
MUSINGS FROM THE OIL PATCH

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Note: Musings from the Oil Patch reflects an eclectic collection of stories and analyses dealing with issues and developments within the energy industry that I feel have potentially significant implications for executives operating and planning for the future. The newsletter is published every two weeks, but periodically events and travel may alter that schedule. As always, I welcome your comments and observations. Allen Brooks

The Promise Of Renewables And Carbon Emissions Goals

Steel yourself for an avalanche of climate change emergency rhetoric during the next few weeks

Steel yourself for an avalanche of climate change emergency rhetoric during the next few weeks. September is the highpoint of activity at the United Nations. The global deliberative body will be holding its 74th session of the UN General Assembly, a time when leaders from around the world descend on New York City, paralyzing traffic and everyday activities. This year, though, the climate change emergency movement is taking center stage. While the UN has just finished its Civil Society Conference in Salt Lake City, which focused on “Building Inclusive and Sustainable Communities,” the emphasis was on climate change and the need to do something about it. That theme will be amplified in September and be the centerpiece of the 25th session of the Conference of the Parties (COP25) to the United Nations Framework Convention on Climate Change (UNFCCC) in Santiago, Chile in December.

Extreme rhetoric is what is needed since the public continues to not be overly concerned about climate change

While we will hear much about the cataclysmic future the planet is facing unless we stop using fossil fuels with their dangerous emissions, there will be little balance in the solutions presented. It is “irrational” to suggest that any of the “science” underlying global warming might be wrong or extreme. Extreme rhetoric is what is needed since the public continues to not be overly concerned about climate change unless specifically asked about it.

The trip was to demonstrate her commitment to reducing her carbon footprint when crossing the Atlantic Ocean

September’s climate change emergency news will be highlighted by the appearance of Swedish teenager Greta Thunberg, who led the student Fridays For Future movement necessitating students skip classes on Fridays to protest the lack of political action in dealing with climate change. The movement spread widely (showing students are always happy to skip school) and turned Ms. Thunberg into a celebrity and the face of the climate change emergency movement. She recently completed a two-week trip by sailboat from

Europe to New York City to attend the UN events. The trip was to demonstrate her commitment to reducing her carbon footprint when crossing the Atlantic Ocean. Few people are aware, however, that two of the sailboat's crew had to immediately fly home and were replaced by two others who flew from Europe to take the boat home.

Part of the September UN events will be acceptance of the reports from the nine coalitions appointed to study key topics impacting solutions for dealing with climate change. The topics include: 1) social and political drivers of change; 2) transition to renewable energy; 3) industry; 4) infrastructure, cities and local action; 5)

nature-based solutions; 6) resilience and adaptation; 7) mitigation; 8) finance and carbon pricing; and 9) youth and citizen mobilization. Key to these topics will be the banning of fossil fuels and replacing them with renewables. The record of renewables, however, has become more questionable in recent times.

The biggest questions seem to be about wind power, especially following the August 9th evening rush hour UK electricity blackout

The biggest questions seem to be about wind power, especially following the August 9th evening rush hour UK electricity blackout that impacted nearly 2% of the country's residents. The event began with a lightning strike that reportedly took down two power sources. According to the preliminary report on the incident from National Grid (NNG-NYSE), Britain's primary electricity supplier, the system is designed to deal with lightning strikes, but something happened this time that overwhelmed the protective systems of the power grid, dropping its performance with severe ramifications.

According to National Grid's report:

"The lightning strike and rapid frequency fall caused the loss of ~500MW [megawatt] of Distribution connected generation, likely to be solar and some small gas and diesel fired generation, due to the operation of the generation sources own protection systems (Loss of Mains Protection).

"Hornsea One offshore wind immediately lost Hornsea modules 2 and 3, totaling 737MW. Module 1 continued to operate smoothly at 50MW throughout the event.

"Little Barford Gas Power Station – near immediate loss of the Steam Turbine unit (244MW) and then, as a result of the loss of the steam unit, loss of the two Gas Turbine units (total station loss of 641MW) over the following 90 seconds."

Customers were inconvenienced anywhere from 15 to 50 minutes

The problem was twofold – first, the magnitude of the power loss exceeded the system's backup power supply, and secondly, the lost power contributed to a reduction in the system's frequency to 48.8 Hz, pushing it outside the bounds of stability (50.5-49.5 Hz) and causing its power-shedding protocols to disconnect approximately 1 gigawatt [GW] of demand, equal to 5% of the nation's power supply, in order to protect the remaining 95%. The system was able to

One issue identified with the wind farm is that all its power flows through a single transmission cable

begin recovering in five minutes, and was fully restored 31 minutes later. Customers were inconvenienced anywhere from 15 to 50 minutes, although in the case of railroads, many of the trains could not be restarted automatically, necessitating engineers be sent out.

While additional study will be undertaken, one issue identified with the wind farm is that all its power flows through a single transmission cable, making the nation's largest offshore wind farm vulnerable to systemic failure if there is any issue with any single component of the system. Will this add to the cost of the system, which is still being constructed, as backup issues are resolved?

Another issue that needs to be addressed is the amount of power backup maintained to protect against the loss of electricity generating capacity

Another issue that needs to be addressed is the amount of power backup maintained to protect against the loss of electricity generating capacity. The total generation lost from the two transmission-connected generators was 1,378MW. The operator of the grid was keeping 1,000MW of automatic "backup" power at the time, a level required under the regulatory-approved Security and Quality of Supply Standards and designed to cover the loss of the single biggest generator to the grid. The backup power included 472MW of battery storage. This power-loss will likely force the power regulators to revisit the magnitude of backup power that will be needed. How much of an increase is needed is unknown, but logically the amount will grow in the future. What will this cost?

The cost of UK's wind power was raised in a recent article in the Telegraph newspaper that reported £173 (\$210) million in "constraint payments" made by National Grid to wind farm operators

The cost of UK's wind power was raised in a recent article in the *Telegraph* newspaper that reported £173 (\$210) million in "constraint payments" made by National Grid to wind farm operators in its latest financial year. The payments are made in lieu of purchasing power when electricity supply and demand are in balance, or when high winds cause wind turbines to produce too much electricity. National Grid claims these payments actually save rate-payers money because the power company doesn't need to construct additional infrastructure to transmit or store the surplus power. The payments are clawed back from domestic energy companies and the benefits passed on to ratepayers in later bills. Wind currently supplies about 20% of the UK's electricity, which is projected to grow by 50% over the next 5-10 years, as more wind farms are built to capitalize on generous government subsidies, raising constraint payments to a projected £1 (\$1.2) billion in the foreseeable future.

The magnitude of the constraint payments came to light when it was reported that National Grid paid Ørsted, the operator of the Hornsea Wind Farm, £100,000 (\$120,000) to reduce power it supplied in the days immediately after the incident that created the UK power blackout. National Grid and Ørsted deny that the payment was related to the power incident, but the details behind the payment have not been revealed.

On the continent, wind energy is facing a challenge in Germany as the shift in licensing has created uncertainty among wind farm developers leading to a sharp slowdown in new turbine installations.

This continues a trend of declining bidding interest, as a February sale saw 71% of the capacity offered awarded, but May's sale reached only 45%

In early August, only 208 out of 650MW of onshore wind tenders were awarded in an auction due to low bidder turnout. This continues a trend of declining bidding interest, as a February sale saw 71% of the capacity offered awarded, but May's sale reached only 45%. With just 30% of the capacity offered amount awarded in the latest sale, industry players are calling for changes to Germany's energy plan, as well as its carbon emissions reduction targets, if the country's plan for a green economy is to be reached.

The German wind industry has already shed 26,000 jobs in the last year

According to wind energy association BWE, 15,800MW of onshore wind capacity has been blocked by licensing problems, locations too

close to aviation infrastructure and ongoing lawsuits. This blockage prompted Danish wind turbine manufacturer Vestas to call for a national wind industry action plan. The German wind industry has already shed 26,000 jobs in the last year. The reduced labor force is a reflection of the fact that only 35 turbines were constructed during the entire first half of 2019. These turbines equaled 290 MW of new capacity, a decline of 80% compared to the first half of 2018. This installed volume is the lowest total in almost two decades. For 2018, Germany installed wind farms with a total capacity of 2,800MW, which was down from the 5,000MW of capacity installed in 2017.

Part of the problem is that wind farms are concentrated in certain regions of Germany and the locals are becoming upset with the prospect of more being constructed. This is only one reason for the slowdown. There is a lack of available space for new wind farms, plus some of the new wind farms are planned too close to aviation facilities, as well as environmental opposition due to concerns about the impact of turbines on wildlife.

Under the government's long-term energy plan, renewables are supposed to account for at least 65% of the country's electricity needs by 2030, up from about 47% today

The dramatic drop in wind farm installations has upset the government's plans for its carbon emissions reduction. It prompted a "wind summit" in Berlin last week hosted by Peter Altmaier, the Germany industry leader. Under the government's long-term energy plan, renewables are supposed to account for at least 65% of the country's electricity needs by 2030, up from about 47% today. The plan calls for a phasing out of nuclear power by 2022 and coal power by 2038, and replacing that electricity with power produced by renewables. According to a study by researcher Agora Energiewende, about three-quarters of additional renewable energy capacity needed in Germany by 2030 will have to come from wind.

Wind power has been the preferred renewables option in Germany. According to the Fraunhofer research institute, wind power accounted for more than 25% of Germany's electricity output in 2019's first half, ahead of lignite with 20% and nuclear at 13%. Solar power contributed just 10%. Renewables have benefited from feed-in tariffs with tax subsidies guaranteed for 20 years. These

Exhibit 13. Germany Electricity Prices Highest In EU

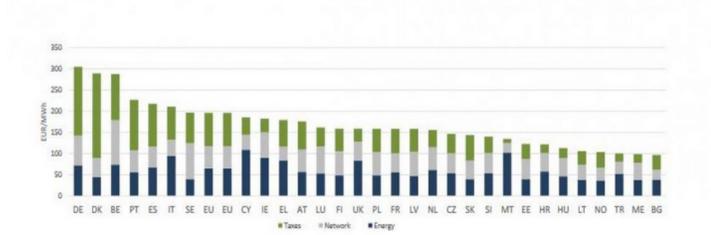


Figure 2 — Household electricity prices in 2017 (most representative consumption band) — Source: DG ENER in-house data collection³

Source: *Clean Energy Wire*

subsidies are paid from a levy on rate-payor bills, which has lifted German electricity bills to the highest in the European Union (EU). Exhibit 13 (prior page) shows household electricity prices in 2017 for all countries in the EU. Germany is the first column on the left of the chart, which towers over most its fellow EU members.

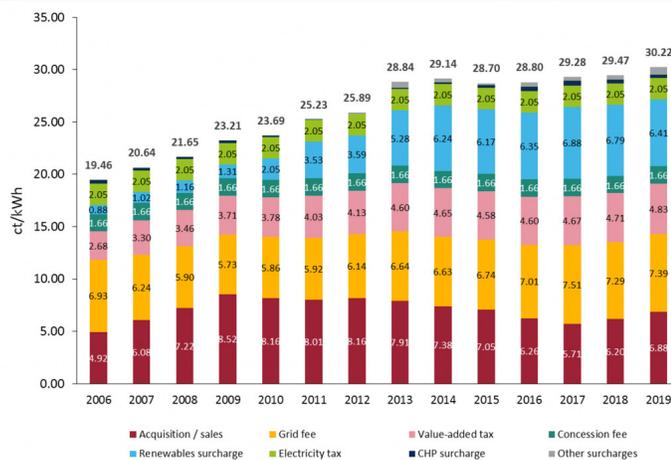
The renewables surcharge has actually declined in the past two years, but still accounts 20% of the total electricity price

To appreciate the history of Germany’s increasing electricity prices, Exhibit 14 shows the household rate by component from 2006 to 2019. We call your attention to three of the cost categories. The red portion of the columns represents the profit margin and cost of acquiring power in the wholesale market, which has been declining in recent years. Offsetting that reduction has been the increase in the grid fee (yellow), which reflects the cost to use the power grid. Additionally, there has been a sharp rise in the renewables surcharge (light blue) over time, which pays the government’s guaranteed power price to developers of renewable generating facilities. The renewables surcharge has actually declined in the past two years, but still accounts 20% of the total electricity price.

Exhibit 14. What Is Driving German Electricity Prices Up

Composition of average power price in ct/kWh for a German household using 3,500 kWh per year, 2006 - 2019.

Data: BDEW January 2019.



Source: *Clean Energy Wire*

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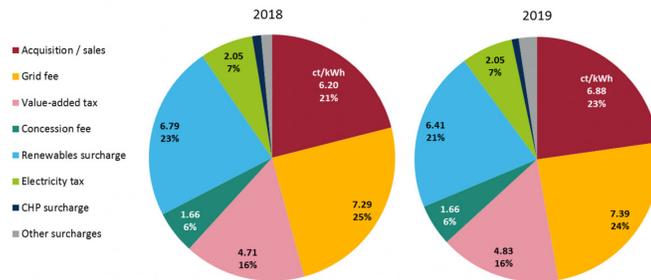
Offsets what grid operators must pay in damages should they fail to connect offshore wind farms in a timely manner in order for them to sell their power

We were intrigued to see how households are required to finance certain costs that should be paid by others, in particular, industry. There is an offshore liability levy, accounting for 1.4% of the electricity bill, that offsets what grid operators must pay in damages should they fail to connect offshore wind farms in a timely manner in order for them to sell their power. These costs are passed on to consumers. Then there is the surcharge for combined heat and power plants (0.9% of the bill) that reimburses them for the difference between the guaranteed price for the electricity they sell and the actual price they receive on the market. Lastly, there is a levy for the industry rebates on grid fees (1.0% of the bill) for large

power consumers who are partially or totally exempt from this expense. These costs are distributed among the other consumers on the grid.

Exhibit 15. After Pause, Renewables Surcharge To Rise

Composition of power price for German households using 3,500 kWh per year in 2018 and 2019. Data: BDEW January 2019. 



Source: Clean Energy Wire

The rate is projected to peak in 2021 at around 7 cents/kWh

According to Agora Energiewende, the renewables surcharge, which is 6.41 cents per kilowatt-hour (kWh) this year, will rise to between 6.5 and 6.7 cents/kWh in 2020. The rate is projected to peak in 2021 at around 7 cents/kWh. That will be about when the first renewable energy projects will have out-lived their 20 years of guaranteed feed-in payments under the Renewable Energy Act. The surcharge is expected to begin declining after 2021, as more projects end their guaranteed payments. The ending of these payments comes just as Germany will be pushing to raise its renewable energy share to 65%, so will new subsidies be needed?

Estimates from several years ago suggested the cost might be €65 (\$86.5 based on \$2014) billion,

An important unknown is the total cost of the country's nuclear and coal power phase-outs. The country's nuclear power phase out is due to be completed in 2022 at undetermined cost. Estimates from several years ago suggested the cost might be €65 (\$86.5 based on \$2014) billion, but there has been another estimate of additional costs of €26 (\$28.6 based on \$2019) billion that must be borne by

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For Germany to reach its 2030 wind power contribution, five 3-MW turbines need to be installed every single day from now until then

Between 1990 and 2018, Germany's use of energy fell 13%

the owners of the nuclear plants. The government's plan to end coal power is targeting 2038, 19 years from now. The proposal has been a political battle within Germany, while the country's carbon emissions reduction plan has pitted the country and the EU bureaucracy. The coal phase-out has now been embraced by the coal mining states in Germany, but it came with expectations that the federal government will shovel over \$45 billion in economic payments their way.

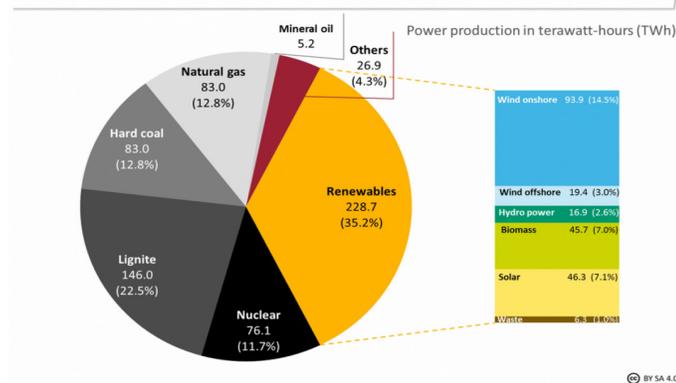
To appreciate the magnitude of the fossil fuel phase-out, Exhibit 16 (next page) shows Germany's 2018 power generation by fuel. Lignite and hard coal, combined, generated as much energy as all

renewables. Nearly an additional 12% of the country's power came from nuclear. A recent study suggested that for Germany to reach its 2030 wind power contribution, five 3-MW turbines need to be installed every single day from now until then, and the additional power will only meet the country's target if power demand does not grow. That might actually happen if Germany's economy weakens and the country's population growth continues to falter.

Exhibit 16. Renewables With Government's Help Fights Coal

Share of energy sources in gross German power production in 2018.

Data: AG Energiebilanzen 2018, preliminary.



Source: Clean Energy Wire

Germany may be Europe's strongest industrial economy, but last year saw the country's power consumption falling 3%. In 2019, consumption fell 3% in the first quarter compared to a year ago. With the country's economy contracting in the second quarter, it is likely Germany's energy consumption also fell. The declines in energy use began before the latest reported weak economic activity. Between 1990 and 2018, Germany's use of energy fell 13%. That decline was not all due to improved energy efficiency; high electricity costs also contributed to savings. However, there has also been a change in the economy's composition, which is reflected by the fact that industrial production is 5% lower than in 1990.

Gas plants will likely need government subsidies if they are to remain viable investments for their owners, and be available to backup renewable energy

If Germany falls into a full-fledged economic recession, it will be interesting to see how much further the country's energy use falls. It will also help boost the share of energy from renewables, as they are favored by government policies, despite their low capacity utilization. This was highlighted by a paper from Deutsche Bank showing that capacity utilization was lowest at wind and solar facilities. Utilization is also low (40%) at natural gas generators, but they are needed for backup power for renewables. The Deutsche Bank paper says that gas plants will likely need government subsidies if they are to remain viable investments for their owners, and be available to backup renewable energy. This may become the next big political battleground for energy, further adding to the cost of electricity and further distorting Germany's economy.

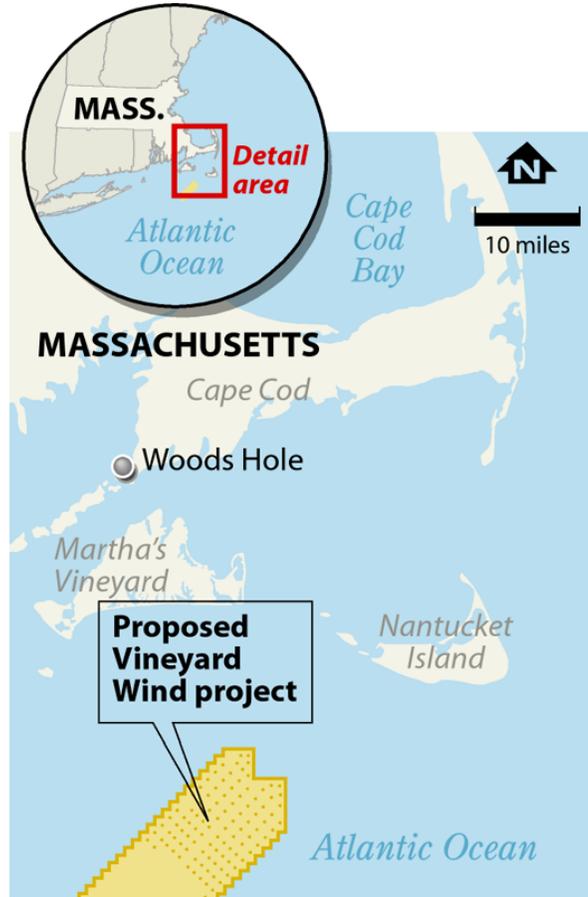
The loss of that tax credit could alter the project's economics, impacting the power price agreements reached with Massachusetts and Rhode Island and the financial returns for the project's developers

In the United States, offshore wind projects are facing delays as the federal environmental review needs further research. The Bureau of Ocean Energy Management (BOEM) said it was expanding its review of the environmental impacts of the Vineyard Wind project to include a "more robust" analysis of the potential cumulative impact if other offshore wind farms are built. This new review is actually being applauded by some offshore wind farm proponents, as it will likely produce a document that can better withstand legal challenges. However, Vineyard Wind, the developer of the \$2.8 billion, 84-turbine offshore project, is seeing its planned timeline to start construction before the end of 2019 (when the offshore wind tax credit ends) derailed. The loss of that tax credit could alter the project's economics, impacting the power price agreements reached with Massachusetts and Rhode Island and the financial returns for the project's developers.

Exhibit 17. Where Offshore Wind Fights For Success

The area where the wind farm is targeted is a major fishing region where the vessels need room to maneuver their nets and for safety should a vessel lose power

This uncertainty is rapidly becoming a global concern



PAUL HORN / InsideClimate News

Source: *Inside Climate News*

The key aspects of the new project review relate to issues impacting the fishing industry in the area and potential marine safety. The area where the wind farm is targeted is a major fishing region where the vessels need room to maneuver their nets and for safety should a vessel lose power. These issues impact the location of turbines, and especially if additional wind farms are constructed, as planned. Any accidents in such a crowded area could also complicate search and rescue efforts, something explored two weeks ago during a Coast Guard search and rescue exercise conducted near the 5-turbine wind farm off Block Island.

The fishing industry is also concerned about the extent of the research on the impact on marine life in and around the Vineyard Wind farm. The fishing industry, which has generally supported offshore wind development, worries that fishing stocks will be impacted by disturbances of their food chain. The results of the BOEM review will set the stage for the reviews of other offshore wind farm projects currently in the queue. The timing delay of the

Vineyard Wind review will have a knock-on effect on those other projects, especially the planned New York offshore wind project that is designed to provide electricity to replace what will be lost when the Indian Point nuclear power plants are shut down. Wind energy and offshore wind power, will continue to play a role in U.S. energy markets, but the timing of the impact is becoming more uncertain. This uncertainty is rapidly becoming a global concern.

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