

# Energy Matters

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

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(Published every two weeks)

The official e-newsletter of ...



This volume has been specially prepared for Premium Members of AES

## Headline News

### *Conventional*

**Oil:** The adoption of digital technologies by the oil and gas industry (see related [articles](#) in *Energy Today* ) has had an **adverse effect on O&G professionals commonly referred to as "roughnecks "**

- BP has reduced its roughneck head count in its Wyoming fields from 300 to around 100 (and production is still at peak levels).
- Devon Energy's WellCon center in Oklahoma City once had about 80 roughnecks working on 40 rigs before the 2014 oil bust; today, the company employs about a dozen roughnecks at the company's 21 active rigs, and production rates are above average.
- In Duncan, Oklahoma, Halliburton had 3,000 workers at the end of 2014 but laid off around 2,000 when oil prices dropped. The sector has fully recovered, but the roughneck employment total has settled at about 1,300.
- In Wamsutter, Wyoming, BP has about 2,000 wells; the adoption of digital technology has allowed BP to reduce its head count there to around 100 roughnecks.

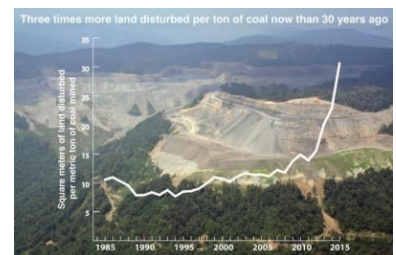


**Gas:** An impressive [market](#) phenomenon:

- **Demand for natural gas continues to grow**, including a record high for natural gas-fired power for electricity generation (now 37%, with coal dropping again).
- Production of natural gas in the US continues to grow, including a record high amount of natural gas from the Permian Basin (avg 10.4 billion cubic feet per day, 2.1 Bcf/d more than last year).
- **Prices for natural gas continue to fall**, including the price of natural gas from the Waha (Permian) Hub - nearly a dollar per MMBtu lower than the average global market price.

**Coal:** Despite recent efficiency improvements in coal mining productivity - lower head-count, better capital investment, improved profit margins (see *Energy Matters* "Coal" [vol. 16.4](#) ), **more land must be [mined](#) to produce the same amount of coal :**

- 1980: about 10 m<sup>2</sup> (~110 square feet) of land was disturbed to produce one metric ton of coal (2,200 pounds).
- 2015: about 30 m<sup>2</sup> (~330 square feet) of land was disturbed **to produce the same amount of coal — a 300% increase.**



**Nuclear:** Researchers at the Idaho National Laboratory are **developing a small modular nuclear reactor (SMR) for pilot deployment**, testing if it is capable of providing reliable [power](#) to a local microgrid and back-up power for the larger centralized grid.

- **More students are pursuing nuclear engineering degrees** than at any time, with graduation rates in the field [tripling](#) since 2001.

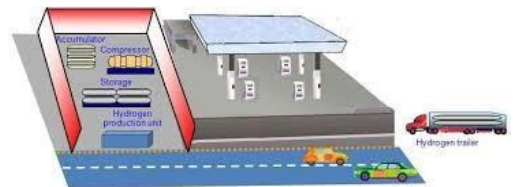
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## Renewables

- There are about 100 carbon capture facilities in the world, about [half](#) of which are in the US. (Note: the American Energy Society is offering a [free Carbon Capture Proficiency Quiz](#); professionals who pass the 20 question multiple choice quiz (80% or higher) can receive a LinkedIn badge to insert into their personal profile. [Contact us](#) if you would like to take the quiz; after taking the quiz, a small fee for the LinkedIn badge may apply.)



- Despite scientific, economic and environmental benefits, **city planners generally oppose hydrogen powered electric vehicles because hydrogen fueling stations (HFS) are massive.** For safety reasons, they require large separation distance between the station's delivery-point and the consumer fueling station. (Note: *Researchers at Sandia National Lab are trying to [develop](#) a compact hydrogen refueling station.*)



- The US DoE is sponsoring a \$72 million prize for any research team that can **identify the most promising and cost-effective method of raising temperatures and efficiencies of "Concentrating Solar Power (CSP)."** *In the last century, there has been virtually no innovative improvements to the steam turbine power cycle - operational efficiencies remain at about 40% and maximum temperatures top out at 600°C. Competitors are trying to find new ways to transfer solar heat to a power cycle that can operate at around 700°C-750°C and raise thermal power cycle efficiency by 10 percentage points. The following is a survey of the leading contenders in this heated competition:*



- **Solid: sand-like particles.** *Advantage:* Already surpasses temperature goals. *Disadvantage:* Particles must be pushed around mechanically, which limits efficiency. *Current favorite:* [Sandia National Laboratory](#) has expertise in particle technology, and they are ready to scale.
  - **Liquid: new molten salts.** *Advantage:* Familiarity. *Disadvantage:* Corrosion. *Current favorite:* [National Renewable Laboratory](#) has expertise with "liquid" molten salts used as a primary source for heat transfer and storage, but their thermal power cycle can only reach 565°C.
  - **Gas: sCO<sub>2</sub>.** *Advantage:* Easy to move / transport. *Disadvantage:* Hard to capture and store. *Current favorite:* [Brayton Energy](#) has an advantage over its competitors because *supercritical*CO<sub>2</sub> gas is easier to transport as opposed to solids or liquids.
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## Policy

- Energy companies - oil drillers, miners, land developers, etc. - **no longer have to pay the federal government "compensatory mitigation" to offset damage** to wetlands and wildlife habitats on public land.

- The Trump administration has asked the US DoE to **automatically approve all exports of natural gas if the amount is so small** (at or below 51.75 billion cubic feet) that environmental review is unnecessary. AES Premium Members have access to a true and correct copy of the new US DoE [rule](#) .

- **The backlog of bodies in Puerto Rico's morgue is still so large** following last summer's Hurricane Maria and subsequent violence that refrigerated trailers have been set up in parking lots. Now the US Federal Emergency Management Agency (FEMA) is [providing](#) \$2 million to help with the issue.

- It isn't exactly clear why President Hassan Rouhani of Iran threatened the US, or why President Trump responded with his own [Tweetstorm](#) , but perhaps the trigger in this confrontation is **Iran's command of the Strait of Hormuz**, which may have emboldened President Rouhani and disturbed the Trump Administration - an average of 14 tankers per day leave the Persian Gulf through the Strait carrying 17 million barrels of crude oil, about 35% of the world's seaborne oil shipments and 20% of oil traded worldwide.



## Beltway Buzz

- The President had submitted a request to repeal one of the nation's oldest conservation programs, the Land and Water Conservation Fund (LWCF), which gets revenue from offshore oil and gas development and uses it for national parks and other public spaces. **The Senate narrowly rejected the President's rescission package by a single vote** - Republican Senator Richard Burr surprised everyone when he said he wanted to permanently reauthorize the LWCF. The Senate has decided to postpone the decision until late September (or about one month before the mid-term elections).

- Also unexpected, **acting EPA Administrator Andrew Wheeler has decided to reinstate limits on the production of glider trucks** (preferred by the trucking industry for their maximum towing efficiency but known by environmentalists as "super polluters"). Wheeler has continued many of Scott Pruitt's deregulation policies, but this particular decision reverses one of Pruitt's last official acts before leaving office. AES Premium Members have access to a copy of Wheeler's [memo](#) reinstating the cap.

- Perhaps more unexpectedly, the EPA administration broke protocol and wrote directly to FERC with a **list of suggested "tools" that FERC administrators could use to improve its evaluation of greenhouse gases**, greenhouse gas reporting methods, and ways to measure the "social cost of carbon." AES Premium Members have access to a copy of the [letter](#) from the EPA to the FERC.

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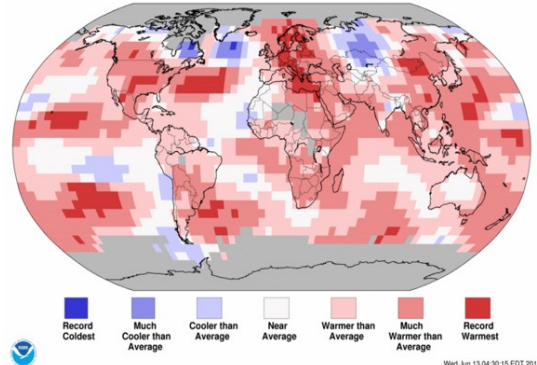
## Climate

- **Featured story: There are 6 plastic gyres on Earth** ("gyre" def: a large system of circulating water currents):

- [Indian Ocean Garbage Patch](#): Concentration of plastic debris about 10,000 particles/sq km; unlike the other patches, the Indian Ocean Patch is not a continuous debris field.
- [North Atlantic Garbage Patch](#): a density of over 200,000 pieces of debris per square kilometer; the debris zone shifts about 1,600 km (990 mi) north and south seasonally.
- [South Atlantic Garbage Patch](#): Litter density off coast of South America 2.5 times greater than waters closer to Africa.
- [The Great Pacific Garbage Patch](#): 7 million tons; twice the size of Texas; 9 m deep; 6 times more plastic than plankton; this is the world's largest plastic gyre.
- [South Pacific Garbage Patch](#): the most recently discovered plastic gyre; approx. 396,342 particles per square kilometer, most of which consists of microbeads.
- [Mediterranean Sea Garbage Patch](#): 250 billion pieces of plastic trash weighing 500 tons; most of debris is smaller than 5mm in size.

### - Global high temperatures in July:

- North Pole - 0 C, or 32°F, or about 30-35 degrees (17-19 Celsius) above normal.
- Africa - highest recorded temperature on the continent (51.3°C, or 124.3°F).
- Northern Siberia - 90°F, 40° above normal.
- Sweden - temperatures reached 86°F, well above normal.
- Denver, Colorado - all-time high 105°F.
- Oman - the highest nighttime temperature ever recorded anywhere in the world, 109°F.
- Austin, Texas - 108°F (it was so hot the Austin Fire Dept responded to a blaze caused by the spontaneous combustion of tortilla chips; technically, the crumbs from a chip factory had been left outdoors in the sun).



- " **Urban Heat Island** " *noun / adjective*; def.: In addition to the heat from the sun, cities have comparatively warmer temperatures because hot air from vehicles and buildings gets trapped between highrises, but there are not enough trees to provide shade and evaporative cooling that can bring down temperatures. Urban heat islands also struggle with a feedback loop because the day's furnace-like heat remains trapped during the night. In the US, **Phoenix, Arizona**, is the most extreme "Urban Heat Island."

- Every part of the US has seen an **increase in average annual temperatures** over the last 30 years, some more than others. *The Northeast has warmed the most* , and the part of that region that has warmed the most is the Gulf of Maine, which stretches between Cape Cod and Nova Scotia; in second place is the [Lehigh Valley](#) of Pennsylvania and parts of New Jersey. AES Premium Members have access to the peer- reviewed [article](#) .

- The Office of Environmental Management in the US DoE announced that it has finished cleaning **91 of 107 "environmentally damaged sites"** (a combined land mass equal to Rhode Island and Delaware). AES Premium Members have access to a [list](#) of the 91 sites.

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## *Electricity, Power and Efficiency*

- *Spotlight - electrical power in Southeast Asia* : Of the 625 million people living in **Southeast Asia**, about **125 million** lack access to reliable electrical power - the average daily supply rarely surpasses 18 hours:

- *Myanmar* (53 million total population) has the highest percentage (60%) of communities without access to electricity.
- *Indonesia* (261 million people) consists of more than 17,500 remote islands, a difficult geographic condition when it comes to grid-supplied electricity - 15% of the population has no access to electricity.
- With 7,000 islands, the *Philippines* (103 million population) have a similar challenge as Indonesia; while 9% of people have no access to electricity, a significantly larger percentage struggle with frequent power outages.

- *Special report*: The US Dept. of Homeland Security has revealed that **Russian hackers gained access to hundreds of US electrical utility companies - far more than previously disclosed**. Many of the cyberattacks used the "worm" called Stuxnet to attack the Supervisory Control and Data Acquisition (SCADA) systems that most utilities use for safe, reliable, and secure operation. Other attacks used the malware known as BlackEnergy, a particularly effective cyber-weapon for "denial-of-service" and data-exfiltration. One of the cyber-terror groups that was identified is known as Sandworm; based in Russia, it is not clear if Sandworm has a relationship with the Russian government. AES Premium Members have access to a [letter](#) from a bipartisan group of Senators to President Trump asking for more intense action to combat mounting cyber attacks from Russia.

- On the one hand, researchers can confidently say that data centers use about 3% of total global electricity (roughly 416 terawatts (data centers in the US consume about 1.8% of all electricity, or about ~70 billion kWh). On the other hand, **trend forecasting of the amount of electricity that data centers will use in the future is far less certain**:

- *More electricity*. According to [NRDC projections](#), data centers will consume more electricity because demand for data will increase as a result of streaming videos, artificial intelligence, and [more](#) IoT devices, etc.

- *Less electricity.* According to the [Lawrence Berkeley Lab](#), improved [efficiencies](#) will offset growing demand for data - like the shift from servers to the cloud, or the Data Center Optimization Initiative (DCOI), which requires all federal agencies to reduce the amount of data used by 25% or more.

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## Research to Market

- **Recent major partnerships and investments in Autotech** (thank you AES Member [David Finke](#) at Russell Reynolds):

- [Ford](#) creates separate unit for self-driving cars, plans to invest \$4 billion.
- [Daimler & Bosch](#) teams up with NVIDIA to manufacture autonomous taxis.
- [Didi Chuxing](#) partners with Booking.com, raises \$500 million to develop stealth Autotech project.
- [Audi](#) partners with Huawei to develop connected cars.
- [BMW](#) partners with Baidu's autonomous vehicle platform in China.
- [Continental](#) teams up with Argus to develop a cybersecurity platform for connected cars.
- Hyundai teams up with [Amazon](#) to offer virtual car-lot showroom.
- [Zoox](#) raises \$500 million to develop driverless cars.

- Cattle waste. Wastewater. Sludge-grease. Leftovers. Researchers at the Northwest National Lab are using these materials with **new waste-to-energy (WtE) technologies to create biofuels**. AES Premium Members have access to the peer-reviewed [article](#).

- **BP paid \$10.5 billion to BHP Billiton to purchase land** in Texas' Permian-Delaware shale basin and in the Eagle Ford and Haynesville shale basins in Texas and Louisiana, respectively.

- Researchers at UC San Diego have developed **an eel-like robot that can swim silently in saltwater without an electric motor**. The robot uses artificial muscle-inspired electrodes filled with a conductive ionic solution akin to saltwater to propel itself. A number of industries see value in this novel, non-invasive, perpetual-motion platform.

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## Quotes

*Lots of change, but some things stay the same.*

"You know, five years ago this wasn't something we particularly worried about. But over - I mean literally millions of times a month you'll see companies that are being hit, particularly these electrical control panels."

- Rick Perry, Secretary of the US DoE, on the need to strengthen cybersecurity.

"When I started this food truck, many people said: 'What? You will sell burgers and sandwiches in the street?'" - Bader al-Ajmi, 38 years old, just opened a burger pop-up food truck in Riyadh, Saudi Arabia. The nation that produces the most petroleum in the world [no longer](#) offers its citizens tax-free cradle-to-grave welfare.

Retrospective: "If you want to find the secrets of the universe, think in terms of energy, frequency and vibration."  
- Nikola Tesla



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