The Cold Night of Forgetting

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On a frigid autumn day let's cast our minds back to the blissful dog-days of summer and the rampant headlines about how coal was now not needed and more than 50% of the UK's power (meaning electricity) was provided by renewables. There has been a remarkable growth in renewable energy in the UK and whilst not blessed with much sun, wind is more abundant. Good news indeed.

Britain passes one week without coal power for first time since 1882

Landmark follows government pledge to phase out coal-fired electricity by 2025

Jasper Jolly

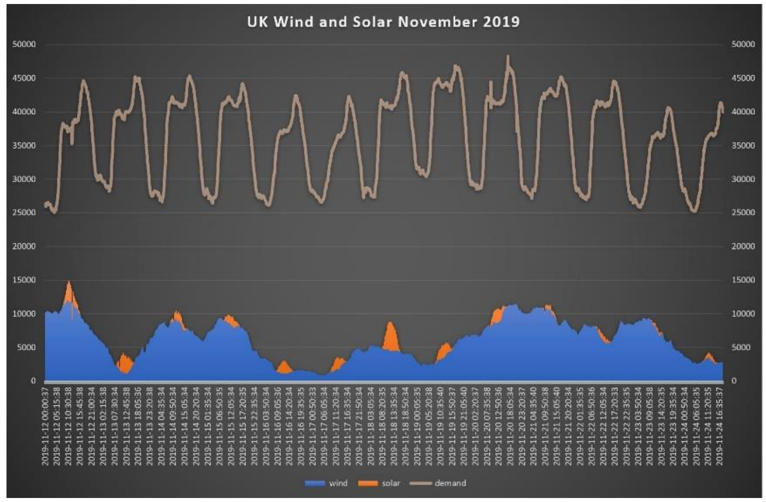
25,306

The following is a not a "dig" at the renewables, but more targeted at the media's uncritical championing, whilst vilifying fossil fuels. Wishful thinking won't warm your home.

Temperatures drop to minus 10C on coldest autumn night this ...
expressandstar.com - 19 Nov 2019
Temperatures dropped to nearly minus 10C on Monday night – the coldest of the autumn so far. ... Met Office (@metoffice) **November** 19, **2019**.

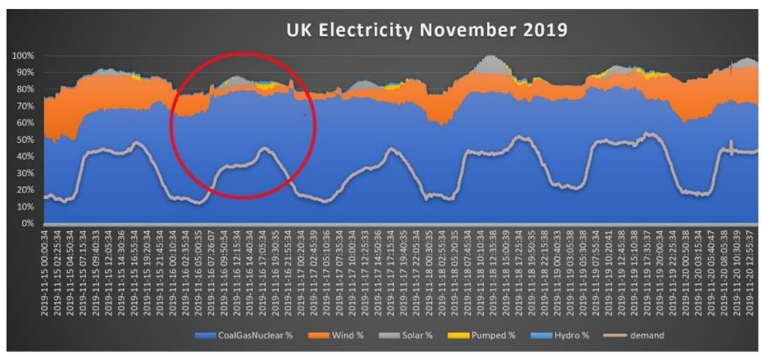
Cold, windless autumn days don't make good headlines, but are very real. Last week the UK had a short-lived high-pressure system sandwiched between two big storm (depression) systems. In summer, big anti-cyclones produce long periods of hot days, with lots of solar radiation and thermal winds. Renewable energy cranks out the KWh and demand is low. In mid-autumn, not so much. Skies can be overcast and the winds silenced. There is nothing new or original in pointing out the problem of intermittency in the current energy mix. But looking at the data is quite informative.

Over a four-day period (Nov 16th - Nov 19th), wind and solar dropped to below 10% of the UK energy supply. As the late afternoon surge in demand set in at about 5pm on the 16th, solar dropped to zero and wind contributed less than 3%. For the UK, "installed capacity" of renewables (dominantly wind, solar and biofuels) is 45.9 GW. This clearly demonstrates the difficulty of comparing traditional power supply to renewables. The installed capacity is greater than peak demand, but was supplying less than 3%.



Pandreco Ltd research on Gridwatch data

At this point CCGT, coal and nuclear (confusingly, blue in the image right) were contributing 80% of the total electricity generation. The 5pm rush-hour demand was managed by increasing these traditional sources as much as possible as well as seeing hydro increasing and even pumped-hydro (yellow) being brought into service to manage the demand peak (clearly this is a limited-time solution due to relatively small storage capacity).



In the period I looked at (15th-20th November), when wind and solar dropped to 2% of UK supply, the slack was taken up by all other sources: coal peaked at 8% (from a low of 1%), nuclear peaked at 24% from a low of 13%), gas peaked at 60% (from a low of 21%) and inter-connectors peaked at 17% (from a low of -6% (ie exports)). So contrary to the renewable evangelist's views, coal and nuclear needed. Moreover, they are not easily variable, but are pressed into this role by the intermittentcy problem - and this raises serious questions about maintenance and reliability since they are not designed to work this way.

Not surprisingly, there were no articles in the press on absence of renewables, or indeed on the continuing reliance on traditional sources of power. As environmental and energy columnists switched on their laptops and sipped their lattes in warm offices, did anyone spare a thought for how this was possible?

This example was a relatively short-lived period of low capacity of renewables, but robust high-pressure systems can sit for days if not weeks. The ability to plug these gaps in a 100% renewable future is a subject for another post, but to give an idea of the scale of the problem, the demand at 5pm on the 16th November was over 40 GW. Note that this is instantaneous power supply/demand.

Not only is this massively above current battery/pumped-hydro capacity, but to have a reliable and secure supply, the storage / backup capacity needed would have to be dimensioned to cover the n-sigma events such as "once in 10 year" and "once in 100 year" possibilities of several days or weeks without significant generation capacity.

To put this into perspective, the biggest battery farms are in the order of 100-300MWh and can push this out at 50-100MW. Put another way, roughly 1.5% of UK demand can be met for about 3-4 hours from existing battery farms (very rounded numbers, but order of magnitude is about right). Scaling this up to be able to replace current base-load over a windless week is almost unimaginable. This has been calculated for the USA, and is quite sobering

> *The annual output of Tesla's Gigafactory, the world's largest battery factory, could store three minutes' worth of annual U.S. electricity demand. It would require 1,000 years of production to make enough batteries for two days' worth of US electricity demand.* *Mark P. Mills*

Even ignoring the physical limitations of this, there is the economic one of just who would pay for the absolutely monumental standby capacity that this would imply?

Article title is borrowed from Les Feuilles Mortes (Yves Montand), "Dans la nuit froide de l'oubli"

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