Independent Planning Commission NSW
Bowmans Creek Wind Works SSD-10315

Submission from Save Our Surroundings
Emailed 19 December 2023 via IPCN email "submissions@ipcn.nsw.gov.au"
Independent Planning Commission - Bowmans Creek Wind Farm (nsw.gov.au)

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Dear Commission
Save Our Surroundings (SOS) has reviewed the 17 March 2021 Environmental Impact Statement for the proposed Bowmans Creek Wind Works, which was submitted by Epuron Projects Pty Ltd (now owned by Ark Energy Corporation Pty Ltd, who in turn is owned by Korea Zinc Company Ltd). We found the EIS to be of unusually high standard with little repetition, and with clear and detailed information that was supported by references or understandable calculations.

However, SOS has considerable concerns with the Bowmans Creek Wind Works proposal. In summary they are:

1. Capacity equivalence implications.

2. The extensive harm it will cause directly and indirectly to the local and global environments.

3. Actual events since 2020 have proven important claims to be now not valid.

1. Capacity Equivalence
Those evaluating projects, making laws or using data provided by proponents must fully understand that stated nameplate capacities for wind and solar works cannot be directly compared with the nameplate capacity of any base-load power plant. The significance and implications of the differences in capacity factors, life-span and energy availability have profound consequences in assessing the full impacts on greenhouse gas emissions and electricity costs.

The project has stated figures of 336MW nameplate capacity, 35% capacity factor (CF) and a design life of 25 years. A modern High Efficiency Low Emissions (HELE) coal-fired power plant of 336MW nameplate capacity has a 90% capacity factor and a design life of 50 years.

Applying the formula for Capacity Equivalence (Ce) = Capacity*(wind CF*wind life)/(HELE CF*HELE life) = 336*{(0.35*25)/(0.9*50)} = 65.3MWe. The implications of this Ce of 65.3MWe are that the project will:

- make very little contribution (2.4% not 12.4% if nameplate capacities are used) towards the loss by 2033 of just the Bayswater capacity of 2,715MW. It is misleading to suggest the project's non-equivalent 336MW capacity is a significant contribution to offsetting retired/retiring coal-fired power stations.

- only intermittently generate 1,030 GWh over a 12 month period or about 39% of that compared to a HELE plant, which can deliver electricity on demand 24/7 (2,649 GWhpa). The 61% gap has to be generated from elsewhere, so pushing up NEM system costs and prices to consumers.

- require over five such projects to be built just to match a relatively small 336MW HELE output, which means five times more land, five times more resources, five times more embedded emissions, five times more "firming" from BESS and pumped hydro storage and lots more transmission lines over farms and wilderness areas. This is not a sustainable use of resources.

- at a 2020 project capital cost of $569 million, which is probably very much higher now, equating to $8.7 million per MW of capacity equivalent is multiple times the 2017 cost of HELE power plant at about $2.2million/MW. (Prospects for a HELE USC coal-fired power station (apo.org.au)). The project will therefore increase overall system costs of the NEM and consequently energy bills for electricity consumers.

- increase the overall cost of the NEM and therefore the cost of electricity to consumers, which has been the trend since 2010. Retail electricity prices have skyrocketed since the NEM passed 30% of installed wind and solar capacity, which is the same experience with every other country and jurisdiction. It is not in the Public Interest to further increase the cost of living pressures on millions of Australians.

This project requires a very significant disproportionate amount of direct resources and external resources (BESS and Pumped hydro) to even provide a relatively intermittent and grid destabilising electricity product to the NEM.

The project will therefore, as stated on page 297 of the EIS, fail to achieve "the primary need for the project is to contribute efficient, low cost electricity to the NEM". The project will not be an efficient use of resources and so will increase overall NEM costs and therefore costs to both consumers and taxpayers.

2. Environmental Harm

The Proponent provided the capacity (336 MW), capacity factor (35%), design life (25 years), initial annual output (1,030,000 MWhac) and wind turbine generator nameplate capacity (5.6 MW) . The Proponent also provided detail of the quantities and weights of components needed to erect one of its sixty 5.6MW wind turbine generators (WTG), namely turbine tower (732 tonnes) and reinforced concrete base (1500t, 600m3). This information allows SOS to update the table below, which was first included in its research paper, "Wind and Solar Electricity Generation Are The Answer. Seriously? May 2021" (see the attachment for the November 2022 version)

Table 1. Comparison of 400MW Capacity Generation Types (May 2021 p52)

Generator	Land Req't	Capacity	Output	Availability	Tonnes Material	Expected	Energy out/in	Materials Over
Type	Hectares *	Factor %	MWh/year		Requirement	Life yrs	Payback %	80 years MT
Stubbo Solar EIS	1772	28.5	1,000,000	Daylight Hrs #	74,200##	30	60	218,666###
Industrial Solar (ave)	1280	25.5	893,520	Daylight Hrs	67,745	25	60	216,784
Rooftop Solar	0	24.5	858,480	Daylight Hrs	13,550	25	>60	43,360
HELE	30	82.3	2,915,328	24hrs/7days	< 108,550	60	3,000	<144,733
CCGT-CCS	146	90	3,153,600	24hrs/7days	< 108,550	25	3,000	NA
Nuclear	169	91.3	3,199,152	24hrs/7days	108,550	80	7,400	108,550

SOS has expanded Table 1 to include wind generators for averages of several wind projects, and two recent specific wind projects based on their EIS data for just the WTG tower and concrete base. All have been adjusted to a 400MW nameplate capacity, including the Bowmans Creek project. This table appears below.

Bowmans Creek Wind Works is highlighted in Tables 2 and 3. All generator types figures have been scaled to a common 400MW capacity. For this project the 336MW, 1,030,000MWh, 60 x 5.6MW WTG in the EIS are up-scaled by 400/336 to yield 398MW, 1,226,190MWh, 71 WTGs and initial materials of 158,472t ((732t tower + 1500t base)*71. The materials used over 80 years is derived from (80/expected life) times the initial materials requirement. For this project the materials over 80 years is 507,110 tonnes for just the turbine and the concrete base, which is very significantly higher than for any other non-wind generator type.

Table 2. Comparison of 400MW Capacity Generation Types (December 2023)

Generator	Land Req't	Capacity	Output	Availability	Materials Requirement	Expected	Energy out/in	Materials Over
Type	Hectares	Factor %	MWh/year		Tonnes	Life yrs	Payback %	80 years Mt
Solar Works EIS^	1772	25.2	883,008	Daylight Hrs	74,200	30	60	218,666
Industrial Solar (ave)	1280	25.5	893,520	Daylight Hrs	67,745	25	60	216,784
Rooftop Solar	0	24.5	858,480	Daylight Hrs	13,550	25	>60	43,360
Wind Works (no BESS) ave	10,160	30.1	1,054,704	Wind dependent	164,212	20	290	656,848
Wind Works EIS^^	12,734	34.2	1,176,471	Wind dependent	202,868	30	NA	540,981
Wind Works EIS^^^	**19,905**	**35.0**	**1,226,190**	**Wind dependent**	**158,472**	**25**	**NA**	**507,110**
HELE	30	82.3	2,915,328	24hrs/7days	< 108,550	60	3,000	<144,733
CCGT-CCS	146	90	3,153,600	24hrs/7days	< 108,550	25	3,000	NA
Nuclear	169	91.3	3,199,152	24hrs/7days	108,550	80	7,400	108,550

^ includes a BESS; ^^ materials for turbines & concrete bases only, scaled from 714MW; ^^^ turbines & bases only, scaled from 336MW.

While the analysis in Table 2 shows that industrial wind and industrial solar generators require significantly more tonnes of materials over 80 years than other generator types, it does not address the return on energy in/out payback. Table 3 below corrects this deficiency.

The Bowman Creek project is highlighted in Table 3. The "Material tonnes/MWh" of 5,169.57t/MWh is derived from dividing the ("materials over 80 years Mt" times 1 million) by the assumed output over 80 years.

Even though the tonnes of materials the project will require is understated it is many more times than for any other non-wind generator. The mining, processing, manufacture, transportation, construction and end-of-lives disposal that all of these activities involve are detrimental to the environments.

Table 3. Comparison of 400MW Capacity by Generation Types (December 2023)

Electricity Generator type	Output MWh/year	Output Over 80 years MWh	Materials Over 80 years Mt	Material Tonnes/MWh	Materials to Equal HELE output Mt	Materials to Equal Nuclear output Mt
Solar Works EIS^	883,008	70,640,640	218,666	3,095.470	**721,945**	**792,230**
Industrial Solar (ave)	893,520	71,481,600	216,784	3,032.725	**707,311**	**776,172**
Rooftop Solar	858,480	68,678,400	43,360	631.348	**147,247**	**161,582**
Wind (no BESS) ave	1,054,704	84,376,320	656,848	7,784.743	**1,815,606**	**1,992,366**
Wind Works EIS^	1,176,471	94,117,680	540,891	5,747.921	**1,340,566**	**1,471,078**
Wind Works EIS^^^	**1,226,190**	**98,095,200**	**507,110**	**5,169.570**	**1,205,679**	**1,323,059**
HELE	2,915,328	233,226,240	144,733	620.569	**144,733**	**158,824**
CCGT-CCS	3,153,600	252,288,000	NA	#VALUE!	**#VALUE!**	**#VALUE!**
Nuclear	3,199,152	255,932,160	108,550	424.136	**98,920**	**108,550**

^ includes a BESS; ^^ materials for turbines & concrete bases only, scaled from 714MW; ^^^ turbines & bases only, scaled from 336MW.

All electricity generators deliver an identical product to the National Energy Market (NEM) grid, namely alternating current electricity. Thus, it is valid to make comparisons using this common output.

Table 3 highlights the tonnes of materials required to be used to generate the same quantity of electricity over 80 years for each of the generator types compared with a HELE (50 years life) and with a Nuclear power plant (80 years life). The Proponent stated that the its wind works could be refurbished after 25 years and even in perpetuity. So one lifetime of a nuclear plant is reasonable to use.

No two industrial wind works projects are the same, so that the material content is understated for the specific EIS cases shown in Table 3. The Proponent for the Bowmans Creek wind works has stated that an estimate of the energy in could be double that of just the WTG and concrete base

alone. However, SOS could not validate their statement and so has ignored the additional materials required, for example for internal roads, transformers, internal transmission lines, operation of vehicles, rock crushing plants, concrete batching plants, onsite buildings, fencing, cabling, etc.

Apart from only including materials for the WTG and concrete base, SOS has also used the apparently optimistic capacity factors contained in each of the EIS examples (34.2% and 35%). Capacity factors for all wind works operating in the NEM, according to the published data from the AEMO, has averaged 30.3% over the last five years and just 29.9% over the last 12 months. A CF closer to 30% would fit with the actual performance of wind works in the NEM, but this will decrease the output of the wind works and so increase the material resources required.

Also, SOS has not allowed for the decline in output with WTG age, component failure, weather damage, blade replacement or maintenance. All these omissions result a significant understatement for the wind and solar EIS examples.

However, just from the results in Table 3 it is obvious that the Bowmans Creek industrial wind works will utilise at least 8.33 times more tonnes of materials than a HELE electricity generator and at least 12.19 times for a nuclear electricity generator. It could possibly be at least double those ratios if all materials could be included.

An article by the ABC published on 13 December 2023 highlighted that 82% of mines globally target minerals critical for the renewables transition. The article continues by highlighting the environmental damage this is already causing and will only get worse. As shown in Table 3 this resource-hungry project will be a contributor to this growing environmental problem. It is not ecologically sustainable.

The Proponent has stated that the 180 turbine blades weighing 3900 tonnes will be cut up and buried at the end-of-life. Turbine blades contain toxic chemicals. Also the 36,000 m3 of concrete bases will remain in-situ. This is a substantial waste of resources and may damage the local environments.

3. Events since 2020

The Bowmans Creek EIS is dated 17 March 2021 includes references related to 2020. Some of these references are no longer valid, including:

- the AEMO statement in its July 2020 Integrated Service Plan that "An optimal split of new solar and wind variable renewable energy would minimise the need for dispatchable storage and generation and therefore keep costs down for consumers." (page 297, 9.1.3). The Federal government recently announced the need for an increase of 9GW of storage and 23GW of wind and solar capacity, a ratio of 1:2.6, which is a significant storage requirement.

- quoting the Clean Energy Council (2020) installed wind works capacity and output for 2019 resulting in an average capacity factor of 35.4%. (page 229). The actual AEMO figures for the wind works capacity in 2019 results in a CF of under 30%.

- since 2018 to now the wind works capacity in the NEM has risen from 5,301MW to 10,277MW, an increase of 94%. In that time electricity costs to consumers has risen to such an extent that it was reported that "...1.5 million people are struggling to pay their power bills as power prices are expected to rise another 20 per cent in the next six months". (P Murray, Skynews 8/10/2023). Rising electricity costs with increases in wind and solar capacity beyond 30% is experienced by every country.

- Liddell power station was decommissioned as planned. The average realised wholesale price in NSW was 32% higher in the period after Liddell's closure (A MacDonald, AFR 19/7/2023). Similar results have occurred each time a large coal-fired plant has closed in Australia. More wind and solar capacity does not show up as reduced wholesale prices.

- the EIS claims fire risks can be mitigated. However, since early 2020 there has been serious fires in a wind turbine, a solar works, two battery energy storage systems and several catastrophic rated fires in NSW Renewable Energy Zones, including a current mega-fire near Grafton in the Hunter-Central Coast REZ that has already destroyed several homes, a tyre business and lots of other property and 8000 hectares of land. Separately near Grafton, two people were killed, apparently after their light plane struck a power line.

  Also, over the same period that fire-risks are increasing from wind, solar and BESS works the number of RFS volunteers continues to fall. The clustering of so many proposed wind, solar, BESS and transmission projects on lands prone to frequent and major grass and bushfires is inviting a catastrophe, including the large-scale loss of generation capacity. Apart from the increased risks to lives and property the security of the NEM will be at risk.

- the AEMO and the NSW government issued warnings that the NEM was on the verge of significant blackouts. Consumers were asked to cut back consumption for Thursday evening of 14 December 2023. Since the 2022 winter the AEMO has increasingly had to intervene in the energy market to match demand with unstable generation. Consumers have been warned that blackouts are likely later in this summer.

- China is now by far the dominate provider of wind, solar and industrial lithium batteries, accounting for up to 90% of all components used in Australia's renewables projects. This poses a an energy and a national security risk, to which this proposed project will add.

- this year alone some large wind turbine manufacturers, projects and construction companies are facing financial headwinds with some cancelling major wind works projects, some facing bankruptcy, some contractors failing, warranty costs rising, heavy losses in the $ billions incurred, investment finance becoming scarcer, share prices plummeting, job losses occurring, and even more government subsidies and financial assistance being requested.

Conclusion

Those evaluating projects, making laws or using data provided by proponents must fully understand that stated nameplate capacities for wind and solar works cannot be directly compared with the nameplate capacity of any base-load power plant. The significance and implications of the differences in capacity factors, life-span and energy availability have profound consequences in determining the full impacts on greenhouse gas emissions and electricity costs.

Just as we use carbon dioxide equivalents (CO2e) to represent all human-induced greenhouse gas emissions then so must Capacity equivalence (Ce) be used when comparing energy generation sources.

Save Our Surroundings has used the data supplied by the Proponent to assess its claims that the Bowman Creek Wind Project will reduce greenhouse gas emissions and lower electricity prices. The results of our analysis are that:

- the 336MW Bowmans Creek Wind Works project only equates to a 65.3MW equivalent base-load power plant; this results in a multiplier effect resulting many times the requirements for all types of natural and material resources.

- the tonnes of materials required for just the 60 wind turbines and their bases is already many times that required for other similar nameplate capacity electricity generation technologies; this is not a sustainable use of resources.

- all electricity generators produce the same product (ac electricity) for the NEM grid it is useful to assess total MWh of generation and the materials needed to support that generation over an extended period of years; this project requires xxxt/MWh of materials just for turbines and their footings, which is xxx times more than other generation sources.

- at a 2020 project capital cost of $569 million, equating to $8.7 million per MW of capacity equivalent is multiple times the 2017 cost of HELE power plant at about $2.2million/MW. The project will therefore increase overall system costs of the NEM and consequently energy bills for electricity consumers. It is not in the public interest to inflict more cost of living pain on Australian people and businesses.

- several events since the EIS was prepared demonstrate how quickly claims and assumptions by proponents can change; these include substantial increases in electricity costs, increased hardship for millions of Australians, the increased possibility of blackouts, increased costs and failures of wind turbines, and industry participant failures and difficulties.

- This project will add to our energy and national security risk.

The project will fail to achieve its own criteria for approval, that "the primary need for the project is to contribute efficient, low cost electricity to the NEM". The project will not be an efficient use of resources and so will increase overall NEM costs and therefore costs to both consumers and taxpayers.

The Proponent has not justified approval for its proposed Bowmans Creek Wind Works. The IPCN should therefore refuse consent.

Yours sincerely

Save Our Surroundings (SOS)

Wind and Solar Electricity Generation Are The Answer. Seriously?

November 2022












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Wind and Solar Electricity Generation are the answer. Seriously? November 2022

Prepared by Save Our Surroundings (SOS) and updates the original November 2020 paper and the updated May 2021, October 2021, February 2022 papers as a result of more current events supporting the evidence we previously provided.

Save Our Surroundings (SOS) is part of network of groups of like-minded concerned and impacted citizens that oppose the proliferation of industrial scale weather-dependent "renewables" and their negative impacts on local and global environments and communities. The independently run groups share and distribute information, research and experiences with each other.

Introduction

Why SOS prepared this paper

Residents of rural Australia are, and continue to be, directly and negatively impacted by mega industrial wind and solar proposals and constructions and the decisions of our policy makers that facilitate the destruction of their local environments and limit their rights. This destruction is long-lasting. Concerned citizens volunteer their time and energy to providing the collective knowledge and experiences gained so far to anyone who wants to learn about the negatives of weather-dependent "renewables" (also known as "unreliables" and "ruinables") and know what questions to ask of our governments, organisations, media and developers. Rural regional Australians want to be heard and their issues appropriately addressed.

"The public and the news media, who should be asking probing questions, have become convinced that they cannot understand science. They are reduced to asking scientists to spoon feed them sound bites. With a little work, most lay people can understand scientific papers and they should try. Relying on politicians, scientists, and the media to tell us what is happening is not acceptable."
Quote by Andy May "Politics and Climate Change: A History"; wattsupwiththat.com/2020/11/15/the-government-corruption-of-science/

The significant conclusions drawn from our nearly four years of ongoing research and input from dozens of affected communities into weather-dependent wind and solar electricity generation, including the required supporting infrastructure for the 70% of time that wind and solar does not generate any electricity, using new transmission infrastructure, batteries, pumped hydro, biomass, and "green" hydrogen are that:

- Australian governments cannot achieve their stated objectives of reducing global temperatures, significantly reducing electricity prices and creating substantial numbers of jobs. No state or country with a large proportion of wind and solar plants in their electricity generation mix has achieved these objectives.

- The risks to the safety of people and the damages to many domestic and overseas environments are substantial and are being ignored. The risks include life-cycle toxicity, causing serious bush and grass fires, loss of productive farmland, pollution of the environments and abuses of people in developing countries, including children. Globally, 82% of mining areas, including wilderness areas, are now targeted to extract raw materials for "renewables".

- Resources are being misallocated: up to ten times more resources (land and materials) are needed for intermittent and unreliable weather-dependent and weather impacted renewables than for alternatives, such as reliable 24/7 base-load modern coal, gas or

nuclear generators. Subsidies, favourable policies and favourable purchase power agreements for renewables distort the market place for other types of energy generation.

- The public are not being told about the many negative aspects of weather-dependent electricity generation or are being mislead about the benefits, the costs and the viability of proposed solutions, such as green hydrogen..

This paper presents many of our research findings that highlight the folly of the successive Federal and State governments' policies in promoting and subsidising solar and wind electricity generating plants and setting net zero targets at the expense of much better modern alternatives, such as High Efficiency Low Emissions (HELE) coal-fired power plants, combined closed cycle natural/hydrogen gas turbines and nuclear reactor electricity generation, which are all much less harmful to the global environment and still reduce emissions in comparison to Australia's old style coal-fired electricity generation plants.

The two policy drivers promoted by governments and others to extensively and radically change the methods of electricity production in Australia are:
(1) to lower carbon dioxide equivalent emissions to reduce Earth's projected temperature increases,
(2) to provide a very low cost electricity supply so as to, in Australia:
a) increase economic activity, especially manufacturing;
b) create sufficient jobs for an increasing population;

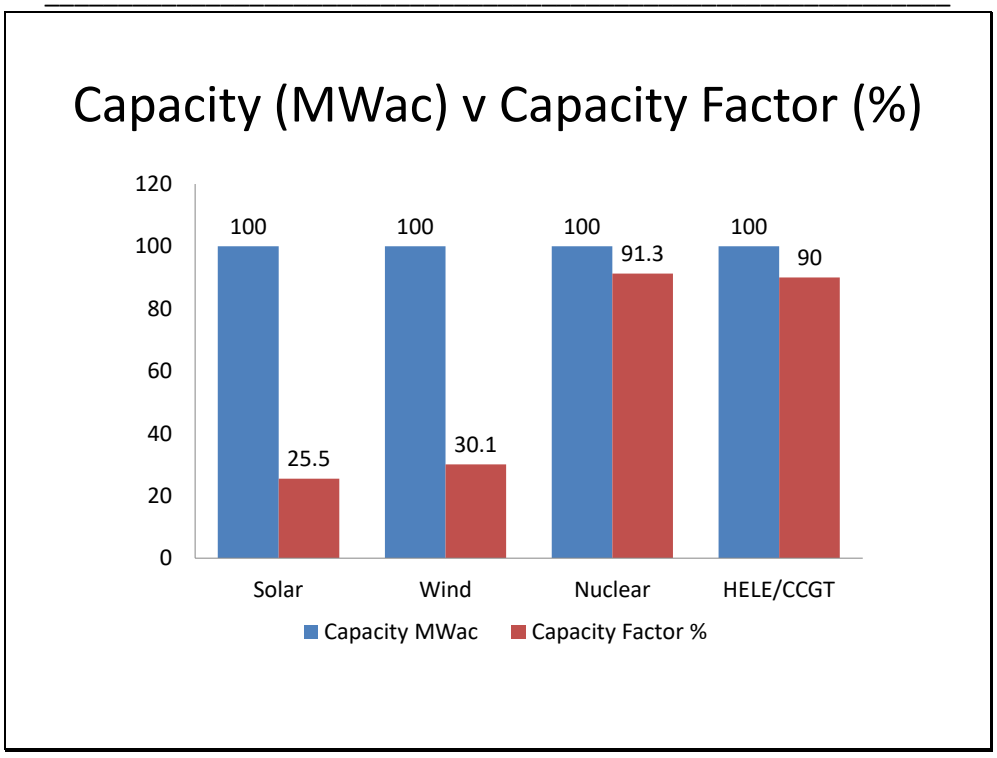
Therefore, the question to be answered is: "To what extent should weather-dependent renewables, and their necessary enormous additional costs, infrastructure and negative impacts on all environments and people, play in achieving these policies?". The NSW State and Federal LNP, Labor and Greens parties and many of the other ill-informed public bodies, companies and main stream media promote, without supporting facts, net-zero emissions and claim that much cheaper electricity will result from ever higher proportions of weather-dependent renewables. However, our research demonstrates that the verifiable facts and the actual experiences to date do not support such claims. Therefore, renewables must play a very small part if Australia is to recover economically and continue to provide and improve the services of a developed country for the current and future generations of Australians.

Our justification for concluding that wind turbines and solar industrial electricity generating plants (IEGP) as only alternative to coal, gas and nuclear power plants should play a small part in Australia's total electricity generation mix derives from examination of the available and increasing evidence, which does not support any of the usually non-factual or unsupported claims made by those that advocate for only wind and solar electricity generation, including the necessary storage backup of battery, pumped hydro, biomass and green hydrogen plants. This research paper examines the main claims by proponents of weather-dependent renewables, which are that renewables will:

- **significantly reduce CO2 emissions;**
- **provide the cheapest sources of electricity generation;**
- **create substantial numbers of jobs (especially in the regions);**
- **are safe;**
- **are good for the environment;**
- **are clean sources of energy;**
- **will eliminate fossil fuel use;**
- **have strong community support;**
- **are reliable;**
- **are sustainable.**

We have to be brief, even though the topic and evidence is substantial, the research extensive and continues to evolve. Therefore, we only provide summary points. We urge readers to examine the hundreds of references quoted throughout this paper that support all our research, findings and conclusions. We will address the claims for the benefits of wind and PV solar "renewables", including the claims that battery, pumped hydro, biomass and green hydrogen storage "backup" is all that is needed for a "modern" electricity system.

Firstly some definitions:
It is important that the reader understand the terms and acronyms used when discussing electrical energy. For example, the net **Capacity Factor** is the ratio of an actual electrical energy output over a given period of time to the maximum possible electrical energy output over that period e.g. a **1MW** wind turbine may produce **2,637MWh** in a year out of a possible **8,760 MWh**, therefore its **capacity factor is 2,637/8760 = 30.1%**, which is a typical value for modern wind turbines. A photovoltaic (PV) solar Industrial Electricity Generating Plant (IEGP) with a rated nameplate capacity of 400 megawatts alternating current (MWac) produces little more than a quarter of the electricity over a year than does a modern HELE coal fired plant or combined cycle gas turbine (CCGT) power plant or a nuclear reactor. The electricity output of a power plant is described as megawatt hours (MWh). More detailed definitions are shown at Appendix A. The chart below shows the relative Capacity (MWac) vs Capacity Factor (%) of the main electricity generating technologies.



Estimated or actual annual output in MWh = Capacity factor % x (capacity MWac x 24hrs x 365 days)

Secondly, some basic facts:

- It is estimated from IPCC data that carbon dioxide (CO2) from all human-induced sources, not just electricity generation, is **3%** of the 0.04% of CO2 in the atmosphere. 97% of greenhouse gases (GHG) are naturally occurring, with water vapour being the major greenhouse gas. Australia is responsible for about **0.036%** (i.e. 1.2% of the 3%**)** of human-induced amount of total global emissions of carbon dioxide equivalents (generally stated as

the main driver of global warming) and by signing the Paris Climate Agreement has undertaken to reduce its human related carbon dioxide emissions over time.

However, Australia's Chief Scientist of Australia, Dr Finkel, told a Senate inquiry in June 2017 that if Australia reduced its **total** carbon emissions to **zero**, that it would do **virtually nothing to reduce global temperatures.** Likewise the CSIRO could not produce to a senate enquiry any scientific evidence that CO2 drives climate change. None of the over 100 climate models based on this "theory" have proven to be accurate and all have estimated higher global temperature increases than actually recorded over recent decades. When SOS, one of 32 witnesses called, pointed out at the House of Representatives hearing into MP Zali Steggall's Climate Change Bills that CO2 is not proven to be a dial for climate change, Ms Steggall disagreed. SOS offered to apologise if she could provide scientific proof that CO2 causes climate change. SOS is still waiting.

Thus, Australia's policies on emissions reductions should be based on logic and practicality. For Australia, electricity consumption is about **33%** of our total energy consumption, i.e. a third of our total CO2 emissions. Restructuring our electricity system can have no affect on our climate but is significantly negatively impacting our environments and electricity costs.

There is no justification for spending many multi-billions of dollars every year in direct and indirect subsidies for no climate benefit, yet causing higher electricity bills, increasing hardship to Australians, damaging our economy and causing wide-scale damage to our environments, both in Australia and overseas.
[ref: https://www.facebook.com/SenatorIanMacdonald/videos/1343186319100574/; IPCC AR4 2007]

- Every country, such as Australia, Germany and Denmark or state, such as California, Texas and South Australia, that have significantly introduced solar and wind technologies into their electricity generation mix have not only significantly increased their electricity prices but also destabilised their electricity grids, which leads to more expenditure on 100% backup, extension of transmission infrastructure, more difficult electricity grid management and more ad hoc unproven "solutions" being pursued, such as the failed geothermal, wave generation and carbon capture experiments already tried.

  Doing more of the same thing (i.e. increasing the percentage of weather-dependent renewables) and expecting a different result is totally illogical.
  [ref: afr.com 5/8/17 "MarkIntell, US Energy Information Administration"]

- The NSW Government in November 2020 declared the Central-West Orana a Renewable Energy Zone (CWO REZ), which was to be an initial **3,000MW** (now increased to 12,000MW) installed capacity "pilot" for several already now declared NSW Renewable Energy Zones. The NSW Electricity Strategy states it aims are to provide low cost electricity to consumers and provide a stable and reliable energy system, while achieving a net-zero emissions target by 2050. *"For households, the Strategy will lead to estimated bill savings of **$40 per year** "* by **2040**.

  The 2020 average residential bills were: **18-29yo $1906**; **60syo $1458**. We need to reduce electricity bills by **half or more not a miniscule $40pa or even AEMO's estimate of $55pa in 20 years' time**. No country, state or jurisdiction has been able to have a high percentage of renewables in their electricity system mix and still provide cheaper electricity or even a stable or reliable supply. Australians already support renewables through direct and indirect subsidies and other means to the tune of at least **$1300pa** per household, amounting to over **$13 billion** nationally, and still growing, each year (in October 2022 it was reported to

now be $22 billion a year by 2030). As of the October 2022 Australian Federal Budget projected that electricity prices are to rise by 20% in 2022 and 30% in 2023. This is on top of a tripling of prices (net of FIT credits) from March 2019 to April 2022 for some NSW residents.

If the renewables subsidies were used to build two or three modern long-life HELE coal-fired (China, India, Japan and others are building hundreds of these right now) or a few combined-cycle gas turbine and/or a nuclear plant (53 nuclear reactors are globally under construction right now) or several of the USA approved Small Nuclear Reactor (SMR) then the average electricity bills should drop by meaningful amounts within in a few years.
[ref: https://energy.nsw.gov.au/media/1921/ " NSW Electricity Strategy"; afr.com 5/8/17 "MarkIntell, US Energy Information Administration"; afr.com 5/8/17 "MarkIntell, US Energy Information Administration"; 23/08/20 Report by Dr Moran "The Hidden Cost of Renewables on Electricity Prices"; ddears.com/2020/07/14/dont-ignore-coal/ ; world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactors-worldwide.aspx' Daily Telegraph p2 9/11/20 "Road to cheaper and cleaner power in NSW"]

- Two of the biggest emitters of CO2 in 2019 (pre-Covid 19) were China (**27.9%**) and India (**7.2%**) who, under the Paris Climate Agreement, can continue to increase their emissions for several more decades. The USA, while the second biggest CO2 emitter in 2019 (**14.5%**) has reduced its emissions substantially since Kyoto Protocol commenced in 2005, largely by significantly increasing gas for electricity generation instead of using coal. In 2019-20 China's emissions were 30% of world emissions despite a slower economy, increased renewables and the full-year operation of seven new large-scale nuclear reactors.

  Australia can have no practical effect in reducing global CO2 emissions.
  [ref: "2019 BP Statistical Review of World Energy"; Paris Agreement targets; iea.org/articles/global-co2-emissions-in-2019 ; https://www.facebook.com/SenatorIanMacdonald/videos/1343186319100574/;]

- Germany and Denmark are regarded as world leaders in transitioning to renewable energy electricity generation, yet in 2020 Germany had the highest household electricity prices in the world at **US$0.366/KWh** with Denmark at **US$0.337/KWh**), despite their massive shift to renewables at **46.5%** and **63%** respectively; the world average electricity price in 2019 was **US$0.14/KWh** , Australia was **US$0.23**. China and India, who generate most of their electricity from burning coal, were each **US$0.08/KWh**. In 2022 Western Europe, the UK and the USA are in an energy crisis with 400% increases in electricity costs, company failures, energy rationing, fertiliser shortages and food shortages, all expected to worsen during the 2022 Northern winter. Australia's electricity cost is expected to increase by 56% by 2024.

  The evidence is clear: the more weather-dependent renewables there are the greater the increase the overall cost of electricity supply. How can Australia be competitive when our electricity costs were already three times more than our competition and near trading partners in 2020?
  [ref: globalpetrolprices.com "Electricity prices for households, December 2020".]

- For energy generation, wind is an ancient technology and solar cells (invented in 1883 by C Fritz) and the first viable solar panel developed by Bell Laboratories in 1954, are both dilute inefficient and inconsistent forms of energy conversion. The energy density (the amount of energy in mega-joules [Mj] released per kg) of different fuels in increasing order is wood (16Mj/kg), coal (24), oil (45), natural gas(55) and nuclear (3,900,000). The higher the energy density the lower the total demand on all resources and the higher the efficiency in producing electricity. A mega-joule is equivalent to 0.278KWh of energy.

  Logically, natural gas and zero emissions nuclear are the preferred fuels at this time.

[ref: understandsolar.com "Who invented solar panels?"; energyeducation.ca/encyclopedia/energy_density]

- A study of Germany's electricity generation found that over their operating life solar and wind have very low energy output compared to the energy used to make and install them. The energy generated by nuclear, hydro, wind and solar was, respectively, **75, 35, 3.9** and **1.6** times greater than the energy required to make them. Wind and solar provide a poor return on an energy in/energy out basis compared with other methods. More energy in means the more emissions created and embedded in the product, especially those sourced from China, which generates the most emissions globally. About 90% of Australia's wind, solar and batteries are made in China.

  Logically, nuclear energy should be preferred for electricity generation as it gives the best energy in/out result, causes fewer emissions in its creation and generates zero emissions during its operation. Also, the imbedded GHG in renewables must be taken into account.
  [ref: 30/6/20 M Shellenberger "Apocalypse Never" p192]

- Australia is the only country of the top 20 developed countries and the top 'developing' countries (China and India) that do not depend on zero-emissions nuclear power for part of their electricity generation. There are currently about **53** nuclear power reactors under construction, mainly in China, India, Russia and UAE.

  Australia is being left behind due to its illogical and damaging ban on nuclear energy.
  [ref: World Nuclear Association "Plans for New Reactors Worldwide" September 2020]

- California at the end of 2019 had 13 in-state sources of electricity (excludes over 30% imported from interstate). Its installed capacity (MW) was PV solar **14.1%**, wind **7.5%**, natural gas **50.6%,** nuclear **3%**, hydro **17.6%,** others **7.2%.** California, America's most populous state, is among the most expensive states for electricity and its electricity prices have increased at five times the average rate of the rest of the USA as they move each year to higher percentages of "renewables" and elimination of fossil fuels and nuclear power sources.

  Again, gas and nuclear should be the preferred power sources for Australia, especially as they do not involve major changes to the electricity grid or place huge demands on scarce resources as do weather-dependent renewables.
  [ref : 2001-2019 www.energy.ca.gov "Electric Generation Capacity and Energy"]

- CO2 emissions reductions have become an end in themselves and so the negative impacts of weather dependent renewables on the environment and on electricity prices, reliability and security are being ignored. Professor Steven Koonin, former New York University **professor** and former **undersecretary for science** in the Department of Energy in the President Obama administration, in his recently released book "Unsettled" highlights the lack of evidence to support claims of human induced climate change that is an "*existential threat, climate emergency, disaster, crisis, but in fact, when you actually read the literature, there is no support for that kind of hysteria at all*". This is in addition to two long-time, well known environmentalists, Michael Moore (documentary "Planet of the Humans" YouTube 21/04/20) and Michael Shellenberger (book "Apocalypse Never: Why Environmental Alarmism Hurts Us All" 30/06/2020) highlighting the environmental damage being caused by the obsession many countries have for weather-dependent renewables.

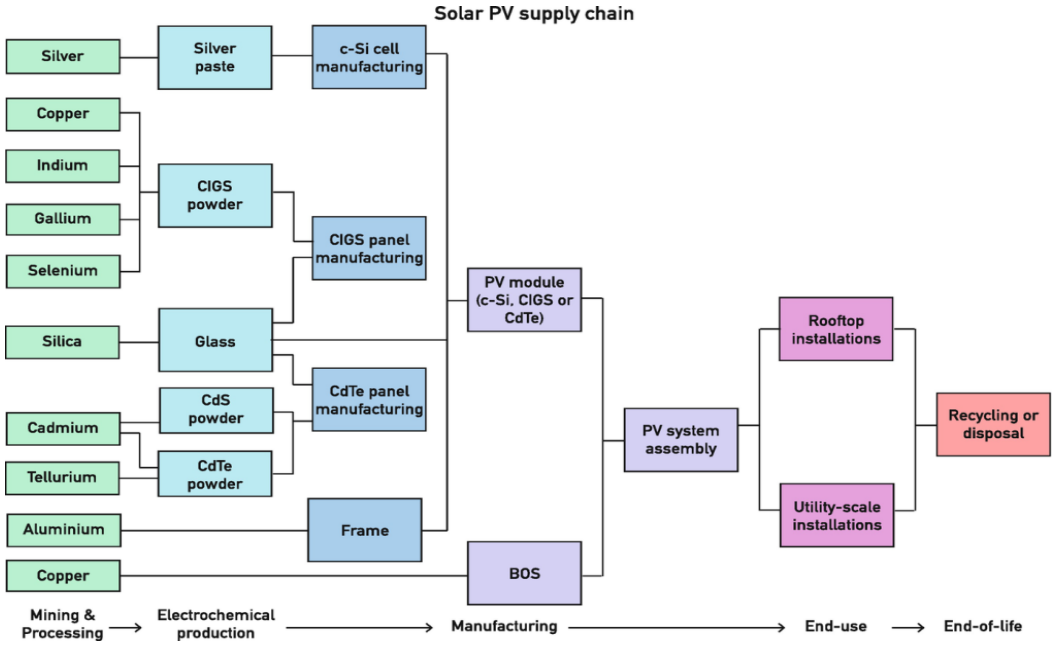
Claimed benefits of solar and wind electricity generation

The proponents of wind and solar electricity generation claim that these will:

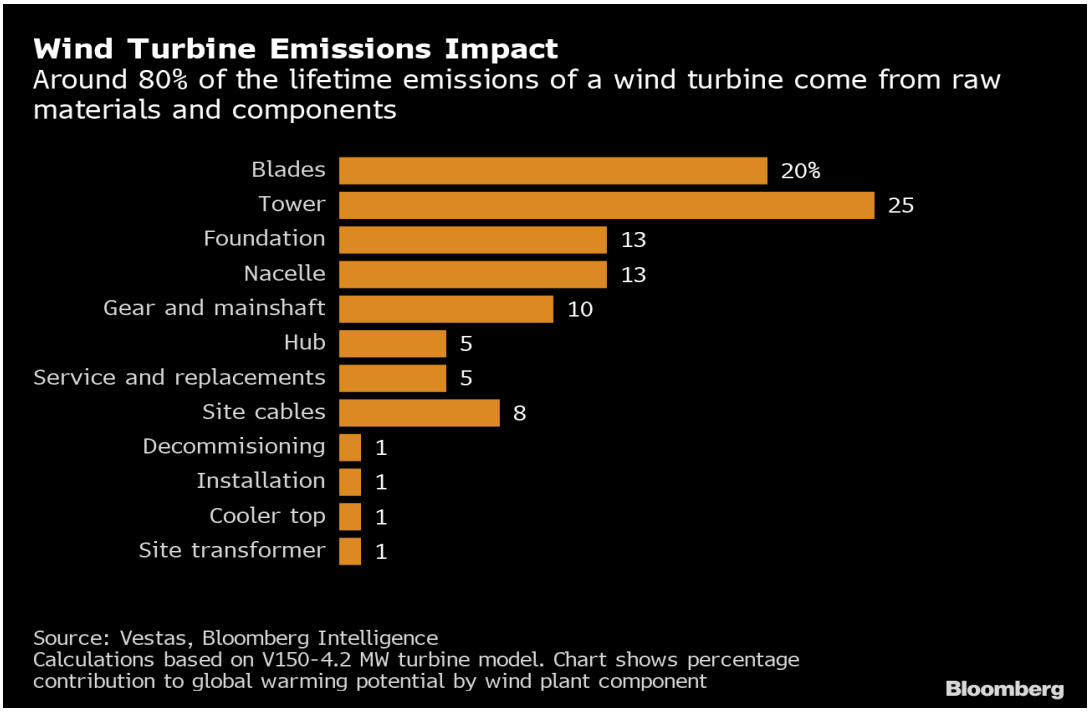
1. Significantly reduce CO2 (or CO2 equivalents) emissions

This claim is not supported by the facts, as advocates omit the multitude of associated emissions that weather-dependent renewables cause over their total short life-cycle, such as:

- Studies show, if the TOTAL life-cycle (e.g. mining, processing, manufacturing, transportation, land acquisition/lease, land clearing, construction, operation, maintenance, decommissioning and disposal/recycling/land rehabilitation) of an industrial PV electricity generating system and the associated extra supporting infrastructure needed (e.g. backup power/storage, grid transmission building/upgrades, substation building/upgrades, recycling facilities/storage, landfill facilities), creates substantially more CO2 emissions than say a nuclear power plant of the same nameplate capacity (megawatts). Only about **60%** more energy is generated over the claimed up to **30** years life of an industrial PV solar plant than it takes to build it. Nuclear generates about **7,400%** more energy than it takes to build it and operates for up to **80** years. Refer to the "solar PV supply chain" diagram below.
  [ref: 30/6/20 Michael Shellenberger "Apocalypse Never" p192; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"]



- Studies show, if the TOTAL life-cycle (e.g. mining, processing, manufacturing, transportation, land acquisition/lease, land clearing, construction, operation, maintenance, decommissioning and disposal/recycling/land rehabilitation) of an industrial wind turbine electricity generating system and the associated extra supporting infrastructure needed (e.g. manufacture of large specialised vehicles & cranes, dock extensions, road building, backup power/storage, grid transmission building/upgrades, substation building/upgrades, recycling facilities/storage, landfill facilities), creates substantially more CO2 emissions than say a nuclear power plant of the same nameplate capacity (megawatts). Only about **290%** more energy is generated over the up to **20** years life of an industrial wind turbine system than it takes to build it. A nuclear plant generates about **7,400%** more energy than it takes to build it and operates for up to **80** years. Refer to the "wind turbine emissions impact chart".
  [ref: 30/6/20 M Shellenberger "Apocalypse Never" p192; Bloomberg "Wind turbines emissions impact chart]



- The relatively short life-cycle of PV solar systems (20 to 30 years) and wind turbines (15 to 20 years) and lithium batteries (8 - 10 years) compared to the alternatives of coal, gas and nuclear plants (60 to 80 years) means that a PV solar plant or a wind turbine plant needs to be replaced/upgraded 2 to 3 and 4 to 5 times respectively, which generates more green house emissions each time, during the lifetime of the alternatives. Over a 60 years period this frequent replacement of solar and wind electricity plants will continue adding CO2 to the atmosphere and drive up electricity prices for decades.
  [ref: 17/08/20 "The excess cost of weather dependent renewable power generation in the USA" from EDMHDOTME]

- The low starting and declining efficiencies of wind turbines (**34%/1.6%**pa) and PV solar panels (under **25%/0.5 - 0.8%**pa) means that the initial resource demands of the installations has to be many times more than the alternatives for the same actual average electricity generation output (megawatt hours pa) over their life-times and so adds more CO2 to the atmosphere.
  [ref: sciencedirect.com Vol 66 June 2014 p775-786; 7/07/18 wholesalesolar.com "How long do solar panels last?"; 2012 NREL study; https://papundits.wordpress.com/2019/10/01/australian-daily-wind-power-generation-data-introduction-with-permanent-link-to-daily-posts/]

- Despite very significant expenditures on renewables, Germany (**A$830 billion** 1999-2020) and the state of California (**A$143b** on wind & solar) have not met their emission reduction targets as at 2019. Germany, whose emissions reductions have been flat for several years, reportedly achieved its 2020 target only because of the Covid-19 virus measures impacting their economy. California has to nearly double its rate of CO2 reduction in the next decade compared to the previous decade.
  [ref: nextbigfuture.com/2019/11/france-spent-less-on-nuclear-to-get-about-double-what-germany-gets-from-renewables; forbes.com/sites/michaelshellenberger/2020/08/15/why-californias-climate-policies-are-causing-electricity-black-outs/#6cf13471591a ; dw.com.en.germany " Germany unlikely to meet carbon reduction targets for 2020"; 16/1/20 mercurynews.com "California's behind on its 2030 climate goals. What's at stake if it doesn't catch up?"; Pandemic helped Germany achieve its 2020 climate targets – DW – 01/04/2021]

- Had California spent an estimated **US$100 billion** (A$143b) on nuclear plants instead of on wind and solar, it would have had enough energy to replace **all** fossil fuels in its in-state electricity mix. Thus, emissions-free nuclear reactors would have seriously reduced CO2 emissions and lowered electricity prices, as is the case in France, which generates about 70% of its electricity from its nuclear reactors.
  [ref: 15/8/20 forbes.com/sites/michaelshellenberger/2020/08/15/why-californias-climate-policies-are-causing-electricity-black-outs/#6cf13471591a]

- The development of nuclear power generation in Australia will lead to the establishment of an entire new industry with long-term environmental, technological, economic and social development benefits. These benefits will flow on progressively to other industries, all while bringing the economy closer to net zero emissions. It will also support our defence capabilities, including our decision to purchase nuclear submarines.
  [ref: "The case for SMRs in Australia" by SMR Nuclear Technology Pty Ltd August 2021]

- Sulphur hexafluoride (**SF6**) is a synthetic greenhouse gas primarily used for insulating electrical connections to the grid. **SF6 is 23,500** times more potent than CO2 and its estimated lifespan in the atmosphere is over 1000 years, whilst CO2 is 100 years. SF6 in the atmosphere has more than doubled in the last two decades and will continue to rise as more renewable energy connections to electricity grids occur.
  [ref: bbc.com 13/09/2019 "Climate Change: Electrical industry's dirty secret"]

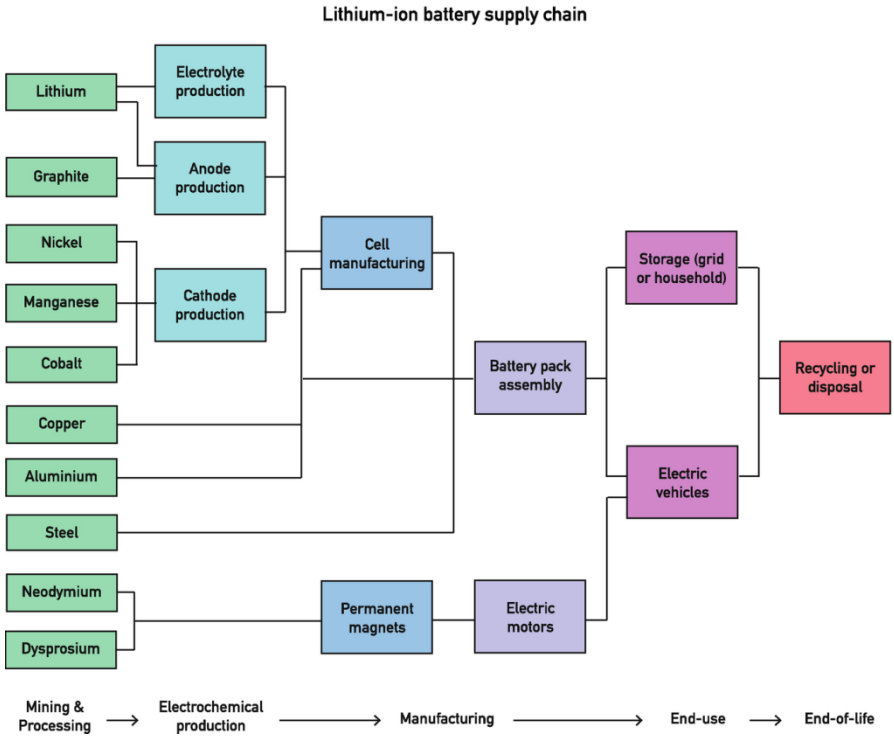
- According to US federal data, building solar panels significantly increases emissions of nitrogen trifluoride (**NF3**), which is **17,000** times more potent than carbon dioxide as a greenhouse gas over a **100** year time period. NF3 emissions increased by **1,057 percent** over the last **25** years. In comparison, US carbon dioxide emissions only increased by about 5% during that time period. A significant and growing proportion of NF3 emissions is due to the manufacture of solar cells.
  [https://wattsupwiththat.com/2018/12/23/solar-panel-waste-a-disposal-problem/; Wikipedia "where is NF3 used]

- A study has shown that a PV solar system only generates **1.6** times the energy that was used leading up to its commissioning. It therefore starts operation with a CO2 and energy deficit. Assuming a 25 year life then the system will only offset its energy deficit at the time of commissioning after 10 years of operation, i.e. at least **40%** of its life before contributing to any global reduction in CO2. Batteries need to be replaced more frequently so adding more CO2 to the atmosphere.
  [ref: https://doi.org/10.1016/j.energy.2013.01.029]

- It was been calculated in 2014 that just the footing for a small (1MW) wind turbine requires **45** tons steel rebar and **481m3** of concrete, which produces **241.85 tons of CO2**. The CO2 produced from mining, processing and transporting the materials was **not** included in the calculation. 241.85 tons (219.4Tonnes) of CO2 is equivalent to an average new petrol driven car in 2017 (0.1201kg/km of CO2) travelling 1,827,000km or 122 cars each travelling 15,000km in a whole year. Currently proposed land-based wind turbines have a 7MW capacity, i.e. seven times bigger than the 2014 example..
  [ref stopthesethings.com 16/8/14 "How much CO2 gets emitted to build a wind turbine?"; 4/10/17 www.lightfoot.co.uk "How much CO2 does a car emit per year"]

A single 1MW wind turbine concrete base under construction

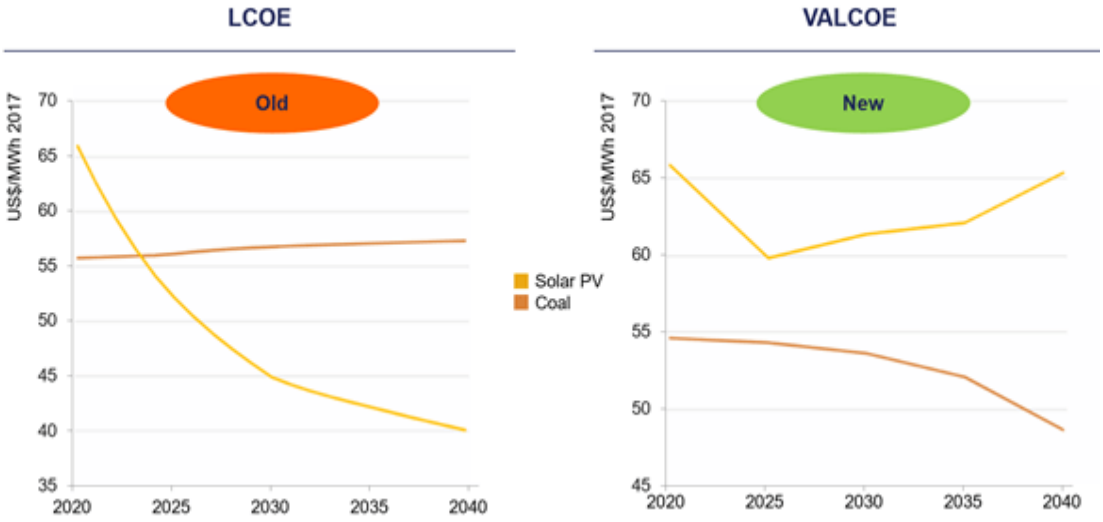
- Energy totalling **10-18MWh** is required to build one Tesla **850kg/85KWh** car battery, resulting in **15-20 tons of CO_2** emissions assuming 50 per cent renewable power is used in its production. Assuming conservatively that 1-2 per cent of mined ores end up in the battery in the form of metals (see diagram below), one Tesla battery requires **25-50 tons** of raw materials to be mined, transported and processed. Batteries are not a good environmentally friendly backup storage solution for wind and solar electricity generators.
  [ref: Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"]



2. Provide the cheapest sources of electricity generation

This claim is not supported by the facts, and actually the opposite is true based on real world experiences, such as:

- The **Levelised Cost of Electricity (LCOE)** measure used in the popular press and by most governments is misleading. The still incomplete but better **Value-Adjusted LCOE (VALCOE)** from the **IEA** was first published in 2019. In January 2020 the prestigious Institute of Energy Economics Japan (IEEJ) published its 280-page 'IEEJ Energy Outlook 2020' and raised concerns about renewables' rising unaccounted-for integration costs, concluding that LCOE is not capable of capturing the true cost of wind and solar. Comparisons of alternate costs using VALCOE helps explain why electricity systems that have significant weather-dependent renewables in their mix always result in higher electricity prices than those that don't.
[ref: Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"; www.iea.org/data-and-statistics/charts/levelised-cost-of-value-adjusted-lcoe-valcoe-for-solar-pv-and-coal-fired-power-plants-in-india-in-the-new-policies-scenario-2020-2040]

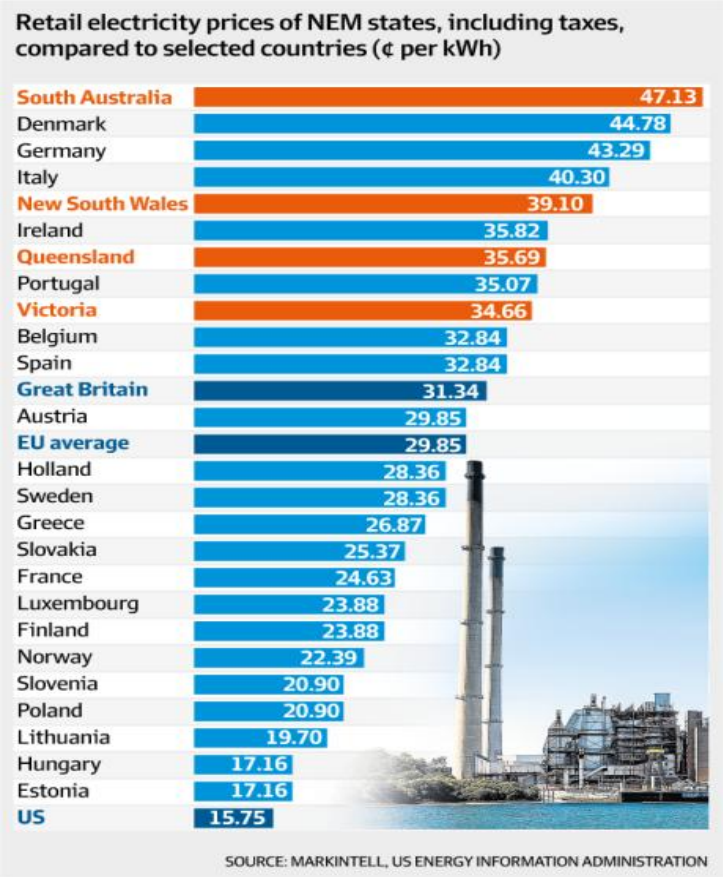


IEA chart

- In South Australia, Wholesale Electricity prices increased from an average of **$52.60 to $109.80/MWh** when the Northern power plant was closed in 2015 and, in Victoria, on the closure of Hazlewood power plant in 2017 from **$51.50 to $97.90/MWh**. After the coal-fired Liddell Power station in NSW closed just one of its four turbines in 2022 wholesale electricity prices rose sharply. Liddell is scheduled to close operation completely during 2023. If coal-fired power stations are claimed to be more expensive then solar and wind why do average wholesale prices rise when they are closed down or policies applied that reduce their efficiency?
[ref: "Life-cycle energy densities and land-take requirements of various power generators: A UK perspective: 18/02/2016]

- A comparison of retail electricity prices emphasises the disadvantage Australia has already created for itself with its high penetration of weather-dependent renewables. The more weather-dependent renewables the higher the electricity costs. A study of retail electricity prices in cents/KWh shows that in 2017 Australia's four NEM states ranked in the top nine highest electricity prices in the world, namely: **South Australia 47.13**, Denmark 44.78, Germany 43.29, Italy 40.30, **NSW 39.10**, Ireland 35.82, **Queensland 35.69**, Portugal 35.07, **Victoria 34.66.** In 1990s Australia had the lowest electricity prices in the world. Closing coal-fired power stations and substituting them with renewables has contributed to the

increased rise.
[ref: afr.com 5/8/17 "MarkIntell, US Energy Information Administration"; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"; www.statista.com/ statistics/263492/electricity-prices-in-selectedcountries/ 2018]



- In 2019 Germany's electricity production mix was **24.6% wind, 9.0% solar**, 8.6% biomass, 3.8% hydro, 29.1% coal, 10.5% gas, 13.8% nuclear, resulting in the highest household electricity price of any country in the world at **US$0.381/KWh**, despite 46.0% (**33.6%** wind and solar) generated from renewable sources. This pattern of substantial increases in electricity prices appears to occur in all countries and states that have significantly increased their reliance on weather-dependent renewables.
[ref: www.ise.fraunhofer.de/news January 15 2020, p2; globalpetrolprices.com "Electricity prices for households, December 2019"; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"]

- In 2019 Denmark's electricity production mix was **57% wind, 3% solar**, 20% biomass, 20% fossil fuels, resulting in the second highest domestic electricity price in the world at **US$0.361/KWh**, despite **60%** generated from weather-dependent renewable sources. This pattern of substantial increases in electricity prices appears to occur in all countries and states that significantly increase their reliance on weather-dependent renewables.
[ref: globalpetrolprices.com "Electricity prices for households, December 2019"; https://en.wikipedia.org/wiki/electrcity_sector_in_denmark]

- In 2019 Australia's electricity production mix included **21%** of renewables, mainly from roof-top solar systems, and its average domestic electricity price was **US$0.246/KWh**. This already puts Australia in the high end of world prices. In 2019 the global average electricity price was only **US$0.14**. China and India, who both predominately use coal-fired electricity generation, were only **US$0.08/KWh** ,. This pattern of substantial increases in electricity prices appears to occur in all countries and states that significantly increase their reliance on

weather-dependent renewables. What should Australia's target price be for, say, 2025?
[ref: globalpetrolprices.com "Electricity prices for households, December 2019"; 26/05/20
energy.gov.au/publications " Australian statistics table O electricity generation by fuel type 2018-19 and 2019]

- It is often stated that renewables put downward pressure on wholesale prices. However, what the consumers are interested in is what they have to actually pay for their electricity. The previous analysis shows that no country or state with a high proportion of renewables has achieved lower electricity prices. This diagram from the NSW Energy website shows why:

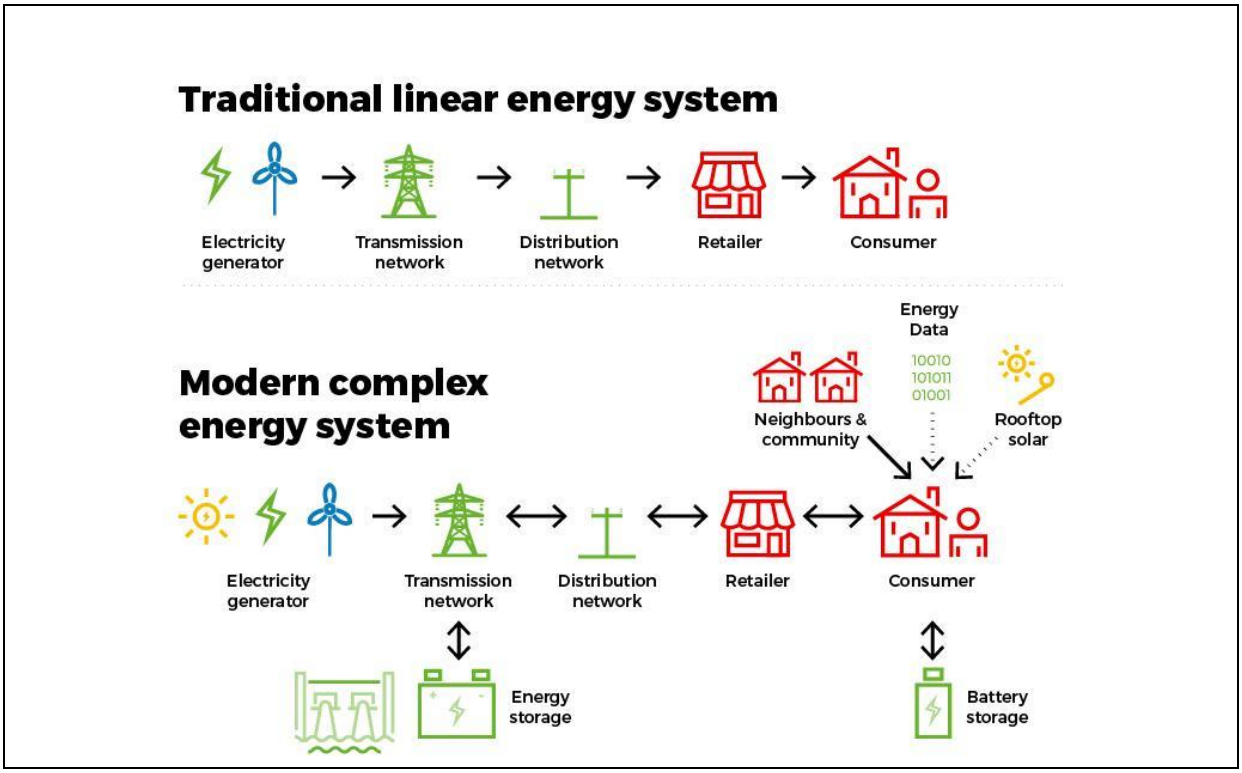


Diagram from NSW Energy 18/12/20 Renewable Energy in NSW | Energy NSW

- Complexity adds cost and risk. Weather-dependent renewables cannot provide the electricity to run our society. They have to augmented with: expensive pumped hydro, of which Australia has virtually none; prohibitively expensive batteries that have to be charged daily, so requiring even more wind and solar plants and favourable weather; upgraded or new transmission lines and infrastructure, specifically to accommodate wind and solar generation; very much more difficult management of an unstable and complex system, something in which Australia has little experience. Since issuing the first SOS Research Paper in November 2020 a lot more has occurred that shows electricity prices must continue to increase, not decrease. UK, Western Europe, USA all face a bleak 2022 winter as electricity prices and power shortages were rising well before 2022 but have risen many-fold in 2022. Australia's AEMO had to suspend the spot market for wholesale electricity in June 2022 because of soaring prices and to avoid wide-spread blackouts.
[Ref: AEMO suspends NEM Wholesale Market | energy.gov.au; Renewables subsidies: $22 billion by 2030 | The Spectator Australia]

- Wholesale prices are claimed to be reducing but the retail costs are rising because of increased infrastructure costs (e.g. Tas-Vic underwater cable > $1b), massive subsidies ($13B in 2019 or 39% of household electricity bills), financial support and favourable regulations ($22 billion yearly by 2030), massive losses and write-downs and enormous cost blow outs

(e.g. Snowy 2.0 $2B to $10B and growing, NSW-SA interconnector $1.35B to $3.32B before its even started) have to be recovered from the consumer or taxpayers. In NSW, each landholder, over which new transmission lines will cross their land, will get paid and indexed $200,000/km over 20 years. In addition, each landholder will get a one off compensation payment for compulsory purchase of easements. Over 28,000km of new high voltage electricity transmission lines is now anticipated at a 2022 Federal Budget cost of $80 billion. Add to this the failure in 2018 of RC Tomlinson, with a loss of 3,400 jobs. In addition, shareholders in Origin Energy and AGL, both ASX listed companies, have seen nearly 50% falls in the value of their shareholdings in less than 12 months. Both Origin and AGL had losses due to write-downs against profits. AGL wrote off over $2.8billion on a wind electricity generation contract. Ultimately the consumer pays for all these extra costs.
[Ref: the HIDDEN COST OF CLIMATE POLICIES AND RENEWABLES (regulationeconomics.com) ;Renewables subsidies: $22 billion by 2030 | The Spectator Australia; Snowy 2.0 emerges as $10 billion white elephant (smh.com.au); Daily Telegraph "Powerful Incentive for Pylons"p16 25 Oct 2022; https://www.sgst.com.au/news/is-it-time-for-an-adult-conversation-about-nuclear-power 28 Oct 2022]

- A NSW resident was advised by EnergyAustralia in January 2020 to justify their 11.9% increase in the usage and supply rates were because *"...supply costs have increased significantly*" and in January 2021 the Feed-in Tariff rate was again reduced because *"..there's more solar-generated energy going back into the grid. This has reduced the wholesale price of energy going back into the grid during the day when the sun is out.*". More wind and solar IEGPs may well reduce wholesale prices during some parts of a day and on some days but it is the consumer and taxpayer who ultimately gets slugged. This has been the case throughout the world.

- The NSW Electricity Infrastructure Investment Act 2020 became law in November 2020. The Act provides very favourable conditions for NSW weather-dependent renewable developers and operator. Rooftop solar already produces 9% of NSW electricity, at a much lower cost per kilowatt hour than solar IEGPs, compared to only 5% by industrial solar. However, the legislation gives no equivalent guarantees for rooftop solar producers. One typical NSW resident on the outskirts of a rural town paid $30,000 for a transformer and pole, which the distributor now owns, just to connect to the pole directly on the other side of the road. Several thousand dollars more was spent to get power onto the other side of the fence. More still was spent to connect to the building. Meanwhile, the feed-in tariff was reduced by 24% from March 2019 to January 2021 and by further 20% in April 2022. Yet for industrial solar operators they get a government guaranteed minimum wholesale price and other favourable payments. The higher production costs and the costly guarantees will add to electricity costs overall and disadvantage the cheaper alternatives, such as rooftop solar, HELE, CCGT and nuclear.

- Energy Australia in 2019/21 increased its household electricity rates by **11.9%** and reduced its rooftop solar feed-in tariff by **24%** for some rural NSW consumers, despite the a nearby PV industrial electricity generating plant becoming operational in May 2019. The reason given for the increase was "supply costs have increased significantly" despite several solar and wind industrial electricity generating plants (IEGPs) already operating in the Central West NSW region, and which is now declared a NSW Renewable Energy Zone.
[ref: a resident's EA notification of changes to their base rates]

- Energy Australia, which is Australia's third largest retail electricity distributor, did not pay any company taxes for years as they did not generate profits on their **$30 billion** in revenue during 2013-2017. They also own power stations, mines and wind IEGPs. Electricity prices will have to rise further if profits are to be made. Higher energy costs to their consumers.

[ref: michaelwest.com.au/energy_australia_four_years_30_billion_zero_tax]

- Renewables in Australia have direct and indirect subsidies and loans by various levels of state and federal governments amounting to **$13 billion a year or $1300 per household (forecast to be $22b by 2030]**, yet electricity prices continue to rise and will continue to do so unless base-load power is put in place urgently. To put this expenditure in perspective , the JobKeeper scheme as part of the then Government's response to the COVID-19 pandemic cost $13 billion to support 3.3 million jobs to the end of June 2020. Just one year's subsidies of **$13 billion** would pay for three **250MW** dual fuel combined cycle gas-fired power plants to be built every year for the next decade. Such plants are very efficient, flexible, provide base-load power, are quick to build and have low resource demands and CO2 emissions compared with wind and solar IEGPs.
  [ref: 23/08/20 Dr Moran "The Hidden Cost of Renewables on Electricity Prices"; smh.com.au 14/06/20 Infrastructure to get $1.5 billion boost and priority list"; finance.nine.com.au/business-news/agl-to-build-400m-gas-fired-power-plant/0ea6303e-65df-4c8d-b501-0cb52aa0d197]

- Germany faced the prospect of replacing/decommissioning **5,700** (4,500MW of capacity) of its over **29,000** wind turbines in 2021 alone. Decommissioning just one wind turbine, without removing most of the enormous concrete footing, costs about **US$532,000**, while replacing with a new wind 3MW turbine costs about **US$3.9 million** plus transport and installation costs. Such frequent decommissioning and replacement costs are not reflected in the KWh price comparisons of renewables electricity against the alternatives using the Levelised Cost of Electricity (LCOE) method. Costing changes in the total electricity system costs is the best way to measure the impact of mixes of renewables and other solutions.
  [ref: weatherguardwind.com 24/3/20 "Wind turbine cost: How much? Are they worth it in 2020": insituteforenergyresearch.org 2/11/19 "The cost of decommissioning wind turbines is huge"; stopthesethings.com 14/11/17 "Kaput!: German Wind Farms set for dismantling as subsidies dry up"; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"]

- Although electricity is available in a road in a rural NSW town in the centre of the NSW CWO REZ, a new owner had to spend over **$30,000** to have electricity connected to their small rural property. The extra pole and transformer, which they had to buy, became the property of the NSW government owned electricity infrastructure provider. So the land owner paid for the additional infrastructure , while the renewables local and overseas developers, who get various types of government subsidies , do not contribute to the grid upgrades/construction that are only needed because the installation of weather-dependent renewables create the need for it. These costs of extra infrastructure, which can be for each additional MW of generating capacity, cost **$275,000/km to $660,000/km** just for the high voltage transmission lines. Such extra costs are passed onto the consumer, which helps explain why electricity prices rise as more weather-dependent renewables are installed.
  [ref: www.transgrid.com.au/news-views/publications/ "Transmission annual planning 2018" p28 Table 14]

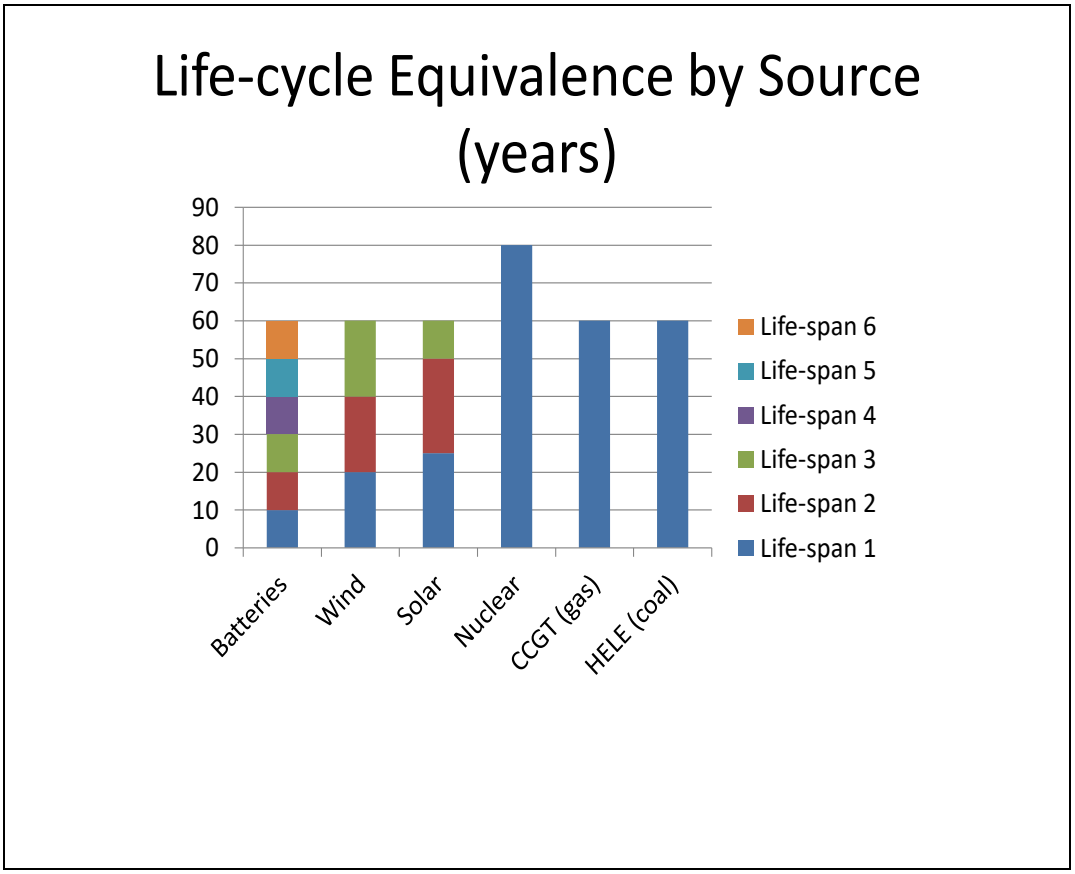
- On 4/11/20 it was reported that the estimated cost of the proposed **900km** electricity inter-connector between Robertson SA and Wagga Wagga NSW had gone from **$1.53 billion to $2.43 billion (by September 2021 the cost estimate was $3.3 billion)**, most of which will get passed onto mainly NSW consumers.
  How did Transgrid and ElectraNet get their initial estimate so wrong? Such extra costs are passed onto the consumer, which helps explain why electricity prices continually rise as more weather-dependent renewables are installed.
  [ref: https://www.transgrid.com.au/news-views/publications/ "Transmission annual planning 2018" p28 Table 14; The Daily Telegraph 4/11/20 page 4]

- The relatively short life-cycle of PV solar systems (20 to 30 years) and wind turbines (15 to 20 years) compared to the alternatives of coal, gas and nuclear plants (60 to 80 years) means that a PV solar plant or a wind turbine plant need to be replaced/upgraded 2 to 3 and 4 to 5 times (plus Battery Storage 5 - 6 times) respectively during the lifetime of the alternatives, which generates more costs into the electricity network each time. Over a 60 years period this frequent replacement of solar and wind plants will continue driving up electricity prices for decades to come. One study shows that wind and solar over **60** years is **SIX** times more costly per 1,000MWh than natural gas combined cycle turbine technology.
[ref: 17/08/20 "The excess cost of weather dependent renewable power generation in the USA" from EDMHDOTME]

- While wind turbines are getting bigger and solar panels cheaper to make, as well as more energy conversion efficient, the cost of electricity to consumers is not falling. The reasons for this appear obvious: land acquisition, transport and construction costs are increasing; 100% duplication by alternate backup generation; inefficient use of base-load coal and gas-fired power plants to backup the grid supply when the renewables outputs are low or zero; rising costs of extending and modifying the electricity grid to connect renewables; increased complexity of managing the grid due to instability caused by renewables' variable output; high level of subsidies even though renewables are a mature industry with over 25 years of field operation; the introduction of high cost, short-life batteries for short-term stabilisation of renewables plant output; frequent replacement of end of life renewable installations and battery backup; high increasing maintenance costs of wind turbines; very high costs of decommissioning renewables plants and disposing of their waste, some of which is toxic.

- For example. The proposed **$1.5 billion** wind IEGP for Robbins Island and Jim's Plain Tasmania will involve **163** turbines up to 270m tall for a nameplate capacity of up to **900MW**. For the project to go ahead the developer requires to be built: a bridge between the island and the Tasmanian mainland; a **500** metre wharf at the island; **115km** of new 220kV transmission lines; a new substation; the Marius Link Interconnector undersea cable to Victoria at about $1billion plus. A direct link to Victoria at $1.5billion to $2billion would have made the project unviable and so was abandoned by the developer. Yet the Federal Government has included funding for the Marius Link in the October 2022 Budget. The amount of government (taxpayers) subsidies is unknown, however, for another project it was stated as **$660,000 per turbine per year**. Therefore the subsidy could total $1.1 billion over just 10 years. So in reality, the project's viability depends on $billions being spent by others (i.e. taxpayers and other consumers). No wonder Australia's electricity prices are near the highest in the world and can't come down anytime soon with years' of committed subsidies, which are still growing yearly.
[ref: robbinsislandwindfarm.com/projects/; 3/7/20 skynews.com.au/details/_6169082592001 "Taxpayers 'taken for a ride' with subsidised windfarm"; Bing search - pics of wind turbines from theconversation]

- The following chart graphically displays the relative life-spans of various sources of electricity generation. Each life cycle requires more resources to replace their output and results in more waste each time.



Created by SOS

- C Millis, a USA Carolina state representative was the lead sponsor of House Bill 745, which required proper decommissioning of utility-scale solar plants after they close, reclamation of the land to its original condition within two years, and posting financial guarantees to ensure the work gets done. For example, he said, a 3 megawatt project in Sacramento County, California, cost the owners US$220,000 to clean up even after they got US$375,000 for recycled materials. A 20MW solar project in Maryland cost US**$2.1 million** to remove *after* off-setting the recycling revenue.
  In Central West NSW alone there are several solar plants in place or proposed with capacities ranging from 87MW to 600MW or more where the cleanup cost will be astronomical. No bonds are required or guarantees that restoration will occur. This is another cost that will be borne by the electricity consumer or local rate payers if the company or land holder fails to properly clean up the site.
  [ref: carolinajournal.com/news-article/environmental-hazard/ "Moore County residents worry about solar's long-term environmental impacts - Carolina Journal"]

- The Lancet study, as with many other studies over the years, found that **6.5%** of deaths in Australia are due to cold weather while only **0.5%** of deaths are due to hot weather. In 2010-11 over **200 people a day died** during winter because they could not afford to heat their homes. Another study in 2020 by University of Illinois found that 94%of temperature-related deaths were from cold temperatures. High electricity prices cause many people to forego

heating, resulting in premature death. In 2018 one charity provided **55,000** winter garments to Australian "families who can't afford to run their heating". Australia must get back to electricity prices near the cheapest in the world, as in the 1990s. Weather-dependent renewables cannot achieve this life-saving goal.
[ref: theconversation.com/cold-weather-is-a-bigger-killer-than-extreme-heat-heres-why-42252; theguardian.com/society/2011/oct/22/older-people-cold-energy-bills; Daily Telegraph 9/11/20 editorial p40; Cold-weather accounts for almost all temperature-related deaths -- ScienceDaily]

- The House Standing Committee on the Environment and Energy launched an enquiry in May 2021 entitled *Federal House Committee on Energy - a new inquiry into dispatchable energy generation and storage capability in Australia.* Save Our Surroundings (SOS) made a submission (sub050) in which it draws attention to many of the issues in the design of a national electricity grid based on projects in NSW near the communities of Gulgong, Wellington, the Riverina, etc, etc., especially increased instability and increased short and long term electricity prices. So far our concerns continue to be validated by actual events.
[ref: Submissions – Parliament of Australia (aph.gov.au) no. 50]

- The ACT stated in 2020 that it uses 100% renewable energy. Yet in June 2021 it announced that regulated electricity prices will rise by 12% from July 2021. *"The main reason for the increase in retail prices is the 36.91 per cent increase in network costs..."* The ACT therefore joined the rest of the world in demonstrating that the more renewables the higher the electricity cost. The facts are against the claims that wind and solar electricity generation will reduce electricity prices. It just does not happen.
[ref: Electricity shock: ACT prices surge 12 per cent | Canberra CityNews]

- AMEC proposed in 2021, which is now been regulated, that rooftop solar systems pay to export their excess electricity to the grid from 2025. The AEMC argued a change was necessary because the current system is unsustainable as the huge uptake in household solar has overloaded the grid, and the alternative would mean more solar users being blocked from exporting their energy. Rooftop solar was promoted since 2010 and is installed on 30% of households in 2022 and growing rapidly due to the ever increasing cost of electricity. It took more than 10 years for our electricity designers to see a problem with rooftop solar producing too much electricity on the sunniest days. Will it take another 10 years for them to see the folly of near 82% intermittent and unreliable wind and solar electricity generation by 2030? The need for more the industrial solar plants is not justified, given that rooftop solar installations are still significantly increasing in number and already produce more electricity on some sunny days at a much lower cost than current industrial solar plants.
[ref: 12/08/21 Electricity companies get green light to charge rooftop solar owners for exporting power to grid - ABC News; 6/6/22 Labor needs to double the pace of its renewable energy rollout to meet 2030 emissions target. Can it be done? | Energy | The Guardian]

3. Create substantial numbers of jobs (especially in the regions)

This claim is not supported by the facts, logic or real world experience, such as:

- Experience with the Beryl 87MWac PV solar electricity generating plant constructed 5km from Gulgong NSW in early 2019 clearly highlights that virtually no local jobs were involved in the five months of construction. Of the claimed **150** 'construction workers' involved, nearby residents and businesses said that the majority were bussed-in, lowly paid, backpackers. There is believed to be only one full-time employee onsite during operation. Small (about 3 full-time equivalents) roaming maintenance crews are brought in if needed. So much for the claims of providing lots of local jobs.
  [ref: 10/17 NSW P&E State Significant Development Assessment Report Table 1; 2019-20 Gulgong/Beryl residents' and business owners' comments; Daily Telegraph 6/11/20 p15 "Clean energy farm a fatal risk"]

- The DA for the PV electricity generating works proposed for Old Mill Road Gulgong stated that up to **50** construction workers would be required for a few months and would be bussed-in if needed, and that **2 to 4** maintenance workers would visit the site every three months and there would be no onsite workers once operational. So much for the claims that renewables provide lots local jobs.
  [ref: Developer's submission to MWRPP August 2020, DA0283/2019]

- A PV solar IEGP built in Wellington Central West Region employed **560** construction workers for under three months but the union said the workforce was "**primarily** made up of **backpackers** hired through contractors". A visit by SOS members also discovered that even the closest coffee shop was staffed by overseas backpackers. So much for creating local jobs.
  [ref: Daily Telegraph 6/11/20 p15 "Clean energy farm a fatal risk"]

- Huge areas of agricultural land within 5 to 12km of Gulgong will be lost for decades. Land has already been taken for Beryl IEGP (310ha) and the approved Stubbo IEGP (1772ha, which is equal to the land area of the new Western Sydney airport) and other IEGPs, such as the proposed Tallawang solar/battery works (1,370ha), Barneys Reef wind/battery works (7,548ha), and Birriwa solar/battery works (1,200ha) will reduce the available farmland by hundreds of square kilometres in just a part of the Central West Orana Renewable Energy Zone (CWO REZ). Just these few industrial projects, if constructed, would cover 122km2 of farm and bush land.

  This expanding loss of agricultural land reduces the ongoing job opportunities for Gulgong area local workers and businesses, such as those involved in farm fencing, machinery supply, equipment maintenance, irrigation, sheep shearing, alpaca shearing, horse shoeing, hay bailing, chemicals supply/dispersion, provisions, fertiliser, feedstock, hardware supplies, goods and animal transport, sales yards, etc, and the support services (accommodation, food, entertainment, health services, etc) and for permanent residents that live on the land, all the associated services (building, plumbing, electrical, etc). These solar IEGPs will take the agricultural/grazing/residential land out of alternative use for 20 to 30 years or more and will provide virtually no local employment benefits over that time, but jobs elsewhere will be diminished. So much for the claims that renewables provide lots of local jobs.

  Gulgong is but one example of what is being repeated across Australia as more and more of Australia's 6% of arable land is covered by industrial scale solar and wind works and their massive increase in supporting and backup infrastructure. A few other examples are: in NSW, Wellington, Liverpool Ranges, Liverpool Plains, Wagga Wagga, Burrendong Dam, Lyall

Lake, Nundle, Lismore, Yass, Hunter Valley, Goulburn, Mittagong, Walcha; in Victoria, Moyne Shire, Nooramunga, Corangamite; in Queensland, Bell, Biloela.

- Once the upright supports for a PV solar industrial electricity generating plant (IEGP) are pile-driven into the ground the assembly of the cross-members and attaching of each imported PV panel (two person activity) are very low skilled jobs required for only a few months duration, hence the use of backpackers and unskilled labour where possible. How much of each project's hundreds of millions of dollars in costs is actually Australian content and utilising Australian workers? The answer seems to be "very little", as 90% of solar panels installed in Australia are imported from China. Nearly all solar panels are made overseas (mainly China), including most of the mined raw materials, material processing, component manufacture, transport by ship and often construction labour (e.g. backpackers).
[ref: https://www.youtube.com/watch?v=KjIiTjs2fjw; 8/9/20 SOS members' solar IEGW site/ town visit discussions with backpackers at Wellington NSW; www.dasolar.com/solar-panel-installation/solar-farms; 2020 solarclap.com "Top 10 Solar Companies in the World"]


Land cleared. cables laid. pile-driven uprights in place


Crew of two install cross-members and panels

- Wind turbines cannot be major creators of jobs for Australians as all wind turbines are made overseas (e.g. Denmark, Spain, USA, but mainly China). In addition, most of the mined raw materials, material processing, component manufacture, transport by ship, manufacture of specialised road transport and cranes also occurs overseas. How much of each project's hundreds of $millions of costs is Australian content? Very little. So much for creating lots of local regional jobs.
[ref: 26/5/20 bizvibe.com "Top 10 wind turbine manufactures in the world 2020"]

- The measure of job creation for Australia must be the net jobs gain or loss as renewables are promoted as a substitute for fossil fuel generating plants, as well as coal mining and gas extraction, which are things that directly employ many tens of thousands of Australians in well paid jobs. They also provide substantial export, company tax and royalty income, which gets reinvested into the Australian economy and contributes to the health, education and welfare services Australians receive. Once installed, weather-dependent renewables produce no export or royalty income and employ few people, so increasing the burden on productive businesses, taxpayers and electricity consumers. Once farmland is used for solar and wind plants then the local jobs that were servicing graziers and farmers are reduced. Less food can be produced for the Australian and export markets. A net job loss is highly likely, as was discovered in Spain.
[ref: abc.net.au 11/7/19 "Are there really 54,000 people employed in thermal coal mining"; statista.com/statistics/1120570 5/6/20 " Australia - Export value of coal 2019"; Deloitte report 26/3/19 "Estimates of payments of royalties and company tax in 2017-18";]

- An in-depth study in Spain concluded that for every subsidised job in renewables that 2.2 jobs were lost elsewhere in the economy. Australia can expect a similar result. So much for

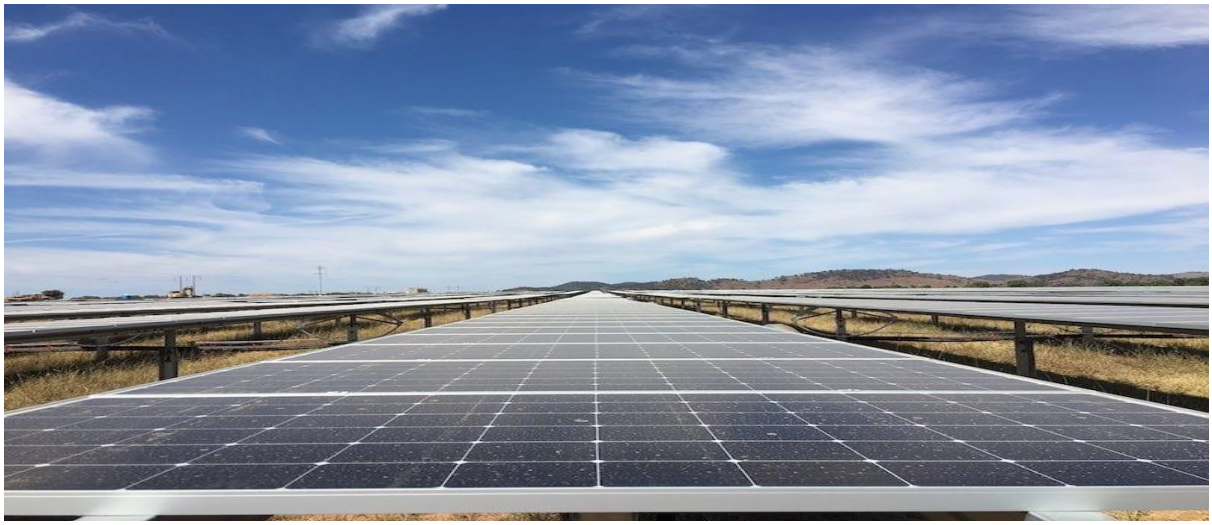
proponents claims that there will be an increase in Australian jobs. A recent report by Institute of Public Affairs concluded that "*for each new renewable activity job created between 2009-10 and 2018-19, five manufacturing jobs were destroyed*."
[ref: 23/08/20 Report by Dr Moran "The Hidden Cost of Renewables on Electricity Prices"p23; IPA-Net-Zero-Jobs-Report.pdf]

- Even with significant government subsidies, in its many forms, the PV solar industry has many failures resulting in fewer jobs and incurring A$billions in losses. Australian company RCR Tomlinson Ltd, an engineering company founded in 1898, collapsed in 2018 after 12 solar IEGP projects failed, leaving **3,400** of its own employees jobless and impacting thousands of subcontracting firms and their workers; creditors were owed **$630** million. Another Australian company Downers EDI Ltd and a UK company, John Laing, both withdrew from the industry in 2020 after losing hundreds $millions in their ventures into Australian renewables. Many other companies have incurred $millions each in write-downs in 2019 (e.g. AGL $14m, QIC $70m, Enel $73.5m). So much for an increase Australian jobs, when we already start with at least a deficit of over 3,400 jobs lost.
[ref: 23/11/18 australianmining.com.au "RCR Tomlinson goes into administration" ; 4/12/18 www.abc.net.au; reneweconomy.com.au 13/8/20 "AGL joins growing list of investors hit by write-downs on wind and solar assets"]

- AGL Energy and Origin Energy, Australia's largest electricity retailers announced their half-yearly results in February 2021. Their write-downs and large profit falls, in addition to previous write-downs, are in the billions of dollars. Just AGL's first half year write-down of its unprofitable wind farm deals amounted to **$2.7 billion**. In its half yearly report AGL wrote in regards to increased supply that *"... the long-term outlook for wholesale electricity and renewable energy certificates now indicates a sustained and material reduction in prices*.". Cost-cutting (job losses?) were announced. Where are the jobs on weather-dependent renewables? Who ultimately pays for these huge losses?
[Ref: AGL Energy Ltd and Origin Ltd Quarterly Update December 2020 and half year results for 2020]

- The USA has many companies that have failed either building or operating renewable electricity generating works. Over 200 venture capital funded solar energy start-up companies in 2008 had failed by 2013. In addition, many solar IEGPs change ownership quite rapidly. This pattern was occurring in NSW in the first quarter of 2021 alone with 15 solar plants and several wind turbine plants for sale.

  For example, the $187million Beryl PV solar IEGP near Gulgong in NSW was built by Downer Group for First Solar FE Holdings Pty Ltd who sold the IEGP, before operations began in June 2019, to New Energy Solar Ltd in 2018, who in turn divested it and sold it to Banpu Plc in June 2021 before exiting the Australian renewables market. Downer had already exited the solar construction market and New Energy Solar, an investment company, has divested its two Australian solar IEGPs (Beryl & Manildra) investments, partly because the Australian assets were in a mature operational state. Neither solar plant was performing to expectations. The two projects cost $187m and $113m (including ARENA funding of $9.8m) respectively and were sold for $97.5m, a loss of $202.9m in less than three years. Who received subsidies and who is responsible for decommissioning and disposal at end-of-life when companies fail, frequently change ownership and exit the market?
[ref: greentechmedia.com/articles/read/Rest-in-Peace-The-List-of-Deceased-Solar-Companies; 14/5/18 downergroup.com/downer-wins-beryl-solar-farm-contract; 9/11/20 pv-magazine-australia.com/2020/11/09/beryl-and-manildra-solar-farms-up-for-sale-as-investor-exits-oz/; New Energy Solar Ltd Quarterly Update December 2020; Manildra Solar Farm - Australian Renewable Energy Agency (arena.gov.au); Banpu buys solar farms in Australia (bangkokpost.com]



Beryl PV Solar Industrial Electricity Generating Works, Central West NSW

- The August 2022 Australian Manufacturing Forum highlighted that there are not enough, and probably will not be enough, skilled labour available in Australia to reach 82% renewables in Australia's electricity mix by 2030. Renewables only supplied 24% of Australia's power in 2021. Construction of a solar works requires only a few skilled workers but lots of relatively unskilled workers. Wind, battery energy storage systems (BESS) and pumped hydro requires many more skilled workers during construction but only a few once operational. Currently, unemployment levels in the Central West Orana REZ are around 2.5% and a chronic shortage of skilled tradespeople has been the norm for many years. Hence, workers are brought in for short periods from outside the region. The long-term benefit of renewables to the regions is minimal but very damaging to the local environments, roads and social fabric. If we don't have the people to skill up in the regions and such required skills are in demand world-wide then how will 30,000 skilled workers be found? Meanwhile, our reliable coal-fired and gas-fired electricity plants are being closed prematurely causing job losses of often differently older skilled workers. NSW power stations closing soon are; Liddell in April 2023 and Eraring in 2025.
  [ref: To hit 82% renewables in 8 years, we need skilled workers – and labour markets are already overstretched - Australian Manufacturing Forum (aumanufacturing.com.au)]

4. Are safe

This claim is not supported by the facts, such as:

- A PV solar IEGP built in Wellington Central West Region employed 560 construction workers, "**primarily** made up of **backpackers** hired through contractors". SafeWork NSW issued 13 improvement notices. Most of the breaches "could easily lead to electrocution of a worker on the project" and "could result in serious injury or death of a worker", most of whom are **backpackers** "who were oblivious to the serious safety risks". **So much for safe working conditions for "skilled" workers.**
  [ref: Daily Telegraph 6/11/20 p15 "Clean energy farm a fatal risk"]

- Solar panels are a toxic mix of gallium arsenide, tellurium, silver, crystalline silicon, lead, cadmium, and heavy earth materials. Batteries use lead, lithium and cobalt, all of which are hazardous materials. The magnets in wind turbine generators are made from neodymium and dysprosium, rare earth minerals mined and almost exclusively processed in China, which has covered large tracts of Chinese fields and lakes with toxic waste. The mining and processing alone of the input materials have already caused human and animal deaths and illnesses, as well as contaminating soil, air and water. **The creation of renewables is toxic.**
  [ref: https://www.thoughtco.com/lithium-production-2340123;
  3/4/15 https://www.bbc.com/future/article/20150402-the-worst-place-on-earth; 5/3/18
  https://www.cbsnews.com/news/cobalt-children-mining-democratic-republic-congo-cbs-news-investigation/;
  abcnews.go.com/Technology/toxic-lake-black-sludge-result-mining-create-tech/story?id=30122911]

Toxic "lakes" in Baotou China from processing rare earths

- PV panels contain toxic contaminates, which is why the state of Victoria EPA lists solar panels as e-waste, as does the EU. A national study in the USA found that solar panels dumped into landfill leached toxic materials in as little as 30 days. Solar panels in solar IEGPs deteriorate and get damaged by hail, wind and fire and so potentially leaching their toxic chemicals into the soil and waterways. Are our governments knowingly risking the health of Australians, our crops, our domestic animals and our wildlife, almost exclusively in rural and regional Australia? **Independent research in Australia is needed into the dangers of installed industrial PV solar IEGPs**.
  [ref: www.epa.vic.gov.au/about-epa/news-media-and-updates/news-and-updates/e-waste-compliance-switched-on 3 July 2019; www.ncbi.nlm.nih.gov/pmc/articles/PMC5607867/;
  https://wattsupwiththat.com/2018/12/23/solar-panel-waste-a-disposal-problem/]

- Beryl Solar Plant near Gulgong NSW had major output issues in 2020 due to heavy rain, a lightning strike, inverter damage and other component failures. Extensive damage to weather dependent and weather exposed wind and solar plants is not unusual. Who monitors the release of toxic chemicals from these damaged plants? If not for the fact that

the owners of some of these plants are listed companies and have a duty of disclosure the regional residents near these plants would be totally unaware of the potential risks. Will there be another "asbestos" health crisis sometime in the future?


Storm damage to a PV solar IEGP


Fire damage to a PV solar IEGP

- PV solar systems increase fire risks resulting from panel and electrical equipment failures, including battery systems, e.g. In June 2019 a bird caused a fire in California Valley Solar Ranch, which burnt out **1,127** acres of grassland causing over **US$8m** in losses. New Energy Solar Ltd had two solar plants severely damaged by grass fires in June 2020. It took over 12 months to get the plants fully operational. **Should such dangers be dismissed?**
  [ref: 20/6/19 www.latimes.com/business/la-fi-bird-fire-solar-farm-20190624-story; New Energy Solar Ltd Quarterly Update December 2020 and half yearly report for 2020]

- Several fire-fighters from different regions advised SOS members that they can only fight fires in a solar electricity works from its perimeter because of the dangerous high voltages and toxic gases released; this also increases the risks to surrounding properties and land owners who may try to fight an IEGP fire themselves without knowledge of the risks. A risk assessment report prepared in response to requirements raised by the Gunnedah RFS confirms the fire-fighters statements. In August 2022, a small 68ha out of control grass fire near Beryl solar works near Gulgong required over a dozen emergency vehicles and three water-bombing helicopters to protect the solar works and a nearby farm. The conditions were relatively benign, yet it took four hours to bring the situation under control. **Such dangers are real and must not be dismissed by authorities**.
  [ref: 23/05/18 Mr McCurdy MP (Ovens Valley) (10.19) speech to parliament; 3/8/20 MWRPP decision on Old Mill Rd Gulgong; www.windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/; Eco Logical Australia April 2018. Gunnedah Solar Farm Bushfire Risk Assessment. Prepared for Pitt & Sherry (Operations) Pty Ltd.; Multiple aircraft called in to assist with 40-hectare grass fire near Gulgong | Mudgee Guardian | Mudgee, NSW]

Photo taken from the RFS video. Part of Beryl solar works, near Gulgong NSW, is along the top of the photo

- In addition to fire risks PV solar panels and electrical components pose risks when damaged, such as by hail. The Clean Energy Regulator reported in December 2018 that up to one in five rooftop solar installations (potentially **425,000** systems) pose a high to severe risk because they are unsafe or sub-standard PV installations. Are IEGPs any different?
[ref: pvstop.com.au/25-australian-pv-installations-unsafe-1000s-pv-systems-damaged-following-sydney-hail-catastrophe/; solarquotes.com.au/blog/taylor-solar-safety-mb0873/; sunpower.maxeon.com/int/blog/]


Remains of a solar panels fire


Solar panels damaged by hail

- Solar panels caused fires on the roofs of as many as seven of Walmart stores in the USA. A solar panel fire in March and two in May 2018 did millions of dollars in damages to the stores and merchandise. All 240 stores had their PV solar systems deactivated pending an investigation. Never-the less, another PV solar fire occurred at the Yuba City Walmart store in November 2018. In the lawsuit filed in August 2019 it is alleged that, among other things, that hotspots on the panels caused some of the fires. Hotspots, which can be caused by bird droppings, dirt deposits, leaf matter, etc, are but 9 common possibilities of how solar system fires can start. Just one fire in a PV solar IEGP could start a devastating grass or bush fire in a rural area. Such **known and recurring dangers must not be dismissed by authorities.**
[ref: arstechnica.com/tech-policy/2019/08/after-seven-roof-fires-walmart-sues-tesla-over-solar-panel-flaws; sunengis.com/nine-common-problems-with-solar-panels]

- Wind turbines contain toxic contaminates, such as neodymium, dysprosium and rare earth minerals. About **1 in 2000** turbines catch fire each year. The burning turbine can release toxic gasses that can drift over residential properties and towns. Independent Australian research is needed into these risks. **Such dangers should not be dismissed.**
[ref: stopthesethings.com/2020/01/26/toxic-shock-millions-of-wind-turbine-blades-leave-poisoned-landfill-legacy-for-generations-to-come/ ; windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/]


Wind turbine on fire

- Both solar panels and wind turbines can and do catch fire, which can cause significant grass fires and bush fires due to being located in rural and regional areas. For example, the February 2017 Leadville-Dunedoo grass fire burnt 55,000ha (550km2) of land, destroyed 35

homes and killed 6000 livestock and untold wildlife. This area is near Gulgong and within the NSW Government's Central West Renewable Energy Zone. With every wind and solar IEGP built the risks of fire devastation increases. **Our governments are knowingly risking the health of regional Australians, our crops and our domestic animals and local wildlife.**
[ref: abc.net.au/news/2018-02-08/dunedoo-coronial-inquiry-to-examine-catastrophic-nsw-fire/9408802; windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/]



February 2017 Central West NSW Leadville-Dunedoo fire front


Why we hate grass fires

- Distributing solar and wind IEGPs into rural areas, such as Central West NSW, even though the electricity is consumed hundreds of kilometres away in the cities, creates the need for hundreds of kilometres of new transmission lines, which not only impact the environment but increase the incidence of bushfires. In the US, one power company caused 1,500 fires in California over a period of six years including the 2018 Camp Fire, which killed 85 people. Devastating transmission line bush fires have also occurred in Australia. A new 180km 500VA high voltage transmission line to specifically cater for more weather-dependent wind and solar plants in the Central West REZ is in development. **Should such dangers be dismissed?**
[ref: newmatilda.com/2020/01/15/greener-power-comes-with-its-own-increased-risks-of-bushfire/]

- Wind turbines already kill trillions of insects and millions of birds and bats each year, some of them endangered species, such as the American Golden Eagle and Bald Eagle, the European Red Kite, The Hoary Bat, the Australian Wedge-tailed Eagle and migratory Arctic shorebirds. This destruction of wildlife and their habitats can only increase as more solar and wind electricity generating works are constructed where wildlife otherwise flourish in rural areas, including agricultural and grazing land. **Should such dangers to wildlife be ignored?**
[ref: 26/6/19 forbes.com/sites/michaelshellenberger/2019/06/26/why-wind-turbines-threaten-endangered-species-with-extinction/#7804852e64b4; 25/6/19 7news.com.au/news/environment/wind-turbines-killing-endangered-birds-c-183380; thegwpf.com/new-study-german-wind-turbines-kill-1200-tons-of-insects-per-year; discoverwindenergy.com/exploding-wind-turbines-a-look-at-the-max-speed-of-wind-turbines/]


The build up of dead insects reduces the output.


Insects attract birds. Blade tip speed can exceed 280kmph

- Documented symptoms reported by individuals exposed to wind turbines sub-sonic noise includes such things as headaches, sleeplessness and dizziness. A farming community near Bald Hills Victoria were tormented by wind turbine noise for years. The Supreme Court's decision on 18/08/2020 declared the wind farm an unlawful nuisance. In addition to audible noise, wind turbines under certain conditions produce infrasound, which is can be damaging to human health. A study by Punch & James concluded that, *"The reviewed evidence*

overwhelmingly supports the notion that acoustic emissions from IWTs [industrial wind turbines] *is a leading cause of AHEs* [adverse health effects] *in a substantial segment of the population."* **Such dangers to rural residents continue to be dismissed by developers and authorities despite this evidence.**
[ref: science, howstuffworks.com ; www.ncbl.nih.gov; abc.net.au 20/08/20 "Bald Hills Wind Farm neighbours win historic legal battle against turbines 'too close to homes'"; Wind Turbine Noise and Human Health: A Four-Decade History of Evidence that Wind Turbines Pose Risks* by Jerry L. Punch, Richard R. James, 21 October 2016]

- A study by Caithness Windfarm Information Forum ("Summary of Wind Turbine Accident data to 30 September 2020") of wind industry accidents, including related deaths and injuries identifies hundreds of such events. Wind turbines have started bush fires (e.g. Sibley Iowa, Nolan County Texas), been involved in road accidents (NZ, Princeton Missouri), worker injuries (Germany) and deaths (Washington USA, UK, Denmark, Netherlands).
[ref: 30/0920 http://www.caithnesswindfarms.co.uk/accidents.pdf; gineersnow.com/industries/renewables/two-mechanics-died-wind-turbine-fire]

Road accident involving a wind turbine part


We hope nobody was home

- A fire incident at a turbine can cost up to $4.5 million, according to a GCube report from 2015, which also stated that, conservatively, one fire a year per 2,000 turbines occurs. The turbines are very much larger now than in 2015 and the cost much higher. Sending a fire-fighting team up the wind turbine tower to manually fight the fire constitutes a significant health and safety risk. How will fire-fighters fight a fire in an 280 metre high wind turbine? The simple answer is "they won't". They will try to contain the fires at the perimeter. The whole turbine can be damaged beyond repair in a matter of hours and cause minor to devastating bush and grass fires in its vacinity.
[ref: 8/9/20 windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/]




Burning wind turbines can easily result in starting devastating bushfires or grass fires in rural areas

- In April 2021 in The Woodlands Houston USA, a Tesla Model S Electric Vehicle crashed into a tree and ignited. It was reported that the fire department took 4 hours and used 30,000 gallons (113,562 litres) of water to try to extinguish the burning lithium batteries, but eventually had to let the fire burn itself out. Even worse was the fire that occurred in the 350MW/450MWh Battery Energy Storage System (BESS) during testing on 30 July 2021 in Geelong, Victoria. One of the 13 tonne battery packs caught fire. It burned for three days and resulted in the evacuation of residents because of the toxic fumes generated. Fire-fighters had to let the Lithium battery pack burn out, as water and ordinary fire suppression measures cannot extinguish a Lithium chemical reaction fire. The risk of BESS fires interrupting electricity supply for long periods, creating environmental disasters (grass fires and air pollution, risks to fire-fighters) and requiring special air conditioned cabinets to maintain battery temperatures below 30C are unacceptable risks to local communities. **Yet these risks are largely ignored by the authorities.**

- Adults and over 40,000 children work in artisanal cobalt mines in The Democratic Republic of Congo in appalling conditions. Many suffer illnesses and death, just to supply China with the cobalt used in the production of Lithium batteries, which are then used to back up weather - dependent wind and solar systems. More than 70 percent of the world's **cobalt** is produced in the Democratic Republic of the Congo (**DRC)** and 15 to 30 percent of the Congolese **cobalt** is produced by artisanal and small-scale **mining.**
  Should Australians ignore this human rights abuse to satisfy some peoples' ideological dogma? The use of cobalt from such sources is in breach of the Commonwealth Modern Slavery Act 2018. **Is it being applied to the developers of wind and solar IEGPs? Where is Australia's morality on the modern slavery issue? Should we ban batteries made in China?**
  [ref: 11/11/14 nationalgeographic.com/news/energy/2014/11/141111-solar-panel-manufacturing-sustainability-ranking/ ; https://doi.org/10.1016/j.gloenvcha.2019.102028 "The decarbonisation divide: contextualising landscapes of low-carbon exploitation and toxicity in Africa"; www.cfr.org/blog/why-cobalt-mining-drc-needs-urgent-attention; https://www.theguardian.com/global-development/commentisfree/2019/dec/16/i-saw-the-unbearable-grief-inflicted-on-families-by-cobalt-mining-i-pray-for-change]


Democratic Republic of Congo: E.g. of artisanal mining of cobalt, used in batteries, destroys many African lives

- In addition, millions of Uyghur Muslims and other minority groups in China are reported to be used as slaves in the manufacture of polysilicon wafers, which are used in the manufacture of solar panels. 90% of solar panels in Australia are sourced from China. Yet we allow overseas de-velopers to continue to import solar panels from China. **Will our governments ban the importation of solar panels made in China?**
  [ref: China uses Uyghur forced labour to make solar panels, says report - BBC News; In Broad Daylight Uyghur Forced Labour in the Solar Supply Chain | Sheffield Hallam University (shu.ac.uk)]

5. Are good for the environment

This claim is not supported by the facts, because of the huge amounts of land, materials and transport required as well as the destruction of habitat and killing of wildlife, such as:

- A 5.8ha Gulgong NSW property just on the town's outskirts has no natural water or dams, only a few trees, and is fully farm-fenced (1.2m high). Never-the-less, over 50 different species of fauna lived on or visited the property in 2020-21 alone. At least three different mobs of kangaroos up to 20 at a time, echidnas, foxes in a den, Peron's tree frogs, flocks of up to 42 Ibis, micro-bats, Black Swans, Pelicans, large flocks of cockatoos and galahs, many varieties of parrots and finches, wag-tails, lizards, tortoises, Wedge-tail Eagles, Nankeen Kestrels, hares, rabbits, Peewees, Currawongs, Magpies, and field mice, are visible at various times. Such wild-life coexists with grazing animals, such as sheep, horses, Alpacas and cattle. Welcome to country NSW and biodiversity, which is valued by residents and visitors to our area. Solar and wind IEGP earthworks will remove the grasses, rocks, logs and top-soil that provide homes and food sources for many species necessary for maintaining the health of the surface layer, as well as being a source of food for larger creatures. Approved and proposed wind and solar IEGPs already total 122km2, which will result in each of the sites' inhabitants and ecosystems being destroyed. This wholesale destruction of ecosystems, which is against the concept of environment protection, is of very serious concern to regional Australians. Biodiversity is not just endangered flora and fauna. It includes all flora, fauna and people. **Why do the authorities ignore this environmental vandalism?**

  This



  or this

- The **land area needed** for an **industrial PV solar plant** per installed (name plate) 1,000MW or **one gigawatt** (GW) is **3,500 hectares** (ha). The **materials needed** on average are: 22,000t (tons) aluminium, 40t cadmium, 60,000t concrete, 2,000t copper, 3.5t gallium, 2t germanium, 13t glass, 20t indium, 3,250t plastic, 6,500t silicon, 0.3t silver, 75,000t steel and 46.7t tellurium for a **total of 169,363t**. **For a nuclear reactor the total is 259ha of land and 217,101t of materials** per **1GW** installed capacity.

  However, a **nuclear reactor annual output is over 90% whereas PV panels are, at best, initially well under 30%**. Hence, the **PV solar** installed nameplate **needs to be at least three times greater** to produce the same, albeit intermittent, output (GWh) yearly i.e. **10,500ha**

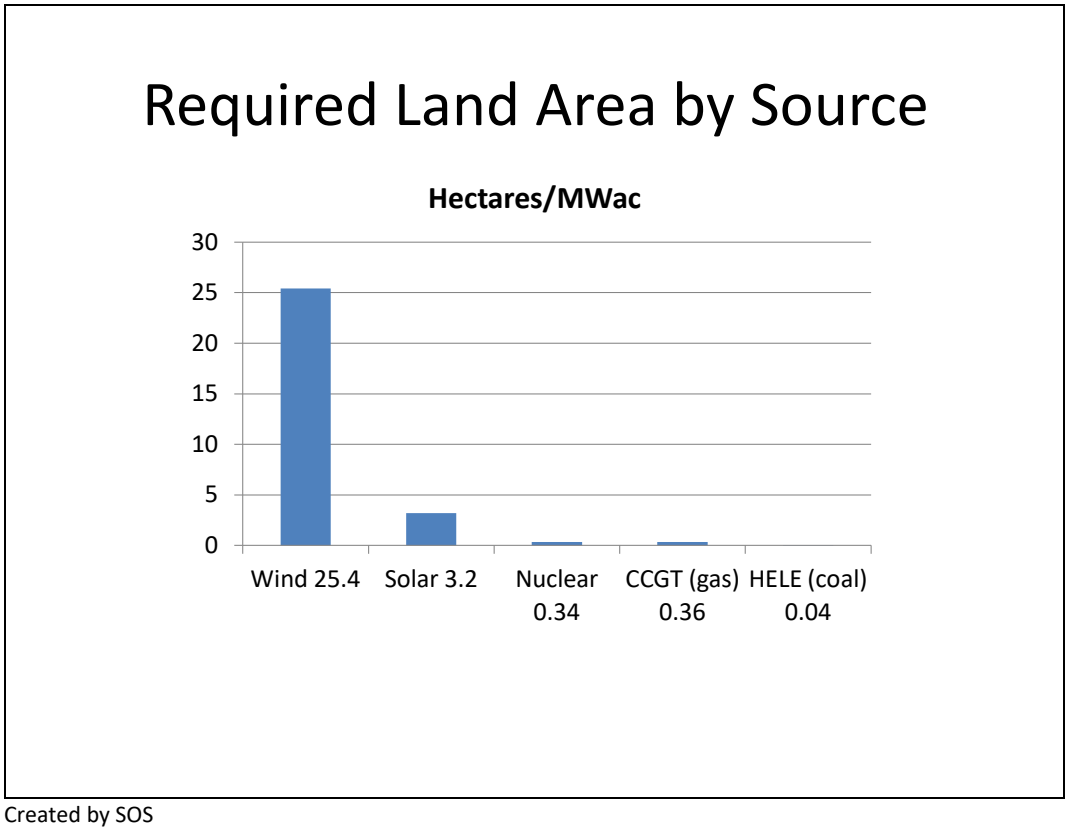
(3,500ha x 3) of land and **total materials of 508,089** (169,363t x 3) tons, which is **40.5 times more land** and **2.3 times more tons of materials than a 1GW nuclear plant**.

The negative impacts on the environment of the significant increase needed in mining, processing, transport, construction, reduction in productive land, etc. is very substantial for PV solar plants and should not be ignored, but it is ignored by our governments and proponents of IEGPs. **How can such misallocation of resources be justified?**
[ref: Average hectares based on developers' published figures for Beryl, Gulgong, Stubbo and Wellington solar works; materials from sciencedirect.com "global environmental change Vol 60 Article 102028 table 1"]

- The **land area needed** for a **modern wind turbine IEGP** per installed (nameplate) 1,000MW or **one gigawatt** is **25,900 hectares**. Materials needed are: 305,891t concrete, 211t copper, 19,863t fibreglass, and 84,565t steel for a **total of 410,530t**. For a **nuclear reactor the total is 259ha of land and 217,101t of materials per 1GW**.

However, a nuclear reactor annual output is over **90%** whereas wind turbines are claimed, at best, initially under **38%**. Hence, the wind turbine installed nameplate needs to be **2.25** times greater to produce the same, albeit intermittent, output (MWh) yearly i.e. **58,275ha** of land and **total materials of 923,693 tons** per 1,000MW, which is **225 times more land and 4.3 times more materials than a 1,000MW (1GW) nuclear plant.**

The negative impacts on the environment of the very significant increase needed in mining, processing, transport, construction, land clearing, etc. is very, very substantial for wind IEGW and should not be ignored , but it is ignored by our governments and proponents of IEGPs. **How can such misallocation of resources be justified?**
[ref: Average hectares based on developer's published figures for Coopers Gap wind turbine works; materials from sciencedirect.com "global environmental change Vol 60 Article 102028 table 1"]



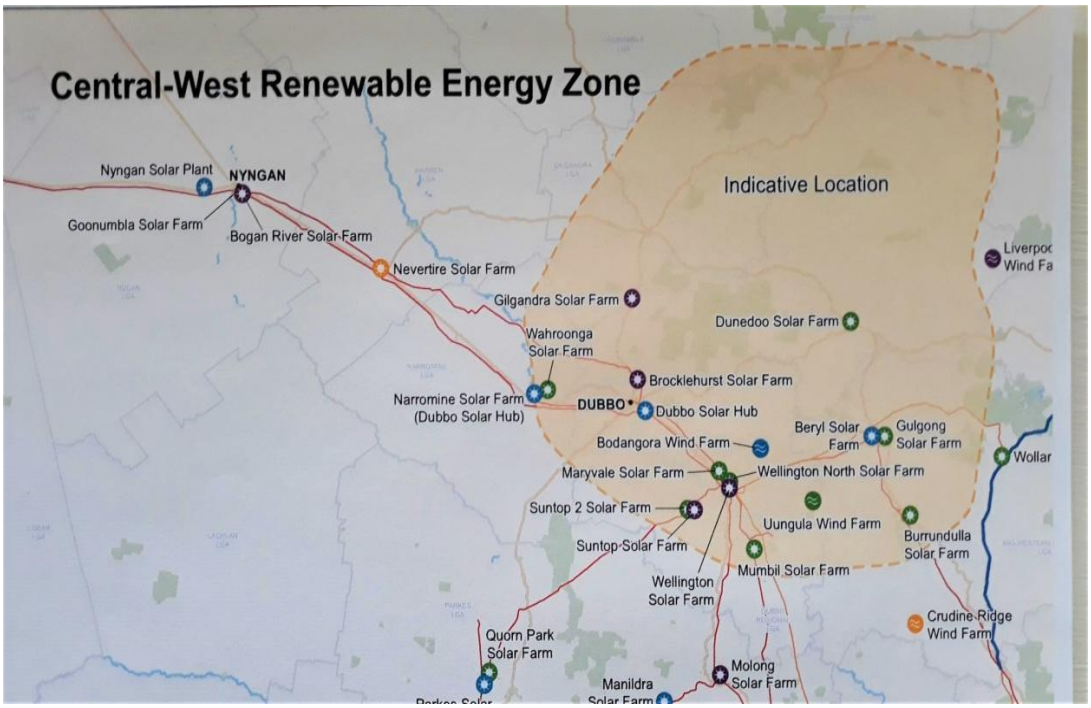
Created by SOS

- **Liddell Power Station** is a **2,000MW** nameplate capacity coal fired power station. Using the previous land/materials for nuclear and solar installations to replace Liddell's nameplate generation capacity of **2,000MW**, and an assumed **90%** output annually of a similar modern replacement plant, will require: **Solar - 21,000ha of land, 1,016,178 tons of materials; Wind - 116,550ha of land (equals in area about 137 Sydney airports), 1,847,386 tons of materials**; **Nuclear - 518ha of land, 434,202 tons of materials.** A very substantial difference on their impacts on the world's environment and resources. Our environment is much more than just CO2. **Why are the impacts on all the world's environments being be ignored?**

  Although beyond the scope of this paper, the solar and wind land and material requirements will be much larger to account for frequent life-cycle replacement/upgrades and efficiency losses as well as the required backup/duplicated power sources. Not only is nuclear power (and closed cycle gas-turbine power for that matter) much less demanding on resources and can operate without alternative backup for over 70 years it also has much less impact on the environment (e.g. less mining, less reduction of flora and fauna habitats, much less volume of toxic waste). **This frequent replacement requirement of wind and solar, IEGPs, including batteries, is ignored in the papers published by NSW Energy, the AEMO ISP, CSIRO, etc. Why?**
  [ref: www.energy.gov "What's the lifespan for a nuclear reactor" lifespan could be 80 years; 29/6/17 technocracy.news/solar-energy-produces-300-times-toxic-waste-nuclear-power/]

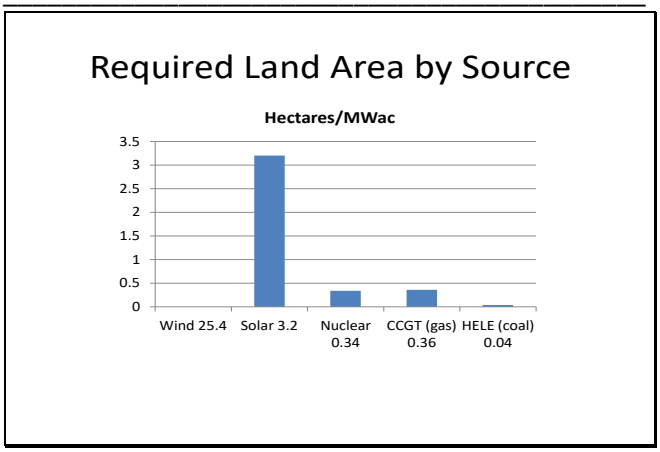
- The NSW Government in November 2020 legislated the creation of the Central-West Renewable Energy Zone (C-W REZ), which is to be a 3,000MW (3GW) pilot for other NSW Renewable Energy Zones. What this means for the Central West, which already has several weather-dependent IEGPs in operation or under construction, is even more environmental destruction.
  Just for the stated small increase of 3,000MW nameplate capacity (potential output of 26,280GWhpa), excluding any backup/duplication power and new transmission infrastructure, etc, of:
  ***Nuclear plant* only, assuming a 90% capacity factor (i.e. 3 x24 x365 x 0.9GWh)**, would require only: land **777ha** (less than one Sydney airport in size); materials **651,303 tons.**
  ***Solar plants* only, assuming a 30% capacity factor,** would require: **31,500ha** of fully high-fenced farm land (size of 37 Sydney airports) and over **1,524,267 tons** of materials;
  ***Wind plants* only, assuming 40% capacity factor,** would require **174,285ha** of farm and mountain top land (size of 207 Sydney airports) and over **2,771,079 tons** of materials.

  Even putting aside all the pre and post negative impacts on the Australian and overseas environments of weather-dependent installations, the massive loss of local wildlife habitat, high increased risk of grass and bushfires destroying more habits and farmland, leaching of toxic substances into soil and waterways, loss of farmland for food production, visual pollution for all local people and visitors for 25 to 30 years minimum, increased water use, ever higher electricity bills, ongoing subsidies to developers, more unnecessary transmission lines scarring our lands and the risk that some of these industrial installations will remain in-situ after their end-of-life as many of the developers and land owners will no longer exist, is a high price to pay for no gain in reducing global temperature increases and for substantially increasing electricity prices (already up 20% in 2021 & forecast to rise 30% more in 2023/4. **Why do rural and regional citizens have to bear the burden and known risks of weather-dependent renewables, which are driven by ill-informed, ideologically obsessed people?**
  [ref: https://energy.nsw.gov.au/media/1921/ " NSW Electricity Strategy"; Average hectares based on developers' published figures for Beryl, Gulgong, Stubbo and Wellington solar works; materials from sciencedirect.com "global environmental change Vol 60 Article 102028 table 1"; Average hectares based on developer's published figures for Coopers Gap wind turbine works]



NSW C-W REZ map as at December 2019

- The National Electricity Market participants (QLD, NSW, VIC, SA, TAS) generated from coal and gas plants **151,900GWh** out of a total of **192,400GWh** in 2019/20. For just PV Solar IEGP or just Wind IEGP to replace this output would require at least **2,187km2** or **11,393km2** respectively of land taken out of other use and excludes the necessary backup/duplication sources (pumped hydro, batteries and roof-top solar) and new transmission lines and infrastructure. Using the 2019/20 mix of industrial solar (28%) and wind (72%) generation, the land mass would be **8,815km2** or **71%** of the size Greater Sydney (bounded by Gosford/Wyong, RNP and Blue Mountains), which is 12,368km2, or more than 58 times the size of The Royal National Park (151km2). This could be doubled when plants are replaced. The fencing of this land for solar and wind IEGPs will destroy wildlife corridors, nesting and feeding habitats for decades and possibly destroy whole ecosystems. **Should we accept this devastation?**
[ref: solar 1.44ha/GWh, wind 7.5ha/GWh based on developers' published figures; https://aemo.com.au/-/media/Files/Electricity/NEM/National-Electricity-Market-Fact-Sheet.pdf 28/07/20; April 2020 www.cityofsydney.nsw.gov.au/guides/city-at-a-glance]



Created by SOS: Wind removed as it distorts the relativity of solar to the other sources

- Visually polluting the land can detract from the natural beauty of the vistas, which in turn can deter tourists from visiting some small towns and surroundings in rural regions of Australia. Domestic and overseas tourists and life-style change people expect to see the best that rural areas have to offer, not thousands of km2 of weather-dependent wind and solar industrial complexes**. Is this acceptable?**
  [ref: 3/8/20 MWRPP decision on Old Mill Rd Gulgong DA0283/2019]


Country scene


Now an Industrial scene

- The proposed **$1 billion** Ritz-Carlton Hotel (Star Hotel) Project development in Pyrmont Sydney involved a building of only **110 metres** tall to be viable. Approval was given in December 2020 for the hotel but limited to 110m because of government imposed height restrictions. Sydney's tallest building is **305m** high plus a **4m** lightning rod.
  However, the rural regions and very near regional towns are expected to accept hundreds of wind turbines that, even today can be **280m tall** and nearly 200m wide and getting larger each year. These wind turbines take up thousands of hectares of agricultural land or bushland hill tops and require dirt roads to be built that will erode the landscape. Such numerous and massive structures with very large fast moving blades are not just visual pollution but pose real dangers to wild-life and their habitats, people and property. Yet the residents in the NSW REZs have fewer rights to object than the people living near the proposed Star Hotel project in Sydney. **Why are rural citizens in the REZs treated so adversely compared to the rest of NSW?**
  [ref: robbinsislandwindfarm.com/projects; Bing search- pics of wind turbines; The Daily Telegraph page 14 4/11/20; 8/9/20 windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/]


Will our regions be dominated by multitudes of 280m wind turbines?


Sydney Tower at 309m dominates CBD

- Nature Communications published on 1/9/2020 a science paper on world-wide mining and its impact on the environment, which stated that: *"Most mining areas (82%) target materials needed for renewable energy production, .."* and so *"Mining threats to biodiversity will increase as more mines target materials for renewable energy production...". "The authors discovered that a greater proportion of pre-operational mines are targeting materials needed for renewable energy production (nearly 84%) compared to around 73% of operational mines".* **All this additional mining just for renewables is environmental vandalism. Why is this acceptable?**

[ref: nature communications "renewable energy production will exacerbate mining threats to biodiversity"]

- Pre-construction pollution of the environment, both within and outside of Australia, is significant for solar installations. Apart from mining ores (coal, bauxite, copper, limestone, aggregate, silver, iron ore, etc.) used in producing construction materials (steel, aluminium, concrete) PV solar panels also need cadmium, germanium, gallium, indium, tellurium, silica, quartz, and plastics (made from cellulose, coal, oil, natural gas). Lithium batteries need rare earths, metals, plastics, cobalt and lithium. Extraction, purifying, and processing many of these inputs results in significant toxic waste, e.g. **producing one ton of rare earth elements releases up to 420,000 cubic feet (11,893m3) of toxic gases, 2,600 cubic feet (73.6m3) of acidic wastewater, and one ton (0.91 tonnes) of radioactive waste**. **Why is this acceptable?**
  [ref: Plasticseurope.org "How plastics are made"; Sovacool 2010; thoughtco.com/rare-earth-metals-2340169; mineralseducationcoalition.org/mining-minerals-information/minerals-in-your-life/ Fact sheet "solar panels"; 16/4/20 heartland.org/_template-assets/documents/publications/PBdriessenmining2Apr20.pdf; samcotech.com/what-is-lithium-extraction-and-how-does-it-work/]

Extraction of lithium pumped from underground salar (salt flat) brine deposits into evaporation ponds

- Crystalline silicon is a key component of many solar panels. The production of crystalline silicon involves a by-product called silicon tetrachloride, which is highly toxic, killing plants and animals. Such environmental pollutants, which harm people, are a major problem for people in parts of China and other countries. Those countries mass-produce “clean energy” solar panels but do not regulate how toxic waste is dumped into the environment. The country’s inhabitants often pay the price. **Should Australians ignore what happens to people overseas so that we can feel good about having "green energy"**.
  [ref: 30/4/18 sciencing.com/effects-chlorofluorocarbons-humans-7053.html]

- Pre-construction pollution of the environment, both within and outside of Australia, is significant for wind turbine installations. Apart from mining ores (coal, bauxite, copper, limestone, aggregate, clay, gypsum, iron ore, etc.) used in producing construction materials (steel, aluminium, concrete) wind turbines also need rare earths (neodymium, dysprosium), cobalt and fibreglass/carbon fibre (made from oil).
  Extraction, purifying, and processing many of these inputs results in significant toxic waste, e.g. producing one ton of rare earth elements releases up to 420,000 cubic feet of toxic gases, 2,600 cubic feet of acidic wastewater, and one ton of radioactive waste. According to the Bulletin of Atomic Sciences, a **2** megawatt (MW) wind turbine contains about 800 pounds (**363kg**) of neodymium and 130 pounds (**59kg**) of dysprosium. For each **ton of carbon fibre**, which is used for wind turbine blades, there is 10 tons (**9.1 tonnes**) of **CO2 emitted**. A **100m** carbon fibre blade weighs **40** tonnes. Three blades per modern turbine therefore weigh **120** Tonnes and these alone cause emissions of **1,092Tonnes of CO2**.
  [ref: bbc.com/bbc news " What happens to all the old wind turbines?" 7/2/20; mineralseducationcoalition.org/mining-minerals-information/minerals-in-your-life/ Fact sheet "wind turbines";

31/3/20 compositesworld.com/articles/wind-turbine-blades-glass-vs-carbon-fiber; July 2020 manhattan-institute.org/mines-minerals-and-green-energy-reality-check]

- Both solar and wind electricity generation require several rare earth minerals. The yield per ton of ore ranges from a few grams to less than a gram depending on the rare earth involved. Extracting rare earths involves the use of toxic chemicals (sulphuric acid, alkali, nitric acid) and creates toxic waste (dust concentrate, sulphur dioxide, hydrofluoric acid) including radioactive waste. China processes the majority of rare earths. Processing of rare earths results in toxic lakes, such as Baotou Lake in Mongolia, China.
[ref: 3/4/15 bbc.com/future/article/20150402 "The worst place on earth"; 11/4/15 digitaljournal.com/news/environment/baotou-a-toxic-lake-created-because-of-a-thirst-for-technology/article/430511; chinapower.csis.org/china-rare-earths/]


Processing rare earths in China

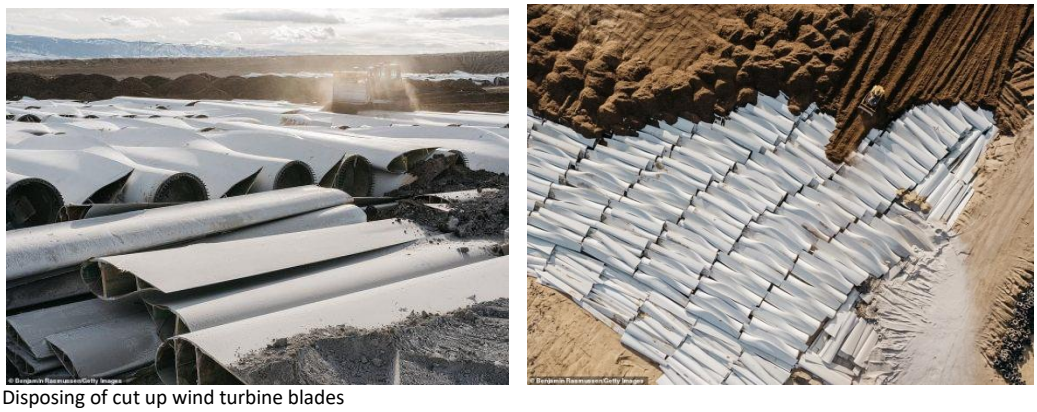

Rare earths toxic waste containment

- Pollution of the environment, both within and outside of Australia, is significant for solar installations during and post decommissioning. The toxic chemicals in solar panels include cadmium telluride, copper indium selenide, cadmium gallium (di)selenide, copper indium gallium (di)selenide, hexafluoroethane, lead, and polyvinyl fluoride. Additionally, silicon tetrachloride, a by-product of producing crystalline silicon, is highly toxic. Lithium batteries used to backup IEGPs contain toxic lead, cobalt and lithium and in themselves pose immediate and future risks to the environment. **Have our governments thought about these risks?**
[ref: 30/4/18 sciencing.com/effects-chlorofluorocarbons-humans-7053; 5/3/18 https://www.cbsnews.com/news/cobalt-children-mining-democratic-republic-congo-cbs-news-investigation/; www.sustainablity.vic.gov.au "The growing issue of PV system waste]

- Pollution of the environment , both within and outside of Australia, is significant for wind turbine installations during and post decommissioning. Apart from the mining, processing, manufacture, transport, construction the disposal of the turbine blades has emerged as a significant issue for Norway, Germany and the USA as old wind turbines are currently being decommissioned.
[ref: stopthesethings.com/2015/04/25/wind-powers-toxic-embrace/; bloomberg.com/news/features/2020-02-05/wind-turbine-blades-can-t-be-recycled-so-they-re-piling-up-in-landfills]

- Wind turbine blades made from fibreglass or carbon fibre are being buried because they are too difficult to economically recycle. Carbon fibre is not biodegradable and will last indefinitely. Germany had over 5,900 wind turbines due for decommissioning in 2021 and therefore 17,700 blades to be disposed. In Tennessee USA, 1,000 end-of-life turbine blades were buried near a river. In other cases the wind turbines remain in situ, just rusting monuments to the lack of foresight of what happens to all these turbines at the end of life.

Have our governments thought about these issues? Apparently not.
[ref: CF technewsworld.com "The Perplexing Carbon Fiber Repurposing Problem"; bloomberg.com/news/features/2020-02-05/wind-turbine-blades-can-t-be-recycled-so-they-re-piling-up-in-landfills]


Disposing of cut up wind turbine blades

- Photovoltaic manufacturers use a lot of water for various purposes, including cooling, chemical processing, and air-pollution control. The biggest water waster, though, is dust control and cleaning panels during installation and use. Industrial-scale PV solar projects in the 230 to 550 megawatt range can require up to **1.5 billion litres of water** for dust control during construction and another **26 million litres annually** for panel washing during operation. An installed **400MW** PV solar IEGP has about **800,000** panels, which should be washed whenever dust accumulates as dust reduces efficiency by up to 10% and other contaminants by up to 30%. Water is precious in the rural areas of Australia where nearly all these solar IEGPs have been or are being built, or are proposed to be built. **Have our governments thought about these water wastage issues? Apparently not.**
[ref: spectrum.ieee.org/green-tech/solar/solar-energy-isnt-always-as-green-as-you-think; pveducation.org/pvcdrom/modules-and-arrays/degradation-and-failure-modes]


Construction site dust control Cleaning PV solar panels

- The Kathleen Valley WA lithium project needs to mine **139 million tonnes of ore to get 1.8 tonnes of lithium** (**1.3% yield**). The extraction and processing of lithium requires considerable heat and the by-products, such as chlorine gas, can contaminate the soil, air and water. More extensive mining and all the habitat destruction, polluting activities and transport will grow and grow as more batteries for renewables backup/grid stabilisation and electric cars expands.
For example, a Tesla utility scale power pack weighs **2199kg** and contains about **45kg** of lithium, which equates to mining **3,475,000 tonnes of ore per power pack**.
The Hornsdale Power Reserve in South Australia uses over **150** Tesla Power Packs. Thus, 521,250,000tonnes of ore had to be mined, initially processed, shipped to China for further

processing and ultimately used to make batteries. Compared with a natural gas power plant, the total mining required for solar, wind and their backup is at least **10** times as many total tonnes mined, moved, and converted to deliver the same quantity of energy. **Are the expanding environmental impacts of all this additional mining, transport and processing being ignored by our governments? Apparently yes.**

[ref: thoughtco.com 21/8/20 "An overview of commercial lithium production"; salon.com 17/6/19 "Electric cars are still better for the environment"; www.boardroom.media 20/02/20 ASX:LTR Liontown's victory"; manhattan-institute.org/mines-minerals-and-green-energy-reality-check ; tesla.com/powerpack; electrek.co/2016/11/01/breakdown-raw-materials-tesla-batteries-possible-bottleneck/]

Open cut Lithium mines, many of which could swallow the regional towns in just the Central West NSW

- The **7,500** hectare Hornsdale Windfarm in SA has a capacity of **316MW** and a claimed capacity factor of **37.9%** (1,050GWh annually). When the wind turbines are becalmed, sometimes for days, then no electricity is produced. Advocates for renewables claim battery backup (they oppose coal, natural gas and nuclear electricity generation) can fill this void. On average, wind IEGPs in Australia do not produce electricity for three days (72 hours) of each week.
  How much would the Hornsdale Power Reserve batteries (currently **150MW/193.5MWh** in size) need to be expanded to supply the backup electricity needed for, say, 72 hours before being exhausted? A staggering increase of **118** times as large (316MW x 72h /193.5MWh). The Hornsdale Power Reserve cost about **$130m** (stage 1 was $90M plus annual fees of $4m+), required 1ha of concrete slabs, and 4.3T of batteries and inverters). Scaled up 118 times comes to **$1.534 billion cost**, **118ha of concrete slab** and **504 Tonnes of battery equipment.**

  Compare this with AGL's previously proposed **250MW** capacity, **90%** (1,971GWh annually) capacity factor, dual fuel combined cycle gas turbine with carbon capture plant (CCGT-CC) on only **91ha** at a cost of only **$400m** and expected life of **25 years**. The CCGT has longer life than the Hornsdale wind turbine plant yet produces nearly twice the electricity output annually and when required almost 24/7 at a very much lower capital cost and demand on resources.

  The extent of mining (10 times more than an equivalent capacity natural gas power plant) of lithium, cobalt, nickel, graphite, etc. is staggering, especially when the output of Hornsdale only represents less than 0.5% of Australia's 2019-20 electricity consumption (NEM **192,400GW** plus WA & NT add 10% more). A similar calculation for solar IEGP would be 30% worse due to their much lower capacity factors.

  In addition, one can calculate that one annual gigafactory production of 50GWh of Tesla batteries would be enough to provide back-up for 6min for the entire US power consumption (and then no Teslas to drive). Today's battery technology cannot be the

solution to renewables intermittency. Why do our governments and renewables proponents continue to falsely claim that batteries will solve the intermittency and variable electricity output of wind and solar IEGPs when they cannot?

How can consuming so much extra of the Earth's resources ever be justified, especially as replacement of weather-dependent renewables is necessary every one, two or three decades?

[ref: hornsdalewindfarm.com.au; The Daily Telegraph p5 21/10/20 "Kean backs kids opposed to govt's gas strategy'; http://joannenova.com.au/2020/08/wind-power-failure-100-times-a-year-we-get-a-500mw-outage ; hornsdalepowerreserve.com.au; abc.net.au/news/2018-09-27/tesla-battery-cost-revealed-two-years-after-blackout/10310680; tesla.com/powerpack; gizmodo.com.au/2017/07/all-the-details-on-teslas-giant-australian-batteryt/; power-technology.com/projects/newcastle-power-station-new-south-wales-nsw/; electrek.co/2016/11/01/breakdown-raw-materials-tesla-batteries-possible-bottleneck/; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"; AER: AEMO, data 9/10/20]

Hornsdale Power Reserve (batteries) and Wind IEGP, South Australia

- Apparently, many advocates of weather-dependent renewables regard CO2 emitting bio-mass power stations that burn wood as a better backup/base load power source than coal, gas or nuclear and better for the environment. The ARD's "Das Erste" reports in 2020 include satellite images that show deforestation has risen **49%** since 2016 in Sweden, Finland, and the Baltic countries, for use in biomass electricity plants.

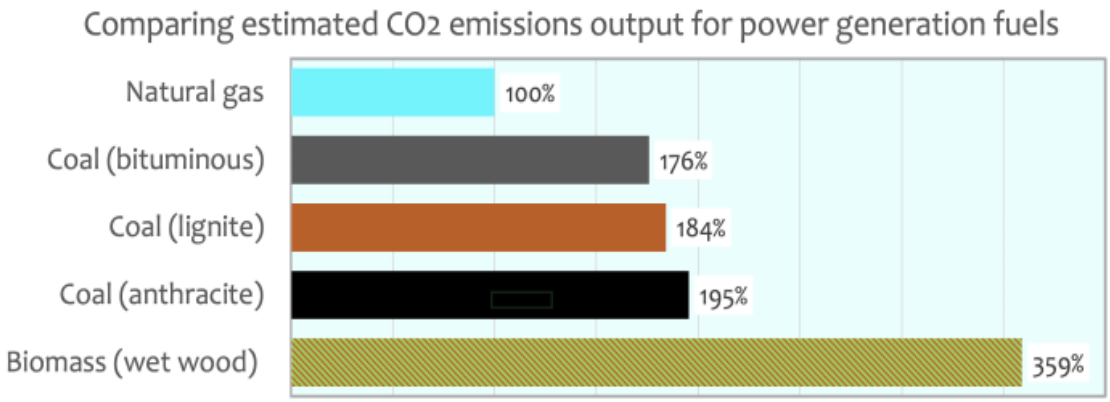
  Also, the EU import wood chips/pellets from North American and Chilean forests for burning in biomass plants, which involves lots of fossil fuel used in harvesting, drying, pelletising, and transport by road and ship. Also, large losses of habitat for wildlife. A harvested forest replacement can take **100** years to reach to the same level of stored carbon that existed prior to harvesting . Biomass plants result in an additional, instantaneous CO2 release into the atmosphere of about **3.6** times that produced by burning Natural Gas for the same power output. Biofuels also destroy whole ecosystems.

  At least some well known environmentalist are speaking out against Biomass and Biofuel plants, stating that they are unsustainable and environmentally damaging methods of pro-ducing electricity. **Will Australian governments rule out creating biomass power plants?**

  [ref: 6/9/20 notrickszone.com/2020/09/06/environmental-disaster-northern-europe-deforestation-up-49-due-to-effort-to-meet-co2-targets/; 30/06/18 theguardian.com/environment/2018/jun/30/wood-pellets-biomass-environmental-impact 20/11/18; https://www.nytimes.com/2018/11/20/magazine/palm-oil-borneo-climate-catastrophe.html; 11/11/20 'The contradictions of Green policies to limit CO2 emissions'; Environmentalists M Moore and M Shellenberger]

Biomass power plant

Biomass fuel



Graph from 11/11/20 'The contradictions of Green policies to limit CO2 emissions'

- *"Solar panels create 300 times more toxic waste per unit of energy than do nuclear power plants. If solar and nuclear produce the same amount of electricity over the next 25 years that nuclear produced in 2016, and the wastes are stacked on football fields, the nuclear waste would reach the height of the Leaning Tower of Pisa (53 meters), while the solar waste would reach the height of two Mt. Everests (16 km)."*
  [ref: quote from https://wattsupwiththat.com/2018/12/23/solar-panel-waste-a-disposal-problem/; Jemin Desai and Mark Nelson, "Are we headed for a solar waste crisis?", Environmental Progress, June 21, 2017]

- *"Contrary to previous assumptions, pollutants such as lead or carcinogenic cadmium can be almost completely washed out of the fragments of solar modules over a period of several months by rain water."*
  [ref: quote from https://wattsupwiththat.com/2018/12/23/solar-panel-waste-a-disposal-problem/; Michael Shellenberger, "If solar panels are so clean, why do they produce so much toxic waste?", Forbes, May 23, 2018]

- C Millis, a USA Carolina state representative was the lead sponsor of House Bill 745, which required proper decommissioning of utility-scale solar plants after they close, reclamation of the land to its original condition within two years, and posting financial guarantees to ensure the work gets done. The article raised the concern that not enough research has gone into the decontamination impacts of solar panels on the soil. One study concluded that after land restoration peanuts could no longer be grown because of the high zinc concentrations in the soil that leached from solar panels.

  In Central West NSW alone there are several solar plants in place or proposed with capacities ranging from 87MW to 600MW where the potential contamination to the soil, surface and underground water supplies are very high. Planning submissions from developers do not currently include independent research on the risks and or a requirement for ongoing monitoring and reporting of soil and water condition on and around the site. Also, fully funded

decommissioning, site restoration and disposal plans should be a requirement and be lodged with the submissions. **Why are our governments and planning panels apparently ignoring the legitimate regional concerns and safety requirements of rural residents?.**
[ref: carolinajournal.com/news-article/environmental-hazard/ "Moore County residents worry about solar's long-term environmental impacts - Carolina Journal"]

- In time, the resource requirements for renewables can be doubled as new IEGPs must be operational before an old plant is decommissioned. For instance, a 400MW solar installation with back up batteries approved for construction near Gulgong on close to 18km2 of quality agricultural land. The average lifespan of solar plants is 21 years. So before this 400MW solar IEGP reaches its end of life, an additional 18km2 of land will need to be acquired and a new IEGP built to ensure continuity of electricity supply. Taking planning and building into consideration, this needs to be at least in the planning stages several years before starting the decommissioning of the original solar plant. In addition, extra transmission infrastructure, battery backup and other backup will be needed, possibly in a different distant location. Any omission or understatement of this overlapping of resources will drastically impact the complexity and costs of the electricity system as whole. **It appears that the government bodies have not factored this into their modelling simply because they only estimate over a claimed life-cycle for renewables of 25 to 30 years.**

6. Are clean sources of energy

This claim is not supported by the facts or actual experience, largely because the toxic waste occurs mainly outside of Australia, such as:

- The PV cell manufacturing process includes a number of hazardous materials, most of which are used to clean and purify the semiconductor surface. These chemicals include hydrochloric acid, sulphuric acid, nitric acid, hydrogen fluoride, 1,1,1-trichloroethane, and acetone. The amount and type of chemicals used depends on the type of cell, the amount of cleaning that is needed, and the size of silicon wafer.
  [ref: https://www.ucsusa.org/resources/ environmental-impacts-solar-power]

- Weather-dependent solar and wind electricity generation, including the use of Lithium batteries for partial backup/grid stabilisation, involve mining and extraction processes that generate huge amounts of toxic waste, especially in China and The Democratic Republic of Congo. Solar panels contain a toxic mix of gallium arsenide, tellurium, silver, crystalline silicon, lead, cadmium, and heavy earth materials. Batteries use lithium and cobalt, both of which are hazardous materials. The magnets in wind turbine generators are made from neodymium and dysprosium, rare earth minerals mined and processed almost exclusively in China and which has covered large tracts of China with fields and lakes of toxic waste.
  [ref: https://www.thoughtco.com/lithium-production-2340123;
  3/4/15 https://www.bbc.com/future/article/20150402-the-worst-place-on-earth; 5/3/18
  https://www.cbsnews.com/news/cobalt-children-mining-democratic-republic-congo-cbs-news-investigation/]

- The Victorian government has declared all solar panels as e-waste, as has the European Union. Disposal of solar panels, even after some recycling, cannot go to land-fill because of the toxic materials in each panel. EPA Regulatory Programs Director Rachel Gualano said *'officers would be inspecting sites with a focus on preventing harm to the environment and human health, including land and groundwater contamination, stockpiling and mitigating fires'.*
  Panels are unsuitable for burying in landfill but our governments think covering tens of thousands of hectares of food-producing rural land with solar panels is alright. Why?
  [ref: www.sustainablity.vic.gov.au "The growing issue of PV system waste"; www.epa.vic.gov.au/about-epa/news-media-and-updates/news-and-updates/e-waste-compliance-switched-on 3 July 2019]

- Victoria's government has stated that: *"It is estimated that more than 100,000 tonnes of solar panels will enter Australia's waste stream by 2035. This has the potential to create a hazardous waste management issue, as materials contained within solar panels can leach into soil and groundwater, causing environmental contamination and safety concerns if managed poorly. Keeping these materials out of landfill prevents environmental and human health problems, and rescues valuable resources for reuse. Compounding the issue is a lack of dedicated processing facilities in Australia that can recover valuable materials contained in PV products."*
  [ref: www.sustainablity.vic.gov.au "The growing issue of PV system waste"]

- Globally, the toxic waste already produced from mining for and processing of rare earths metals, cobalt, silver, lithium, etc. for use in wind and solar systems, including backup batteries, is causing pollution of land and soil, serious health conditions in residents, workers, animals and crops and the exploitation of children in cobalt mines. Is this acceptable?
  [ref: 11/11/14 nationalgeographic.com/news/energy/2014/11/141111-solar-panel-manufacturing-sustainability-ranking/ ; https://doi.org/10.1016/j.gloenvcha.2019.102028 "The decarbonisation divide: contextualising

landscapes of low-carbon exploitation and toxicity in Africa"]

- As wind and solar systems reach their end-of-life, the decommissioning, recycling and disposal are creating more toxic waste. It is estimated that the waste from just solar panels will grow from **0.25 million tonnes** in 2016 to **78 million tonnes** by 2050. At present most of these toxic panels go to landfill or storage. **Should this waste be tolerated?**
  [ref: www.sustainablity.vic.gov.au "The growing issue of PV system waste"; https://www.irena.org/publications/2016/Jun/End-of-life-management-Solar-Photovoltaic-Panels]

- The main environmental problems linked with photovoltaic panels, if not properly disposed of are: leaching of lead; leaching of cadmium; loss of conventional resources (primarily aluminium and glass) and; loss of rare metals (silver, indium, gallium, cadmium and germanium). Studies have shown that rain can leach toxic materials from in-situ solar panels over time due to deterioration or within 30 days if disposal is in land-fill. Recycling solar panels is not currently economic and is becoming less so as the silver content has been significantly reduced since the PV panels made in 2010. Therefore, more and more panels will go to land-fill, whether locally or sent to developing countries. Alternatively, as in the EU, levies and charges will apply when installing solar panels and on disposal to subsidise their safer disposal. **How many more subsidies will the wind and solar industry require from the us?**
  [ref: ec.europa.eu/environment/waste/weee/pdf/Study on PVs Bio final.pdf; 15/0/15 www.ncbi.nlm.nih.gov "Leaching of cadmium and tellurium from cadmium telluride (CdTe) in thin-film solar panels under simulated landfill conditions"]

- Wind turbine blades are made of toxic composite materials, such as fibreglass, epoxy, polyvinyl chloride foam, polyethylene terephthalate foam, balsa wood, and polyurethane coatings. These blades cannot be economically recycled and are being incinerated in the EU countries or buried in other countries. The plastics in the blades are highly toxic, and contain Bisphenol A, which is so dangerous to health that the European Union and Canada have banned it. **How are our governments ensuring the safety of regional citizens?**
  [ref: stopthesethings.com/2020/01/26/toxic-shock-millions-of-wind-turbine-blades-leave-poisoned-landfill-legacy-for-generations-to-come/]


Cutting up end-of-life wind turbine blades


Disposing of cut up wind turbine blades

- Fire-fighters have to take special precautions when fighting a fire in a PV solar electricity generating plant because of the dangerous voltages and the release of toxic fumes from burning panels and cables. Their approach is to just contain the perimeter of a solar IEGP.
  [ref: submission on DA0283/2019 to MWRPP 3 August 2020; 23/05/18 Mr McCurdy MP (Ovens Valley) (10.19) speech to parliament; www.windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/]


PV solar IEGP left to burn out


PV solar panel fires create toxic smoke

- Fossil fuels are regarded by renewables advocates as not being clean energy. Then weather-dependent renewables and their required backup (batteries and biomass plants) cannot be clean either as coal and oil are extensively used throughout the life-cycle of these weather-dependent renewables. For example: for mining and processing materials; to make steel and plastics; for lubrication; for use in transporting components; for clearing land; for decommissioning and; for disposal.

  Also, to produce just one ton of metallurgical grade silicon (MG-Si) for use in making solar cells the **ingredients** include high grade quartz (2400kg/59%), coal (550kg/14%), oil coke (200kg/5%), charcoal (600kg/15%) and hardwood chips (300kg/7%). In addition, their manufacture involves 5 days of continuous heating in a furnace at 1100 degrees Celsius. Most solar cells are made in China and therefore rely extensively on fossil fuels to supply the required energy to the furnaces. Five to six tons of CO2/ton of SG-Si is produced during the smelting process. More fossil fuels are required to the upstream processes to make the solar cell wafers, 50% of which is discarded, the solar cells and a complete solar panel. Hence, this is why installed renewables start with such huge emissions and energy deficits requiring years of electricity production before these deficits are eventually offset.

  Without carbon, in its various forms, there can be no solar panels. Why is this basic fact ignored by proponents of solar plants?
  [Ref: Troszak, Thomas. (2019). Why do we burn coal and trees to make solar panels?. 10.13140/RG.2.2.15715.71207/6].

- The use of biomass (burning wood and vegetation) power plants as a backup to weather dependent wind and solar electricity generation when they are not producing sufficient/any electricity is being recognised by prominent environmentalists as adding more CO2 and airborne particulates than burning coal because wood has a lower energy density than all other fuels. Many countries are now reclassifying Biomass plants as unstainable due to environmental damage, especially to logging hardwood forests.
  [ref: Michael Moore documentary "Planet of the Humans" 21/4/20 Youtube; 30/6/20 Michael Shellenberger "Apocalypse Never" p192 - 193]

Biomass energy plant - trees to woodchips to fuel


Biomass energy from wood chips by the truck load

- If Australia is to have a clean energy system then it must include nuclear energy generation in its mix. The more electricity generated from modern large-scale nuclear reactors and the currently under development small modular reactors (SMR), the cleaner, cheaper and more reliable our electricity system can return to being amongst the world's cheapest.
  [ref: "The case for SMRs in Australia" by SMR Nuclear Technology Pty Ltd August 2021]

- According to an article in Nature.com the lead from perovskite, used in the next generation of solar cells, leaking into the ground can enter plants, and consequently the food cycle, ten times more effectively than other lead contaminants already present as the result of the human activities. All solar panels contain some degree of contaminates yet the developers do not disclose these risks and in most cases do not even specify what type of solar panels they will install until well-after approval of the project. **We must be given this information at the EIS stage. Our environment and health are at risk. Will our governments introduce appropriate regulations?**
  [ref: 21/01/20 nature.com/articles/s41467-019-13910-y]

7. Eliminate fossil fuel use

This claim is not supported by the facts, such as:

- Mining for metals and minerals required for renewables is targeting **82%** of all mining on Earth. With increased mining comes increased use of fossil fuels to manufacture equipments, undertake mining, transport and process ore, etc, etc, etc.
  [ref: Nature Communications "renewable energy production will exacerbate mining threats to biodiversity"]

- Fly ash is a useful by-product of burning coal in coal fired power plants. It has several uses but a very important use is in making concrete, either Portland or Geopolymer, for use in building dams and wind turbine footings. Fly ash use in concrete reduces the amount of cement required, which reduces the cost of concrete and also reduces CO2 emissions.
  [ref: cementaustralia.com.au/products/fly-ash; gharpedia.com/blog/fly-ash-for-concrete-uses-advantages-and-disadvantages]

- Transport, much of it specialised for wind turbines, requires tyres, lubricants, diesel fuel, plastics to name a few examples essential to the construction of wind and solar IEGPs. In 2011, moving just one complete turbine took 9 to 10 trucks, most of which were specialized trailers. Different trailers are needed for the nacelle, blades, and towers. In 2022 wind turbines are significantly bigger and heavier. A single blade can now be about 100 metres in length. Ports and ships also have to be modified and extended to handle such sizes and weights. **All these equipments used for renewables depend on fossil fuels for their construction and operation.**
  [ref: windpowerengineering.com/challenges-in-moving-huge-and-heavy-components/]


Unloading a wind turbine blade from a ship


One wind turbine blade being taken to its site

- Steel manufacture needs coke (solid carbon and some ash) derived from heating metallurgical coal at 1000 degrees Celsius. The coke is added to iron ore in a 2,000 degrees Celsius flame blast furnace. The furnace heat is created from either oil or natural gas combined with oxygen. It takes around **770 kilograms** of coal to make **one tonne** of steel. Steel is essential in all stages of weather-dependent renewables from mining, processing, transport, manufacture, construction, decommissioning and disposal. **Hence, coal remains essential to creating wind and solar IEGPs.**
  [ref: bhp.com/our-businesses/our-commodities/metallurgical-coal/; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"]

- *"Plastics are derived from natural, organic materials such as cellulose, coal, natural gas, salt and, of course, crude oil"* and are heavily used in solar panels and wind turbine systems, including lithium batteries. Fossil fuels will have to remain in use for many decades.
  [ref: plasticseurope.org " How plastics are made"; sciencedirect.com]

- To produce just one ton of metallurgical grade silicon (MG-Si) for use in making a component of solar cells the ingredients includes high grade quartz (2400kg/59%), coal (550kg/14%), oil coke (200kg/5%), charcoal (600kg/15%) and hardwood chips (300kg/7%). In addition, their manufacture involves 5 days of continuous heating in a furnace at 1100 degrees Celsius. Most solar cells are made in China and therefore rely extensively on fossil fuels to supply the required energy to the furnaces. Five to six tons of CO2/ton of SG-Si is produced during the smelting process. More fossil fuels are required for the upstream processes to make the solar cell wafers, 50% of which is discarded, the solar cells and a complete solar panel. Hence, this is why installed renewables start with such huge emissions and energy deficits requiring years of electricity production before these deficits are eventually offset.

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8. Have strong community support

This claim is not supported by the facts, such as:

- The NSW mid-west historic town of Gulgong is one of many rural and regional towns around Australia that oppose the locating of wind and PV solar electricity generating works close to their towns. They already have the 310ha Beryl IEGP only 5km from town. The historic rural town of **2500** people lodged **435** objections against a DA for another solar electricity generating works close to the Gulgong township. The objections represented 17% of the residents and therefore a significant proportion of households. Ultimately they achieved a unanimous decision by the Mid-Western Regional Planning Panel (MWRPP) on 3/8/2020 to not approve the development application for a PV electricity generating works at Old Mill Road.
  [ref: 3/8/20 MWRPP decision; soundcloud.com/user-645092504/western-regional-planning-panel-ppswes-1-mid-western-3-august-2020 6/8/20 www.mudgeeguardian.com.au/story/6867372/solar-farm-at-old-mill-road-in-gulgong-will-not-go-ahead/?cs=12]

- Similarly, a proposed solar IEGP proposal for Burrundulla, near Mudgee, had over 1100 objections (about 10% of the residents). The Mid-Western Regional Planning Panel (MWRPP) on 22/12/2020 unanimously decided to not approve the development application for a PV electricity generating plant being built on the main approach to the town, which in both 2021 and 2022 won the major national award of Top Tourism Town.

- There many community groups that oppose weather-dependent renewables, especially those in country and regional Australia where residents have to live with the consequences of ill-conceived and ruinous government policies. Examples, just in the Central West region of NSW, include: *28/6/19 " Residents and business leaders opposed to the location of the proposed Burrundulla Mini Sustainable Energy Park, met in Mudgee on Friday to voice their concerns." (Over 1100 objections were lodged)*; *"16/9/2020 · Local News RURAL ANGER: Farmer Rob Green is upset about plans for 12,180 solar panels to be built in 140 rows on this land next to his property."; "26/11/2018 · Local residents, farmers in the Suntop district southwest of Wellington, are gathering to oppose the installation of a giant solar farm covering one-and-a-half times the area of Wellington itself."* In other regions across all sates are many other community groups opposing renewables so near their towns and properties, such as, currently: in NSW, Wellington, Liverpool Ranges, Liverpool Plains, Wagga Wagga, Burrendong Dam, Lyall Lake, Nundle, Lismore, Yass, Hunter Valley, Goulburn, Mittagong, Walcha, Hume; in Victoria, Moyne Shire, Nooramunga, Corangamite; in Queensland, Bell, Biloela.
  [ref: theland.com.au/story/6254162/hugely-visible-and-too-close-issues-raised-over-proposed-solar-farm/; centralwesterndaily.com.au/story/6925887/farmer-fights-12000-panel-solar-farm-blight-planned-for-the-property-next-door/;theland.com.au/story/5768400/suntop-residents-heated-over-proposed-second-solar-farm/]

- EPYC withdraws application to develop **54** turbine wind farm 5km from Tarago NSW, after two planning department rejections and **400** plus **community** objections.
  [ref: reneweconomy.com.au "Jupiter wind farm plans abandoned in face of community objections"; abc.net.au/news/2018-03-18/controversial-wind-farm-application-withdrawn/9560698]

- *"Nundle, a small town in NSW is pleading with Sydneysiders to join them in a fight against a $600 million wind farm. The historic village of Nundle, in the New England region, is fighting against a proposal to build 98 wind turbines, spanning 20km between Nundle and Hanging Rock".*
  "A picturesque little village of 300 people near Tamworth, Nundle is about to be transformed

by a wind farm on its doorstep. Within a few kilometres of this tourist town, and visible to almost everyone in the district, there's a proposed $600 million wind farm with nearly eighty 220m high turbines stretching over 20 kilometres of ridge line." What they're trying to do here is force it on a community that doesn't want it".
Why are our governments not listening? Why are they destroying our surroundings?
[ref: 1/7/20 2gb.com/we-need-your-help-small-towns-impassioned-plea-to-sydneysiders/;
4/7/20 dailytelegraph.com.au/news/ Peta Credlin]

- A proposal for eight wind turbines, a one hectare solar farm, and an environmental sustainability centre on land at North Head on The Northern Beaches of Sydney was not supported by 'green' politicians Zali Steggall MP Warringah, James Griffin MP Manly and Michael Regan Mayor of NBC. All three stated they do not support the proposal for a wind farm at North Head, but that such developments are more appropriate in the Renewable Energy Zones in Western NSW, i.e. over hundreds of kilometres from where they are well out of their sight from their electorates. Yet the May 2022 elected "Teal" MPs calling for more renewables all come from electorates where wind works, solar works, BESS works, massive transmission lines, etc. will NOT be built.
[ref: www.northernbeachesadvocate.com.au/2020/07/17/politicians-oppose-wind-farm]

Wind, solar & sustainability centre proposal for North Head, NBC Sydney

- Regional communities may be more receptive to the destruction of their local environment when we see advocates for more and more renewables in the regions share some of the pain, such as, wind turbines on, for example, the beaches of Warringah or floating solar works on the waters of Pittwater. Many residents in the regions have their visual amenity destroyed by dozens or even hundreds of wind turbines, many amongst the tallest structures in Australia (250m - 280m tall and up to 200m wide) being built only kilometres from their towns.

- There is now significant opposition by rural citizens in Germany to any more wind turbines. So much so that the construction of new wind IEGP collapsed in 2019.
  [ref: ft.com/content/d8b9b0bc-04a6-11ea-a984-fbbacad9e7dd " Germans fall out of love with wind power"]

- Victoria's Corangamite Shire Council has unanimously rejected a proposal for a massive 550 hectare **solar farm** at Bookaar near Camperdown. The Rural City of Wangaratta has voted to oppose construction of a new $170 million solar farm at Glenrowan.
  [ref: 25/9/18 www.standard.net.au/story/5667482/huge-solar-farm-gets-flick-from-council; 30/8/2018 weeklytimesnow.com.au]

- Councils and communities in Victoria reject solar and wind IEGP. e.g. The government pushes 3 wind and 3 solar IEGPs on regional communities in Victoria, and, RURAL communities are trying to stop solar farm developments across some of Victoria's prime irrigation land. Sunraysia citrus, dried fruit and winegrape growers have joined lifestyle-block owners in campaigning against three solar developments of 75,000 panels being built next to their properties.
  [ref: www.theaustralian.com.au/nation/politics/ "communities forgotten in Victoria's rush to renewables"; weeklytimesnow.com.au "Rural communities campaign against solar farms" "

- Just a few examples of the depth of feeling , stress and anxiety suffered by residents in various rural communities when an industrial solar works is proposed or approved near their town are:

  - *"Hi [name of addressee], I'm gutted! We lost! So unfair. Are you aware of any appeal process we may have, or is that it? In anger, [Name of sender]*", Solar works approved in Orange December 2020,

  - "gut-wrenching ...", says another when a solar works was approved near Jindera NSW, December 2020

  - The renewables energy project *"had a lot of resistance. They are worn out....don't even want to talk about it"*. Wagga Wagga resident.

  - "*I'm so disgusted [name] with how this government, all governments are allowing this to happen to our pristine, countryside our environment and Australians in general*" , Mudgee resident, January 2021 following lodgement of Stubbo EIS.

- *"The only positive thing I have considered will come out of this significantly stressful situation is that I will have found some sensible, thoughtful and lovely people in the same situation that are prepared to support each other in need. Thanks for reaching out."* Resident impacted by Culcairn Solar and loss of agricultural land. January 2021

- Communities around the world reject wind and solar IEGPs. e.g. Mexico: *One killed and 20 injured in wind farm protest*. Mexico: *Unhappy residents have also managed to stop at least four other solar and two wind projects in Yucatán, again due to the lack of prior consultations and environmental impacts.* USA: *Pennsylvania Richmond Township supervisors rejected a proposal that would have allowed a solar panel project to move forward.* USA: *North Carolina Woodland rejected rezoning application for a solar farm. But then they went further, supporting a complete moratorium on new solar farms, after residents made their opposition crystal clear.* UK: *The Say No to Sunnica* ***action group*** *is not* ***against solar****, we are not 'NIMBY's' (Not in My Back Yard) but do not agree with losing our entire back yard to a scheme (solar farm with batteries) that is simply too large and too intrusive.*
[ref: wind-watch.org/news/2011/11/03/one-killed-and-over-20-injured-in-mexican-wind-protest; 5/5/20 dialogochino.net/en/climate-energy/35244-mexican-communities-reject-chinese-solar-yucatan/; 14/12/15 *Roanoke-Chowan News-Herald*; 5/5/20 *wind-watch.org/news/2020/05/11/mexican-communities-reject-chinese-solar-farm-in-yucatan/; wind-watch.org/news/2020/05/09/mexican-government-halts-grid-connection-of-new-solar-and-wind-projects;* 13/10/20 readingeagle.com/news/environment/richmond-township-supervisors-reject-zoning-change-for-solar-farm/; 14/12/15 SMH "Woodland North Carolina reject solar farms"; www.saynotosunnica.com]

- On 14 July 2020 the Benton Public Utility District of Washington State, USA, issued a report detailing many scientific and economic reasons why they now oppose wind turbine IEGPs. Just one of the points made was: *"Customers and citizens throughout the region are desirous of the natural beauty and open spaces that are part of their way of life. This is the reason for the report and for their formal declaration that Benton PUD does not support further development of wind power in the PNW. The PUD's position is consistent with a recent decision in California as the San Bernardino County's Board of Supervisors slammed the brakes on big industrial solar projects and highlighted a challenge for the huge landscaping demands of renewable intermittent electricity*".
The rural regions of Australia totally agree with these points as we are the people affected by having wind and solar IEGPs thrust onto us, without regard for the health of us and our environment. Why are our governments ignoring us?
[ref: https://wattsupwiththat.com/2020/10/12/washington-state-blows-away-wind-fantasies/]

- Bob Brown, environmentalist, founder and long-time leader of the Australian Greens Party opposes a major wind farm development because its towers will affect an area's natural beauty and could kill endangered wildlife without any economic benefit to the state. Many communities throughout Australia, mainly in the rural regions, are those who are the most impacted by such developments. Why are our governments not supporting us?
[ref: 15/07/19 the guardian.com; 25/07/19 abc.net.au]

- Two long-time, well known environmentalists, Michael Moore (documentary "Planet of the Humans" YouTube 21/04/20) and Michael Shellenberger (book "Apocalypse Never: Why Environmental Alarmism Hurts Us All" 30/06/2020) highlight the environmental damage being caused by the obsession many countries have for weather-dependent renewables. Michael Shellenberger, in June 2020, publicly apologised for the decades of misleading the public. "But as an energy expert asked by the US congress to provide objective testimony, and invited by the Intergovernmental Panel on Climate Change to serve as a reviewer of its next assessment report, I feel an obligation to apologise for how badly we environmentalists

have misled the public."
[ref: stopsolarfarms.com/news/i-cried-wolf-on-climate-change-says-michael-shellenberger; Forbes Censored Michael Shellenberger: Here Is His Full Apology - The Global Warming Policy Forum (thegwpf.com)]

- The Australian Energy Infrastructure Commissioner made two observations recently. Land holders who lease their land to wind and solar project developers may have their land rezoned from primary industry to industrial uses and so face additional costs of land tax, insurances, levies, and council rates. Land holders who lease their land to wind and solar project developers may also be responsible for removing the wind or solar infrastructure and rehabilitating their land at the end of the industrial wind or solar plants life. Evidence to date indicates this could cost the landowner a lot more than the total of all the lease income received over 25 years. SOS previously also highlighted examples of such cases occurring in the USA where even small solar plants cost landowners $millions (net) to decommission.

- Community consultation started in April 2021 on the jointly proposed 500MW solar plant with a 1000MWh BESS only 8km from Gulgong and a 441MW, wind turbine plant (63 x 280m high turbines) plus BESS only 12km from Gulgong. If the already approved Stubbo 400MW plus 200MW BESS, and the Tallawang and Barneys Reef Road projects were to be approved, together with the existing Beryl solar plant only 5kms from Gulgong, the small township would be overwhelmed with industrial scale weather dependent electricity generating plants. This is even before the proposed 180km 500VA TransGrid transmission line is built from Wollar to Wellington and passing a few kilometres north of Gulgong to allow even more such projects to be built. All the risks and issues with the such industrial projects will be multiplied many times over. Such impositions on the residents and the rural surroundings of Gulgong for at least a decade and beyond is unreasonable, damaging to the local environment and the health of some residents. **For them it is all pain no gain. The communities across Australia continually express their unreasonable treatment but are ignored by their governments.**

9. Are reliable

This claim is not supported by the facts, real world experience and logic, such as:

- As wind and solar electricity generation are weather-dependent, then by definition, they cannot ever provide a continuous 24/7 energy supply in themselves. During August and early September 2020 California had several days of rolling blackouts affecting hundreds of thousands of homes, despite demand falling short of the state's peak years. The Governor proposed extending the planned forced shut-down of gas-fired plants past 2020 to counter the unpredictable renewables output. The failure of the Texas power system in February 2021, resulted in several deaths, shortages of food, water and heat during its winter storms. Texas has a largely independent electricity system and a 23% proportion of wind and solar generation. Virtually all parts of the Texas system were impacted by the extremely cold weather. It is unclear from the conflicting reports from the USA the extent of failure of each part of the system. However, the wind and solar IEGPs were heavily affected by ice and snow, so limiting their output. Wind and solar are not only weather-dependent but also weather exposed more so than other forms of electricity generation. Even solar panels and lithium batteries are temperature affected. Both lose efficiency in temperatures over 30C and batteries are less efficient at colder temperatures, which frequently occur in regions west of the Dividing Range. **They are therefore less reliable as a generator/provider of electricity.**
  [ref: latimes.com 24/08/20 "The power went out. Now California might let these gas plants stay open" 4/9/20 "State of emergency declared as California faces historic heat, possible power outages" ; www.nytimes.com 16/8/20 "Rolling blackouts in California have power experts stumped'; Texas - State Energy Profile Overview - U.S. Energy Information Administration (EIA)]

- Likewise, the Australian electricity grid is becoming more and more unstable and unreliable as more weather-dependent renewables are added. The AEMO, who manages the grid, has proposed several measures, including their right to remotely shut down roof top solar systems, and charge owners of roof top solar systems to pay to export excess electricity to the grid, in an effort to prevent increasing frequency of blackouts. Roof top solar systems, which are on about 30% of Australian households, currently supply more electricity to the grid than does either wind or solar IEGPs. Why then do we need more IEGPs instead of just continuing to expand roof top solar? **The owners of roof top solar systems are to be penalised further to the benefit of the developers/owners of IEGPs. Why?**
  [ref: reneweconomy.com.au/aemo-sees-urgent-need-to-have-power-to-switch-off-rooftop-pv-94963/amp/]

- In parts of Gulgong NSW, during the 2019-20 summer, there were five unplanned blackouts, three of which were of two hours or more in duration. Without electricity, many residents were not only without power but also water, as they rely on tank water and electric pumps. The Beryl 87MW IEGP, only 5km west of Gulgong town, was operational since May 2019. The days were cloudy and there were equipment failures at Beryl. In fact, according to the then owner of Beryl and Manildra solar IEGPs located in the Central West REZ both suffered component failures and Beryl suffered damage from a lightning strike. In addition, their output was further reduced due to heavy rain, lack of sunshine and curtailment of output due to roof top solar systems producing more electricity than all users required. Beryl has not achieved its expected electricity output since commissioning. Unplanned blackouts, brownouts & spikes are now frequent. **Reliability of IEGPs is definitely not a strong point.**
  [ref: reneweconomy.com.au/component-issues-hit-beryl-solar-farm-new-energy-solar-cuts-dividend-89936/; 25/2/21, New Energy Solar (ASX: NEW) Full Year Results 2020]

- A number of previously ASX listed renewables companies delisted because they regarded their share price as not reflecting the value of their assets. No, the share price reflected what the investors regarded as not a good investment. For instance, New Energy Solar was $1.35 in January 2020 but $0.85 ex 3 cents dividend on 12/2/21. New Energy was seeking a 50% sale of its portfolio in January 2020 but nothing eventuated. It has now managed to sell its Australian solar assets at about one third of the cost to build them and then exited the Australian renewables market. **Why should the regional communities of Australia put our faith in the government's drive to more and more renewables when so many others don't?**

- Germany relies on alternative back up (e.g. imports electricity from France who generate about **74%** of their electricity from nuclear power at a cost **59%** less than Germany) to keep the country operating when the wind speed is inconsistent, too light or too strong. Australia does not have the luxury on calling on other countries when its electricity system can't cope. **Yet Australia continues to go down the damaging renewables path.**
  [ref: forbes.com/sites/michaelshellenberger/2019/02/05/if-saving-the-climate-requires-making-energy-so-expensive-why-is-french-electricity-so-cheap/#183179541bd9; https://stopthesethings.com/2019/01/06/germanys-renewable-energy-fail-german-co2-emissions-10-times-higher-than-nuclear-powered-france/]

- Both solar panels and wind turbines lose efficiency over time. Solar panels decline by about **0.5% to 0.8%** a year and wind turbines about **1.6%** a year. They also can suffer failures from deterioration of plastics, solar cells, components, etc. and the weather (e.g. hail, storm, strong winds and fire). Not only are IEGPs not reliable they produce less and less electricity each succeeding year. Such rapid declines in output means ever greater new capacity has to be installed to make up the growing output shortfalls as more IEGPs are added to the grid. **Has this decline in efficiency been considered by the supporters of wind and solar IEGPs?**
  [ref: PV, www.wholesalesolar.com " How long do solar panels last"; Wind: www.science direct.com "How does wind farm performance decline with age"]


Fire shuts down whole solar array


Wind turbine collapse impacts output

- Both solar and wind IEGPs have to shut down if a major component fails. For example, just a fire in one turbine requires shut down of the plant. Once a fire starts, the project must be shut down and taken off grid for a period of time as a safety precaution, resulting in lost revenue. Likewise, for example, storm damage to part of a solar array may close down the whole works, such as the Queensland Oakey 2 IEGP.
  [ref: 8/9/20 windpowerengineering.com/the-true-cost-of-wind-turbine-fires-and-protection/ ; reneweconomy.com.au/uk-developer-takes-write-down-after-another-storm-hits-oakey-2-solar-farm-32373/]


Lightning strike shuts down wind turbine


Oakey 2 wind damage

- On average, Australia, loses 500MW of wind IEGP of output every 3 days. About 50 times a year we get the equivalent of 500MW or more outage within an hour or less when the wind becomes too strong. About 20 times a year a whole wind IEGP region can become becalmed, sometimes such wind droughts last for days, causing a loss of output between 2GWh and 4GWh. Building more IEGPs in the same region makes the intermittency worse, not better. To counter this intermittency, base load generation must sit idling ready-to-go to pick up the slack or the Snowy Hydro scheme must sit in reserve. Therefore, capital infrastructure is being used inefficiently for unreliable and expensive wind (and solar) generators.
  This is an additional cost attributable to adding renewables to grids but is ignored by advocates of renewables.
  [ref: Aug 2020 joannenenova.com.au "Wind power generation intermittency - It's worse than you think it is - Part one"]

- Solar panels deteriorate, resulting in additional lost efficiency, total failure or even fire. e.g. by delaminating /internal corrosion, electrical wiring issues, micro-cracks, hot spots, birds, dust, "snail trails" and inverter problems. **These failures can cause significant loss of output for an entire solar array or IEGP.**
  [ref: https://www.sunengis.com/nine-common-problems-with-solar-panels/; reneweconomy.com.au/uk-developer-takes-write-down-after-another-storm-hits-oakey-2-solar-farm-32373/; pveducation.org/pvcdrom/modules-and-arrays/degradation-and-failure-modes]




Examples of some types of PV panel deterioration

- The House Standing Committee on the Environment and Energy launched an enquiry in May 2021 entitled *Federal House Committee on Energy - a new inquiry into dispatchable energy generation and storage capability in Australia.* SOS made a submission (sub050) in which it draws attention to many of the issues in the design of a national electricity grid based on projects like Stubbo, Wellington, the Riverina, etc, etc., especially increased instability and increased short and long term electricity prices, which has since been borne out by the 2021-22 energy crises in the Northern Hemisphere and in currently in Australia.
  Submissions – Parliament of Australia (aph.gov.au)

- Through Snowy Hydro the Federal and NSW governments approved in December 2021 a 750MW dual gas fired power plant to be built in the Hunter Valley (Kurri Kurri) on only 12.75ha of land. Construction is expected to be completed by late 2023. Also, in May 2021,

EnergyAustralia, with the support of the NSW and Federal governments will build a 316MW carbon neutral gas fired power plant in the Illawarra region (Tallawarra B). These two projects, which can actually produce significant amounts of electricity on demand and continuously at their rated capacity, may be operational by the end of 2023, but not before Liddell coal fired power station closes in mid-2023. **Both gas electricity plants should, unlike the industrial renewables plants, require very substantially much less land and material resources and provide more local jobs, among other benefits**.
[ref: Snowy Hydro's $600m Hunter Power Project at Kurri Kurri in the NSW Hunter Valley gets all-clear, amid doubts about whether it is needed (afr.com) ; Tallawarra B Project | EnergyAustralia]

- Several jurisdictions with significant dependence on weather dependent electricity plants suffered severe blackouts and power availability over the period February to October in 2021. e.g. Queensland, Texas, China, UK and Germany to name a few. When base load power fails or the weather is not favourable, or both, for solar and wind generation plants then they add to the power shortages, not alleviate them. The UK had to pay to start up a remaining coal-fired power plant because they, and most of Western Europe, suffered from long periods of virtually no wind, an unreliable energy source, in early September and so no wind generated electricity was available. Also, more use of gas-fired power plants was necessary to make up the shortfalls in renewables output and so substantially drove up the price for natural gas, which in turned significantly increased electricity costs for businesses and other consumers.
[Why are factories shutting down in Europe and China? Not enough coal - Advance Australia 1/10/21]

- The NSW Tomago aluminium smelter shut down three times in one week in May 2021 due to insufficient electricity being available causing the wholesale price to reach the cap of $14,500MWh. More weather -dependent renewables exacerbate the instability of the NEM, as 95% of all electricity infrastructure expenditure over the last five years has been on renewables. The retail price of electricity has risen substantially in Australia, which has been the global experience.

- Investing in more wind capacity doesn't make the wind blow harder when there isn't any wind; and if there is little or no wind, wind power output will be as close to zero that it makes no difference. Likewise, solar IEGP produce zero or little output when the sun is obscured or at night or in winter months. On average over 12 months, wind and solar electricity generation in combination can only produce electricity 30% of the time. Something else has to not just cover the other 70% but also 100% when batteries are flat and dams are low or empty. These obvious facts appear to be glossed over by energy policymakers and the experts advising them. Very expensive batteries and pumped hydro storage is then claimed to solve these problems, but these fail to address the fact that more energy has to be put into them then they will provide. So where does the energy come from, say at night, when there is no/little wind power, no solar power and the stored capacity is empty? **Renewables can never be reliable because our policy makers cannot regulate the weather.**

10. Are Sustainable

This claim is not supported by the facts, such as:

- Just as coal, gas, and oil have a finite lives so do the many rare earths, metals, and numerous materials needed to produce, to transport, to provide backup support (e.g. Lithium and Cobalt for batteries) to maintain and replace weather-dependent renewables. The growing demand for lithium is already forecast to exceed the world's production supply by 2023 and various scenarios indicate supply could run out between 2040 and 2100. Weather-dependent renewables already need up to ten times the resources (mining raw materials to end-of-life disposal) than required by the equivalent capacity coal, gas or nuclear plants. This enormous magnitude of depletion of Earth's resources for renewables is unsustainable, some of which may disappear even in this century.
  [ref: www.pv-magazine.com/2020/09/15/how-long-will-the-lithium-supply-last/; sciencedirect.com "global environmental change Vol 60 Article 102028 table 1; Oct 2020 Dr Lars Schernikau "The truth behind renewable energy"; manhattan-institute.org/mines-minerals-and-green-energy-reality-check; nature communications "renewable energy production will exacerbate mining threats to biodiversity"]

- In 2019, **37%** of known reserves of rare earths, which are used in renewables, as well as many electronic devices, are in China. In 2019 China produced **85-90%** of all rare earths output. That country has already twice threatened to cut off its supply to other countries. If they act on that threat, or even withhold some supply so forcing up prices, then solar and wind renewables expansion and frequent replacement could largely and abruptly cease.
  [ref: statista.com/statistics/277268/rare-earth-reserves-by-country/; 7/8/20 .forbes.com/sites/timtreadgold/2020/08/07/chinas-rare-earth-threat-sparks-an-international-backlash/amp/ https://chinapower.csis.org/china-rare-earths/]

- The huge volume of water needed for mining and processing rare earths is now at risk in China. Widespread water pollution from growing industrial development in China continues to diminish freshwater supplies. The rapid economic growth and the increased consumption of animal products, is putting a further strain on the freshwater resources of China. Priority for human water consumption becomes clear, and this could put the zirconium and rare earths industry way down the list.
  The increasing huge amounts of water used by the renewables industry for the life-cycles of their wind, solar and battery products is likely unsustainable in coming decades.
  [ref: investorintel.com/sectors/technology-metals/technology-metals-intel/china-is-facing-a-water-crisis-that-could-threaten-rare-earths-production-and-their-mining-industry/;]

- The world has spent $trillions on all renewables to only get their share of global energy from **22% in 2001 to 34.7% in 2019**. To get to 100% renewables by 2050 is estimated to be many $trillions (USA alone, $5.7 trillion). Goldman Sachs' Jeff Currie in October 2022 stated that *"$3.8 trillion of investment in renewables moved fossil fuels from 82% to 81% of overall energy consumption"* in 10 Years.
  In the light of the damage done so far to nearly all economies in the world as a result of dealing with the global COVID-19 Pandemic, it is not feasible that these economies can sustain such extraordinarily high expenditures for renewables, including their 100% backup duplication and grid reconfiguration for three more decades.
  [ref: https://www.americanactionforum.org/research/what-it-costs-go-100-percent-renewable/; www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Highlights_2020.pdf; Goldman Sachs' Jeff Currie: '$3.8 Trillion of Investment in Renewables Moved Fossil Fuels from 82% to 81% of Overall Energy Consumption' in 10 Years – Watts Up With That?]

- Currently it costs Australians **$13 billion** or more annually to support the wind and solar expansion in Australia. Dr Alan Moran in April 2022 forecast that subsidies for renewables in Australia will reach $22 billion annually by 2030. However, the AEMO 2020 Integrated Planning Report Overview states a benefit to consumers of only **$11billion** over **20** years i.e. by 2040. Despite these levels of subsidies Australia's electricity prices continue to rise substantially each year. In one Gulgong NSW example, a 204% increase from 2019-20 to 2022-23, even before the post April 2022 forecast increases of 56% by end of 2023.
  The AEMO's forecast meagre benefit will not provide any significant reduction in Australia's already high electricity prices to maintain existing manufacturing let alone significant growth to help Australia's economic recovery post COVID-19 Pandemic. We need meaningful reductions (50% or more) in our electricity bills. 39% of our bills are already caused by funding renewables and can only increase further if government policies do not change now.
  [ref: Report by Dr Moran "The Hidden Cost of Renewables on Electricity Prices"; Dr Moran Renewables subsidies: $22 billion by 2030 | The Spectator Australia ; https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp]

- *"Unlike other forms of electricity generation, like nuclear plants or coal plants, there doesn't seem to be any foresight on how to deal with the waste that will be generated when solar panels and wind turbines reach the end of their short lifetimes. Remember, nuclear plants can run for 80 years, as can coal plants with proper maintenance and upkeep, but even the best wind turbines and solar panels will last for just 25 years, creating staggering amounts of waste products."* Waste generated from renewables in the next 30 years is expected to be 866 greater than all the waste produced by nuclear power in the last 50 years. Recycling solar panels in the USA cost 10 times more than the revenue obtained according to a Arizona State University solar researcher Meng Tao.
  The disposal of mega tonnes of weather-dependent renewables toxic waste to landfill, storage or by incineration, as currently done in the EU, is not sustainable.
  [ref: americanexperiment.org/2020/08/solar-panels-are-starting-to-die-what-will-we-do-with-the-megatons-of-toxic-trash/; 22/07/20 onlinelibrary.wiley.com/doi/abs/10.1002/pip.3316]

- It was reported in April 2021 that about 89,000 roof solar systems were installed within Australia in 2010 and over 360,000 systems in 2011. In September 2022 over 3 million or 30% of households have roof top solar systems and new installations are growing daily. In NSW, unlike Victoria, the damaged and older solar panels (11 to 12 years old!) are largely going to landfill. An estimated 3,000 tonnes of panel waste was expected to go to landfill in 2021 alone. It cost more to recycle the panels than it does to dispose of them, even though the early panels had a very high silver content. Some councils are already banning disposal of panels in landfill. The then Federal Environment Minister announced in June 2021 that she is demanding solar panel companies produce a 'clear timeline' for an industry-led national solar panel recycling program by July 2022 for how to deal with old, unusable technology to avoid a looming 'landfill nightmare' or face harsh regulations from the federal government. The change of Federal Government in May 2022 appears to have delayed this. While there are presently six PV panel recycling companies in Australia they only currently reclaim 17% by weight of each solar panel i.e. the aluminium frame and the junction boxes.
  [ref: Feb 2022 The Importance of Having Solar PV Recycling Facilities in Australia (energyterrain.com.au) : June 2021 Sussan Ley Puts Australia's Solar Panel Industry "On Notice" (solarquotes.com.au)]

- On June 12, 2021 it was reported that the demand for Lithium, as used in the lithium batteries for most BESS, could quadruple by 2030. Prices for Lithium Carbonate rose 400% during 2021 and are up another 250% to October 2022. The processing of lithium ore is extremely toxic and mining intensive (a Western Australian mine's yield is only 1.3% lithium per tonne of ore). The BESS projects will add to this toxic waste and environmental damage.

Facts which most officials and renewables proponents ignore.
[ref: October 27 2022 Lithium - 2022 Data - 2017-2021 Historical - 2023 Forecast - Price - Quote - Chart (tradingeconomics.com); 3 Feb 2022 Lithium prices rose more than 400% in 2021; supply agreements failed to keep up - Fastmarkets]

- Table 1 below compares the approved Stubbo (near Gulgong NSW) 400MW solar and very small battery storage (BESS) plant with the output and resource requirements of alternatives over an 80 years period. Clearly, such resource requirements and poor energy payback for intermittent, short life, solar, wind and batteries is not sustainable over the medium to longer term.

Table 1. Comparison of 400MW capacity Generation Types

Generator Type	Land Req't Hectares *	Capacity Factor %	Output MWh/year	Availability	Tonnes Material Requirement	Expected Life yrs	Energy out/in Payback %	Materials Over 80 years MT
Stubbo Solar	1772	25.2	883,008	Daylight Hrs #	74,200##	30	60	218,666###
Industrial Solar (ave)	1280	25.5	893,520	Daylight Hrs	67,745	25	60	216,784
Rooftop Solar	0	24.5	858,480	Daylight Hrs	13,550	25	>60	43,360
Wind (no BESS) ave	10,160	30.1	1,054,704	Wind dependent	164,212	20	290	656,848
HELE	30	82.3	2,915,328	24hrs/7days	< 108,550	60	3,000	<144,733
CCGT-CCS	146	90	3,153,600	24hrs/7days	< 108,550	25	3,000	NA
Nuclear	169	91.3	3,199,152	24hrs/7days	108,550	80	7,400	108,550

* Ratios used to bring to all types to 400MW capacity level, except nuclear, used 50% for 1000MW plant
# plus up to one hour from BESS
Stubbo estimated by SOS: 4,800T batteries, 16,000T (20kg x 800,000) solar panels, 53,400T steel (40kg/m x 5m lengths X 133,500 piles plus 133,500 cross members) but no allowance for concrete, inverters, wiring, etc.
Batteries replaced 7 times, rest of system 2.67 times (80yrs/30 yrs)
[ref: Average hectares based on developers' published figures for Beryl, Gulgong, Stubbo and Wellington solar works; materials from sciencedirect.com "global environmental change Vol 60 Article 102028 table 1"]

- Current technologies of wind and solar renewables are getting close to their theoretical limits of energy efficiency, which is well under 60%, have relatively short lives and need 100% backup due their intermittent operation. Whereas coal, gas and nuclear energy generation are already 60- 90% efficient, have considerably longer lives, can operate with capacity factors in the 90% plus range and so need minimum backup.
  In addition, modern coal and gas plants produce much less CO2 emissions than the existing older operating plants. Nuclear reactors produce no CO2 emissions, have the longest lives, and the development of small module reactors and Thorium reactors (India is constructing one for commissioning in October 2022 and plan to build up to 62 for operation by 2025), will be cheaper and quicker to deploy. Also, new technologies are likely to appear in the next decade or two, such as nuclear fission and hydrogen driven turbines. These new technologies are likely to cause inefficient, intermittent and unreliable weather-dependent technologies to again be abandoned.
  Placing faith in weather-dependent renewables with battery and expensive and environmentally damaging pumped- hydro as the 100% backup will not be sustainable. As other technologies are improved and invented in the next decade, renewables will become uneconomic stranded assets and outdated technologies.

[ref: wattsupwiththat.com/2020/10/18/the-truth-behind-renewable-energy/; Michael Shellenberger "Apocalypse Never: Why Environmental Alarmism Hurts Us All" 30/06/2020; en.m,wikpedia/thorium-based nuclear power]

Photo by Jarek Radimersky Aug 2015

Photo by Daniel Hagerman March 2013

Is this our future: abandoned wind turbines

- A small Australian company, Clean Energy Resources Pty Ltd, claims that it has developed a method of extracting hydrogen from coal , as well as from tyres and other waste without producing greenhouse gases. If true and if commercially viable, given that 95% of the world's hydrogen is currently derived from fossil fuels as electrolysis is too expensive, it would make wind and solar plants obsolete and stranded assets.
  [ref: Oct 2022 Clean Energy Resources | LinkedIn]

- Both Hyundai and Toyota started trialling their Hydrogen Fuel Cell cars in Australia. If hydrogen driven cars, which only need a few kilograms of liquid hydrogen to travel hundreds of kilometres, gain favour over Electric Vehicles then this will affect electricity demand and the viability of weather dependent renewables. The October 2022 Federal Budget included more funding for both EV charging stations and Hydrogen Fuel Cell refuelling stations as well as research funding.
  [ref: Nexo | Fuel Cell | Hyundai Australia; Building the next generation hydrogen service station in Geelong - Australian Renewable Energy Agency (ARENA)]

11. Australia is a laggard in emissions reductions

This claim is not supported by the facts, such as:

- Australia has the highest uptake of solar globally, with more than 28% of homes with rooftop PV solar . As of 31 December 2020 more than 2.66 million rooftop solar power systems have been installed across Australia (source: CER). Angus Taylor, Minister for Energy and Emissions Reduction, said in February 2021 that Australia has the highest uptake of solar in the world with one in four homes using it and the highest wind and solar capacity of any non-European country. In October 2022 rooftop solar installations were close to 3 million (30% of households)
  [ref: : Clean Energy Regulator; Rooftop solar drives Australia to renewable energy record – pv magazine Australia (pv-magazine-australia.com)]

- "In 2019, Australia deployed new renewable capacity at least 10 times faster per person than the global average and four times faster per person than China, Europe or the United States," Mr Taylor said. "In 2020, Australia invested $7.7 billion or $299 per person in renewable energy. This places us ahead of countries like Canada, Germany, Japan, Korea, New Zealand and the United States on a per-person basis."
  [ref: Rooftop solar drives Australia to renewable energy record – pv magazine Australia (pv-magazine-australia.com)]

- In its submission to the House of Representatives Standing Committee on the Environment and Energy hearing held in January 2021, the Dept. Industry, Science, Energy and Resources (DISER) Submission, Attachment E, highlighted that Australia leads the world in 2019 in new renewable energy capacity per person (240.3 watts) and per capital investment in renewables ($A324.7). The next closest country is Germany (74.3 watts) and USA (A$259.9) respectively.
  [ref: sub588 Climate Change Bills 2020]

- Attachment E of the DISER submission also shows that Australia is highly ranked in its emission reductions 2005-2018 on a per capita basis (-29%) when compared to the next best countries of UK (-40%), EU (-22%), USA (-19%) and Germany (-16%). China increased by +60%. Australia is hardly a laggard.
  [ref: sub588 Climate Change Bills 2020]

- According to Climate Action Tracker only eight of the 200 signatories are on track to meet their emissions targets. Apart from India the other seven countries are small contributors to emissions. Australia sits just outside this group and is also a small contributor to emissions.

- The IEA as of 10/02/20 compared the emissions of the advanced economies and the rest of the world for the period 1990 to 2019. The 14 advanced economies are Australia, Canada, Chile, EU (including UK), Iceland, Israel, Japan, Korea, Mexico, Norway, NZ, Switzerland, Turkey and USA have not collectively increased their emissions in 29 years. Meanwhile, the Rest of the World have increased their emissions by 239% from 9.2 to 22Gt (refer table below). In 2019 China emitted 10 gigatons (Gt) of the 22 Gt of CO2 emitted by the Rest of the World.
  [ref: iea.org]

Year	Advanced Economies Emissions (Gt)	Rest of World Economies Emissions (Gt)
1990	11.3	9.2
1999	12.3	10.1
2019	11.3	22.0

If significant reduction in global emissions is a goal then it is not the advanced economies that have to do a lot more as they only represent 33% of emissions in 2019.

12. What needs to change

In this paper, SOS has:

1. Provided just some of the wealth of research and real-life experiences, gathered and analysed over the last three years, of the potential and actual harmful effects that renewable energy projects have on agricultural land and on the communities surrounding it. Despite the rhetoric of the NSW Electricity Infrastructure Roadmap, the role of renewable energy projects in providing affordable, reliable energy for NSW is not achievable. Even while writing this paper, numerous electricity retailers have advised customers of massive increases of up to 90% and the Federal Government in its October 2022 budget forecast prices to increase by another 56% by 2024. One Gulgong resident has used four suppliers in three years trying to get the lowest net electricity cost, yet their annual cost will be up by $554 or 204%, based on the same usage pattern for the 12 months to April 2022. He also reported that his property has suffered from multiple unplanned blackouts, brownouts and power surges/drops over the three years. No electricity then no power and no water, as the electric water pumps can't pump the tank water to the house, shed and water troughs in the paddocks. Also, multiple damaged circuitry to new items, such as pump controller, roller door opener, and electronic devices, such as fan controllers.

2. SOS has also provided in this paper:
   a) many of the issues with the actual and forecast growth of renewables for the agricultural sector and regional communities of dozens of communities in NSW, Victoria and Queensland and elsewhere. The overall impact includes loss of productive food production, discord amongst community members, increased mental and physical health issues, loss of local amenity, prolonged disruption of normal life, increased risk of fire and toxic contamination, being left with abandoned renewables infrastructure, cleanup costs forced onto ratepayers, lack of enforcement of developer's commitments, higher energy costs, unreliable energy supply, an evaluation process that favours the developer, unreasonable expectations of residents to cope with multiple long evaluation processes and submissions, to name a few.

   b) that there is little benefit accruing directly to the affected local agriculture sector and the local communities. Most construction jobs, especially for solar projects, are low paid and come from outside the impacted community. Once commissioned the projects provide insignificant job opportunities and economic benefit for potentially 20 or more years. Income diversification may benefit a very few landowners, including in some cases landowners who do not reside in the region or very old landowners unable to manage their land but unwilling to leave their intergenerational homes. Community funding schemes sound good, but when they are used to promote the "benefits" of renewables to school children we would be much better off if our governments stopped subsidising and favouring renewables (why can't they stand on their own feet if they are so good rather than suck billions of dollars annually from us in taxpayer funded subsidies and higher electricity prices) and support the regions directly by improving health and education services and supporting food producers all the time. Renewables do provide a global benefit by increasing CO2 emissions (plant food) and so increasing the greening of the planet (NASA confirmed) and enabling record crop output year on year. The value of Australian agriculture production in 2021-22 is predicted by to reach a record $81 billion with exports of $64b (source ABARES at awe.gov.au), but such records are at risk as more and more agricultural land is subsumed by renewables and government "green" policies.

c) that coexistence between renewable energy projects and agriculture is damaging to both the local community, but ultimately the Australian economy. Reduction of Australia's meagre 6% arable land for renewables projects, with all their necessary "firming" requirements (BESS, pumped hydro, and sometime in the future affordable hydrogen hubs) and transmission infrastructure, is an oxymoron.

d) We add one more example. A Proponent claimed for Gulgong that an existing solar/BESS project they have in progress elsewhere successfully manages and balances the impact on the local community during the current solar works construction. Here is the realty of the communities impacted as provided to SOS today by a group of local citizens, *" ...everyone complains of being unable to secure electricians or plumbing services. We lost our farm worker to XXXX [the project]. The intensive agriculture sector (Costas tomato farm) is in addition to EGW [electricity generating works] in demand for housing and services with fencing contractors happily installing EGW works and unavailable to rural sector. Second severe impact is on resources such as concreting and gravel extraction/supply. Demands on water had been significant in the lead up to this year."* Developer assurances to the communities and the DPIE are just a sales pitch, not a true commitment. Developer's must be held accountable.

3. The existing framework governing the planning, approval, construction, and operation of renewable energy projects hugely favours the renewables project developers as:

* the alterative safer, flexible, reliable, less resource intensive and cheaper generation methods, such as modern low/zero emissions HELE, CGCT and nuclear alternatives, are not even considered.

* our scarce agricultural land is not protected, otherwise the proliferation of renewables projects and related industries would not be built on high yielding food producing land, such as in the Riverina, one of Australia's "food bowl" locations.

* there is a lack of transparency on the deals done, such as landholder agreements (who is liable for what when the company sells or liquidates, or when owner sells or dies, when neither party can afford to rehabilitate the land, etc?), Power Purchase Agreements (often with government bodies, which may be at inflated values, what happens after the 10 or 15 year term of a PPA expires? Does the EGW just become unviable?), Voluntary Payment Plans (why should an upfront 1% development fee payable by home owners and businesses be converted to what is effectively a ratepayer subsided loan to a renewables developer?), government guaranteed minimum wholesale prices for the operators (how is this compatible with lower electricity prices for consumers? Just another form of subsidy of the already many existing and favourable regulations they get, all of which increase the cost of electricity to consumers)

* developers can say and write whatever they like in their community "consultations" and submissions to the DPIE; they have strategies to isolate objectors, avoid responding to specific questions they don't like (e.g. by amalgamating specific questions under single headings), ignoring evidence or quoting outdated sources or statements in their defence, frequently changing the design during and after approval, making hundreds of vague non-committal statements (e.g. "where possible", "best endeavours") or just kicking the can of issues down the road, many until after approval is received. None of these marketing tricks are apparently challenged by the DPIE during the planning and evaluation process.

* no matter how many community members object to a SSD renewables proposal (almost always over 90% of public submissions object) the projects are approved. Why? (see previous point)

* assurances by the developer are meaningless with no effective oversight. As one DPIE planner told SOS, "We don't monitor compliance. It is up to community members to raise any non-compliance issues". The community can't access the project sites. How can they know if contaminants are leaching from solar panels, native habitat or aboriginal artefacts are destroyed, water is being taken from unapproved sources for construction or cleaning, fire prevention activities are carried out (unless visible from the road such as tree screening not done or weed control near the perimeter is inadequate and so a fire risk)?

* little protection, compared to say what farmers have to comply with, for flora and fauna at the site. Buying offsets for being able to eliminate a local ecosystem is not just tragic for endangered wildlife but all wildlife in the vicinity.

* they can state, contrary to all the evidence, that their project will reduce emissions (but not limit global temperature rises); reduce wholesale electricity prices (but not retail prices), which are the core reasons why our governments are transitioning to an unproven electricity system design. They are not required to offset their emissions claims with the significant emissions the project generates, unlike a NSW coal mine proposal where the PAC decided that emissions created by the South Korean buyer burning the coal was a factor in rejecting the proposal, at the cost of 100's of well paying long-term jobs. Where is the consistency?

4. Yes, there are many additional measures that are required to improve or be incorporated into the existing framework to address the largely unregulated growth in renewable energy projects on agricultural land. A truly independent audit carried out by a team of electrical system design engineers, management accountants, economists, is required on the NSW Electricity Infrastructure Roadmap and the AEMO ISP. SOS is concerned that: there was no consideration of the modern alternative electricity generation; that assumptions are made that favour a renewables transition (e.g. not considering the frequent replacement cycle of solar and wind EGWs over two or more life cycles), no evidence that the very complicated system design will work (not done elsewhere), using outdated costing comparisons, jobs created are gross and not net loss and appears to multiple count renewables construction jobs, and no consideration of the predominately agricultural land requirements of the transition.

   For instance, the following gives you some idea of the land required by wind and solar plants, based on the proposed projects for Gulgong NSW (Solar: 500MW, 13.7km2; Wind: 441MW, 75.5km2) requiring 89.2km2 for a capacity of 941MW, which will produce intermittent and unreliable electricity output of about 2,409GWh annually but not usually when required.

   The AEMO draft ISP 2022 proposes that electricity demand will increase at least three-fold (EVs, industry electrification, gas use reduction, pumped hydro) and possibly ten-fold (due to green hydrogen production), which for NSW could mean 26,550km2 land covered in just wind turbines and solar panels. This amount of land is more than twice the current size of Greater Sydney (12,370km2). Of course, wind and solar generation is very intermittent, so that the required storage (batteries & pumped hydro) and/or 24/7 sources (gas plants) of generation and 11,000km of new transmission lines will greatly increase these figures, as will the progressive replacement of renewables infrastructure after 15 to 25 years or a

higher proportion of wind turbines.

Another way of appreciating the enormous land requirement of 26,550km2 (2,655,000ha) for just solar and wind generation plants is one could drive 13,275km with 1km of wind and solar plants either side of the road the whole way.

Similar calculations can be easily done for the massive amount of materials needed for such a transition, much of it involving mining and processing of toxic materials, mainly done by or on behalf of China.

We have covered the issues around adequate workforce which are mainly provided from transient backpackers, who shun fruit picking and other agricultural work in favour of assembling meccano sets of solar panels. Most rural towns do not have the population to support the construction of one large renewables project let alone several overlapping projects only a few kilometres apart. The supply chains are imported solar panels and components, imported wind turbines and components and imported batteries, predominately from Chinese companies, that have to transported by road over hundreds of kilometres. There is a national security risk in relying so heavily on such imports and subsequent availability of spare and replacement parts, as already experienced by local and overseas solar works.

Coexistence of agricultural land and renewables is claimed based on small scale examples of a few sheep, some of which died after being caught up in the tracking mechanism, and proposed agricultural use of the remaining land around wind turbines. In the latter case dozens of wind turbines of 280m tall and blade to blade tips 200m wide have rotating blade tip speeds over 500km/h. Farm equipment and animals would need a significant safe distance from the turbines. So the 1% to 2% footprint stated by wind works developers is misleading as they are only referring to the concrete bases that are visible above ground. Conflict is already occurring between farm neighbours who lease their land to renewables and those that don't or can't and townspeople.

Maximising the economic benefits for farmers and regional communities is little more than bribing a few beneficiaries of the scheme. For example, only a few of hundreds of farmers can or will lease their land to renewables developers. SOS has been told that those that object to, say the 180km proposed 500kv transmission line, have been threatened with compulsory acquisition of their agricultural land. Also, no compensation was offered by the transmission company. Apparently the NSW government has taken over negotiations.

The proposed community funds are also to intended to garner support by the project, especially by those not immediately directly affected. Most of these people have little understanding of the size and impact of the proposed projects and the ongoing disruption that there town will endure for decades, if it survives the loss of jobs from coal mining, agriculture and tourism. Instead of billions in subsidies we think using it to provide direct support of farmers and regional communities is a much better use of our taxes. The current massive over 1000 pages of EIS/SIA submissions per project is impossible to be read, assess and then make a personal submission. In addition, there may be two or more projects on exhibition at the same time and due in the same month (Gulgong residents have four in November 2022).

SOS suggests the following changes to the evaluation and approval processes and government policies. Also, **Appendix C: What Regional Communities Require** provides a comprehensive **list,** although probably incomplete, to help communities understand the EIS/SIA/DA and be provided with the real information about the project, not just marketing spin, in a brief document.

SOS suggests that our governments:

1. Create a level playing field for all forms of electricity supply.

2. Stop all subsidies to the renewables industry in Australia within 12 months.

3. Require all 'renewables' projects to contribute to access electricity network infrastructure or build/pay for infrastructure specifically needed for the project, or NSW Renewable Energy Zones, to connect to the grid.

4. Ban the use of Sulphur Hexafluoride (SF6).

5. Require truth and completeness in project documentation when promoting their projects for assessment.

6. Require that all risk events that occur be publicly reported.

7. Require projects to lodge upfront bonds upon project approval for decommissioning, disposal and land rehabilitation.

8. Require at least a five years warning by a project that it is to be decommissioned so as to give time for its replacement to be planned, approved and built.

9. Place a limit on the size and location of an industrial solar and wind plants so as to preserve land for agriculture, and the attractiveness and ambiance of the surroundings of regional towns.

10. Give much more weight to community objections when the authorities are evaluating projects.

Conclusion

The two drivers of more renewables for electricity generation in Australia are reductions in CO2 emissions so as to reduce future human-induced global temperature rises, and to significantly reduce electricity prices to stimulate the Australian economy, especially in manufacturing. It is clear from the evidence provided in this research paper that neither of these goals can be achieved by more expenditure on renewables, especially weather-dependent renewables with only very expensive battery and pumped-hydro storage as backup.

All the various claims made by advocates for renewables have been shown to not stand up to scrutiny. At under 1.2% contribution to global emissions Australia can not affect global temperatures. The two biggest contributors to global emissions are China and India, who both have about the lowest cost electricity in the world and the smallest renewables percentage for electricity generation.

The countries (e.g. Germany & Denmark) and states (e.g. South Australia and California) with the highest proportion of renewables also have the highest electricity prices and unreliable grids in the world. As Australia continues down the path of more renewables our governments somehow think the we will achieve what no others have so far.

The unspoken tragedies of these government policies is the damage being done to the world's environments, to wildlife and to people in Australia and other countries. How can it be justified to use ten times more resources for environmentally damaging, unreliable, dangerous and intermittent weather-dependent wind and solar renewables than for modern coal, natural gas and nuclear plants?

The same MWh output from industrial wind or solar plants can be achieved at a fraction of the materials and land required by nuclear power plants because of their much higher capacity factors. Nuclear also has the advantages over wind and solar of three times the life, three times the output, much less additional infrastructure, a fraction of the lifecycle waste and the ability to provide electricity almost 24/7 with zero CO2 emissions.

Why do our governments ignore the obvious solutions to achieve their stated policies of CO2 reduction, electricity price reductions and job increases? Why do they use CO2 emissions reductions as an excuse when their actions will not affect the climate? Why do they pursue energy policies that reduce our economic activity? Why do they risk the safety of its regional communities? Why do they support large-scale destruction of regional and overseas environments? Why do they think that 100% duplication of weather-dependent renewables at great cost makes economic sense? Why do they turn a blind eye to the use of slave labour to produce materials for renewables? Why do they support outdated unreliable renewables technologies that are likely to become obsolete in the near future?

By reading this or previous SOS research papers they can no longer continue to proceed on their current course in ignorance. Yet that is exactly what they are doing!

Appendix A: Definitions

In any discussion about electricity generation it is essential that the various terms used are fully understood as some people mislead others, either accidentally or deliberately, by their incorrect use. The main terms and their acronyms used in this paper are:

- **Megawatt (MW):** A megawatt (MW) is equivalent to 1,000 kilowatts or 1 million watts of electrical energy e.g. a 1MW ("nameplate capacity") wind turbine can, under ideal conditions, produce a maximum of 1MW of electricity at an instant in time. MW and MWac (ac = alternating current) are usually synonymous but MWdc (dc = direct current) is sometimes used as it gives a higher nameplate capacity value, i.e. output before conversion to ac, which involves energy losses. e.g. Beryl solar is 110MWdc but only 87MWac capacity.

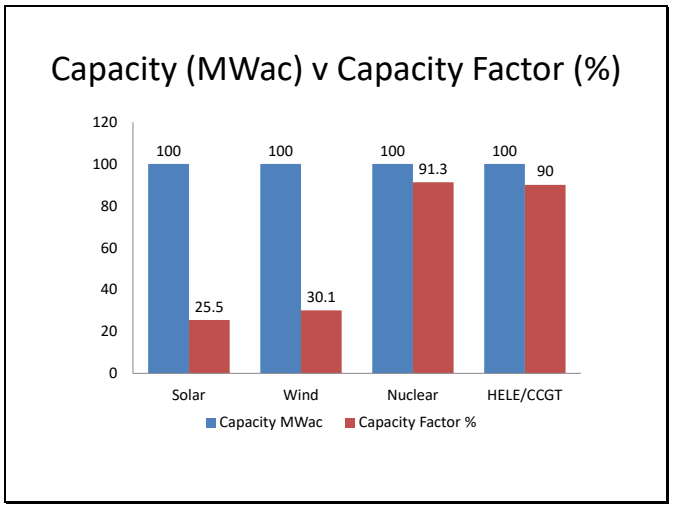
- **Gigawatt (GW):** A gigawatt (GW) is equivalent to 1,000 megawatts or 1 billion watts.

- **Megawatt hour (MWh):** A megawatt hour is equal to 1,000 Kilowatt hours (KWh). It is equal to 1,000 kilowatts of alternating current electricity used continuously for one hour e.g. a **1MW** wind turbine may only produce over a year **3,240 MWh** of electricity depending on the average strength of the wind. The theoretical maximum annual electricity output for a **1MW** system is **1MW x 24hours x 365 days = 8,760MWh**.

- **Gigawatt hour (GWh):** A gigawatt hour (GWh) is equivalent to 1,000 megawatt hours.

- **Capacity factor:** The net capacity factor is the ratio of an actual electrical energy output over a given period of time to the maximum possible electrical energy output over that period e.g. a **1MW** wind turbine may produce **2,637MWh** in a year out of a possible **8,760 MWh**, therefore its **capacity factor is 2,637/8760 = 30.1%**, which is a typical value for modern wind turbines. For solar panels the typical capacity factor is less than **26%**. For new coal, gas and nuclear power stations the typical capacity factor is **90%** or more, which is why they are the backbone of most of the electricity systems throughout the world (refer chart below).

- **Artisanal:** Made in a traditional way by someone who is skilled with their hands; in this paper it refers to Cobalt mining done by hand.



Estimated or actual annual output in MWh = Capacity factor % x (capacity MWac x 24hrs x 365 days)

Appendix B: Abbreviations

Acronym	Description
AC or ac	Alternating current (e.g. 240Vac electricity supply to homes)
AEMO	Australian Energy Market Operator
CCGT	Closed Cycle Gas Turbine, also known as Combined Cycle Gas Turbine
CCGT-CC	Closed Cycle Gas Turbine with Carbon Capture
CO2	Carbon Dioxide (colourless gas making up 0.04% of the Earth's atmosphere)
C-W REZ	Central-West Renewable Energy Zone
DC or dc	Direct current (e.g. 12Vdc car battery)
EPA	Environmental Protection Agency
EU	European Union
GW	Giga Watts (equals 1000 megawatts)
GWh	Giga Watt hours (equals 1000 megawatt hours)
Ha	Hectares (1 hectare equals approximately 2.471 acres)
IEA	International Energy Agency
IEGP	Industrial Electricity Generating Plant (excludes roof-top solar and domestic wind turbines)
IPCC	Intergovernmental Panel on Climate Change
ISP	Integrated System Plan (bi-annual plan issued by AEMO)
Kg	Kilograms (equals 1000 grams)
Km2	Square kilometres (one Km2 equals 100 hectares or about 247 acres)
KV	Kilovolts (equals 1000 volts)
KW	Kilowatt (equals 1000 watts)
KWh	Kilowatt hours (e.g. household electricity is billed as cents per KWh)
LCOE	Levelised Cost of Electricity (a method of expressing $/ MWh over a period of time)
Mj	Mega joule (a measure of energy equals one million joules or 0.27778 KWh)
MW	Megawatt (equals 1000KW or 1,000,000 watts)
MWh	Megawatt hour (equals 1000KW hours)
NEM	National Energy Market (covers QLD, NSW. ACT, Vic, Tas, SA; excludes WA & NT)
NF3	Nitrogen Trifluoride (a very potent colourless greenhouse gas)
PV	Photovoltaic
SF6	Sulphur Hexafluoride (a highly potent **human-made** colourless greenhouse gas)
t	Ton or short ton (equals 2000 pounds; used by USA)
T	Tonne or metric ton or long ton (equals 1000kg or 2240 imperial pounds)
TW	Terawatt (equals one million megawatts)
TWh	Terawatt hour (equals one million megawatt hours)
VALCOE	Value-adjusted Levelised Cost of Electricity (developed in 2019 by IEA to reflect more of the revenue timing and costs associated with renewables)

Appendix C: What Regional Communities Require

To enable transparency and proper community and DPIE evaluation of a solar, wind, storage and new transmission infrastructure projects, the Proponent/Developer Application (EIS/SIA or DA) must provide:

1. That each "Independent Report" included in an application to include a declaration of any financial interests the consulting firm or their owners have in the Proponent/Applicant company or their owners.

2. The comparison with generation alternatives must be against all alternatives of similar capacity (e.g. rooftop solar, CCGT-CC, modern coal-fired plants, modern nuclear plants) on a total life-cycle basis of the longest life alternative. Comparisons to include land space required, total types and tonnes of materials required, and nature of output over each 24 hour period. This information should then be assessed on the basis of sustainability.

3. Details of how and where, if not a standalone electricity generating works, the electricity supply will come from when the solar, wind or storage plants are not supplying sufficient electricity to supply electricity consumers.

4. The life-cycle CO2 equivalents embedded in their specific project once installed.

5. The payback period for life-cycle CO2 equivalents deficit embedded in their project

6. The payback period for life-cycle energy in/out deficit once operational.

7. Evidence for claims that their output is enough supply 'x' households with electricity (actually they can't supply households over just 24 hours without an alternate source), to ensure the public are not mislead and understand that there will be long periods of no supply from such projects.

8. Soil analysis pre, on and post installation to establish a benchmarks for future comparison.

9. Annual testing of soil for contamination, reported to the Council and government depts.

10. Confirmation that the project site is not within 15km of the closest boundary of a town, national park, dam or reservoir.

11. Minimum setback from all roads with embankments and vegetation as screening, as for coal mines e.g. 200 metres.

12. The Australian content ($ and %) of their project, separated into labour, transport, materials, taxes and services.

13. The gross value of the project and the net amount the community can expect to gain/lose.

14. The value of any initial and ongoing subsidies, favourable loans or other benefits provided by all levels of government to the project.

15. Details of any Power Purchase Agreements (PPAs), including duration, price received, and contingency if term is not renewed, penalties for non-delivery of supply amounts.

16. Full details of a decommissioning and disposal plan, including safe-removal and disposal of toxic elements and the full rehabilitation of the land within and around the project site, including resources and estimated times and costs to complete the works.

17. Amount of decommissioning/disposal bond to be lodged with an appropriate government body and the conditions for release.

18. Value of any direct contribution to transmission and distribution networks and associated infrastructure necessary for the project to operate.

19. Value of any contribution or fees to access to the electricity network/infrastructure.

20. Total amount of materials required for the project by type (steel, PV panels, copper wire, etc.) and by weight (tonnes).

21. Type of fire suppression methods to be installed, including type (e.g. water sprinklers, gas retardant) and the alert methods to fire-fighters (water bombers).

22. Water use plan (source and quantities) for construction and operation, including methods of use.

23. Confirmation that no part the project is within 200m of any waterway (surface and underground)

24. Risk event reporting plan e.g. when any panels or equipment is damaged by fire, storm, hail, etc, including notification to the local community.

25. Extent of compensation to be paid to nearby property owners who incur a reduction in land value as a result of the project or due to fire or contamination.

26. The value of any contributions made to independent research bodies who scientifically study life-cycle "renewables" pollution, resource requirements, impacts on the environment, wildlife and food chain and on humans.

27. Evidence that their product does not include materials obtained from the use of child labour, human rights abuses, and unacceptable impacts on the environments in overseas countries.

28. A risk analysis of the project be included (safety, obsolescence, vulnerability to damage, economic vs. physical life, etc).

29. A chart showing the decline in energy output efficiency each year and projected physical and economic life-time of the project, supported by evidence.

30. Maintenance plan to identify component deterioration on a regular basis (e.g. soil testing if cracking, de-lamination, weather-related damage, turbine blade insect build-up, etc. occurs).

31. Written confirmation from all landholders who lease their land to renewables developers that they fully understand any liabilities they have to remove infrastructure at the project's end-of-life should the then current plant owner not be able to do so (e.g. due to bankruptcy)

Appendix D: Save our surroundings (in pictures)

This

or This over hundreds of km2 for decades instead?

This

Or This over hundreds of km2 for decades?

This

This

Or This over hundreds of km2 for decades instead?

None of these local animals can get though a PV solar IEGP fence

Like this