



ENVIRONMENT

A Tricky Transition From Fossil Fuel

Denmark Aims for 100 Percent Renewable Energy

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BY DEGREES

COPENHAGEN — Denmark, a tiny country on the northern fringe of Europe, is pursuing the world's most ambitious policy against climate change. It aims to end the burning of fossil fuels in any form by 2050 — not just in electricity production, as some other countries hope to do, but in transportation as well.

Now a question is coming into focus: Can Denmark keep the lights on as it chases that lofty goal?

Lest anyone consider such a sweeping transition to be impossible in principle, the Danes beg to differ. They essentially invented the modern wind-power industry, and have pursued it more avidly than any country. They are above 40 percent renewable power on their electric grid, aiming toward 50 percent by 2020. The political consensus here to keep pushing is all but unanimous.

Their policy is similar to that of neighboring Germany, which has spent tens of billions pursuing wind and solar power, and is likely to hit 30 percent renewable power on the electric grid this year. But Denmark, at the bleeding edge of global climate policy, is in certain ways the more interesting case. The 5.6 million Danes have pushed harder than the Germans, they have

gotten further — and they are reaching the point where the problems with the energy transition can no longer be papered over.

The trouble, if it can be called that, is that renewable power sources like wind and solar cost nothing to run, once installed. That is potentially a huge benefit in the long run.

But as more of these types of power sources push their way onto the electric grid, they cause power prices to crash at what used to be the most profitable times of day.

That can render conventional power plants, operating on gas or coal or uranium, uneconomical to run. Yet those plants are needed to supply backup power for times when the wind is not blowing and the sun is not shining.

With their prime assets throwing off less cash, electricity suppliers in Germany and Denmark are on edge. They have applied to shut down a slew of newly unprofitable power plants, but nervous governments are resisting, afraid of being caught short on some cold winter's night with little wind.

The governments have offered short-term subsidies, knowing that if they force companies to operate these plants at a loss, it will be a matter of time before the companies start going bankrupt.

Throughout Europe, governments have come to the realization that electricity markets are going to have to be redesigned for the new age, but they are not pursuing this task with urgency. A bad redesign could itself throw customers into the dark, after all, as happened in California a decade ago.

Denmark is geographically lucky. It has strong electrical linkages to neighboring Sweden, with plentiful nuclear power capacity, and Norway, with power available on demand from dams. But Swedish politicians have vowed to shut down the country's nuclear plants and go renewable, and Norway's cheap hydroelectric power is in rising demand, with a supply line under consideration to energy-hungry Britain. So the Danish electricity industry sees trouble coming.

“We are really worried about this situation,” Anders Stouge, the deputy

director general of the Danish Energy Association, said in an interview. “If we don’t do something, we will in the future face higher and higher risks of blackouts.”

The government is somewhat dismissive of that notion but well aware that it needs to find a way out of this box. Environmental groups, for their part, have tended to sneer at the problems the utilities are having, contending that it is their own fault for not getting on the renewables bandwagon years ago.

But the political risks of the situation also ought to be obvious to the greens. The minute any European country — or an ambitious American state, like California — has a blackout attributable to the push for renewables, public support for the transition could weaken drastically.

So the trick now is to get the market redesign right. A modest version of reform would essentially attach a market value, and thus a price, to standby capacity. But Rasmus Helveg Petersen, the Danish climate minister, told me he was tempted by a more ambitious approach. That would involve real-time pricing of electricity for anyone using it — if the wind is blowing vigorously or the sun is shining brightly, prices would fall off a cliff, but in times of shortage they would rise just as sharply.

As Denmark, like other countries, installs more smart meters and smart appliances able to track those prices with no human intervention, one can imagine a system in which demand would adjust smoothly to the available supply. Most people would not care if their water heater were conspiring with other water heaters to decide when to switch on and off, as long as hot water reliably came out of the tap.

Yet, even if Denmark can figure out a proper design for the electric market, it has another big task to meet its 2050 goal: squeezing the fossil fuels out of transportation. Prematurely, perhaps, the country embraced a proposed system of electric cars in which depleted batteries would be switched for fresh ones in minutes, but only a few hundred cars were sold before that overly ambitious plan flopped.

Mr. Petersen told me he still felt electrification of cars was the way to

go, but the cars themselves were not really ready.

“We need longer range and lower prices before this becomes a good option,” he said. “Technology needs to save us here.”

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