



ENERGY MATTERS

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— HEADLINE NEWS —

Conventional

Petroleum

- *Saudi Arabia vs. West Texas.* Saudi Arabia's Ghawar oil field, discovered in 1948, is the largest oil field in the world, currently producing 5 million barrels of oil per day. However, the Permian oil basin of West Texas is capable of producing 8 - 10 million bpd in oil, gas and liquids. The "sweet" spot for the Ghawar is about \$100/barrel; the ideal price for the Permian is about \$70 to \$75/barrel. **When oil prices rise to the \$70 range, [the Permian will take over](#) as the largest oil play in the world.**

Gas

- "*February 24, 2017*" is now a historic date in the US natural gas market. **[For the first time ever](#), natural gas storage levels rose during a winter week.** (Note: temperatures throughout much of the US have been higher than normal this winter, and natural gas storage is particularly sensitive to fluctuations in weather - natural gas is consumed directly by furnaces and boilers in homes and businesses for heating, and natural gas is used to generate electricity, which then fuels electric heat pumps and radiant heaters.)

- A cautionary note about a respected peer-reviewed article in an academic journal... (AES Members have access to the [article](#).) Researchers reported that on average, there are about 5 leaks and spills for every 100 hydraulically fractured wells each year. The study went on to say that North Dakota had the highest rate of accidents while Colorado companies reported just 11 accidents per 1,000 wells annually. **However, the evidence is unreliable - the total number of accidents is unknown, and there is no reliable state trend.** For instance, North Dakota requires operators to report spills of 42 gallons or more, while Colorado and New Mexico do not ask for anything smaller than 210 gallons, and Texas - the nation's top oil and gas producing state - was not included in the study because detailed data was not available.

Coal

- The US typically imports more than it exports, but that is not the case with coal. In 2016, the US exported 41 million tons of metallurgical coal and 18 million tons of thermal coal - and imported only about 10 million tons. Exports are and have been a lifeline for many coal companies in the last few years. **[With the newly rewritten NAFTA and TPP trade deals](#), the US cannot export coal to large Asian markets** like Vietnam and [Japan](#); so, Australian and Canadian coal companies will benefit.

Nuclear

- **Nuclear power does better under state ownership than it does under market-driven forces**, and the [collapse](#) of the Toshiba-Westinghouse nuclear construction deal is further evidence. Nuclear power in Eastern Europe, Asia and the Middle East benefits from [state-ownership](#). Furthermore, in the US, only the Tennessee Valley Authority, itself a government corporation, has been able to bring a new nuclear reactor into operation in the last 20 years.

Renewables

- A report by the Chatham House argues that **biofuels are not cutting greenhouse gas emissions**. The report outlines how policies intended to boost biomass are in many cases inadvertently *increase* emissions. AES Members have access to the Chatham [Report](#).

- Despite the new administration, the Department of Defense will forge ahead with a decade-long effort to **convert its operations to renewable power**. The reasons have nothing to do with the debate over climate change: in combat zones, renewable energy saves lives. For instance, diesel fuel convoys are vulnerable to attack: in Iraq, 1:40 fuel convoys result in a death or serious injury; in Afghanistan, 1:24 fuel convoys suffer casualties. At sea, gas-electric hybrid battleships save fuel and allow for fewer stops, making them less vulnerable to attacks like the bombing of the USS Cole in 2000, when al-Qaeda militants killed 17 U.S. soldiers during a refueling stop in Yemen. US military energy use, [by the numbers](#):

- The armed forces nearly doubled renewable power generation between 2011 and 2015, to 10,534 billion British thermal units, or enough to power about 286,000 average US homes.
- The military's renewable energy projects nearly tripled to 1,390 between 2011 and 2015.
- The US Navy produces 1 gigawatt of renewable electricity in a single year.
- The US military's use of oil has fallen by more than 20 percent between 2007 and 2015.

- In the European Union, [renewable sources](#) provided **16.7 percent of the bloc's total energy** in 2015, nearly double the share a decade earlier.

- In 2016, **China's solar capacity rose 82%**, while coal consumption declined 4.7% and coal production declined 9%. *Editor's note*: it is difficult to make sense of this data - one way to measure the reduction in coal use is to measure the total physical weight of coal burned, but when measuring the total amount of energy units produced by coal when burned, the decline was just 1.3%. (perhaps due to an improvement in coal quality or improved efficiencies.) Further, coal production fell 9% from 2015 to 2016, but this decline was matched by a 25% surge in imports.

- **Solar, [by the numbers](#)**:

- The US installed 14,762 MWdc of solar PV in 2016 – double the total in 2015.
- Solar was the top source of new electric generating capacity additions in 2016 (at 39%).
- In 2016, a record 22 states each added more than 100 MW of solar PV (and California added more than 1 GWdc of utility PV in Q4, the largest single quarter by one state).
- The "community solar" market quadrupled in 2016.
- At 19%, residential PV saw its growth slow in 2016 from record growth in 2015.

Editor's note: the data is impressive, but it is difficult to assess the true value of "installed capacity" - the term implies "potential" rather than actual "use."

Policy

- **Inside the Beltway** - the most important components of President Trump's energy landscape:

- Congress approved the nomination of Secretaries Perry (Energy) and Zinke (Interior), who arrived at his first-day on the job via [horseback](#).
- President Trump has prepared a sweeping executive order on coal leasing and climate action (Clean Power Plan), and now the White House is determining the timing of its release.
- The White House is trying to decide if the EPA or the Dept. of Transportation will dismantle the Obama White House Phase II fuel economy standards - but the Administration will allow [California](#) to set its own vehicle rules.
- **Lots and lots of budget cuts** (eliminating ARPA-e, reducing the EPA budget 25 - 31%...).
- *The silence is deafening* - no one is talking about the Paris climate accord. What this silence means is unclear: perhaps the Trump Administration plans to pocket-veto the Accord, or the White House has not made a decision ... yet.

- The Interior Department, the EPA, the Advisory Council on Historic Preservation, and the Army Corp of Engineers all can claim jurisdiction over the issue of permitting the Dakota Access oil pipeline. **Question: why does it rest in the hands of the U.S. Army? Short answer:** The Army Corps has authority under the Rivers and Harbors Act of 1899. For a more in-depth answer, see your [AES account](#); or, AES Members have access to Section 404 of the 1972 Clean Water [Act](#), which restates the authority of the Army Corps under the 1899 Rivers and Harbors Act.

- A belated adoption of an Obama-era directive, the Federal Energy Regulatory Commission has unilaterally posted a new manual on environmental reporting that **directs natural gas pipeline companies to disclose potential climate change impacts**. The two-volume, 470-page handbook advises project developers to include in their applications potential greenhouse-gas emissions, a cause of global warming that President Barack Obama said the agency should start taking into account in reviews. AES Members have access to the [manual](#).

- Congress is considering **recommendations for autonomous vehicle regulations**, such as:

- Formulating objective, practical, quantitative metrics for measuring AV safety.
- Authorizing road testing and deployment when statistical evidence confirms that AV performance is as safe as the average human driver.
- Publishing of safety milestones and accompanying validation.
- Requiring redundant layers of technology to increase safety beyond a minimum standard.
- Making the sharing of safety records and technical data compulsory.

Climate

- More and more **countries are planning to use "carbon capture" techniques as a primary strategy to meet the Paris Climate Agreement**; however, the panel of speakers at the US Congressional [Briefing](#) sponsored by AES were not certain that this is an effective approach.

- **There were 3,146 record high-temperatures in February**, compared to only 27 record lows, ensuring February will go down as the 27th month in a row in which there were **more high-temperature records than lows**. Further, the 116-to-1 ratio of highs to lows set a record for the most lopsided monthly ratio in history.

- Atmospheric **carbon dioxide concentrations climbed** 3 parts per million in both 2015 and 2016 to the

current rate of 405 parts per million.

- **Most of the extra warmth (90 percent) for the hottest year on record, 2016, was stored in the oceans** rather than the atmosphere. Indeed, about 337 zetajoules of total energy — that's 337 followed by 21 zeros — has been added to the ocean in the form of heat, and most of the warming has occurred since 1980. AES Members have access to the peer-reviewed [abstract](#).

- Members of the Group of 20 economies (the US, China, Germany, etc.) are [scaling back government pledges to combat climate change](#). The shift in policy is a significant departure from a communiqué issued in July, when finance ministers from wealthy nations were preparing commitments of \$100 billion annually to cut greenhouse gases around the globe.

Electricity, Utilities and Power

- Featured resource: On the heels of the [Congressional Briefing](#) hosted by the American Energy Society there is a powerful **convergence of thinking around deep decarbonization and carbon capture**, especially as it relates to utilities and electricity generation. *Energy Matters* strongly recommends a series of [publications](#) about this important issue. Key takeaways include:

1. Reaching near-zero emissions is challenging and requires a very different mix of resources.
2. A diversified mix of low-CO2 generation resources offers the best chance of affordably achieving deep decarbonization.
3. Dispatchable low-carbon resources (nuclear and/or CCS) in the generation mix is virtually indispensable for any least-cost pathway to deep decarbonization.
4. Intermittent renewables such as solar and wind will contribute to decarbonization if they are not expected to power the entire grid.
5. Very large amounts of long-duration seasonal energy storage technologies do not currently exist in plausible form or scale.

- Corporations are being offered **wind power purchase agreements for as low as \$15 per megawatt-hour and \$35 a megawatt-hour for solar**. At the same time, the influence of state renewable mandates is declining.

- **States are pushing to modernize their grids**. From California and New York to Hawaii and Rhode Island, public service commissions are opening regulatory dockets to investigate how best to upgrade the electric power grid to enhance its efficiencies, and Ohio is the latest to join the race. The most common modernization techniques:

1. Tools that increase an operator's ability to monitor and respond to system conditions, such as monitoring and data assessment hardware.
2. Smart meter rollout, which allows electricity users to take advantage of real-time metering and rates, a significantly less expensive upgrade than most modernization strategies.
3. System upgrades that allow operators to transition away from traditional generation to renewables and distributed energy.
4. Exchange one-way switches for bidirectional switches to accommodate the two-way power flows from rooftop solar, especially in regions with high DER growth.

From Basic Research to Tech-to-Market

- Boaty McBoatface, a remotely operated underwater research vessel, is preparing for its first research mission — an expedition into "some of the deepest and coldest abyssal ocean waters on earth."

(Note: **Boaty McBoatface** is the moniker selected by popular vote in a recent online poll to name the newest research ship in the UK's Natural Environment Research Council fleet.) AES Members have access to a [rare photo of Boaty McBoatface](#).

- Fulcrum BioEnergy is turning eggshells, coffee grounds, mattresses and other [garbage](#) into jet fuel.

- **Maersk ocean-going tankers are experimenting with a type of “[spinning sail](#)”** - an unusual rotating column of sails fixed to the deck of the ship, which helps propulsion because when wind passes the spinning rotor sail, the air flow accelerates on one side and decelerates on the opposite side, creating a thrust force perpendicular to the wind direction.

- The US Interior Department has informed coal, oil and gas companies that they **no longer need to comply with the federal accounting system that requires payment of [royalties](#) to the government**. The payment of royalties for minerals extracted on federal land was aimed at preventing firms from underpaying what they owe by selling coal to subsidiaries at an artificially low price.

- Power Africa is a bipartisan US government initiative that lacks statutory basis - it was a pet-project of previous White Houses. Introduced by President George W. Bush, the program increased its activity throughout the Obama administration with a goal of providing 30,000 megawatts of new electricity generation and electricity to 60 million new customers. Though the [Trump Administration](#) has made it clear that it will not continue Power Africa, AES expert-Members believe **this is probably one of the [best times to invest in Africa](#)**. Among the best opportunities are:

- LNG.
- Utility-scale projects that sell to the grid.
- Inside-the-fence projects that sell directly to mines or factories.
- Small distribution generation systems, like micro-grids or rooftop solar.

— FEATURES —

Feature - What we are reading

- *The Economist's* study of the [gender gap in science](#). Summary: Scientific research remains male-dominated but women are catching up.

- "[How to Build a Tech Startup](#)," by Backchannel. Summary: There is a whole new mindset for start-ups (hint: emphasize MVTV).

"[The Gender Stereotypes of Entrepreneurship](#)," by the Kauffman Foundation. Summary: The cultural image of an entrepreneur as a lone warrior is no longer valid or useful.

Credit: Cyclotron Road.

The University of Tulsa

Overheard at a recent conference in Palo Alto: a director at [Russell Reynolds Associates](#) executive search firm noted that she appreciated working in the energy sector because “everyone is in the energy business.” Everyone indeed, but few have truly mastered the business of energy. Great programs in this field are often located on the periphery of mainstream academic programming, such as at the Energy Institute at Haas, UC Berkeley, or the Environmental and Energy Law Society at Boston College. Few, however, support the dynamic and ever-changing global energy industry like the **Master of Energy Business program at the University of Tulsa**, which blends contemporary business principles and practices with current issues and perspectives. What makes this program unique is Tulsa perspective –

the world of energy through the lens of industrial relations. The American Energy Society applauds the global, business-oriented approach of the [Master's program in Energy Business at the University of Tulsa](#).

Quotes

"This new administration has promised to aid manufacturers that have had to endure an unprecedented number of regulations which increased the cost of doing business in America, harmed consumers, stifled job creation, and hurt our global competitiveness." - HVACR Trade Assn President Stephen Yurek Urging the White House to ignore the "Social Cost of Carbon."

"If the goal was actually to identify rules that are unnecessary or inefficient, which could be a noble goal, this is not the way to go about it." - Jack Lienke, senior attorney for New York University's Institute for Policy Integrity.

"Somehow we're going to do this with just public-private partnerships and no new money." - Rep. Michael Capuano, D-Mass., following the Trump administration's pledge to invest in infrastructure.

"These decisions really should not be about politics." - Lt. Col. Wayne Kinsel, head of renewable energy conversion for the Air Force Asset Management Division for Logistics and Force Protection.

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