

Energy Matters

January 6, 2020

Sound-bite summaries of the energy news you need to know.

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Fossil Fuels

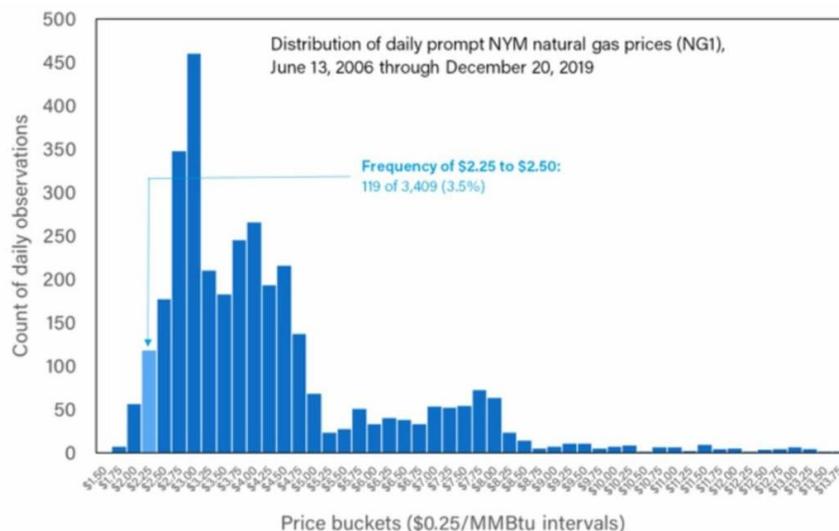
Oil: The State of the Sector

- Shale production projections are generally unreliable because today's wells have wide-ranging life-spans - the issue is referred to as "survivor bias";
- The sector is struggling with a skill shortage compounded by the need to "redesign work processes" and adopt more current corporate culture practices;
- The acquisition of subsurface data is a serious bottleneck and underscores the need for machine learning in reservoir engineering; new algorithms are quickly integrating physics into machine learning programs and will soon replace traditional reservoir simulation programming.

Visit the [AES website](#) for access to a complimentary early draft of "Technical Report on Data Analytics in Reservoir Engineering," which is currently open for comments.

Natural Gas: The \$2.41 test

For more than a decade, the average daily closing price for natural gas has been \$2.41 MMBtu; however, the distribution of prices is mathematically uneven. The distribution of all daily natural gas price settlements trends higher, but on the other hand **the frequency of a closing price falling lower than \$2.41 is 5.4%.**



Coal: [Mining employment declining in the US](#)

Coal mining employment **fell from a high** of 92,000 employees in 2011 to 54,000 employees in 2018, with the vast majority of the decrease in the Appalachian region.

Carbon Capture: [Making sense of CCU](#)

The field of carbon capture and utilization (CCU) is so broad and all-encompassing that it is becoming a useless term; indeed, peer-reviewed journals have published more than 11,000 articles about carbon capture and utilization. To make sense of the field, **Nature** divided all 11,000 articles into four categories, which anticipates the growth of new CCU subdisciplines:

- CO2u: utilization of CO2
- CO2p: reduction in CO2 emissions relative to baseline
- CO2r: removal of CO2 from the atmosphere
- CO2s: storage of CO2

Low-Carbon Energy

- [Wind](#): Onshore wind capacity exceeded 100 gigawatts at the close of 2019.

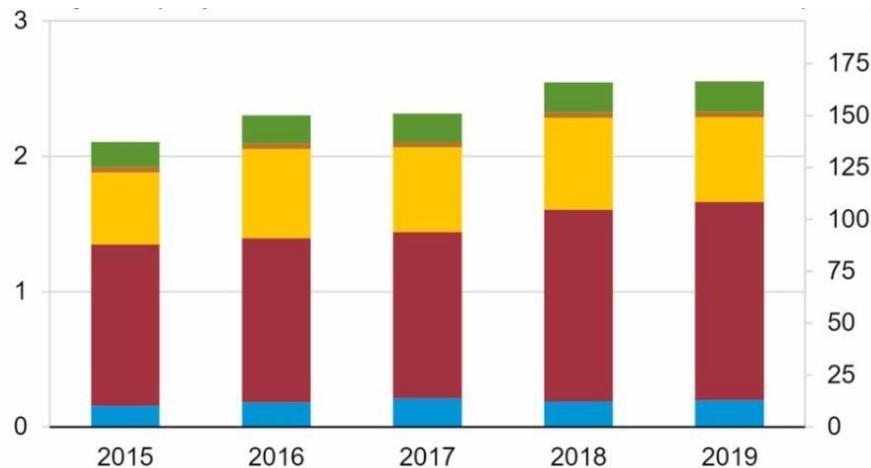
- [Geothermal](#): Half of all geothermal capacity in the US came online in the 1980s.

- [Hydrogen](#): To drive as far as conventional gasoline vehicles, hydrogen powered cars store hydrogen gas in tanks at a pressure 700 times greater than atmospheric pressure. While **hydrogen storage tanks are technologically and commercially viable, they do not meet safety targets set by the DoE**. Current research at Sandia has developed two types of metal hydride storage materials to meet those federal targets; now, the goal is to optimize the materials to reduce operating pressures in the tanks at a commercially viable cost.

- Recommended resource, [Renewables Market Analysis and Forecast](#). AES recommends a new publication by the IEA with special emphasis on technologies, global trends, and new opportunities in the electricity, heat and transport sectors.

- [Biofuels](#): **Total biodiesel production for all operating plants in the US**, in billion gallons per year (below insert, left axis) and thousand barrels per day (right axis).

Note: red = midwest; blue = east coast; green = west coast; yellow = south-central



Policy

- *In case you missed it*, the US Congress passed a spending bill with some obvious winners and one loser:

- The bill includes \$40 million for negative emissions tech, with at least \$15M for "direct air capture" (more than double the total spent to date) and \$21M for CCU.
- The DoD received \$8 million to support air and ocean carbon capture research.
- Wind energy projects will qualify for a 30% Investment Tax Credit if they start construction by January 1, 2021 (as opposed to the current law: January 1, 2020).
- However, planned reduction of investment tax credits for solar remains unchanged.

AES offers Members a copy of the House-side [internal notes](#) about the bill.

- Last week, **Iran Major General Qassem Soleimani was killed in an US-led airstrike**:

- He was in charge of the Quds Force of Iran's Revolutionary Guard, a special forces unit that undertakes Iranian missions in other countries.
- His strategic goal was an outright victory over Iraq; he was also the chief strategist behind Iran's military ventures and influence in Syria.
- In a speech denouncing Trump, General Soleimani was openly mocking: "We are near you, where you can't even imagine. We are the man in this arena, not you."

Note: **Oil prices spiked in response to the news of the attack**, as traders weighed the possibility of disruption to supply from the region.

- *In case you missed it*, **COP25 in Madrid, Spain, from Dec. 2 - 13, was a dismal failure** indicated by how negotiators spent 20 minutes arguing over whether to "adjourn" or "close" their meeting and an equal amount of time debating whether or not to display PowerPoint slides on projection screens. The most substantive effort at COP25 was the discussion of COP26, except that it came to a halt when some delegates started preparing a list of countries in Africa that "deserves special considerations" and the effort was blocked by Latin American countries that also wanted extra attention.

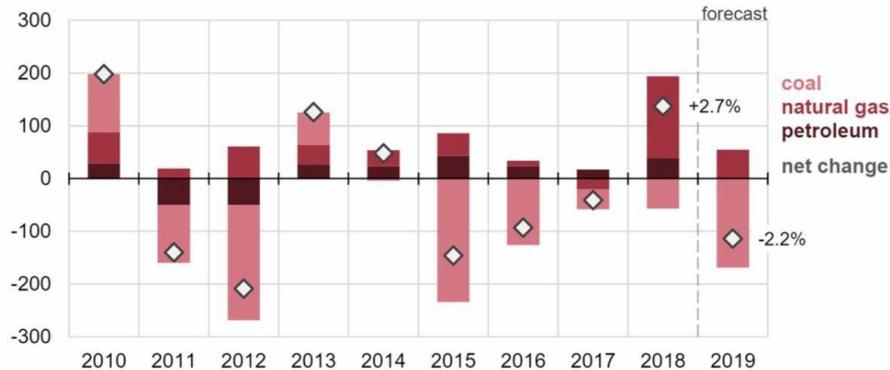
- *In case you didn't notice*, President Donald Trump signed a law that **imposes sanctions on companies that help Russia complete construction of its Nord Stream 2 pipeline**, a 1,230-kilometer (764-mile) undersea natural gas supply link between Russia and Germany. Some European countries, like Germany and France, oppose the sanctions, while others are critical of the pipeline, like Poland.

- *Possibly related*, the European Union imposes a fee of 25 euros (nearly \$28) per metric ton of carbon dioxide emitted by industries like oil refineries and steelmakers. Since no other region has a similar carbon tax, the EU runs the risk it will make many European companies noncompetitive. **Some EU countries are calling for a "border adjustment" tariff** on imports based on their carbon footprint; many consider this proposed import tariff a retaliation against President Trump's Nord Stream 2 sanctions.

- **The courts cleared ExxonMobil** of allegations that it misled investors about the risks posed to its business by climate regulations. Justice Barry Ostrager sided entirely with Exxon on the claims brought against it by the New York Attorney General's Office, saying that he found all the company's witnesses to be truthful and that the state had failed to present any credible evidence. Ostrager also made clear, however, that "nothing in this opinion is intended to absolve ExxonMobil from responsibility for contributing to climate change," adding that the company's emission of greenhouse gases was not on trial.

Climate, Emissions and Sustainability

Emissions: After a 2.7% increase in U.S. energy-related carbon dioxide (CO₂) emissions in 2018, it appears there will be a 2.2% decrease in CO₂ emissions for 2019; **nearly all of the forecast decrease is due to fewer emissions from coal consumption.** Annual changes in US energy-related CO₂ emissions 2010 - 2019, in million metric tons:



Climate Spotlight: Australia

In **Australia**, heat and wildfire conditions are "extremely dangerous" (*insert*):

- Temperatures are above 40C (104F) for prolonged periods of time.
- Strong winds have increased fire danger.
- An estimated 480 million animals have been **killed** in the New South Wales region so far this summer.
- The fires have already **burned** about 14.5 million acres, three times the area destroyed by the 2018 fires in California.



Climate Spotlight: China

- **Pigs:** **Half the pigs in China** – last year about 440 million (or, half of the world's pigs) – have either died of African swine fever (ASF) or been killed to stamp out the virus.

- **Drought:** The Poyang River in China's northeast Jiangxi province, the largest body of freshwater in the country, is **drying up** and is now smaller than 1/3 its original size.

- **CO₂ emissions, by the numbers:**

- the G20 countries account for almost 80% of total global emissions;
- the poorest 50% of the world account for 1/10 of total CO₂ emissions;
- **China contributes over 1/4 of total global emissions** (the US is second at 15%).

Research and Markets

- [Stanford Global Energy Heroes competition](#) : Young people around the world are using sustainable energy to benefit their communities. Share that impact in a three-minute video to compete for one of three \$20,000 cash prizes plus a trip to the Global Energy Forum 2020. Applications are due by January 31, 2020.

- The X-Prize "[Carbon-Tech](#)" finalists include:

- Vodka made of CO₂ (!?)
- Fuel made of CO₂
- Toothpaste made of CO₂
- Yoga Mats made of CO₂



- [Methanol](#) : The current process of extracting hydrogen from methanol results in carbon emissions. To increase the 'green' aspect of methanol as a source of hydrogen fuel, a research team at the Curtin Institute in Australia is **using solar energy to break down methanol** at room temperature and under normal pressure using atomically thin single-layer (MoS₂) nanosheets.

- [Global EV sales trends](#):

- China, 8% of all automobiles sold are EV
- Europe, 7% of sales are all-electric (led by Norway)
- United States, 4% of sales (led by California)

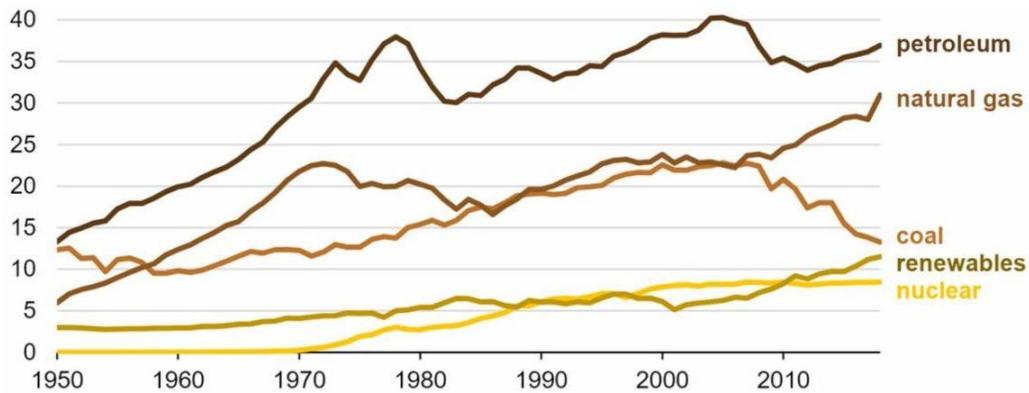
Electricity, Power and Efficiency

- **Efficiency**: Nearly two-thirds of the energy consumed by the power sector is lost before it reaches end users. Most of these losses occur at steam-electric power plants (nuclear and conventional) when heat energy is converted into mechanical energy to turn generators. Other losses include the electricity used to operate power plants and lost in transmission and distribution to end users.

- **Microgrids**: The most advanced renewables-driven storage-supported microgrid system in the US is being deployed in the Goleta Load Pocket (GLP), a disaster-prone, transmission-vulnerable stretch of California coastline in Southern Santa Barbara County. The GLP is currently served by just one set of transmission lines (insert, in purple).



- [Energy consumption in the US](#): Primary energy consumption in the US reached a record high of 101.3 quadrillion Btu in 2018, up 4% from 2017 and 0.3% above the previous record set in 2007. The increase in 2018 was the largest increase in energy consumption, in both absolute and percentage terms, since 2010. Consumption of fossil fuels—petroleum, natural gas, and coal—grew by 4% in 2018 and accounted for 80% of U.S. total energy consumption. Natural gas consumption reached a record high, along with relatively smaller increases in the consumption of renewable energy, and nuclear electric power, more than offsetting a 4% decline in coal consumption (insert below).



Cybersecurity Spotlight

- Argonne National Lab - [Summer Coding Camp](#)
- Brookhaven NL - [Cyber Programs for Women and Minorities](#)
- Idaho NL - [Girls Go Cyber](#)
- Los Alamos NL - Computer System Cluster [Summer Institute](#)
- Lawrence Berkeley NL - [Summer Research Program](#)
- Pacific Northwest NL - The [Pink Elephant Unicorn](#) program
- Sandia NL - K-20 Cybersecurity [Consortium](#)