AMERICAN ENERGY SOCIETY

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Energy Matters

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Headline News

Conventional

Petroleum: There are about 40 known shale plays in the continental US:

- The Permian is currently the most productive basin in the US with a record 2.8 million barrels per day (BPD), making it the world's second-most-prolific field behind the legendary Ghawar in Saudi Arabia.
- The largest proven reserve in the US is the Green River Formation (along the border of Colorado, Wyoming, and Utah). The basin could hold up to 3 trillion barrels, half of which may be recoverable by shale extraction technologies.
- Oil from the Eagle Ford shale basin (in South Texas) is the most valuable crude in the world, characterized as "exceptionally light and sweet" and inexpensive to refine.

Gas: US gas exports quadrupled in 2017 - 1.94 billion cubic feet per day (Bcf/d) in 2017.

Coal: Much like production of oil, gas and all renewables, **new innovations have improved coal mining productivity in the US** by 26% in the last five years, reaching 6.8 tons per miner hour in 2017, up from 5.4 tons per miner hour in 2012.

Nuclear: Russia's state-owned and -operated nuclear power company, **Rosatom, is developing nuclear plants in Bangladesh, Argentina, Congo and Mongolia**. China is working on projects in the United Kingdom and Pakistan. South Korea, Japan, and France are currently working on deals to export nuclear power technology to developing nations. Saudi Arabia has a goal of spending about $80 billion on 16 nuclear power plants over the next 25 years.

Renewables

-The state of renewables, a summary:

- The return of California's snowpack in 2017 helped boost the production of hydropower, which allowed it to stay ahead of wind as the largest source of renewable energy.
- In two years, wind should displace hydropower as the top source of renewable energy.
- 2017 was a record year for solar - the combination of utility- and residential-scale solar added 8.2GW of capacity (note: solar still contributes only a small portion of the total energy produced in the US - less than 1/5th of the total generated by hydropower.
- All renewable sources of energy produced about 15% of all US electricity last year.
- Add biomass, and the total generated renewable energy climbs to 18% of the US total.

- 150+ cities in the US that have signed a pledge to get 100% of their power from renewable energy. **Ten have achieved the objective**, including: Portland, Oregon; Hanover, New Hampshire; Madison, Wisconsin; and, Boulder, Colorado.

- **Saudi Arabia is building the largest solar farm in the world** - a staggering 200 GW, with about 7.2 GW slated to come online in 2019. (Editor's note: what does Saudi Arabia plan to do with 200 GW when it consumes 77 GW each year?)

- Spotlight - *Storage*. Amid DoE attempts to favor coal power (for instance, proposed coal subsidies; and the NETL report that coal saved the eastern US during the winter "bomb cyclone"), **battery storage is slowly carving out a place on the power grid.** While battery deployment remains minor, declines in prices (-24% last year), demand from solar and wind developers, and crucial regulatory decisions (Order 841) are creating room for batteries in energy markets. Large-scale batteries offer utility-scale renewable projects the ability to sell their electricity when it can fetch the highest prices, not just during windy or sunny periods. The technology has the power to change the economics for many projects and create much-needed flexibility for grid operators. Indeed, storage is starting to make a bigger play across New England and in California.

Policy

- Congress passed a $1.3 trillion omnibus spending bill for fiscal 2018. The 2,232-page document is not light reading. **Summary of how the budget affects energy and environment policy:**

- The DoE is a big winner - it gets $35 billion, a $3.8 billion increase over fiscal 2017. Its Office of Science (which runs the national labs) receives $6.26 billion, $868 million above fiscal 2017. ARPA-e, which the President wanted to eliminate, gets $353 million, and the EERE receives $2.32 billion.
- Overall, Energy-Water appropriations receive $43 billion, up from $38 billion in fiscal 2017, and Interior-Environment appropriations rose to $35 billion from $32 billion.
- EPA's operational budget remains about the same, but grant programs all increased. • The Department of Interior's budget remains near $13.1 billion: funding for agencies overseeing offshore oil and gas development and safety get a boost, and the Bureau of Safety and Environmental Enforcement, from $98 million to $186 million this year.
- The Army Corps of Engineers is set to receive a $800 million boost to its budget, bringing it to $6.83 billion. Most of the agency's budget lines also saw increases, too.
- About $100 million was given to create a new Office of Cybersecurity, Energy Security, and Emergency Response (CESER), to operate under the DoE.
- A couple of riders didn't get funding, of these, the most significant cut was the controversial Mississippi flood control project.

- Beltway Buzz I: The EPA has announced that it will **revise the Obama rules to limit vehicle greenhouse-gas emissions,** and most automakers agreed with the revisions - only Ford publicly opposed the changes. In response, California is poised to revoke its so-called "deemed to comply" provision by declaring that the state will not recognize any car maker that fails to satisfy the Obama greenhouse gas standards.

- Beltway Buzz II: The US EPA is working on a proposal that would categorically **disallow research that references data that is not publicly available.** If approved, it would end what some are calling "secret science," with particular aim at Obama's Clean Power Plan, which used confidential medical/patient records to argue that reducing greenhouse gases would save 3,600 lives and prevent 90,000 child asthma attacks each year. By disallowing non- public research, the EPA could by extension disallow the Clean Power Plan.

- Outside the Beltway I: In a court hearing in San Francisco, **Chevron publicly accepted the scientific consensus that human activity has been driving global climate change** since the middle of the 20th Century; they just don't think they can be sued for it.

- Outside the Beltway II: An experimental light water **nuclear reactor is likely up and running at North Korea's major nuclear facility**, according to recent satellite imagery.

Climate

- Of the 195 signatories of the Paris Climate Treaty, **not a single major industrial nation is on track to fulfill its commitments.** The only countries "in range" of their Paris targets are: Morocco, Gambia, Bhutan, Costa Rica, Ethiopia, India, and the Philippines.

- When Paris Climate officials set an aspirational goal of limiting global warming to 1.5 C above pre-industrial levels, they used the results of an 1850 study as the baseline marker for global temperatures. The problem is that **the research team that measured the average global surface temperature in 1850 did not include the Arctic, Antarctica and much of Africa** - where the Earth is currently warming the fastest.

- China announced that it met its 2020 carbon goals three years ahead of schedule. However, China also said it met its 2017 goals, but their system of self-evaluation ignored fundamental and reliable emissions data. **Officials eventually created a scaled-back assessment model** that only measured emissions from the power sector and did not count emissions from automobiles. Meanwhile, the UN was going to investigate Germany's claim that it is meeting its carbon goals ... and then **Germany scrapped their goals**.

- The 'Great Pacific Garbage Patch' - in the Pacific Ocean between California and Hawaii - contains about 87,000 tons of plastic bottles, children's toys, broken electronics, abandoned fishing nets and millions of plastic fragments like a floating island in the water. The size of the island is about 4 times the size of California and consists of about 1.8 trillion pieces of rubbish. And its growing. Exponentially.

- **The last male northern white rhino in Africa just died.** Next in line is the vaquita porpoise; there are fewer than 30 vaquita remaining in the wild, with an extinction rate of about 50 percent each year. AES Members have access to The State of Biodiversity, a comparison of the four global regions: the Americas; Europe and Central Asia; Africa; and the Asia-Pacific area (summary: no region is doing well).

Electricity, Power, Efficiency, and Utilities

- **The state of global power demand, a summary** (AES Members have access to the World Energy Outlook):
  - Global energy demand has increased by about 0.9% every year for the last five years.
  - Over 70 percent of all global energy demand growth was met by oil, natural gas and coal, while renewables accounted for almost all of the rest.
  - Improvements in energy efficiency slowed last year.
  - Global energy-related CO2 emissions increased by 1.4% in 2017 to 32.5 gigatons, a record high.

- **Demand for energy by country/continent can be neatly summarized by the numerical sequence 5-4-3**: China uses about 5 TWh annually; the US uses about 4 TWh annually; the EU uses about 3 TWh annually; and the combination of Southeast Asia, the Middle East and Africa use about 3 TWh annually. (Southeast Asia and the Middle East are just below 1 TWh, and Africa uses about TWh.)

- **There are still 70,000 people in Puerto Rico who have not had power restored since Hurricane Maria** six months ago.

- The Electric Reliability Council of Texas (ERCOT) ISO will see a **net 2,552 MW added to the grid** this year. The aggregate numbers are remarkable:
  - 7,755 MW scheduled to be added this year, led by wind plant with 5,058 MW
  - 5,203 MW scheduled to be retired this year, all of which is coal-fired

- The typical utilities customer in the US experiences about 1.5 to 2.4 electricity outages each year (including major disruptive events, such as hurricanes); on the other hand, about 0.00865 percent of all US customers lose electricity due to normal service or operational interruption (excluding atypical events, such as hurricanes). AES Members have access to the study.

From Basic Research to Commercial Markets

- Breaking news: Senior executives at Aramco and Alphabet (Google) have been in talks about building a "Silicon Valley for energy" in Saudi Arabia.

- There are fewer than 100 known species of Inoviridae viruses. A team of computational biologists at the Department of Energy's Joint Genome Institute fed a machine-learning algorithm a huge set of genomic data about the Inoviridae family. The result: **the DoE team and its algorithm detected more than 10,000 additional viruses in the Inoviridae family.** AES Members have access to the peer-reviewed article.

- The storage life of a lithium-ion battery is limited because dendrites sometimes grow and expand through the electrolyte that separates the anode and cathode. Researchers may have found a way to ameliorate this dendrite growth, not by fighting them as many researchers have attempted, but by using the heat generated by dendrites to make them grow smaller.

- NETL and ORNL are preparing an ambitious joint research initiative to **support projects that use coal as a precursor for basic products and materials.** (Note: there are currently about 50 commercially operating "coal / carbon" projects in the US right now.) AES encourages Members in these fields to begin preparing for these opportunities.

- **The DOE has announced the American Inventions Made Onshore (AIM Onshore) prize competition** - total funding for the AIM Onshore prize is $950,000; four organizations will win the AIM Onshore initial prize of $150,000 each. After one year, the AIM Onshore final prize will be awarded to the two best organizations ($250,000 for first place; $100,000 for second place)

- Unlike de-icing planes - a procedure performed on the ground - de-icing wind turbine blades is high-risk work because it typically happens several hundred feet in the air. A Latvian company (Aerones) is using a heavy-lift drone to haul the de-icing equipment into the air while the operator stays safely on the ground. AES Members can see footage of the drone in action.

- Because federal solar investment tax credits (ITCs) were retained in the recently passed budget, US electric utilities and energy developers are committing to more solar investments before the ITCs drop to 10% in 2021. NextEra, Duke, Dominion, Xcel, and Alliant are all adding more solar than expected. The fastest growing solar market? The US southeast.

Energy Quotes

"The alternative is no good."
- DoE Secretary Rick Perry, suggesting to lawmakers that if the US doesn't work with Saudi Arabia to develop civilian nuclear reactors, then countries such as China and Russia, which don't have nuclear proliferation standards, may step in.

"It is an act of war."
- Sen. Richard Blumenthal (D - CT), on repeated Russian efforts to penetrate the US electric grid.

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American Energy Society
654 Gilman Street
Palo Alto, CA 94301