

ENERGY MATTERS

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

Special Issue:



The Energy Year In Review, 2017



A Look Back at the Year in Energy

2017: "A New Energy Economy"

So much attention was paid to the next generation of innovations - AI, AR, and VR; bitcoin and blockchain; data and analytics; sensors and drones; integrated and bi-directional flows - that it was easy to miss the obvious: a new energy economy took hold. The cause was the broad application of new digital technologies, which drove cheaper and abundant energy: US oil and gas output rose to a level 50% higher than any other country has ever managed; US tight oil output was the highest sustained period of growth by a single country in the history of oil markets; US shale gas production comfortably exceeded the previous record. And because energy is a fundamental (aka "foundational") accelerator, it had an impact on everything: food, health, water, the movement of people and goods, geopolitics, the climate, etc. This was a revolution on a scale comparable to any that human-kind has ever seen, and has changed lives, life styles and life...forever.



The Nine Most Important Take-Aways for Energy in 2017:

1. **Cost-effective energy prices** drove 3.4% growth of the global economy.
2. **Cheaper energy drove urbanization** at a rate never before seen in human history - the world added the equivalent of four Shanghai's (pop. 24 million) to its urban population.
3. **Cheaper energy prices benefited consumers, while energy producing nations with a nationalized oil sector were disrupted:** Arab oil-producing nations lost their hold, Russia is in turmoil, Venezuela is even worse off, ... while the US re-established itself as an undisputed geopolitical power.
4. **The world's fastest growing energy need was for electricity** (close to 40% of final consumption). What was unusual was the way the world met that need: natural gas dominated, followed by renewable energy, and then energy efficiencies; coal took another step backward.
5. **China's president called for an "energy revolution" and "declare[d] war on pollution." And when China moved, so did the world:** the combination of this two-front war drove demand for natural gas and improved energy efficiencies in the world's most populated country.
6. **Interest in "renewables" waned in the developed world, but they remained the least-harmful source of new generation for the developing world,** and the cost of new solar PV, wind, and battery storage continued to decline.
7. **The benefits of the new energy economy were uneven. For instance, universal access to electricity remained elusive** - about 675 million people – 90% in sub-Saharan Africa – do not have access to electricity; and 2.3 billion people burn dung-piles, wood, coal chips or kerosene to cook food or sterilize water. Yet, **there were some positive signs:** about 100 million people benefited from improved access to electricity - progress in India and Indonesia was notable, and in sub-Saharan Africa electrification outpaced population growth for the first time ever.
8. **The flattening of global energy-related CO2 and other GHG emissions was not enough to avoid a severe impact on the climate.** However, there was significant commitment to solve the problem of methane leaks and flaring.
9. To a significant degree, **all of the above was caused by the advent, arrival, and application of new digital technologies** throughout the entire energy sector, improving production, consumption, and efficiencies, and facilitating flexible operation of utility-scale power systems. But the rise of digital energy technologies also created vulnerabilities that remain unaddressed.



The "It's Not A 'Thing'" Award goes to ...

- **"Energy Dominance."** The US is and always will be "energy inter-dependent" with the rest of the world. Energy is, fundamentally, an economic market in a constant state of exchange and flux. Nations will try to "dominate" or even collude and form cartels (like OPEC) in order to gain competitive advantages. But market forces eventually prevail.

The "Janus-face" Award goes to ...

- *2nd place:* **Scott Pruitt.** Director Pruitt said: "Science should not be politicized." But then Director Pruitt politicized science when he announced that his EPA would evaluate the "accuracy" of climate science with "rigorous" 14 person red-team/blue-team panels.

- *1st place:* **Germany.** Germany hosted the COP23 climate conference and attendees celebrated "energiewende." However, there was little mention of the demolition of Immerath, a town in western Germany, in which everything was removed - the hospital, most of the houses, trees, the cemetery, and a Roman ruin - to create a large [coal mine](#).

The "Momus" Award (aka, Irony) goes to ...

- *2nd place:* **November 5, 2020.** The US is not allowed to formally withdraw from the Paris Climate Accord until November 5, 2020 - the exact date of the next presidential election.

- *1st place:* **Coal mining companies.** The four biggest coal mining companies in the world (Rio Tinto, Glencore, Anglo American, BHP Billiton) use a significant amount of renewable energy (36% for the former; 12% for the latter).

The "Catch-22" Award goes to ...

- *2nd place:* **Puerto Rico leadership.** [The island's leaders](#) are ready to upgrade its electrical grid, but they must wait for the lights to come back on before they can begin the work. (Note: before the Whitefish \$300 million contract to rebuild the Puerto Rico utility grid was cancelled due to evidence of collusion, Whitefish contractors were able to repair just one electrical line - and that line failed, and hasn't been re-repaired.)

- *1st place:* **Secretary of State Rex Tillerson.** At about the time that the US pocket-vetoed participation in the Paris Climate Agreement, Secretary Tillerson signed a joint statement with seven other foreign ministers calling for "action to reduce greenhouse gases." Called, the [Fairbanks Declaration of 2017](#), the agreement was also signed by Russia, Canada, Norway, Finland, Denmark, Sweden and Iceland.

The "Surprise" Award goes to ...

- *2nd place:* **Renewable energy** is booming in Iran; and, installed renewable energy capacity is expected to grow at least sevenfold over the next five years.

- *1st place:* **Private companies and local governments.** With national governments in retreat, [companies and local governments are leading a global sustainability movement](#).

The Award for dumb, dumber, and dumbest goes to ...

"Dumb" - Useless Reports

- *2nd place:* An un-named think-tank published a report that concludes that the oil and gas boom did not hurt student learning. Based on interviews with teachers and parents in six oil and gas producing states - Pennsylvania, Ohio, West Virginia, North Dakota, Montana and Colorado - the paper found that student enrollment was statistically higher in boom districts and declined in neighboring areas. (Editor's note: Where does this study begin to unravel? Causations? Correlations? Coincidences? A reliable data-set...?)

- *1st place:* The DoE grid report. Despite the implication of the study, FERC has all the authority to regulate electricity markets, and the DoE has none. And the DoE does not control FERC. (Perhaps the Tweet of the year was a satirical summary of the DoE Grid Report by Dave Levitan (author of *Not A Scientist*) who needed just 63 characters: "The grid is important. Smart people did the thing you're reading."

"Dumber" - Blanket Skepticism of Climate Science

The eclipse was predicted and verified by science - and people believed the scientific predictions and rushed to eclipse locations across the US for maximum exposure. Scientists are also telling us that the Arctic is warming especially fast, they tell us to expect heavier rainstorms, they tell us that heat waves are becoming more severe. Relatively sensible people will believe "eclipse science" but will tune-out scientifically verified evidence of climate science?

"Dumbest" - Useless Policy

- *2nd place*: A solar Mexican-border wall

- *1st place*: At the same time North Dakota politicians came close to passing a law allowing drivers to run over and kill environmental protesters without facing jail, North Carolina actually passed a similar (but watered-down) law, while 18 other states are also considering new anti-protest laws, too. (Shouldn't it go without saying that harming another human who is not a clear and present danger is not OK.)

The Moral Dilemma Award goes to ...

- **Nuclear Power.** If all US nuclear reactors operating uneconomically were replaced by new gas plants, [US GHG emissions would increase by 4.9 percent](#) because generation of electricity through nuclear energy reduces CO2 and other greenhouse gas emissions. *On the other hand*, rescuing the nuclear industry is a costly, complex challenge; subsidizing uneconomical nuclear reactors to keep them online would require an estimated [\\$2.9 billion of tax-payer funding](#) each year - the Vogtle Nuclear Power Plant in Georgia is \$2.3 billion USD over-budget. *On the other, other hand*, nuclear-plant meltdowns like the ones in Fukushima or Chernobyl released enormous amounts of radiation into surrounding communities, and beyond the risks associated with radioactive waste, the threat of nuclear weapons looms large.

The "Sorest Winner" Award goes to ...

- **The US Farm Belt.** President Trump faced the unenviable position of having to choose between two political allies: the Farm Belt political bloc, and the oil and gas industry, which had also teamed up with auto- and enviro-lobbies. The former wanted stronger biofuel RFS (a huge market for corn farmers), and the latter wanted them reduced (because they're bad for gas, bad for cars, bad for the environment). On September 25, President Trump announced that he would side with the Farm Belt and that the White House would not reduce RFS. Upon hearing of their important political victory, the Farm Belt lobby (led by the National Biodiesel board and 33 Senators) called on Trump to [increase](#) biofuel renewable fuel standards significantly higher than the agreed compromise preferred by President Trump.

The "Phaedrus" Award (aka, "Things are not always what they seem") goes to ...

- **The Congressional tax proposal (aka, 'the Energy Bill').** If not for the multi-trillion-dollar tax overhaul, the GOP tax proposal is a blockbuster energy policy on its own. For instance, Republicans have pushed for decades to open up ANWR to drilling; additionally, the House version of the tax reform bill includes cuts to renewable energy tax credits. (At the time of publication it is hard to know that is next - ANWR language was included to secure Alaska Senator Lisa Murkowski's vote because the margin in the Senate is razor thin.)

The Shakespeare ("Much Ado About Nothing") Award goes to ...

- **The ANWR Debate.** In a recent lease sale of land in Alaska's nearby North Slope ([NPR-A](#)) the Interior Department auctioned off 900 tracts of land of "unprecedented value." Unprecedented value? There were only seven bids by O&G companies for less than 1% of the total land offered. (There is so much unrealized value in more accessible O&G regions around the world that ANWR might not be a worthwhile investment.)

The Best Energy Stories

The most intriguing story about energy

- *2nd place*: **A new geopolitical reality.** The Saudi King visited Russia for the first time in history, suggesting a new convergence of interests between the Middle East and Moscow. This relationship may grow stronger and more powerful as the US takes hold of oil markets.

- *1st place*: **The US oil export boom.** Oil exports [rose to an all-time high](#) 1.98 million barrels a day, surpassing the previous record of nearly 1.5 million barrels that was hit the previous week, which surpassed the record of the week prior to that.... At this rate, the US will ship more oil than what OPEC countries like Venezuela and Nigeria produce. Fueling the boom is the widening [gap in the price of a barrel of US oil vs. non-US oil](#). US oil is now about \$6.25 cheaper per barrel.

The biggest energy story no one noticed

- *2nd place*: A shipment of [LNG from a US port was headed to China](#), and then changed course and delivered to a [Japanese port](#) because market prices had changed during transport; furthermore, the first-ever cargo of [US crude oil arrived in India](#). Both are evidence of a new and more mature market.

- *1st place*: The world added nearly a terawatt of renewable energy capacity, with about a quarter of it in the US and about half in China.

Biggest Winners and Losers

2017 was a Good Year for ...

- *2nd place*: **Energy consumers**, because, lower energy prices means declining commodity prices, too.
- *1st place (tie)*: **Texas**, particularly the Permian Basin and Houston. The 2.5 year-long recession receded, here comes Eagle Ford Shale, and while Hurricane Harvey was devastating, it brought "Houston-strong" together. (And then there was the World Series...!)

2017 was a Bad Year for ...

- *Honorable mention*: **The climate**. It could "win" this award every year, but that would be boring (and sad).
- *2nd place*: **Coal miners**. President-elect Trump promised to bring back jobs in the coal industry - but an aggregate total of 430 new mining jobs in the US does not make for a renaissance. This reminds AES of a quote by J.R.R. Tolkien: "False hopes are more dangerous than fears."
- *1st place*: **Cape Wind**. From the initial proposal in 2001, the Cape Wind project — 130 turbines across a 24-square-mile stretch of Nantucket Sound — stirred furious support and dissent. The installation would have been the nation's first offshore wind farm, but no more. The project is officially dead.



[Energy Insights from AES Member Thought-leaders](#)



Signals vs. Noise: For an *Energy Matters* end-of-year favorite, a selection of AES expert Members were asked to identify an overlooked energy development ("signal") and an over-emphasized topic ("noise"):

Allison Lami Sawyer, CEO at [Rebellion Photonics](#)

- *Signal*: Fully autonomous refineries using continuous monitoring sensors
- *Noise*: Drones (and other periodic monitoring methods)

[Scott Desmarais](#) - Partner at McKinsey & Company

- *Signal*: Continuous innovation. The energy sector continues to build on its remarkable innovation and productivity gains to remain relevant and power economic/social growth.
- *Noise*: The over-hyped future of EVs. EVs and driverless vehicles are the future, but their development path will vary significantly between markets and will be more circuitous than we currently imagine.

John Gibson - Senior Advisor at [Tudor, Pickering, Holt & Co](#)

- *Signal*: Digital Image Analysis. Cameras are cheap and images contain rich data to be harvested in every aspect of the energy industry
- *Noise*: Virtual Reality. Why "play" when a computer can analyze and give you rigorous insights?

Craig Lewis - Executive Director at [Clean Coalition](#)

- *Signal*: Wholesale Distributed Generation (WDG). The market segment that is responsible for the German renewables revolution is poised to finally unleash commercial-scale renewables in the US.
- *Noise*: Blockchain. Simply, a technically sophisticated method for tracking electronic transaction details, is frequently misrepresented as if on par with the Internet revolution.

Charles D. McConnell - Executive Director at the [Energy and Environment Initiative](#), Rice University

- *Signal:* Federal funding of innovation. The DOE recently launched a [new initiative](#) to take early stage ideas and R&D out of labs and effectively begin to implement trials and demos.
- *Noise:* The US extracting itself from the Paris Climate Agreement to reduce CO2 emissions. If all countries that signed on complied 100% it would be 1% of all necessary reductions to meet 2C target. (The message here is that we need a 6X jump in fundamental R&D funding to solve the problem.)

Gil C. Quiniones - President and CEO of the [New York Power Authority](#)

- *Signal:* Digitization
- *Noise:* Utility death spiral

Meghan O'Sullivan - Kirkpatrick Professor of the Practice of International Affairs, Harvard Kennedy School

- *Signal:* US foreign policy outside energy domains (aka, a "boomerang" policy, such as US immigration policy towards Mexico, which has an indirect impact on energy)
- *Noise:* OPEC supply deals (i.e. production cuts, etc.)

Jamey Rosenfield - SVP, IHS; Cofounder, [IHS Cambridge Energy Research Associates](#)

- *Signal:* Energy innovation
- *Noise:* The "end of exploration"

[Tim Sasseen](#) - Principal Advisor for Distributed Generation at the [Center for Sustainable Energy](#)

- *Signal:* Waste-to-energy conversion. A goldmine of energy value hidden in plain sight. Aggressive programs are needed to demonstrate and evolve technologies like syngas and hydrogen generation from a wider variety of feedstocks, and to leverage natural gas infrastructure to utilize these recovered fuels.
- *Noise:* Grid instability caused by renewables. This should be settled; let's move on to discussing how renewables and storage helps solve resiliency and distribution infrastructure challenges.

Dahvi Wilson - Director of Public Affairs at [Apex Clean Energy](#)

- *Signal:* Utilities, corporations, and industrial customers are buying wind energy with urgency.
- *Noise:* The concept that adding more wind to the grid will make our electric system less reliable. This claim is inaccurate - more diversity actually makes the grid more resilient and secure.



[The Best In Energy Content](#)



The best book on energy

- *Honorable mention:* [Troublemakers](#), by Leslie Berlin. Though this book isn't about energy - it's about innovators in Silicon Valley - it is a model for a book about this generation of innovators in oil & gas.
- *2nd place:* [Playing Through the Whistle](#), by E.L. Price (published too late in 2016 for consideration last year). A beautiful and painful story about a high school football team in steel-town Aliquippa, Pennsylvania.
- *1st place:* [Windfall: How the New Energy Abundance ... Strengthens America's Power](#), by Meghan O'Sullivan - winner of the AES Energy Writer of the Year, 2017 - the premier literary award for energy.

The best article about energy in *Energy Today*, the AES e-magazine

- *2nd place:* [Clean Energy's Dirty Secret](#)
- *1st place:* [In Silicon Valley, Power Industry Is Next Target for Disruption](#)

The most popular story in AES *Energy Matters* newsletter (based on total "clicks")

- *2nd place:* [Boaty McBoatface](#). (Boaty is the name of an UAV used to conduct research in the Antarctic Bottom Water, an extremely cold and dense body of water that contributes to ocean circulation worldwide.)
- *1st place:* **Any story about US National Parks and Monuments**. Similarly, the US Interior Department received 2.7 million unique public comments in favor of [protecting the 25 national monuments](#) designated for review, removal, or reduction - nearly 98% were in favor of protecting the parks.

The most oft-asked question via [Expert Link](#), the AES expert network service

Q. Why is it that IF the climate gets warmer and sea levels rise, that the rising and expanding sea level on all coastlines won't be exactly the same?

A. Because sea levels actually decrease near an ice formation when it loses mass because it no longer exerts the same gravitational pull on the ocean, so the water shifts farther away. Also, shifting ocean currents always redistribute ocean mass unevenly.

Sustainability and climate change were very popular cinematic themes in 2017.

In the category, "Hollywood's best 'climate-change' supervillain," AES nominates:

- *Blade Runner 2049*
- *Downsizing*
- *Geostorm*
- *Interstellar*
- *The 100 (season #4 and the radioactive super-storm)*
- *Mother!*

In the category, "documentary about 'sustainability,'" AES nominates:

- *An Inconvenient Truth, The Sequel*
- *Chasing Coral*
- *Made In Cambodia*
- *New!*
- *Plastic China*
- *The True Cost*
- *Water & Power; A California Heist*



AND THE WINNERS ARE:

- In the category of **Best Climate Change Super Villain**: [Blade Runner 2049](#). The film received the highest critics' score on Rotten Tomato's - 86%.
- In the category of **Best documentary about 'sustainability'**: [Chasing Coral](#). The sleeper of the film festivals and winner of an Audience Award in the Documentary category at Sundance, Chasing Coral is not a disaster-film; its a celebration of the endless frontier of the deep.

5 interesting facts about oil and gas that you probably didn't know ...

1. On average, a soldier in WWII [consumed about 1.7 gallons of oil](#)-based fuel per day; today, US soldiers use on average sixteen times that amount, or a bit more than 27 gallons/day.
2. According to the Pentagon, the cost of one gallon of gas for a soldier 'deep within battle' is more than [\\$200/gallon](#); furthermore, the Pentagon consumes [more oil](#) than all but forty-four countries in the world, and more than 90 percent of all oil used by the federal US government.
3. The US consumes about 3/4 of [Canada's oil production](#) and about 1/2 of the natural gas it produces.
4. If all the natural gas that flared around the world was converted into power, it could meet the [electricity needs of Africa](#).
5. What replaces oil, and how? Oil is not just used as fuel for transportation. In addition to a multitude of petro-chemicals, oil is refined with other additives to manufacture fertilizers, floor coverings, perfume, insecticides, petroleum jelly, soap, vitamin capsules ... (more than 6000 products); furthermore, Americans consume 3.5 gallons of non-gasoline petroleum products per day. It may be a noble and necessary cause, but replacing oil with different and safer substances won't be easy.

Looking Back, Looking Ahead

What [we had to say in 2016](#) about what to expect in 2017.... and we were right!

"Make no mistake, there is another wave of new US-based innovations coming - in oil and gas there are new drones, high-resolution 3D and AR/VR geological maps, advanced data analysis; renewables (especially storage) and nuclear can also anticipate robust RD&D pipelines. The overall consequence is that North America will solidify as the new epicenter of energy production for the next few years. Any region or sector (ie, OPEC or coal) that fails to innovate rapidly will be shocked to see that energy output in North America will surge every time prices nudge slightly higher."

What to expect in 2018 and beyond ...

In 2007, who would have thought that by 2017 the US would be nearly a net exporter of O&G, an electric vehicle would have won Motor Trend's Car of the Year, or that solar energy would be one of the fastest growing forms of new energy generation? So what will next year and beyond look like?

- Distributed power will become more commonplace
- Energy storage will continue to transform the grid
- Electric vehicles will be even more prevalent
- "Choice" will dominate energy
- Something new will become the new-new-thing: might it be Toyota and its hydrogen vehicles, or Bill Gates' funding of fusion reactors, or Audi making diesel from the sunlight...?

— Thank you!—

With great appreciation for another great year ...

- Caleb, Jean, and Mike of the Astros. Everyone at Tudor, Pickering & Holt. Event moderators Scott Desmarais (McKinsey), Vivek Chidambaram (Accenture Strategy), and Nate Clark and Jim Harris (PwC). Jim Claunch, especially for finding Jon Krome. Jeannie and the Women's Energy Network. Mark Mills and Coral Davenport, and now Meghan O'Sullivan. Mike Brownell at Dayaway ... just because. The Nordic Innovation House(s). Rachel Gentile in the US House of Reps. Always Bob O'Conner and Greg Miller at WSGR. The ever patient Nikki Chang. The EEI at Rice, Sally Benson at Stanford, Nika at Harvard, and Julio Friedmann at the LLNL/UC-Berkeley. Kate Ronan. Lots of people at NETL and NREL, but especially Tom Tarka and Matt Ringer, respectively. And Julio Friedmann at LBL, too. Anke, Karin, and Matthew at DeGruyter. Kaitlyn Khoe and the rest of the brilliant interns at Paly High. Our friends at Hess and Balcones. Our buddy Tom Rose. Ian at the CTO. AES BoD's, especially Scott Magargee and Greg Allen. AES staff - Colin the cool, Bryan the enthusiast, Zack the steady, Kristen the purposeful, Stacy the energizer, and Katy the glue-stick. The time and commitment of Ted Larson. And of course, Heidi Hackford.



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