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## Obstacles to Danish Wind Power

By [JAMES KANTER](#)

COPENHAGEN — During howling winter weather two years ago, the thousands of windmills dotting [Denmark](#) and its coastline generated so much power that Danes had to pay other countries to take the surplus.

The incident was the first of its kind, and lasted only a few hours. Low temperatures were an aggravating factor, because Denmark's combined heat and power plants were also running full bore and generating a lot of electricity.

Since then, there have been just two more instances in which the price of wind power in Denmark turned negative for a significant period of time because of excess wind, according to the national grid company, [Energinet.dk](#).

Still, the incidents have highlighted the risks of expanding the reliance on renewable sources like wind before necessary grids, storage and other technologies are established to handle their intermittency and volatility.

The incidents also make the recent proposal by the Danish government — to generate half the nation's power from wind within eight years, up from less than a quarter currently — look all the more ambitious.

Danish consumers already pay more than the European average for their power, and the Danish Parliament still must approve the target amid concerns that realizing the plan would be expensive and could damage competitiveness.

A major part of the expansion into wind will be at offshore sites that are comparatively costly to build and maintain, compared with onshore sites and many other energy sources.

Martin Lidegaard, the Danish minister for climate and energy, has portrayed the plan as an insurance policy against the rising costs of fossil fuels.

Expanding wind is “a good investment if energy prices increase more than we forecast, and there is a significant risk of that happening,” he said.

Yet the biggest challenges may be more technical than financial.

Meeting the government’s target was “possible but not straightforward,” said Jens Moller Birkebaek, a vice president at [Energinet.dk](http://Energinet.dk).

A major concern is that the supply of electricity might exceed demand for about 1,000 hours each year by 2020 unless there are substantial changes in the way electricity is managed in Denmark, Mr. Birkebaek said.

Denmark already must store abroad, where the geography is more suitable, large amounts of excess energy from its fleets of windmills.

In Norway and Sweden, wind power from Denmark pumps water uphill to reservoirs. That water is released and drives turbines when power is in demand.

But the Danes often pay more for the repurchased power than they received for the surplus because prices depend on demand in the broader Nordic power market.

Improved weather forecasting could help power companies anticipate when other countries need Danish power or to anticipate when those countries are in a position to sell power to Denmark.

Denmark also is expected to take advantage of an existing plan to remove overhead power lines and bury them underground to install a more efficient and responsive domestic grid to help handle variations in the wind.

But experts say that the critical factor for enabling the government to meet its goal will be investment in new and bigger interconnectors to trade more electricity with neighboring countries.

Along with projects already under way in Scandinavia, there are plans for new interconnectors between Denmark and the Netherlands, and there are early discussions about building an interconnector with Britain, said Anders

Eldrup, the chief executive of Dong Energy, the biggest Danish power utility.

“It is a steep increase to go from 20 percent to 50 percent wind in just a few years time, so there is a challenge there,” Mr. Eldrup said. “But I think our experience tells us that there also solutions to these challenges.”

Mr. Eldrup said using vastly more wind is part of his strategy to switch off [coal](#) plants within 20 years by using a combination of power generated from wind, biomass and gas, which is less polluting than coal and can be fired up quickly when the wind is not blowing.

“Big-scale wind and gas are a sort of yin and yang,” Mr. Eldrup said.

To encourage this, governments would need to allow utilities to earn a premium rate for using gas to encourage the utilities to switch it on and off when needed, he said.

New storage technologies to manage the increase in wind power might also be necessary, he said.

Among the most promising is electrolysis, or extracting hydrogen from water. The hydrogen could then run fuel cells or be used to synthesize gas to provide power when wind was unavailable.

A breakthrough is possible before the end of the decade but “the technology is not mature there yet,” Mr. Eldrup said.

One storage strategy that Dong is already focused on is the anticipated electrification of the transport sector.

Two years ago Dong Energy took a stake in the Danish subsidiary of Better Place, a U.S. company that leases batteries and builds charging facilities for [electric vehicles](#), including home charging equipment and battery swap stations.

[Renault](#), the French car manufacturer, has received orders in Denmark for about 1,000 models of its all-electric Fluence that will operate on battery systems from Better Place. Delivery of those cars should start in coming weeks, and there could be 20,000 electric cars on Danish roads by 2014, according to Better Place.

That is still a tiny fraction of the two million cars on Danish roads — but enough to help to start balancing power on the national grid, said Torben Andersen, the chief commercial officer for Better Place Denmark.

“Electric cars are basically big batteries on wheels that have the virtue of being largely paid for by consumers and managed by companies like ours,” Mr. Andersen said. “That’s a hugely attractive proposition for utilities in countries like Denmark that need to find outlets for their renewable energy.”