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Why 2015 may be remembered as a transformative year for how we get energy

By Chris Mooney December 24, 2015

The United States is on track to shut down a record amount of coal-fired power plants in 2015. At the same time, it has installed a record amount of new solar energy capacity.

The past year, in other words, hints at a historic transition for the U.S. energy sector. From dramatic price plunges for oil and natural gas to the significant emergence of industrial batteries for energy storage, 2015 was on a momentous course even before the world came together in Paris to agree on steps to reduce global warming.

While it's not always a simple story, the overall tenor of these changes is clear — Americans are moving into a world that will get less of its energy from fossil fuels, that will embrace clean or low emission sources of electricity and that will write this into policy.

The change didn't begin in 2015 — and won't happen overnight. Nor is it really marked by any single development – but rather, by a whole range of them. Just consider these developments this year:

A turn away from coal. If there is one energy sector that received seemingly uninterrupted bad news in 2015, it was coal. From the Clean Power Plan in the United States — which will privilege natural gas and renewables — to plans in the United Kingdom to "close all unabated coal-fired power stations" by 2025, this energy source will struggle in a new world of international climate concerns.

It's expected that by the end of 2015 in the United States, there will have been a record number of coal plant retirements.

According to government data, 11 gigawatts of coal-fired power plants "had already dropped offline through September 2015," said Colleen Regan, senior analyst for North American power at Bloomberg New Energy Finance. She added that 3.4 gigawatts were scheduled to go offline in the fouth quarter of this year. The total, of 14.4 gigawatts, would be "far above the previous record of 9.3GW lost in 2012," Regan said.

And it's not just clean energy concerns driving coal down. Extremely low natural gas prices have meant that for several months this year in the United States, gas has actually supplanted coal as our number one source of electricity. As of the end of September, according to the U.S. Energy Information Administration, coal had generated 34.4 percent of U.S. electricity in 2015, and natural gas had generated 32.1 percent — almost neck-and-neck. By contrast, in 2014 at the same time, coal was at 39.3 percent and natural gas was at 27.3 percent.

The future suggests more of the same. A medium-term market report (looking out to 2020) for the global coal sector recently released by the International Energy Agency summarizes the turn. It predicts considerably lower coal demand in the future in the United States and European Union, suggests that the "golden age of coal in China seems to be over," and overall suggests only India and southeast Asian nations will see coal demand grow in the future.

Indeed, China — the world's top coal user — recently announced a "green dispatch" system that would privilege the use of renewable energy sources on its grid.

"The series of factors pushing coal prices down has been astonishing," notes the report, ranging from climate and environmental policies across the world to very low natural gas prices. The growth of coal demand stopped in 2014 after increasing for many years, the report finds, and a continued "downward trend in global coal consumption in 2015 is likely."

The maturation of wind and solar. Meanwhile, 2015 underscored that wind and solar are not only generating an ever-larger percentage of U.S. electricity, but that this will continue out to 2020 and likely well beyond it – and not just here but across the globe.

In the United States, solar likely will see record installations in 2015 — some 7.4 gigawatts' worth of capacity, according to GTM Research. Having just secured a much coveted extension of the 30 percent investment tax credit, solar may reach 100 gigawatts worth of installations by 2020 and provide 3.5 percent of U.S. power, according to the Solar Energy Industries Association.

In the past few years, U.S. solar has emerged as a kind of triple threat, as utility-scale installations are now very nearly matched by individual homeowner rooftop installations, even as corporations and businesses are also installing plenty of panels of their own. And the fourth wave is still only beginning — community or "shared" solar, which will extend availability to renters, members of condo buildings and many others.

Wind, meanwhile, just hit 70 gigawatts installed this year and is already providing about five percent of total U.S. electricity. "We're now at a 66 percent cost decline in the price utilities are paying for wind energy since 2009," said Michael Goggin, senior director of research at the American Wind Energy Association. Goggin believes the industry is on course to fulfill the Department of Energy's vision of getting 20 percent of U.S. electricity from wind by 2030.

Other parts of the world are rushing in the same direction. This year African leaders announced plans to install 300 gigawatts of clean energy by 2030, which is nearly double the total energy capacity installed on the entire continent. India has set plans for 175 gigawatts of renewable energy by 2022, and the International Energy Agency now forecasts that renewables will be energy's single biggest growth sector out to 2020 – largely in developing countries — and see 700 gigawatts of total added capacity.

None of this means that coal use will end tomorrow, but it does mean that wind and solar are entering the big leagues.

A "breakout" for energy storage. At the same time, a key "enabling technology" that may further enhance our ability to

use solar began to seem truly viable this year.

It has long been a mantra that because "electricity cannot be stored in large quantities," as the North American Electric Reliability Corp. puts it, the amount of electricity generated and the amount used on the grid must stay in "constant balance." But 2015 is the year where this may cease to really be true — because it has been a banner year for the emergence of energy storage, especially when it comes to the use of large, grid-scale batteries.

Energy storage drew massive public attention back in April when Tesla announced its new home battery, the Powerwall. Less visible has been the much greater growth of energy storage on the electric grid. Just last week AES announced plans to buy a gigawatt-hour worth of batteries for use on the grid. GTM Research's Ravi Manghani has declared that "2015 is turning out to be a breakout year for the U.S. energy storage market," with triple the deployments seen in 2014.

Utility firms are adding large batteries to the grid in key places because there are myriad benefits from doing so — including potentially replacing natural gas "peaker plants" that are used to ramp up very quickly at times of high demand. Batteries, it turns out, can potentially do that, too.

Most important, storage means that in the future, energy originally generated from solar installations may not have to be used immediately. It could be saved for later — used even at night. This is critical for enabling the further growth of solar because it helps to get around one of its key limitations — that it is intermittent, due to weather and the simple rotation of the Earth.

The launch of global and domestic climate policy. The growth of renewables and the decline of coal aren't happening by accident — they are being buoyed by a sense that the world must move in this direction, due to climate change. That sense was made official early this month in Paris as 195 nations agreed to steadily cut their emissions with the goal of keeping the planet's warming not only considerably lower than 2 degrees Celsius above pre-industrial levels, but perhaps even as low as 1.5 degrees C.

This is probably the single most transformative energy development of 2015, because it provides a global policy signal that the world will shift, as rapidly as possible, toward lower-emitting forms of energy. In effect, it assures the future of wind and solar even as it provides the starkest "writing on the wall" for coal, as Michael Liebreich, advisory board chairman of Bloomberg New Energy Finance, has put it.

And it probably wouldn't have been possible had not the United States also released a domestic policy, in the form of the EPA's Clean Power Plan, to cut emissions from the largest source — the electricity sector. The plan doesn't even kick in until 2022, by which time measures like the Paris agreement and newly extended tax breaks for wind and solar will likely have already spurred along a considerable clean energy transition (and perhaps as much as doubled the percentage of U.S. electricity that comes from these sources).

Along with Paris, the Clean Power Plan shifts the debate. The question is no longer about whether action will be taken — it already has been – but about how rapid and effective it will be.

The possible decoupling of economic growth from emissions. There were also tantalizing signs in 2015 that the world is learning how to grow economies without spewing an ever larger amount of carbon pollution at the same time.

Examining 2014 data earlier this year, the International Energy Agency found that global carbon dioxide emissions from the use of energy did not grow last year. It marked "the first time in 40 years in which there was a halt or reduction in emissions of the greenhouse gas that was not tied to an economic downturn," the agency said.

And then just this month, scientists published the finding that in 2015, emissions may have actually ticked down slightly in comparison to 2014 levels, even though, again, there was no global recession.

It's important to be cautious here – many scientists think that emissions have not yet peaked for good and suspect they'll keep going up as electrification reaches more people in nations like India, and much of that power still comes from traditional sources like coal. Nevertheless, it was a tantalizing hint that growth is possible without worsening the state of the planet.

Dramatically low oil and natural gas prices. There was one other major energy trend worth noting this year — incredibly low prices for both oil and natural gas.

Cheap natural gas contributes to the decline of coal, and emits only about half as much carbon dioxide when burned. Yet the stark plunge in oil prices, from over $100 per barrel little more than a year ago to around $ 36 per barrel today, likely works to undermine progress in another key sector: transportation, which contributes nearly 25 percent of all greenhouse gas emissions from fossil fuel burning.

While electric vehicles have grown in popularity, they still comprise a relatively tiny percentage of all vehicles in the United States. The story of renewable fuels or biofuels is even more disheartening, especially in the United States, where mounting controversy has plagued the Renewable Fuels Standard and long-awaited cellulosic ethanol remains a tiny fraction of our overall fuel supply. Meanwhile, low oil prices — and correspondingly low gasoline prices — mean that in the first nine months of this year, according to new data from the U.S. Energy Information Administration, levels of gasoline consumption actually shot up three percent.

Overall, this confirms a common mantra in the climate arena — it's going to be harder to transition the transportation sector than it will be to transition the electricity sector, principally because powering something that moves (like a car or plane) without energy-dense fossil fuels is a lot tougher than powering something that stays put. And cheap gasoline only makes it tougher to bring on such a change.

The fact remains that humans will be using coal, oil, and gasoline for a long time. As a result, it could be quite the planetary photo finish when it comes to whether we actually stay under that global target of 2 degrees Celsius.

Nonetheless, 2015 marked a key moment in the shift toward a new way of doing things in the energy world, and the consequences will unfold over the course of the entire century.

Correction: In a previous version of this article, the quotation from Colleen Regan stated that 4.4 gigawatts of coal plants were scheduled to go offline in the fourth quarter. The actual number is 3.4 gigawatts, for an expected total of 14.4 gigawatts in 2015.

Chris Mooney reports on science and the environment.

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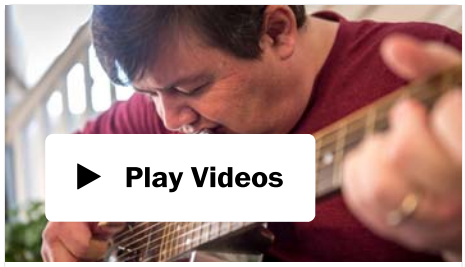

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