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ENERGY

Portugal Ditched Fossil Fuels for 4 Days. Can We Go Longer?

Achieving a big scale-up of renewable energy will take more than building wind and solar power plants.



Solar panels in Amareleja, Portugal, help the country increase its supply of renewable energy.

PHOTOGRAPH BY MARIO PROENÇA, BLOOMBERG/GETTY IMAGES

By **Christina Nunez**

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Portugal became the latest country to coast solely on renewable energy this month, going without fossil-fuel power for four days straight. Denmark, Germany, and others recently have declared similar feats. But are these temporary clean-power surges a mark of real change, and if so, how far can that go?

“This is definitely signalling a shift in terms of the energy mix,” says Luca De Lorenzo, project manager at Sweden’s nonprofit research group [Stockholm Environment Institute](#).

Overall, renewable energy is gaining ground on the world’s electric grids, accounting for nearly 60 percent of the world’s new electric capacity, according to the [renewable energy research network REN21](#).

Still, wind and solar panels together account for just 4 percent of the total power supply. Though the coal industry has been on the decline in some places, the world is still largely reliant on fossil fuels to generate power. Efforts to cut planet-warming greenhouse gases depend markedly on the power sector, which accounts for about 42 percent of all energy-related carbon emissions. Nuclear plants can contribute to the clean-energy bottom line, but they face opposition over waste and safety issues, as well as political and [economic headwinds](#).

De Lorenzo says fluctuating day-to-day factors can influence how much of a share renewables can grab on the grid. “These events [like Portugal’s] happen when you have, on one hand, lower demand,” he says, “and at the same time, you’re lucky that during those days or hours, you had an extremely rich resource of renewable energy.”

Unusually high winds, for example, helped [Denmark](#) generate 140 percent of its electricity needs one day last year.

Wind and solar command a lot of attention when it comes to renewable energy, but in many cases, other low-emissions sources are providing big assists. A key player in Portugal’s win is hydroelectric power, which accounts for about 19 percent of the country’s supply. Hydro can provide the steadier output needed to fill in gaps when the wind isn’t blowing or the sun isn’t shining.

“It is an achievement,” says Mark O’Malley, an engineering professor and a coordinator for the [European Energy Research Alliance](#), of the Portugal landmark. But he adds, “I’m pretty sure that without [hydroelectricity], they wouldn’t have been able to do it.”

Other countries, including Costa Rica, Paraguay, and Uruguay, have also benefited from strong hydroelectric resources. For all of 2015, Costa Rica got 99 percent of its [power from renewables](#), the majority of that coming from dams.

Having a strong reserve of geothermal energy can help lay a foundation, too, as is the case in Iceland, Philippines, and others. But developing those resources takes time, money, and political consensus, which can often hold projects back.

“What would be *really* surprising,” O’Malley says, “is if somebody was running the entire system off wind and solar.”

That’s the crux of many renewable energy debates: Just how far can wind and solar expand?

The answer depends on a dizzying array of factors, from policy to local natural resources to the grid itself. Denmark, for example, has achieved a breathtaking scale-up of wind power, which now provides [more than 40 percent](#) of its electricity.

O’Malley points out, though, that it also has connections to larger grid systems, allowing it to export surplus power to Norway, Sweden, and Germany. Denmark also has a carbon tax, further discouraging fossil fuel use. Without such outlets, the extra capacity is wasted, and the economics become less attractive. China, for example, wasted at least 15 percent of its [wind capacity last year](#), in part because of policies that favored coal-fired power.

Smarter grids can allow for greater flexibility in incorporating wind and solar. The current U.S. grid, for example, could probably scale up to 35 percent wind and solar (up from about 5 percent), according to a presentation from the National Renewable Energy Lab at a recent [symposium](#).

Paul Denholm, an NREL analyst, said his group’s research found that the U.S. could ultimately push that figure to 80 percent—but “we do need to change the way we build and operate the system.” Among other measures, more interconnections would need to be built to move electricity around to where it’s needed, and more power plants would need the ability to cycle up and down quickly. ([See an example of such a plant in California.](#))

What about storage to capture those midday bursts of sun and nighttime gusts of wind? “Storage is too expensive,” Denholm said. “It doesn’t make sense to deploy it in today’s system.” Down the road, however, as costs come down and renewable penetration goes up, that could change.

The idea that the world as it stands today can transition to 100 percent renewable energy, as some experts have [suggested](#), just isn’t feasible, O’Malley says, but he also disagrees with the notion that wind and solar can only play a small role. The answer, he believes, is somewhere in the middle. “If you hear anyone making any extreme statements,” he says, “they’re most certainly wrong.”

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