

Energy Matters

The energy news you need to know - published without fear nor favor.

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The official e-newsletter of ...



This volume has been specially prepared for Premium Members of AES

Headline News

Oil

- Oil markets are a key battleground in the current US/ China trade war and US sanctions on Iran. For instance ...

- [China](#) reduced its oil trade with the US and has turned to Iran as a key source;
- [France and the Netherlands](#) have turned away from trade with Iran and to Iraq;
- [Turkey](#) has shifted its oil trade from Iran to Russia;
- [India](#) has cut off its oil trade with Iran and is now buying from Saudi Arabia.

Natural Gas

- **China has about 1.115 trillion cu/ft of recoverable shale gas reserves** - the biggest reservoir of shale gas in the world (Argentina has the second largest, with a little over 800 trillion cu ft). However, unlike the shale reserves in the US, which are buried evenly and close to the surface, China's reserves are [inaccessible](#) - unevenly buried deep below several impenetrable plates. In other words, **geology and technology are preventing China from getting at its own natural gas reservoirs.**

Coal

- Egypt, Oman, Iran, Jordan, and the United Arab Emirates currently have no coal-fired electricity generation **is [building new](#) coal-fired electricity power.**



Nuclear

- [The State of Nuclear Energy](#)

- Global annual nuclear electricity output is 2506 TWh (with 29 TWh added).
- Total nuclear-generated electricity has increased the past five consecutive years.
- There are 448 operating nuclear reactors globally; last year four new reactors were added and five reactors were shut down - though two of the shuttered reactors (Monju and Santa Maria de Garoña) had not been operating for years.

- There are 59 nuclear reactors currently under construction.
- It takes on average about 58 months to build a new reactor.

Renewables - Spotlight: hydro-power

- Global energy-storage capacity by technology

- Pumped hydro - 96.2%
- Electro-chemical - 1.5%
- Thermal - 1.5%
- Electro-mechanical - 0.8%



- Global energy-storage capacity by country

(Note: 10 countries have three-quarters of all the pumped hydro storage in the world):

- China - 28%
- Brazil - 9%
- Canada - 7%
- United States - 7%
- Russia - 4.3%
- India - 4%

- The US has removed about 500 dams since 2006.

- China's Three Gorges Dam is so big that it slowed the rotation of the Earth. (For comparison, the concrete and iron to build the dam could have built 63 Eiffel Towers.)

- *Spotlight* : hydro-power start-ups:

- Energy Vault has created an alternative to pumped-hydro. Instead of using water and dams, it uses concrete blocks and cranes. The science underlying Energy Vault's technology is simple: when you lift something against gravity, you store energy in it. When you later let it fall, you can retrieve that energy. Because concrete is a lot denser than water, lifting a block of concrete requires—and can, therefore, store—a lot more energy than an equal-sized tank of water.
- Natel is redesigning traditional hydro-power dams with smaller turbines that do not obstruct waterways, have little to no environmental impact, and can even rehabilitate damaged watersheds.

Policy

- AES *Special report*. **Every country in the world except the US supports the COP21 Paris Climate goals, but no major developed country is on track to meet them.** Australia's government fell apart over a climate bill; Canada weakened Prime Minister Trudeau's signature climate policy; and Germany, Japan and the United Kingdom — where right-wing governments have made combating climate change a national priority — will miss their target goals by a lot. It appears the Paris Accord of 2016 may have produced a worldwide climate backlash. Meanwhile, California's state legislature has voted to transition its energy grid to 100 percent renewable

energy by 2045, making it the second US state after [Hawaii](#) to set such an objective and the largest (only?) economy in the world to commit to carbon-free electricity. AES Members have access to [CA Senate Bill 100](#).

- **Electric vehicles receive [special policy considerations](#)** for federal-fuel economy standards. For example, the rules assume that electric vehicles generate no upstream greenhouse gas emissions - in other words, the emissions from the coal and natural gas power plants that produce electricity for EVs are not counted. Also, automakers get to count electric vehicles more than once to meet minimum mileage requirements, thanks to a multiplier in the rules. For instance, ZEVs (Zero-Emission Vehicles) are allowed to transfer emissions to another source, such as power plants, unless such plants run on renewable energy.

- A new economic study argues correlation and **possible causation between stronger environmental policy and improved manufacturing output**. AES Premium Members have access to the peer-reviewed [abstract](#) of the forthcoming economic study.

Beltway Buzz

- **The US and Mexico have come to an agreement in principle on a revised NAFTA; now Canada is involved in the negotiations** - though President Trump took a page out of "Art of the Deal" by '[freezing](#)' Canada out of the original negotiations in order to force concessions. Note: even if the three countries agree to a new deal, the US Constitution requires Senate approval of all US trade law, which means that **ratification can occur in the next Congress**. AES Premium Members have access to fact-sheets that review the revised draft-treaty for [manufacturing](#), [agriculture](#), and [intellectual property](#).

- The US Environmental Protection Agency (EPA) has **proposed replacing the Clean Power Plan (CPP) with the Affordable Clean Energy (ACE) Rule**. AES Premium Members have access to a [pre-publication version of ACE](#) in the Federal Register. The [new ACE rule](#) allows individual states to set their own emission guidelines to limit GHGs. The administration's argument for replacing the Clean Power Plan:

- Individual states are in a better position to manage their own emissions.
- The previous administration's efforts were a Constitutional overreach; 29 states pushed back against the rules and the Supreme Court blocked implementation.

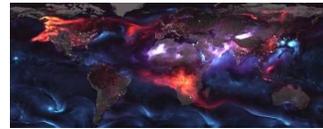
Note: public hearings on ACE are from 10 a.m. local time until 5 p.m. at three locations:

1. Sept. 24 at The Grand, 1401 Fulton St. in Fresno, Calif.
2. Sept. 25 at The Dearborn Inn, 20301 Oakwood Blvd. in Dearborn, Mich.
3. Sept. 26 at the DoubleTree, 1 Bigelow Square in Pittsburgh

Climate

- A color image from NASA provides **a different way to see [airborne aerosols](#)** caused by recent fires and industrial and consumer activity. NASA notes that the aerosols that appear in the visualization are "causing pretty serious problems on the ground":

- *Red*: Black carbon
- *Blue*: Sea-spray salt
- *Purple*: PM 2.5 dust Note: PM stands for particulate matter; also called pollution.



- *Spotlight*: **Treated drinking water** in the US

- The US consumes about 42 billion gallons of water a day; around 80% comes from surface waters such as rivers, lakes, reservoirs, and oceans, and the remaining 20% from groundwater aquifers.
- The US loses about two trillion gallons of treated drinking water to leaks.
- There are 51,356 community water systems in the US, but 8,674 systems (or about 17%) serve close to 92% of the total population.
- Memphis has the *cleanest* treated drinking water of all mid- to large-US cities.
- The second-dirtiest drinking water city in the US is Midland, Texas; the dirtiest drinking water in the US is Modesto, California.
- the US state whose treated drinking water is the **lowest** quality is West Virginia (most of the state has no treated water that can be consumed - ever); Kentucky has the second worst quality treated water (Martin County, Kentucky, has had contaminated "drinking" water for decades).

- **Americans recycle about 87 million tons of waste each year**; however, **contamination levels** of recycled materials in the US are 25%, meaning 1:4 items in a recycling bin should be thrown in the trash. For example, most recycling centers consider a cardboard pizza box that has tomato sauce residue as "contaminated" and cannot be recycled.



Electricity and Efficiency

- **Texas consumes more electricity than any other US state**, and Vermont uses the least (totals in trillion British Thermal Units, 2015).



- **Cumulative electricity generation totals in the US** - the first half of 2018, by source:

- Natural gas (34% of total electricity generation in the US)
- Coal (29%)
- Nuclear power (20%)
- Renewables (11%, excluding hydro-)
- Hydro- (6%)

- *Spotlight*: **Electric Utility Co-operatives**, by the numbers:

- There are about **900 electricity cooperatives** in the US; Texas has 75 electricity co-ops (the most), while Massachusetts, Connecticut and Rhode Island have 0;
- From 2014 to 2016, *use of coal to generate electricity declined* from 54% to 41%;
- From 2014 to 2016, *use of natural gas increased* from 18% in 2014 to 26%;

- From 2014 to 2016, *use of renewable energy increased from 14% to 17%* (total solar capacity at electric cooperatives is more than four times in 2015).

- The DoE is going to hold "[Liberty Eclipse](#)" - a military-like simulated exercise to test the grid's ability to bounce back from a cyberattack on electric, oil and natural gas infrastructure. The week-long exercise will take place in November on Plum Island.

- In the US and Japan, around 90% of homes have [air conditioning](#) ; only 5% of homes in India and 7% of homes in Indonesia have air conditioners.

Research to Market

- SunPower has [pivoted](#) away from the power-plant market in favor of commercial and residential rooftop:

- In 2016, power plants accounted for 54.8% of SunPower's \$2.56 billion in revenue but generated a gross margin of just 5.3%.
- In 2017, power plants were down to 42.1% of \$1.87 billion in revenue and a gross margin of negative 9.2%.
- Management decided to focus on commercial and residential markets.
- In 2018 first quarter, residential solar sales grew 31.7% versus a year ago to \$205.2 million and generated a 21.8% gross margin.

- Kalashnikov, the Russian firm that makes the famous AK-47 assault rifles, has built a proto-type EV: [the CV-1](#) . The company says the CV-1 is a "revolutionary cutting-edge 'supercar'" that will rival Tesla. (The Russian auto-industry is calling the CV-1 "Little Igor" and uses it as a combat robot.)



- Venture capital investments in clean energy – or cleantech – startups peaked in 2008 and have been **mired in a slump for the past six years**, despite a 10-year bull market for almost all other US investment sectors.

- Utah has the largest oil sands reserve in the US, but no one has had the technology to safely and effectively extract oil-sand resources - the process is price-sensitive, environmentally destructive, and water-intensive. For example, Canada's oil sands - characterized by vast toxic ponds - are extremely expensive to extract. But **Petroteq Energy has developed a disruptive technological process that mixes the oil-sand in solvents and then spins the residue in centrifuges to separate them.** The sand, free of oil and solvents, can be returned to the earth, while the solvents can be reused. Furthermore, the process uses no water and does not leave toxic residue in the soil.

- Grid scale solar output has dramatically expanded in California over the last 5 years, transforming the California power market and the economics of electricity generation. New research has found that, while the solar expansion has lowered wholesale electricity prices on average, it has **increased wholesale prices during morning and evening periods.** (AES Premium Members have access to the [paper](#).)

Features

Spotlight - The Global Climate Action Summit

On September 12 - 14, 2018, San Francisco will host the [Global Climate Action Summit](#). About 1,000,000 people are expected to attend dozens of "high-level" plenary sessions and more than 1,000 Affiliate sponsored break-out events - including those hosted by AES Partners and friends like [Orrick](#) (storage), Darktrace ([cybersecurity](#)), the Nordic Innovation House ([progressive companies](#)), and the [United Nations Sustainable Development Network](#) (low emissions).

What You May Have Missed - *Energy Matters*, vol. 18.4

- **Spotlight - [uranium](#) mining in the US:**

- In 1980, US companies produced about 44 million pounds of uranium - the primary supplier of the material for all nuclear power plants; last year, the US produced 2.4 million pounds.
- The US uranium industry, which once supported nearly 22,000 jobs, now employs just a few hundred people.
- The US imports 40% of its uranium from Canada and Australia; 40% from Russia, Kazakhstan and Uzbekistan; and from Niger, Mali and Mongolia.
- In 2007, uranium prices were \$140 per pound; today they are about \$20-\$25.

Quotes: On the proposed replacement of the Clean Power Plan ("CPP") with the Affordable Clean Energy ("ACE") rule

"The Clean Power Plan stunted 'energy dominance.'"
- EPA acting Administrator Andrew Wheeler

"We've been waiting even in Republican administrations for this type of deregulatory reform that has been put forward."
- Tom Pyle, President of the energy industry-backed American Energy Alliance

"We still need more changes ... to create a level playing field for coal."
- Michelle Bloodworth, CEO of the American Coalition for Clean Coal Electricity on the need for more deregulation and greater subsidies that support coal

"The CPP was like burning the Constitution."
- Harvard Law School Professor who argued in court against the CPP

"This will be remembered as the day that the war to stop climate change was lost."
- Washington Post editorial