

Energy Matters

Volume 7(4)

Headline News

Conventional

Petroleum

- *Featured story:* In a worst/best case scenario (depending on your perspective), by 2040 the highest projection for the electric vehicle market is that about 30% of all passenger car miles will be powered by electricity (or about 300 million cars). If this market projection becomes true, **the impact on oil consumption would be trivial, even if that number is increased by another 100 million: [oil demand](#) would decrease by only about 2 MMbbl/d.** (Note: today's market consumes 97 MMbbl/d; by 2040 the demand is likely to exceed 100 MMbbl/d.)

- Statoil changed its name to ... [Equinor](#).

Gas

- [Top 5 natural-gas importers](#), (by country, 2017 - avg.):

1. Japan (11 billion cubic feet per day)
2. China (5.6 bn cubic feet per day)
3. South Korea (5.5 bn cubic ft per day)
4. India (2.1 bn cubic ft/day)
5. Taiwan (2.0 bn cubic ft/day)

NOTE: China's [LNG import levels spiked](#) 51 percent y/y in January.

Coal

- *In the context of the President's tariff on steel ...* of the 785 million tons of coal mined in the US in 2017, **7.6% of the total was "metallurgical," a type of coal used for steel-making** because it burns hotter (power plants burn "thermal coal" to generate electricity). Most metallurgical coal comes from the states around Lake Superior (Minnesota, Michigan, and Wisconsin) and around Birmingham, Alabama. (Thermal coal comes primarily from West Virginia, Kentucky, Illinois, and Pennsylvania.) Editor's note: the go-to source for information on metallurgical coal mining in the US is still a study from 1951; AES Members have access to that original [coal study](#).

Nuclear

- The White House has mapped out a strategy for achieving "energy dominance." At the top of the list is "advance nuclear energy" ... and not coal, oil, natural gas, or renewables. Step 1: look for ways to **expand nuclear power domestically**. AES Members have access to the [nuclear energy report](#) by The White House Office of Science and Technology Policy.

Renewables

- *Batteries*: The US now has the **capacity to [store 1,000 megawatts of power](#) for one hour and is on pace to double that total by the end of 2018**. In 2017, energy storage capacity - overwhelmingly dominated by lithium ion batteries - grew 27 percent to 431 megawatt hours. (Note: as a comparison, **on a per day basis, the US uses about 10 million megawatt hours** (or 10,000 gigawatt hours, or 10 terawatt hours).
- *Solar*: **The US [rooftop solar industry contracted in 2017](#) - after 16 straight years of gains**. Meanwhile, Tesla is now in second place to SunRun as the top installer of residential solar in the US. (Note: Tesla bought SolarCity about one year ago.)
- *Wind*: **The average [wind plant](#) generates between .02 and .04 pounds of carbon dioxide** equivalent per kilowatt-hour of electricity produced - spread out over the life cycle of a typical turbine. Even at the high end, that's less than 3% of the emissions from coal-generated electricity and less than 7% of the emissions from natural gas-generated electricity.
- *Algae*: There is growing interest in algae as a tool for carbon capture and sequestration. Algae may not be a perfect solution for carbon mitigation, but it could be a key enabler for carbon capture, storage, and use (CCU). A few thought-leaders in this field include but are not limited to: [Richard Sayre](#) (Pebble Labs and Los Alamos); [Jose Olivares](#) (Editor-in-Chief, Algal Research), and [Marie Magnusson](#) (Centre for Macroalgal Resources, James Cook University, Australia)
- *Carbon Capture*: The US DoE is providing \$26 million in financial assistance for RD&D that is focused on [carbon capture technologies](#).

Policy

- Beltway Buzz I: White House Chief of Staff John Kelly **blocked efforts to host a public ["red-team / blue-team" debate](#) about the science around climate change** that had been advocated by US EPA director Scott Pruitt. Mr. Kelly and other top officials in the administration regarded the debate as "ill-conceived and politically risky."
- Beltway Buzz II: Even though President Donald Trump is seriously considering firing VA Secretary David Shulkin and contemplating Rick Perry as his replacement, multiple sources close to Perry say he is not interested in leaving the DoE. But that hasn't stopped the Beltway Buzz. If Perry was persuaded to take the VA job, **there are already rumors of who would become the next Secretary of Energy**, including: Ray Washburne, a Dallas entrepreneur and Republican fundraiser; J. Larry Nichols, the former chairman of Devon Energy; and T. Boone Pickens, a Texas oilman. And remember: Continental Resources CEO Harold Hamm, who advised Trump during the transition, was a top contender back when Trump ultimately selected Perry.
- The "Furthering carbon capture, Utilization, Technology, Underground storage, and Reduced Emissions" (FUTURE) Act, part of the recently enacted Bipartisan Budget Act of 2018, extended and expanded the 2008 tax credits for capturing CO2. **The new tax credit could incentivize deployment of new CCS technology**. AES Members have access to an essay on the [tax policy and its potential to affect CCS](#).
- Arnold Schwarzenegger - former Terminator and California governor - has announced that he is going to **sue the oil and gas industry for 'First Degree Murder.'** Schwarzenegger is talking with several private law firms to prepare a legal strategy, timeline and public push around the effort. AES Members have access to the Off Message recording of [The Terminator's public address](#).

- **Legislation reauthorizing the US Department of Energy is *not* moving in Congress** right now - yes, THE Department of Energy. Congressman Fred Upton (Michigan - R): House Energy Committee): "We sat down with Secretary [Rick] Perry.... We're a little frustrated with the Senate ... they're not moving fast.... It (the DoE re-authorization bill) is probably something that will bleed into next year." AES members have access to the stalled [DoE Bill](#).

Climate

- An electric vehicle (EV) in Kentucky has lifetime carbon emissions that are not much better than an ordinary gasoline car because it is charged mainly with coal-fired electricity. **An EV in Washington State has lifetime [carbon emissions](#) a thousand times less than a gasoline car, or an EV in Kentucky**, because it is charged with non-carbon-based renewable energy.

- There is anecdotal evidence but no peer-reviewed study comparing the effect of climate change on women and men. **The assumed hypothesis is that [women are more likely to suffer](#) from a changing climate than men.** For instance, in central Africa, where up to 90% of Lake Chad has disappeared, nomadic indigenous women have to walk farther to collect water, while men's patterns remain unchanged - typically, they still walk to nearby towns to go to work.

- **The Chesapeake Bay is [thriving again](#).** Beginning in 2010, the six states in the bay watershed launched an ambitious cleanup plan, leading to some of the most robust re-growth of underwater grasses and aquatic vegetation in the world.

- "[Land Subsidence](#) (səbsədns), *noun*, def: when groundwater pumping causes land-mass to sink, **a process in which the ground below the surface begins to "deflate."** Compact landfill regions are the most susceptible. An example of a region with measurable "land subsidence" is the San Francisco Bay area ... sometimes as much as 1/10" to and 1/2" per year.

- Every year, the nation's coal plants produce 140 million tons of coal ash pollution, the toxic by-product that is left over after the coal is burned. Power-plants are responsible for disposing of the ash; some of these sites lack adequate safeguards, leaving nearby communities at risk. **There are about 1,100 coal-ash pits in the US**; of these, about 70 sites are leaching exceptionally dangerous toxins like arsenic, mercury, and radium into groundwater. AES Members have access to a [map of all the coal-ash sites in the US](#) (note the huge discrepancy between east and west on the map). The top-4 utilities with the most reported [groundwater contamination](#) sites - (exhibiting radioactivity levels many times higher than federal standards: AEP, Duke Energy, Xcel Energy, and the Tennessee Valley Authority).

Electricity, Power and Utilities

- The FBI and Homeland Security have confirmed that **Russian [hackers](#) have targeted American electric utilities** - including Wolf Creek Nuclear Power Plant in Burlington, Kansas. (Note: there is a big difference between infecting a few energy companies' Windows machines with malware and grabbing the controls of a nuclear power plant ... but according to the report that day is coming - the hacks are relentless.)

- Featured story: There is a common but somewhat mistaken assumption that solving the global energy problem (greater access to clean, reliable and affordable energy) will [solve the global poverty problem](#). For instance, the head of Swedfund, a global development finance group,

recently repeated this widely-held belief: "Access to reliable electricity drives development and is essential for job creation, women's empowerment and combating poverty." Access to clean, reliable, affordable energy offers huge advantages, but it is not entirely true that it will solve global poverty. **The poor also lack running water, basic sanitation, consistent food supplies, quality education, sufficient health care, and ethical governance.**

- A new class of "**hybridized utilities**" are taking advantage of battery storage. Roughly 80 hybridized power plants are in operation (a total of 11,628 MW) In addition, there are plans for 31 new hybridized power plants (with 6,008 MW of generating capacity). Note: AES Members have access to a summary of [hybridized utilities](#), followed by an invitation to submit personal information to S&P for access to the full article.

- A popular debate among energy pundits: **is the electricity grid undergoing a revolution or an evolution.** Bill Gates' argues "revolution." however, one of his favorite scientists, Vacil Smil, argues that transformations take a long time. Indeed, data suggests that it took coal close to 25 years to become the leading energy source in the US. For petroleum, it took even longer - more than 50 years. Renewables began their significant increase fewer than 10 years ago, suggesting that perhaps we have a ways to go until renewables become a dominant source.

- **On average, a household in [underdeveloped regions use just 3 kilowatt-hours per month](#) (about 1.1 billion people);** in comparison, a US household uses 900 kilowatt-hours per month. (Note: a [microwave](#) operating on "high" will use about 1 kilowatt in about 4 minutes.)

- "[Neural grid](#)" *noun*, def: new technologies (like artificial intelligence, distributed intelligence, the cloud, blockchain, etc.) are disrupting and decentralizing the sale of electricity, which has created **a competitive environment that is vastly more crowded than what utilities experience today.** *Antonyms:* public utility; "smart grid"

From Basic Research to Commercial Markets

- There are [GSSI research funds](#) available for graduate students and recent grads who have designated "**Near-Surface**" or "**Exploration**" **geophysics research (10 meters or less from the surface)** as an educational specialty (via AGU). Application deadline is April 1, 2018.

- Rice University is hosting a "People's Choice Business Plan" competition. Watch the [YouTube video pitch-presentations](#) and then cast your vote.

- US LNG export capacity grew from just 0.8 Bcf/d (billion cubic feet / day) in 2016 to about 9.5 Bcf/d by the end of 2019, right behind Australia and Qatar. But then something strange happens after that: **planned capacity [expansion](#) falls to virtually zero in 2020 and beyond** ... though keep an eye on [Texas LNG](#).

- Commonwealth Fusion Systems (CFS), the Italian energy company Eni are conducting staged [RD&D fusion experiments](#). The key to this project is the development of powerful large-bore superconducting electromagnets. If successful, these magnets will produce a magnetic field four times stronger than any previous fusion experiment.

- **The IRS has started ruling in favor of storage** as deserving of tax credits as an energy source. This is unusual since storage is not, by definition, a *source* of energy. AES Members have access to a copy of an [IRS letter](#) that ruled in favor of tax credits in favor of storage.

- Long ago **Chevron went big in the Permian**, buying up millions of acres. They sat inactive, from 2010 to 2014, while everyone else increased drilling. Now, Chevron is [drilling everywhere in](#)

[the Permian](#) ... pouring nearly a fifth of its global spending into the region and aiming for 650,000 barrels a day, versus about 100,000 barrels daily as recently as 2014.

- China has been the global leader in [EV sales](#) since 2015. To get there, China has subsidized manufacturers and tightly regulates the sale of fossil-fuel powered cars. Chinese EV manufacturers have benefited, including BYD Co. (a Warren Buffett-backed carmaker that soared 67 percent last year and sold more cars than Tesla). Also, watch Geely Automobile, Ltd.

Feature: CERAWeek in review

The American Energy Society was kindly granted permission to attend CERAWeek, an annual energy conference organized by IHS Markit in Houston, Texas. The conference provides a platform for discussion on a range of energy-related topics, but the emphasis is always on hydrocarbons. The following is a summary of the week-long event:

Top-5 take-aways from CERAWeek

1. Forget peak demand.
 2. Oil supply shortage is a concern (by the early 2020s).
 3. Climate change is starting to become a worry for the oil industry.
 4. Technology and digitization are crucial strategies.
 5. There is a wide range of expectations for shale.
- *On O&G:* The old-normal: multi-year, billions-dollar contracts that lock in prices for years. The new-normal: 7-day contracts and spot-pricing.
 - *On renewables:* O&G companies are celebrating their (*small*) alternative energy programs.
 - *On policy:* The administration is comfortable following rather than leading the sector.
 - *On climate:* O&G companies were vocal in their commitment to environmental stewardship and the reduction of greenhouse gas emissions; and yet, the phrase "climate change" wasn't a popular topic of discussion.
 - *Summary:* The scarcity of environmental voices onstage provide a window into how the oil industry believes an energy transition should unfold. Essentially, attendees prefer a *slow* transition to cleaner technologies over time.

What you may have missed - vol. 6(4) of Energy Matters

- From 2015 through to the present, [gas prices](#) in California have been well above the national average. The extra payments since February 2015 have cost California drivers about \$15 billion. For a comparison, the state government's entire contribution to the University of California system will be about \$3 billion this year.

Contacts

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Energy Quotes

*Stephen Hawkins
in memoriam:*

"You cannot understand the glories of the universe without believing there is some Supreme Power behind it."

"We are in danger of destroying ourselves by our greed and stupidity. We cannot remain looking inwards at ourselves on a small and increasingly polluted and overcrowded planet."

"Remember to look up at the stars and not down at your feet.... And however difficult life may seem, there is always something you can do. It matters that you don't just give up." (wev)