

Energy Matters

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

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The official e-newsletter of ...



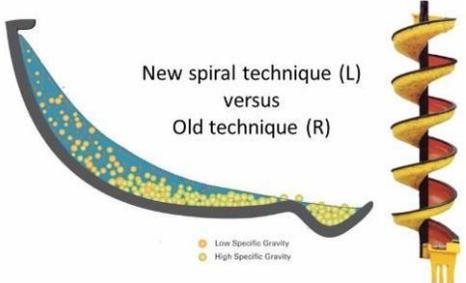
Headline News

Oil and Gas

- There are roughly [9,000 oil and gas fields in 90 countries](#) .
- Through a combination of oil and gas production along with total solar and wind capacity, **Saudi Arabia is capable of generating more than 21 terawatt hours of electricity** - that is enough to [power the world](#) .
- A 10% rise in oil prices [increases](#) the market value of oil and gas production companies by 9.9% — almost a 1-for-1 relationship. No other industry is so precisely linked to a single global price.

Coal

- Coal industry's top 3 most commonly adopted new tech improvements:

- *Spirals*: used to separate light and heavy coal particles; recent improvements in engineering design that take better advantage of gravity have made dramatic efficiency and performance improvements in the technique (R)
- *Separators*: devices that are used to separate the components of coal based on particle density as well as hydrodynamic properties. New slurry separators have a smaller modular footprint that perform better.
- *WHIMS*: wet high intensity magnetic separators are devices used to haul coal to the surface; new engineering designs have solved blockage and spillage problems caused by congestion.

Nuclear

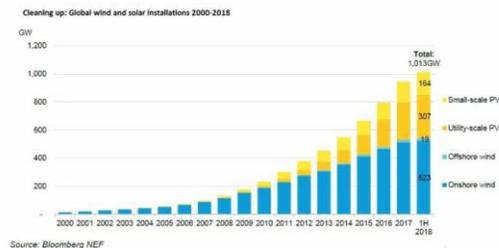
- The [Vogtle nuclear expansion project](#) in Waynesboro, Georgia, received permission from its owners - Georgia Power and Dalton Utilities - to **continue construction of two new AP1000 reactors, with contingencies:** a cost-cap trigger that stops construction immediately if the budget exceeds an additional \$1.1 billion. (Note: the project is five years behind schedule and \$13 billion over budget.)



Renewables

- **Spotlight: Solar energy + Wind energy = 1 trillion watts** (total global installed power generating capacity.) In addition ...

- Wind energy is 54% of the total;
- Solar will surpass wind by 2020;
- It took 40 years to reach the 1 terawatt mark, but around 90% of the total capacity has been installed within the last ten years.
- The next terawatt will be achieved within the next five years and will require half as much capital investment for deployment.



- " **Pavement Vehicle Interaction**", *noun*, def: pavement vehicle interaction (" [PVI](#) ") is a measurement of road quality - roughness, texture and deflection - and how this quality impacts the amount of fuel used. Recent PVI studies have found that poor road conditions can increase fuel consumption by as much as 8%.

- **Comparing energy efficiency rates between California and the rest of the US**, by total amount of energy consumed. AES Premium Members have access to the California Innovation [Report](#).

California

- \$3.29 of GDP generated for every 10,000 BTU of energy consumed
- Emissions fell by 11%, while its economy grew by 16%

The rest of the US

- \$1.75 of GDP generated for every 10,000 BTU of energy consumed
- Emissions fell by 10.6% while the economy grew by 11%

Policy

- The US Congress boosted funding for the Department of Energy for the next 12 months by \$974 million, to a total of \$35.5 billion. This appropriation is almost unprecedented:

- The funding package for the DoE had overwhelming bipartisan support.
- Unlike the rest of the budget that keeps the government funded through December, the DoE has guaranteed funding for the next year.
- It was a rejection of deep budget cuts called for by President Trump, [again](#) - and despite the discrepancy, Trump signed the department's budget into law.
- It increased funding for alternative energy RD&D.
- Perhaps most shocking, Congress ignored the advice of the US Office of Budget and Management, which asked Congress to shift responsibility for developing new energy technologies from the federal government to the private sector.

- The US EPA announced that in the future it will **only fund US citizens and permanent residents and will no longer support work in its labs by foreign nationals**. The Office of the Inspector General of the US EPA had found that its Administration recently paid \$14.5 million to fund foreign fellows at its labs through a cooperative agreement with the National Academy of Sciences. AES Premium Members have access to the EPA IG's [report](#) and to a summary of the [previous](#) requirements.

- The Office of the Inspector General of the US EPA has determined that the EPA has **fallen behind its schedule to inspect public schools for asbestos and lead in water**, and that it has not developed plans to catch-up. (AES Premium Members have access to the EPA IG [report](#).) Meanwhile, the EPA placed Dr. Ruth Etzel, head of its Office of Children's Health Protection, on administrative [leave](#). Very quietly, the EPA also eliminated all regional children's health coordinator positions. In consideration of all of the above, it looks as if the Administration may shut down the office.

Beltway Buzz

- **Looking beyond the Supreme Court confirmation hearings, here are the biggest energy/environment [cases](#) in the SCOTUS pipeline:**

- [Weyerhaeuser Co. v. Fish and Wildlife Service](#) - Does the Endangered Species Act apply to private land that is designated "unoccupied?"
- [Virginia Uranium Inc. v. Warren](#) - Does the Atomic Energy Act pre-empt state laws that regulate uranium mining?
- [Sturgeon v. Frost](#) - Does the Alaska National Interest Lands Conservation Act prohibit the National Park Service from exercising regulatory control over states?
- [Herrera v. Wyoming](#) - Does Wyoming's admission to the Union, the establishment of the Bighorn National Forest (in Wyoming), or the Crow Tribe of Indians' 1868 federal treaty determine access to "unoccupied" lands (in particular, Wyoming) in the United States?

- The following five disputes before the Supreme Court are **the important cases that the justices have not yet decided to consider** - *all involve environmental regulations*. (Note: It takes the votes of four justices for the Supreme Court to accept a case):

- [Hawai'i Wildlife Fund v. County of Maui](#): at issue is whether the **Clean Water Act applies to pollutants that reach a federally regulated body of water**.

- Silicon Valley tech billionaire Vinod Khosla has pushed forward a [dispute](#) over beach access along his property, a case with implications for **coastal management and environmental regulation**.
- An emergency [motion](#) filed against **EPA rules phasing out heat-trapping coolants** could also land on the court's agenda.
- There are a number of cases that seek clarification on how responsible parties for **restoration damages related to Superfund** sites are determined.
- There are also a number of "agency deference doctrines" in the pipeline, including **the landmark 1984 Supreme Court "[Chevron Case](#)"**, which allowed the courts to defer to federal agencies the power to interpret ambiguous laws.

Climate

- **About 9 trillion gallons of [water](#) fell over North Carolina during the "Florence" storms.** Flooding at Duke Energy's Sutton Power Plant near Wilmington breached a toxic coal ash landfill, displacing roughly 150 dump trucks' worth of toxic ash, and the Lee Power plant in Goldsboro, where coal ash coated nearby trees. AES Members have access to a true and correct copy of Duke Energy's [water quality test results](#) at and around the Sutton Power Plant. (Note: Florence was the [second](#) wettest storm in the US, behind Harvey.)



- **September was an "[odd](#)" wet month for North America:**

- Obviously, all of the Carolinas set a record for most rainfall in a single month.
- Dallas-Forth Worth received four times as much rain as normal.
- Washington, DC had a top-five all-time monthly rainfall total.
- the Appalachians experienced their wettest-ever September.
- Oklahoma set a monthly rainfall record.
- Dense rain clouds over the Gulf of Mexico released record amounts of moisture.
- A rare bout of tornadoes hit Ontario and Southern Canada.

- Tropical forests in the Amazon have been so degraded by logging, burning, and agriculture that they have started to [release more carbon](#) than they store. **The rain forests are flipping from carbon sinks to carbon sources.**

- AES recommends the **interactive climate-opinion [map](#) developed at Yale.**

Electricity and Efficiency - *AES Exclusive* : **Cybersecurity**

- **The Top-8 most powerful cyber-terrorist groups** (by assigned code-names; all target utilities or power infrastructure):

1. [Xenotime](#). Target: Oil and gas pipelines in the Middle East and the US.
2. [Raspite](#). Target: Electric utilities in the US, Europe and Japan.
3. [Magnallium](#). Target: petro-chemical industry, especially in the Middle East, and specifically Saudi Arabia.
4. Sandworm (aka "[Electrum](#)"). Target: global power sectors.

5. [Dymalloy](#). Target: Electricity sector in Europe and North America
6. [Covellite](#). Target: Electric utilities in the US.
7. [Chrysene](#). Targets: Oil and gas infrastructure in the Middle East.
8. [Allanite](#). Targets: electric utilities in the US, UK and Germany.

(Note: AES e-magazine, [Energy Today](#), has published key articles about cybersecurity.)

- Top 3 motives for launching a cyber attack:

1. Money/financial gain
2. Revenge, by inflicting damage or pain
3. Strategic acquisition of information (reconnaissance) for later attack

- Top 5 mistakes businesses make that leave them vulnerable to cyber attack:

1. *Insecure protocols*: about one-third or all cyber attacks gain access through an open system-wide weakness, like public Wi-Fi.
2. *Abnormal or unnecessary employee web-use/traffic*: many websites are not secure and accept or allow extraordinary data-acquisition requests.
3. *External communication*: inadvertent or intentional sharing of too much information.
4. *Unpatched code*: about 5-10% of all software patches have not been uploaded.
5. *Open ports*: managers often have no idea and have not identified all of the technical devices under their control and inadvertently leave open ports on company assets.

- Top 3 consumer-side mistakes that leave them vulnerable to cyber attack:

1. Authentication and encryption is left open or unprotected.
2. Passwords insecure, mainly because a device has an initial password provided by the vendor that the consumer leaves unchanged.
3. Continued use of old IoT-based devices that have no or weak security protocols.

Editor's Note: all cybersecurity bad-actors are targeting energy infrastructure. The least serious focus on the disruption of services (like outages); the most serious focus on causing irreparable damage to life and infrastructure, like the destruction of hydro-electric dams or nuclear power plants. *Source*: reporting from the Cyber Senate Summit, 9/16/2018, by invitation of [Darktrace](#).

Research to Market

- Many new tech-to-market ventures are small, digital consumer-facing products; however, a few **new entrepreneurial efforts are dedicated to the [construction side of energy](#)**. The following are four new energy construction ventures and active venture firms investing in energy construction (by number of deals in the past five years):

New energy-construction ventures

- [Katerra](#)
- [3DR](#)
- [PlanGrid](#)
- [BuildingConnected](#)

New energy-construction financing groups

- [Brick & Mortar Ventures](#) (14 deals)
- [Borealis Ventures](#) (11 deals)
- [Cottonwood Partners](#) (8 deals)
- [Caterpillar Tech Ventures](#) (7 deals)

- **The downside of [energy storage](#) , in the last year:**

- Aquion ran out of cash while developing its saltwater batteries.
- Alevo has stopped working on its long-duration lithium-ion battery.
- LightSail closed its compressed air storage business.
- ViZn Energy, manufacturer of flow-batteries, [laid off](#) its staff.

- **But the search for energy's silver bullet continues**, from flow batteries to thermal, chemical and geomechanical storage:

- [Primus Power](#) is testing improvements of its zinc-bromine flow batteries.
- [Form Energy](#) is developing a "sulfur-in-water" flow battery.
- [Antora Energy](#) is testing the storage capacity of carbon blocks that have been heated to temperatures exceeding 2,000 °C and then exposing them to thermophotovoltaic panels, similar to traditional solar panels but specifically designed to efficiently use the heat radiated by the blocks.
- [Quidnet Energy](#) is pumping pressurized water into underground rocks, and then the induced strain in the rocks forces the water back up to the surface into generators that produce electricity.

Features

Spotlight: CITRIS at the University of California, Berkeley

The current energy revolution seems to privilege small technologies ... nano, software, sensors, and of course electrons. That is why [CITRIS](#) (Center for Information Technology Research) at UC Berkeley stands out. It is a (really) big lab - the building contains 141,000 square feet of laboratory space - with lots of brilliant people chasing big dreams. One of the most impressive projects is the Sustainable Infrastructures program, where researchers test big things like corridors, highways, water channels, and building foundations. If you happen to be on the Berkeley campus and have a moment, stop by and take a peek in the window ... something big will be happening.

Quotes: The physics of energy - *Snap. Crackle. Pop.*

- ***Snap, crackle and pop*** are terms used for the fourth, fifth and sixth time derivatives of position with respect to time. (The first derivative of position with respect to time is velocity, the second is acceleration, and the third is jerk (aka "jounce"). Editor's note: "Snap, Crackle and Pop" are the cartoon mascots of Kellogg's crisped-rice breakfast cereal Rice Krispies, known in Australia as Rice Bubbles.