

## CLIMATE AND ENVIRONMENT

# Turns out wind and solar have a secret friend: Natural gas



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We're at a time of deeply ambitious plans for clean energy growth. Two of the U.S.'s largest states by population, [California](#) and [New York](#), have both mandated that power companies get fully 50 percent of their electricity from renewable sources by the year 2030.

Only, there's a problem: Because of the particular nature of clean energy sources like solar and wind, you can't simply add them to the grid in large volumes and think that's the end of the story. Rather, because these sources of electricity generation are "intermittent" — solar fluctuates with weather and the daily cycle, wind fluctuates with the wind — there has to be some means of continuing to provide electricity even when they go dark. And the more renewables you have, the bigger this problem can be.

Now, a [new study](#) suggests that at least so far, solving that problem has ironically involved more fossil fuels — and more particularly, installing a large number of fast-ramping natural gas plants, which can fill in quickly whenever renewable generation slips.

The new research, published recently as a working paper by the National Bureau of Economic Research, was conducted by Elena Verdolini of the Euro-Mediterranean Center on Climate Change and the Fondazione Eni Enrico Mattei in Milan, Italy, along with colleagues from Syracuse University and the French Economic Observatory.

In the study, the researchers took a broad look at the erection of wind, solar, and other renewable energy plants (not including large hydropower or biomass projects) across 26 countries that are members of an international council known as the Organisation for Economic Co-operation and Development over the period between the year 1990 and 2013. And they found a surprisingly tight relationship between renewables on the one hand, and gas on the other.

"All other things equal, a 1% percent increase in the share of fast reacting fossil technologies is associated with a 0.88% percent increase in renewable generation capacity in the long term," the study reports. Again, this is over 26 separate countries, and more than two decades.

"Our paper calls attention to the fact that renewables and fast-reacting fossil technologies appear as highly complementary and that they should be jointly installed to meet the goals of cutting emissions and ensuring a stable supply," the paper adds.

The type of "fast-reacting fossil technologies" being referred to here is natural gas plants that fire up quickly. For example, General Electric and EDF Energy currently [feature](#) a natural gas plant in France that "is capable of

reaching full power in less than 30 minutes.” Full power, in this case, means rapidly adding over 600 megawatts, or million watts, of electricity to the grid.

“This allows partners to respond quickly to grid demand fluctuations, integrating renewables as necessary,” note the companies.

“When people assume that we can switch from fossil fuels to renewables they assume we can completely switch out of one path, to another path,” says Verdolini. But, she adds, the study suggests otherwise.

Verdolini emphasized this merely describes the past — not necessarily the future. That’s a critical distinction, because the study also notes that if we reach a time when fast-responding energy storage is prevalent — when, say, large-scale grid batteries store solar or wind-generated energy and can discharge it instantaneously when there’s a need — then the reliance on gas may no longer be so prevalent.

Other recent research has suggested that precisely because of this overlap between fast-firing natural gas plants and grid scale batteries — because they can play many of the same roles — extremely cheap natural gas prices have helped the industry out-compete the storage sector and slowed its growth.

Two other researchers contacted for reactions to Verdolini’s study largely agreed with its findings.

“I think policymakers haven’t really grasped what 50 percent renewables really means in a system, without at least cheap batteries available,” says Christopher Knittel, who directs the Center for Energy and Environmental Policy Research at MIT, and who said he found the study’s results quite plausible.

“It’s certainly true that as one adds more renewables, the value of flexible generation increases, and so I would expect to see some correlation as they found,” added Eric Hittinger, an energy system researcher at the Rochester Institute of Technology who like Knittel was not involved in the study.

Hittinger and Knittel agreed that adding flexible natural gas alongside renewable projects is not a major climate change concern because the gas plants wouldn’t be running all the time — so it’s not like adding coal plants. The emissions would be real, but considerably more limited. However, they said, the principal issue is that the research suggests renewable plants are more costly to build, because of the added backup requirement.

“It’s a reality check now,” said Knittel of the study. “I think it’s potentially bad news as we start to get higher and higher penetration levels of renewables.”

The study also lends some credence to the widespread description of natural gas as a so-called “bridge fuel” that allows for a transition into a world of more renewables, as it is both flexible and also contributes less carbon dioxide emissions than does coal, per unit of energy generated by burning the fuel. (Environmentalists like to point out that if there are enough methane leaks from the process of drilling for and transporting natural gas, this edge could be canceled out.)

Hittinger also questioned what the correlation found in the study actually means — does it mean that natural gas *spurs on* the development of more solar and wind, or vice versa?

Verdolini said the study implies that the causation occurs with gas plants being added first, which then makes renewable projects more easy to integrate. “It’s an enabling factor,” she said, although she cautioned that the study cannot fully demonstrate causation.

Verdolini agreed that the findings are something that decision-makers hoping to add more clean energy to the grid will have to take into account.

“If you have an electric car, you don’t need a diesel car in your garage sitting there,” said Verdolini. “But in the case of renewables, it’s different, because if you have renewable electricity and that fails, then you need the fast acting gas sitting in your garage, so to speak.”

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