



ENERGY MATTERS

The trusted source for objective sound-bite summaries of the energy news you need to know

Volume 5(3); March 6, 2017

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— HEADLINE NEWS —

Conventional

Petroleum

- The [previous wave of innovations](#) in O&G ([Shale 2.0](#)) improved production efficiencies ... a lot:

- The price to build a well dropped by 65 percent in the last 3 years;
- Costs for shale drillers fell 22 percent in the same period;
- The cost to operate a land-based oil-rig has dropped from US\$25,000 to US\$16,000;
- The cost to operate a drill ship in a deepwater field fell from US\$650,000 to US\$400,000/day.

And now, **Shale 3.0 - [a third wave of innovation](#) - has arrived.** For instance, "big data" techniques (mass data collection and analysis) are being used to mitigate risks, and predictive analytics are being used to identify potential drilling and pipeline failures. In addition, new automated drilling rigs are [reducing the number of persons in a drilling crew](#) by almost 40 percent. For example, drilling company Nabors Industries has installed automated drilling rigs and reduced the size of their well-site crews from 20 to around 5 workers.

Gas

- Though most of the oil and gas sector has gone through a revolutionary period of innovation in the last 3 years, **[natural gas utilities have been slow to connect their infrastructure to the so-called Internet of Things](#)**, especially compared to their electricity sector counterparts.

- **China has begun working on its [first domestic shale play](#)** - China's Sinopec Corp is spending 339 million yuan (\$49 million) to quickly build a gas facility in Chongqing, and should be able to produce about 5 billion cubic meters of gas each year.

Coal

- Executives of three large coal companies in the US - Cloud Peak Energy, Peabody Energy, and Arch Coal - are asking Congress to **expand government subsidies to help [reduce the environmental impact of coal](#)**. They are promoting carbon capture and sequestration. Please [contact AES](#) if you would like a complimentary copy of the forthcoming White Paper summary of its Congressional Briefing on Carbon Capture - the four panelists were: Sally Benson (Stanford), Howard Herzog (MIT), Gary Rochelle

(UT-Austin) and Nicholas Flanders (CEO of Opus-12).

Nuclear

- In 2013, the EPA conducted a study on the "health costs and benefits" of nuclear power plants that very few people saw, but the study is making a comeback. Summary: **the costs/benefits of nuclear power depends on alternative energy sources in the state**. For example, nuclear power benefits health in Illinois, but less so in California. AES Members have access to the little-known [EPA study](#) and its accompanying state ranking.

Renewables

- **Plug-in/electrified vehicles (PEVs) have decoupled from gas prices**. When oil prices plunged in 2014, the sale of hybrid vehicles went down in several global markets. However, PEVs have seen sales rise significantly in the US, Europe, and China during the past two years, even though gasoline prices have stayed down. Further, **China has become the top selling global PEV market**, surpassing the US for the first time.

- Tesla's Gigafactory 1 has received a lot of attention. However, it is just one of many large-scale **battery/storage "megafactories" being built, and most are in China**: Panasonic, LG Chem, and Boston Power are all building new megafactory plants in China, while companies such as Samsung and BYD are expanding existing ones. By 2020, China will have 62% of the world's lithium-ion battery production capacity. (Note: only four countries produce large-scale batteries (in order of capacity): China, United States, South Korea, and Poland.

- **Clean energy in the US added 22GW of capacity** — the equivalent of 11 Hoover Dams — to the grid last year

- Renewable energy sources made up nearly **nine-tenths of new power added to Europe's electricity grids** last year. Of the 24.5GW of **new capacity in the EU**, 21.1GW – or 86% – was from wind, solar, biomass and hydro, eclipsing the previous high-water mark of 79% in 2014.

- Wind, [by the numbers](#):

* The US wind industry added 6,478 MW of generating capacity in the fourth quarter of 2016, its second-best quarter ever;

* Texas and the Midwest/Plains states accounted for nearly 90% of the total installed wind capacity last year (Texas led all states with 2,611 MW of new capacity, followed by Oklahoma with 1,462 MW, Iowa added 707 MW, while Kansas installed 687 MW and North Dakota installed 603 MW);

* Iowa remains the second-ranked overall US wind market with a total installed capacity of 6,917 MW, while Oklahoma (with 6,645 MW) leapfrogged California (with 5,662 MW) as the third-ranked US state on a cumulative basis.

- **What we are reading**: Though a somewhat misleading title, *Energy Matters* recommends, "[Clean Energy's Dirty Little Secret](#)," in *The Economist*. Note: the article is actually about a market/pricing problem throughout the entire energy sectors.

Policy

- The President's **proposed budget slashes money for most federal agencies**, especially the EPA and the DoE. But like any budget, the President's proposal is more of a visionary statement that outlines the direction the Administration wants to take. Congress has responsibility to submit and formally agree upon the federal budget - with little input from the White House. All this is to say that [the President's budget will change](#) – probably dramatically.

- Beltway updates: After two consecutive 4-day workweeks, the **Senate resumes its confirmation hearings**: up next is Ryan Zinke's nomination to run the Interior Department. Meanwhile, **the House will review existing regulations**, with special emphasis on the EPA's Clean Power Plan, the Waters of the US Regulations, and Interior's federal moratorium on new coal leases.

- Ivanka Trump and her husband, Jared Kushner, a senior White House adviser, have convinced the Administration to **withhold US withdrawal from the COP21 Paris Climate Accord**. President Trump has said that he will defer to Secretary of State Rex Tillerson, who once backed the Paris deal while serving as CEO of Exxon Mobil Corp.

- President Trump's Administration and transition teams are conducting an **informal 360-Review of the Department of Energy and the National Laboratories**. It is unclear if or how the agency or the labs will be affected, or what affect the answers to these questionnaires will have on policy. AES Members have access to the [initial questionnaire for the DoE](#) and follow-up questions for the [National Laboratories](#).

Climate

- Spotlight: Arctic Circle

- Every additional metric ton of carbon dioxide puffed into the atmosphere appears to [cost the Arctic](#) about 3 square meters of summer sea ice. (To put that into perspective, each flight from New York City to London leads to 1 square meter of ice melt.) AES Members have access to the peer-reviewed [abstract](#).
- The Arctic Ocean is becoming more acidic. It's a process that occurs when carbon dioxide dissolves out of the air and into the sea, lowering the water's pH in the process. Scientists believe acidification is occurring at varying rates all over the world, but especially so within the Arctic Circle. AES Members have access to the peer-reviewed [abstract](#).
- There is now [less sea ice](#) on Earth than at any time on record.
- AES recommends "[Chasing Ice](#)," the award-winning documentary.

- **The maple syrup industry in New Hampshire is struggling** with too many warm days and too few freezing evenings.

- From 2014 to 2015, all non-HFC greenhouse gas emissions declined about 2%, but **HFC emissions rose more than 4%** during that same period, and have risen more than 45% since 2005. (Note: HFCs, or "hydrofluorocarbons," are used in air conditioners, for instance.)

- AES recommends the New York Times' series, "[Changing Climate, Changing Cities](#)," which addresses how climate change is challenging the world's urban centers. The first installment explores Mexico City. **Summary: climate change didn't cause a lot of Mexico City's fragile infrastructure and social problems, but it acts as a threat multiplier.**

Electricity, Utilities and Power

- "**Time shifting**", *noun*; def.: 1) capturing excess energy generated during low demand times in order to dispatch it during high demand times. (*Example*: when electricity generated at 3:00 am can be stored for use at 3:00 pm); 2) without time shifting, utility companies rely on fossil fuels like coal and natural gas for base load needs, but with time shifting the need for a base load disappears. Note: AES conducted a sample survey of its expert members and a majority believes that storage will be the next "big thing"

because it solves the age-old dilemma of "time-shifting."

- **California has a large — and growing — glut of power.** The state's power plants are on track to produce at least 21% more electricity than needed by 2020. That doesn't even count the soaring production of electricity by rooftop solar panels that have added to the surplus. Consequently, Californians pay a higher premium to cover the expense of new plants whose power isn't needed. For instance, Colusa Power Plant is operating far below capacity, and the Sutter Energy Center is just 15 years old but is closing because the power it generates isn't needed. In recent years, **Californians pay about 50 percent more for electricity** than the national average.

- *Energy Matters* has often written about cybersecurity; it is a topic of great import for the entire energy sector, and especially so for power companies. Below is a **summary of necessary skills for effective cybersecurity**:

- * General Assessment: Basic understanding of cyber risks
- * Cyber-Economics: Ability to apply relevant and cost-effective security measures
- * Cyber Hygiene: Commitment to consistent (re-)training in antivirus, firewall, and security updates
- * Cloud Security: Rigorous study of cloud providers that provide security features
- * Cyber-Physical: Authenticate devices to networks, encrypting data and handling updates/patches
- * Incident Response: An ability to rapidly respond to, solve, and recover from a cyber-breach

- AES Members have access to a new **ranking of the world's most energy efficient industrialized nations** — the US places 8th overall, while Brazil comes in last at 22nd.

From Basic Research to Tech-to-Market

- It seems that **venture capital is starting to invest in green technologies again**; about \$834 million was funneled into the [clean-energy industry](#) last year, marking the third consecutive annual increase and the most since 2004.

- Right now, grid-scale battery storage is too expensive for wide-scale use. It is well-suited for special situations, like in remote locations that have no access to traditional and expensive electrical grids. However, a Stanford research team may have broken through this storage/cost barrier - they have **created a battery whose main component is urea**, a substance found in most fertilizers and the urine of mammals. The battery is nonflammable and contains electrodes made from aluminum and graphite, two materials that are inexpensive and readily available.

- Statoil, which is developing its own hydraulic fracturing technologies in the US, is **suing a former chief technology officer** for allegedly absconding with trade secrets and then selling the patented, proprietary Statoil technology. (The litigation of IP is evidence that Shale 3.0 has arrived - see AES treatment of Shale 2.0 in previous [posts](#) and [TEYIR](#).)

- A research team at the Air Force Lab has **created liquid metals that are flexible, multi-functional, and reconfigurable**. These flexible metals could provide power connections for non-traditional electronics and energy transmission.

- A team of researchers performed what may be the **fastest read/write of magnetic media** ever by solving the "heat" problem - instead of using magnets they are using [ultrafast laser pulses](#).

- A new study found that there is **no ideal replacement for HFCs**, the refrigeration chemicals that are the perhaps the most potent greenhouse gas. AES Members have access to the full [article](#).

— FEATURES —

Feature

On Friday, March 3, The American Energy Society hosted a Congressional Briefing, "*Carbon Capture: Tomorrow Just Happened.*" It was a balanced, thoughtful, non-partisan discussion that emphasized the technical aspects of and prospects for sequestration, utilization, and commercialization. The American Energy Society would like to thank the panelists on the Briefing:

- Sally Benson, Professor, Director of the Precourt Institute for Energy, Stanford University;
- Howard J. Herzog, Senior Research Engineer, MIT Energy Initiative;
- Gary Rochelle, Professor of Chemical Engineering, University of Texas-Austin;
- Nicholas Flanders, Co-Founder and CEO at Opus 12, (and Forbes' 30 Under 30);
- And, especially our Congressional hosts Rachel Gentile and Margo Brown.

BRIEFING SUMMARY:

1. Small-scale CCU technologies can be used to manufacture basic products like shampoos and soaps, cement, foam, and of course fuel. (i.e. Opus-12)
2. Large, utility scale "carbon capture" is not yet economical and needs more testing, piloting, funding, and commitment.
3. Carbon capture will require supportive policies in order to develop into a viable sector. These policies may include but are not limited to: carbon taxes, investment tax credits/rebates, subsidies, federal loans, SBIRs, etc. - similar to the support given other sources of energy (renewables, nuclear, coal, O&G, etc.). Additionally, there is need for governmental risk-sharing and support in the ongoing development of both research and pilot-scale carbon capture systems.
4. Carbon capture can mitigate some CO₂ greenhouse gas emissions, but it is not a comprehensive solution. At its most efficient level, carbon capture solutions can remove in the short-term about .5 billion tons of CO₂ out of the 32 billion tons that are produced.

Please visit the American Energy Society website for a comprehensive [summary](#) of the Briefing, and please do not hesitate to [contact the AES](#) if you are interested in the transcripts of the Briefing and the forthcoming White Paper.

Quotes - Sustainability and the absence of consensus

"Sustainable energy is becoming the new normal ... this is where utilities should put their money."
- Colleen Regan, Bloomberg New Energy Finance.

"The international target for climate change (limit of 2C) ... appears to be infeasible with reasonably accessible technologies."
- Professor Nordhaus, expert on the economics of climate change and author of "[Projections and Uncertainties About Climate Change in an Era of Minimal Climate Policies](#)"

"I simply don't agree with all the hysteria about climate change."
- William Happer, physicist, Princeton University; advisor/confidant to President Trump