

Submission to
Joint Standing Committee on
Trade and Investment Growth
into
Australia's transition to
a green energy superpower

Wind Droughts

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1. Executive summary

You may think it impossible to run out of wind however wind droughts in Australia prove otherwise.

The attached two articles provide details of wind droughts in Australia and in Europe.

The articles detail how the energy capacity of a wind farm is not the installed capacity but output that is generated when there is little or no wind.

It should be noted that a change in wind speed becomes a three fold change in energy output, as a wind turbines energy production is directly linked to the cube of wind speed.

The cost of the energy produced by a wind farm has to take account of the cost of alternate energy needed in wind droughts.

2. Wind Droughts in Australia

PART 1 of 2

July 26, 2020

Australia's wind industry in 2020 suffered from Big Calms (wind droughts) – with dozens of occasions over the winter months when the entire wind fleet battled to deliver more than a tiny fraction of its combined capacity.

Spread from Far North Queensland, across the ranges of NSW, all over Victoria, Northern Tasmania and across South Australia its entire capacity routinely delivers just a trickle of its combined notional capacity of 7,728MW.

Collapses of over 3,000 MW or more that occur over the space of a couple of hours are routine, as are rapid surges of equal magnitude, which make the grid manager's life a living hell, and provide the perfect set up for [power market price gouging](#) by the owners of conventional generators, who cash in on the chaos.

During June 2020 there were lengthy periods when the combined output of every wind turbine connected to the Eastern Grid struggled to top 400 MW (5.1% of total capacity). Such as: 11 June when output collapsed to a trifling 86 MW (1.1% of total notional capacity); 17 June when total output fell to 134 MW (1.7% of total notional capacity); 26 June when, after a 1,200 MW slide, output was between 300-400 MW (3.8% to 5.1% of total notional capacity); and 27 June when output dropped over 900 MW to bottom out at 96 MW (1.2% of total notional capacity)

Wind Droughts

There are frequent and prolonged “wind droughts” that can be measured using the output from some 70 wind farms and over 2000 turbines across South Eastern Australia, all connected to the grid of the National Energy Market and monitored by the Australian Energy Market Operator.

The low points lasted for 33 hours on the 5th-6th, 18 hours on the 11th, 16 hours on the 17th, 14 hours on the 26th, 11 hours on the 27th and nine hours on the 28th. There were several other lows of shorter duration, giving total of 13 episodes and much of the time during the low spells the supply was well below 10 per cent, with lows of 3.4 per cent, 1.1 per cent and 2.3 per cent during the most prolonged “wind droughts.” All the monthly records are available at <https://anero.id/energy/wind-energy>

Choke Points

Wind droughts cause “choke points” in the supply of electricity to the grid. Consider the supply of air to our lungs. We need a continuous supply of air and when this is interrupted by choking or drowning we are soon dead. The electricity grid also needs a continuous input of power or it will die, at least in parts.

The reason for talking about choke points is to drive home the fact that the critical indicator of the wind supply that we need to monitor is the low points, not the high points, not the total installed capacity and not the average delivery.

PART 2 of 2

What has happened here?

Was information on the frequency and duration of wind droughts available before the government decided to back wind power and renewable energy at large with subsidies and mandates to use power from intermittent sources?

Still, regardless of this discovery, all the Australian states are pressing on with ambitious plans to put more resources into the windpower equivalents.

Why in Australia, of all places?

Australia is leading the world in the rush to “clean energy” but this is a serious mistake for two other reasons in addition to the problem of wind droughts. First, Australia is an island. Practically every other industrialized country in the world has neighbours to provide power when wind and solar power are in short supply. European countries can turn to France for nuclear energy, the Scandinavian states for hydro, Poland for coal and Russia for gas. Every kind of power feeds into the North American grid, but in Australia we are on our own.

Second, we have no nuclear power. Isolation would not be such a problem if we had nuclear power.

Please don't mention batteries and pumped hydro

Elon Musk created a media sensation when he installed a big Tesla battery in South Australia in record time. The big battery has been hailed as a great contribution to the green transition but it is important to realise how small it is compared with the demand of the grid.

It is a remarkable piece of technology, occupying a hectare of space and carrying a price tag of \$60 million. It is attached to the Hornsdale No 3 windfarm (100MW rated capacity) and it stores 109 megawatt hours (MWh) of power. That means it can maintain a flow of 100MW from the farm for a little over an hour after the wind stops.

By comparison, the SA grid requires a flow ranging from 1000Mw to 2000MW depending on the time of day. So if the wind stops for an hour the grid needs at least 1000MWh. How far does 109MWh support the grid in that situation?

Pumped Hydro is the other great hope for storage and the showpiece is Snowy 2.0 that is planned to deliver 2000MW of power continuously, matching a large coal-fired power station such as Bayswater in NSW. In the real world this offers no more hope than big batteries. For a start, Snowy 2.0 is not a primary generator because the power that flows from it will come originally from a fleet of solar and wind farms. It is designed to regulate the lumpy RE input and deliver a steady supply. Unfortunately, between 30 per cent and 40 per cent of the original power is lost in the pumping and pipe resistance. The projected cost is enormous. Far beyond the original estimate.

And if Snowy 2.0 is completed, along with the extra wind turbines to go with it, just 2,000MW of our existing 20,000MW of coal-fired capacity will be replaced. All we need is a few more mountain ranges with reliable rainfall — nine of them, to be precise — to replace the other 18GW of coal power.

3. Wind Droughts in Europe

You might think it's impossible to run out of wind, however Europe's 2021 wind drought proves otherwise.

In 2021 the load factor - that is, the ratio of actual wind farm output to the theoretical maximum dropped by 13% in Germany and the UK; and by 15% to 16% in Ireland and the Czech Republic; reports the French newspaper Les Echos.

The 2021 "wind drought" hit Northern Europe particularly hard, especially those countries relying most on wind energy — notably Denmark, which gets 44% of its energy from wind, and Ireland, where the share of wind in total energy production is 31%. Other European countries relying heavily on wind include Portugal (26%), Spain (24%), Germany (23%), the UK (22%), and Sweden (19%). In France, which gets most of its power from nuclear, it's just 8%.

A change in wind speed becomes a three fold change in energy output, as a wind turbine's energy production is directly linked to the cube of wind speed.

As a result of the reduction in average wind speed, Danish energy company Ørsted reported a loss of €380 (\$366) million. German energy company RWE acknowledged a 38% drop in profits in 2021, although this was from both its wind and solar units combined.

As Europe enters winter 2022, Europe will face what the Germans are calling a Bibber-Winter (shivering winter) while the least week-off Britons will have to choose between "heating and eating" as the tabloid call it.

Europe's energy crisis could be an opportunity to accelerate a switch to renewables. However, there is the problem with wind and solar energy.

They are not constant.

The Germans have a new word to describe when the wind does not blow and the sun does not shine. The word is "Dunkelflaute" which translated into English means dark doldrums.

Europe's winter 2022/2023 will be a test of Europe's renewables policies.

References

Ref_1 : Hitoshi://[big think.com/strange-maps/Europe-wind-drought/](http://bigthink.com/strange-maps/Europe-wind-drought/)