball-sized hail, weighing about 20 grams each, damaged the solar panels on the roof of the CSIRO building in Canberra⁴⁶. The risk of damage in NSW is illustrated by the severe hailstorm of 11 November 2016 that struck far-western to central NSW, ranging from Broken Hill to Bathurst and north to Tamworth, with hail the size of golf balls and severe winds removing roofs from houses, smashing windows and damaging cars in Broken Hill⁴⁷. The significance of the risk is evident having regard to the

³⁷ NSW Electricity Strategy, 2019, p 11.

³⁸ NSW Electricity Strategy, 2019, p 17.

³⁹ Speech of the NSW Minister, Matt Kean, for Energy and Environment to the Committee for Economic Development of Australia (**the CEDA Speech**) on 7 June 2019, p 6.

⁴⁰ NSW Electricity Strategy, 2019, p 11 and p 17.

⁴¹ NSW Electricity Strategy, 2019, p 11.

⁴² NSW Electricity Strategy, 2019, p 18.

⁴³ *Investment in Solar and Wind Generation in Australia – Lessons Learned*, Australian Energy Market Commission, undated but referring to the 2019/2020 year, p 4 and p 5.

⁴⁴ Australian Power Generation Technology Report of 16 November 2015, page iii.

⁴⁵ NSW Electricity Strategy, 2019, p 14; Solstice Development Services report “Prospects for a HELE USC Coal-fired Power Station”, June 2017, p7.

⁴⁶ <https://ecos.csiro.au/solar-power-and-extreme-weather-in-australia>,

⁴⁷ *Severe Hailstorm Cuts Power to Thousands of Homes in Broken Hill, Bathurst and Tamworth*, abc.net.au/news/2016-11-12.

facts that the Central West contains hot spots for hailstorms, such as Armidale and Orange⁴⁸, and a tornado broke 154,843 solar panels in the Desert Sunlight solar farm in California on 23 April 2015⁴⁹. Risk also arises from severe dust storms during droughts. They can cause a thick layer of dust to accumulate on solar panels, with a significant adverse impact on output⁵⁰. That will be remain the case until the dust is removed. But how will that be done? Using water in a drought to wash clean millions of panels?

18. The remote location of the solar farms will “make it difficult, time-consuming and expensive to locate and fix faults and provide general maintenance”⁵¹.
19. In March 2020, the Standing Committee on State Development, of the Legislative Council of NSW, noted concern about the loss by NSW of its competitive edge as an industrial and manufacturing economy⁵² and stated that “If the goal is to be an internationally competitive manufacturing economy, an appropriate mix of generation technologies is required to address trending affordability and reliability issues and power a competitive manufacturing base”⁵³. The Committee found that solar power, combined with wind power, both firming with gas, batteries and pumped hydro, will not be an adequate solution to meet the State’s future needs for affordable and reliable electricity following the decommissioning of the State’s coal-fired power stations⁵⁴.

Wind power

Environmentally disastrous

20. Wind power is not carbon neutral and environmentally neutral. It has a massive environmental footprint.
 - a. A 2 MW wind turbine essentially contains about 900 tonnes of steel, fibreglass blades and 2,500 tonnes of concrete for its base. The construction of a 2 MW wind turbine requires approximately 150 tonnes of coal to make the required steel and concrete⁵⁵ with the consequent CO2 emissions. They also require carbon-fibre, resins and rare-earth elements.
 - b. Mining of rare-earth elements generates toxic and radioactive waste on a large scale.
 - c. Wind turbines require large areas of land⁵⁶ - up to 450 times the land required for a natural gas plant⁵⁷.

⁴⁸ *Take Cover: 50 Hailstorms in Six Months Shows We’re a Hot Spot*, Central Western Daily, 14 June 2017.

⁴⁹ *Tornado Impacts to Solar Project*, <https://www.basinandrangewatch.org/DesertSunlight.html>, 28 August, 2015.

⁵⁰ <https://ecos.csiro.au/solar-power-and-extreme-weather-in-australia>,

⁵¹ Technology Investment Roadmap Discussion Paper, May 2020, p 20.

⁵² Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.41 to 3.46.

⁵³ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.47.

⁵⁴ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.64.

⁵⁵ *Wind Turbines Are Neither Clean Nor Green And They Provide Zero Global Energy*, Matt Ridley, *The Spectator*, 30 December 2017.

⁵⁶ *Wind Turbines Are Neither Clean Nor Green And They Provide Zero Global Energy*, Matt Ridley, *The Spectator*, 30 December 2017.

⁵⁷ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p182.

- d. Wind turbines cause noise pollution, shadow flicker and vibration for people living near them and kill birds and bats (including critically endangered and vulnerable species - especially large birds of prey that soar on uplifts and are slow to reproduce)⁵⁸.
- e. The non-recyclable wind turbine blades must be buried because their fibre contents prevents them from being able to be cut up⁵⁹. The size of the wind turbine towers also pose significant disposal issues.

Strategically disastrous

- 21. The comments in relation to solar power with respect to strategic issues apply equally to wind power⁶⁰.

Economically disastrous

- 22. The comments in relation to solar power with respect to strategic issues apply equally to wind power⁶¹.

Track record of renewables

- 23. The assumption that the use of renewables has been a success in Australia and internationally is without foundation.
- 24. Michael Shellenberger points out that the idea that society could be powered solely by renewables was first proposed in 1833⁶². To this day, the concept has proven to be unachievable. Germany has invested nearly half a trillion dollars in renewables with the result that just 34% of its electricity comes from wind and solar. That 34% has had to be backed up by natural gas. Further, electricity prices have risen 50% in Germany since 2007 and in 2019 were 45% higher than the European average. Further, in 2019 Germany's electricity grid came close to having blackouts on 3 days in July 2019. In 2019 McKinsey Consultants issued a report on Germany's energy policy which states "Problems are manifesting in all three dimensions of the energy industry triangle – climate protection, security of supply and economic efficiency"⁶³. Nothing has changed in the intervening years as the current problems in not only Germany but Europe generally demonstrate.
- 25. Michael Shellenberger states the same issues have arisen in California which is heavily reliant on renewables (21%). There prices have risen 6 times faster than the rest of the USA since 2011. Other States have also incurred price increases due to the adoption of renewables. The

⁵⁸ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p183; *Unintended consequences of climate change policy*, The Global Warming Policy Foundation, Report No 16, Andrew Montford, 2015, p 10; *Green Killing Machines – The impact of renewable energy on wildlife and nature*, The Global Warming Policy Foundation, Report No 36, Andrew Montford, 2019, pp 3, 5 and 6; *Cork [Ireland] brothers and sister who lived close to windfarm settle actions for E 225,000*, *Irish Examiner*, 25 February 2020, <https://www.irishexaminer.com/news/aird>

⁵⁹ SRSrocco report "The Renewable Green Energy Myth: 50,000 tonnes of non-recyclable wind turbine blades dumped in landfill", 9 January 2020.

⁶⁰ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.41 to 3.47, 3.63 and 3.64.

⁶¹ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.41 to 3.47, 3.63 and 3.64.

⁶² *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 185.

⁶³ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 184.

University of Chicago has reported that renewables have meant that consumers in 29 States have paid \$125.2 billion more than they otherwise would have in the absence of renewables⁶⁴. In addition, California suffered many more power outages between 2008 and 2017 than any other State⁶⁵ and suffered rolling blackouts in August 2020 because it could not generate enough electricity due to its heavy reliance on renewables, the reduced capacity of its hydro generators due to insufficient water in a drought and its inability to import all of its usual 25% of electricity from other States which relied on dispatchable power⁶⁶.

26. The only State in Australia with no coal-fired generation has experienced similar issues. South Australia has the highest priced wholesale electricity in Australia. Its price was 21% higher than that of NSW in 2017⁶⁷ and it suffered blackouts in 2016 and 2017⁶⁸. South Australia remains reliant on coal fired power stations in times of wind droughts (which have always occurred and for far longer than can be offset by battery storage).
27. Interestingly, Michael Shellenberger notes that France invested \$33 billion over the last decade in adding more solar and wind to its grid. The result has been it now uses less nuclear energy but more natural gas, leading to higher electricity prices and more carbon-intensive electricity⁶⁹. France has recently reversed that policy and will now build up its nuclear power capacity.
28. The Australian government recognises the issues of price and reliability raised by renewables. The Federal government states that renewables alone, backed by battery storage, cannot provide the affordable and reliable electricity to NSW and NSW industry in particular⁷⁰. The Federal Minister for Energy, Angus Taylor, was also critical of the failure of the private sector to build a single new reliable power plant in the NSW over the last decade⁷¹.
29. Windfarms are unpopular. In Germany, for example, once idyllic rural communities are now industrial wastelands of giant wind farms⁷². Like their predecessor industrial chimneys, they have destroyed the beauty of the English, Scottish and German countryside and are doing the same to the countryside of NSW⁷³. Locals and tourists alike increasingly do not like them⁷⁴.

⁶⁴ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 184.

⁶⁵ *Why wind and solar generation of electricity fail – California learns the hard way*, Science and Public Policy Project, 27 August 2022, <https://wryheat.wordpress.com>.

⁶⁶ *California's renewable warning*, Matthew Warren, *Australian Financial Review*, 14 September 2020.

⁶⁷ *Prospects for a HELE USC Coal-fired power station*, Solstice Development Services, June 2017, p 6.

⁶⁸ *Prospects for a HELE USC Coal-fired power station*, Solstice Development Services, June 2017, p 48.

⁶⁹ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 181.

⁷⁰ Minister for Energy and Emissions Reductions, Angus Taylor, during an interview by Alan Jones on 1 October 2020.

⁷¹ *The Australian*, 15 September 2020.

⁷² *"The Tragedy of Germany's Energy Experiment"*, Jochen Bittner, 8 January 2020.

⁷³ *Unintended consequences of climate change policy*, *The Global Warming Policy Foundation*, Report No 16, Andrew Montford, 2015, pp 6-8; *"The Tragedy of Germany's Energy Experiment"*, Jochen Bittner, 8 January 2020.

⁷⁴ *Unintended consequences of climate change policy*, *The Global Warming Policy Foundation*, Report No 16, Andrew Montford, 2015, p 10.

Batteries

30. Batteries are used to back-up intermittent or variable renewable energy (**VRE**) from solar and wind power. Firming VRE with batteries is significantly more expensive than VRE firmed with HELE USC coal-fired power stations, even with CCS⁷⁵.
31. The operational life of batteries is limited⁷⁶.
32. The adverse environmental impact of renewables is compounded to the extent they rely on batteries to provide storage to make them viable. Neither GenCost 2018 nor GenCost 2019-20 consider the adverse environmental impact of batteries⁷⁷. That is notwithstanding millions of batteries are involved which require enormous amounts of energy to mine, refine and transport the minerals required to make them and then to manufacture, transport and install the batteries and then recycle or dispose of them at the end of their lives which are much shorter than even those of solar panels and wind turbines⁷⁸. Mark Mills, energy analyst and senior fellow of the Manhattan Institute and fellow of the McCormick School of Engineering and Applied Science at Northwestern University, estimates that 230 tonnes of raw materials are required to produce one backup-power battery weighing 0.46 tonnes (1,000 pounds)⁷⁹. The problem is compounded by misery the extraction process involves for the miners and local villagers and the pollution of the environment caused by that process⁸⁰.
33. Furthermore, batteries raise significant disposal or recycling issues⁸¹.

Stranded assets

34. Other sources of power are being relied upon and developed in the world including:
- a. HELE USC coal-fired power stations, with or without, carbon capture and storage;
 - b. nuclear power; and
 - c. hydrogen power.
35. The development of nuclear power and hydrogen power is occurring rapidly and it is clear that those developments will leave largescale solar and wind farms stranded assets within the next 2 decades for the reasons indicated below.

Nuclear power stations

36. In March 2020, the Standing Committee on State Development, of the Legislative Council of NSW, stated that “overall” it “considers nuclear power to be a compelling technology”⁸². However, that is subject to the Committee’s comment that further independent and detailed analysis and modelling is required properly to evaluate the viability of nuclear energy from an

⁷⁵ Solstice Development Services report “Prospects for a HELE USC Coal-fired Power Station”, June 2017, p11.

⁷⁶ Ecttld.com.au – Why Japan is building 22 new coal-fired power stations, 10 February 2020.

⁷⁷ GenCost 2018, p 20.

⁷⁸ *The Green Road to Blackouts*, Viv Forbes, forbes@carbon-sense.com, 2 September 2020.

⁷⁹ *The staggering human costs of renewable energy*, Paul Driessen, 9 August 2020, cfact.org/2020/08/09/renewable-energys-staggering-human-costs.

⁸⁰ *The staggering human costs of renewable energy*, Paul Driessen, 9 August 2020, cfact.org/2020/08/09/renewable-energys-staggering-human-costs.

⁸¹ See for example, Lithium Battery Recycling in Australia, CSIRO, April 2018, paras 15.1 and 15.2.

⁸² Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.82.

economic perspective⁸³. The Federal government's Technology Investment Roadmap is to the same effect⁸⁴.

37. The advantage of nuclear power stations are:

- a. Nuclear power has a miniscule environmental footprint. In the 1960's nuclear power was favoured by conservationists as clean, energy-dense and limitless⁸⁵. The amount of fuel required is tiny. It does not cause air pollution. It has zero carbon dioxide emissions. Nuclear plants have a life of up to 80 years. Nuclear waste is small and spent fuel is now able to be reprocessed. Nuclear waste will not escape and even if it did and entered the water table the water would provide a shield against dangerous levels of radiation⁸⁶.
- b. Nuclear power is the safest of all energy sources – fewer deaths per unit of energy than any other method of electricity generation including solar, wind and hydro⁸⁷. Nuclear power is the safest form of electricity generation even taking into account the 1979 Three Mile Island incident (meltdown), the 1986 Chernobyl incident (reactor caught fire during an unauthorised experiment allowing radioactive particulates to escape) and the 2011 Fukushima incident (meltdown of uranium fuel rods due to a tsunami disabling electrical and diesel generators)⁸⁸. No one died in the 1979 incident and only just over 100 people have died as a result of the 1986 and 2011 incidents⁸⁹. Furthermore, nuclear power plants cannot detonate like a nuclear bomb because the fuel in the nuclear reactor is not sufficiently enriched to do so⁹⁰.
- c. Used nuclear fuel rods would be virtually impossible for any terrorist successfully to remove from a nuclear plant because they are contained in a 100 tonne canister which would have to be lifted out of position by crane, loaded onto a massive truck, driven out of the plant to some other location or to a sea terminal for shipment overseas⁹¹. The reality is all of that would be prevented by armed forces.
- d. They can be in the form of a small 300 MW or less, modular, light water nuclear reactor (**SMR**), which reduces the cost of construction because most construction is undertaken off site⁹² and arguably makes them suitable to complement variable renewables⁹³.
- e. They complement Australia's natural advantage of extensive uranium resources⁹⁴.

⁸³ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 4.80.

⁸⁴ Technology Investment Roadmap Discussion Paper, May 2020, p 29 and p 31..

⁸⁵ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 156 to 157.

⁸⁶ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 151 to 153 and p 171 and the references cited therein; Submission of Bright New World to House of Representatives Committee on Environment and Energy, dated 16 September 2019, pp 20 and 25 and Nuclear Regulatory Commission 2019.

⁸⁷ Member for Fairfax, in *The Australian*, 26 May 2019; Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 4.47.

⁸⁸ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 145, p 148 to 150 and the references cited therein.

⁸⁹ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 151 and p 169 and the references cited therein.

⁹⁰ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 242.

⁹¹ *Apocalypse Never: Why environmental alarmism hurts us all*, 2020, p 153.

⁹² Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 4.12 and 4.15.

⁹³ Report 46: Uranium Mining and Nuclear Facilities, March 2020, para 3.75 to 3.81.

⁹⁴ Technology Investment Roadmap Discussion Paper, May 2020, p 22.

- f. They are suitable for use in Australia because it is geologically stable and therefore not subject to the hazard of significant earthquakes or tsunamis. Furthermore, that makes NSW a suitable site for deep geological storage of high level radioactive nuclear waste.
38. There are 450 nuclear power plants in the world, spread across 30 countries including the USA, France, Britain and Canada. They produce between 9% to 11% of the world's electricity⁹⁵. 13 new nuclear power plants were opened in the world in 2018 and 2019. 9 were in China. Another 12 GW of nuclear power is under construction in China. Nuclear power now provides 4.6% of China's electricity, which is more than solar (3%), slightly less than wind (5.5%) and less than hydro (18%)⁹⁶.
39. None of those plants are SMR plants. The first SMR plant has been approved in the USA and is due to be completed by 2029. Rolls Royce has plans to construct 18 SMRs in the UK. France is investing in SMRs. The Netherlands has recently announced it will construct 2 more nuclear power plants. Finland is also relying on nuclear power.

Hydrogen power stations

40. Hydrogen power is favoured by the Chief Scientist of Australia and is being considered commercially in Australia. Hydrogen production is the subject of a Federal Government strategy paper⁹⁷, which aims to position the hydrogen industry in Australia as "a major player by 2030"⁹⁸. Furthermore, the first specific goal of the Technology Investment Roadmap is producing hydrogen below \$2 per kilogram⁹⁹.

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⁹⁵ Member for Fairfax, in *The Australian*, 26 May 2019.

⁹⁶ *China's response to climate change: A study in contrasts and a policy at a crossroads*, David Sandalow, an Issue Paper for The Asia Society Policy Institute of New York, July 2020, p 6 and p 9.

⁹⁷ Technology Investment Roadmap Discussion Paper, May 2020, pp 12, 13 and 30.

⁹⁸ Australia's National Hydrogen Strategy, November 2019.

⁹⁹ Technology Investment Roadmap Discussion Paper, May 2020, p 13.