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## Germany's energy transformation

# Energiewende

**German plans to cut carbon emissions with renewable energy are ambitious, but they are also risky**

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"THE quieter the evening, the more you hear it," says Wilfried Bockholt, mayor of Niebüll in North Friesland. He mimics the sound of a 55-metre-long rotor whirling round a windmill's mast. He is a driving force behind the "citizens' wind park", but he has mixed feelings. A region famed for broad horizons is now jagged with white spires. "They alter the landscape completely," he laments.

North Friesland's wind boom is part of Germany's *Energiewende* (energy transformation), a plan to shift from nuclear and fossil fuels to renewables. It was

dreamed up in the 1980s, became policy in 2000 and sped up after the Fukushima disaster in March 2011. That led Angela Merkel, the chancellor, to scrap her extension of nuclear power (rather than phasing it out by 2022, as previous governments had planned). She ordered the immediate closure of seven reactors. Germany reaffirmed its clean-energy goals—greenhouse-gas emissions are to be cut from 1990 levels by 40% by 2020 and by 80% by 2050—but it must now meet those targets without nuclear power.



A new dawn

AFP

The rest of the world watches with wonder, annoyance—and anticipatory Schadenfreude. Rather than stabilising Europe's electricity, Germany plagues neighbours by dumping unpredictable surges of wind and solar power. To many the *Energiewende* is a lunatic gamble with the country's manufacturing prowess. But if it pays off Germany will have created yet another world-beating industry, say the gamblers. Alone among rich countries Germany has "the means and will to achieve a staggering transformation of the energy infrastructure", says Mark Lewis, an analyst at Deutsche Bank.

Much could go wrong. Wholesale electricity prices will be 70% higher by 2025, predicts the Karlsruhe Institute of Technology. Germany must build or upgrade 8,300km (5,157 miles) of transmission lines (not including connections to offshore wind farms). Intermittent wind and sun power creates a need for backup generators, while playing havoc with business models that justify investing in them. Hans-Peter Keitel, president of the Federation of German Industry, likens the *Energiewende* to "open-heart surgery".

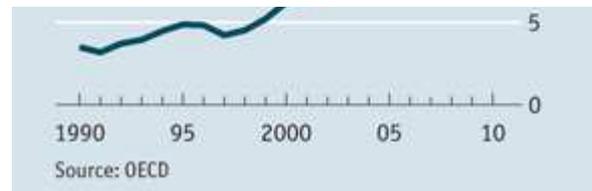
In May Mrs Merkel sacked the environment minister, Norbert Röttgen, after he led her Christian Democrats to a disastrous defeat in a regional election. His successor is Peter Altmaier, a canny parliamentarian who will share responsibility with the economy minister, Philipp Rösler. In fact Mrs Merkel has taken charge herself. She convenes energy summits with leaders of the 16 states, and promises to incorporate grid operators' plans into federal law by the end of the year. But even she admits the *Energiewende* is a "Herculean task".

## Power from the people

The plan will require two transformations, one micro and one macro. The first is an unruly, subsidy-fed explosion of wind, solar and biomass power, a "strange mixture of idealism and greed," as one energy boss calls



it. The second is the effort to pull this into a system providing reliable and affordable electricity. Protagonists of the micro version



see themselves as democratising economic and political power. The renewable-energy law entitles anybody who puts in a solar panel or a windmill to sell surplus power to the grid, receiving a generous "feed-in tariff" guaranteed over 20 years. This gives renewable electricity priority over conventional power. Not surprisingly, renewables grew ten times faster than the OECD average from 1990 to 2010 and now account for 20% of electricity output (see chart). The government's target is 35% by 2020. Germany gets more electricity from renewable sources than any other big country.

The return on capital can top 20% a year in the best spots. But do not confuse harvesters of sun and wind with electricity plutocrats. "One important goal is to break the monopoly" of the four big power companies that dominate the market, says Hermann Albers, president of the Federal Wind Energy Association. Municipal utility companies plan to boost their share of electricity production from a tenth to at least a fifth by 2020. More than 100 municipalities want to be "100% renewable".

The number of "energy co-operatives" has risen sixfold since 2007, to 586 last year. Solar parks have migrated from farms and family houses to apartment blocks. "Roof exchanges" match owners with investors. Niebüll allows only wind farms in which residents can buy stakes, lest landowners become local fat cats and others rebel against the project. In 2010 over 50% of renewable-energy capacity was in the hands of individuals or farmers, according to trend:research, a consultancy. The big four had just 6.5%.

This is perking up sleepy regions. Farmers are likelier to remain on the land. Services, from consultants who guide investors through the subsidy jungle to specialist windmill repairmen, have taken root in towns. The taxes paid by Niebüll's wind park are one of the town's main sources of revenue; in smaller

settlements they may be almost the only local source.

The micro-level works almost too well. Schleswig-Holstein plans to generate three times as much renewable energy as it consumes and to export the surplus south and west. Southern states are keen to produce their own renewable power, too. Bavaria talks of self-sufficiency. The states' windpower targets add up to double the federal government's goal of 36 gigawatts by 2020.

Solar power, which consumes half the total subsidy but provides just a fifth of renewable electricity, is racing ahead of target. The *Energiewende* raises costs, unsettles supply and provokes resistance at grass-roots level. The system coped with the first influx of renewable energy, says Rainer Baake, who heads a lobby group called Agora Energiewende. But the next 20% will require a transformation.

One fight is over who will pay. The most energy-intensive consumers are shielded from the feed-in tariff, leaving ordinary folk, including pensioners and the unemployed, to foot the bill. The nuclear shutdown pushed up industry's electricity bills relative to its competitors, argues Annette Loske of VIK, which represents big consumers. The political assault on their exemption undermines the confidence they need to invest. An even bigger worry is supply interruptions, which can disrupt factories even if they last for fractions of a second. VIK says they have risen 30% in the past three years. The odds of outright power cuts have jumped.

Renewables can depress wholesale prices, eg, when the sun creates a midday jolt. This discourages investors in the flexible, gas-powered generation needed to provide backup for windless, cloudy days. "The market dynamics are completely destroyed," says Peter Terium, boss of RWE, one of the big four. There is talk of paying generators to offer capacity, not supply power. But such payments would add another subsidy distortion to the market.

The €20 billion national-grid plan is another macro-project

meant to channel micro-level exuberance. It assumes that the biggest need will be to supply northern wind power to southern and western consumers. Yet if so, perhaps renewables should be tempered elsewhere. "We have to synchronise infrastructure and renewables", by allowing new wind and solar projects only where the grid can take delivery of what they produce, says Stephan Kohler, head of the German Energy Agency. Upgrading the grid, to beyond Germany as well as within it, would reduce waste and the risk of instability.

But the vision is contested. Expansion of the grid has been thwarted by bureaucrats' inertia, politicians' foot dragging and activism by those who hate transmission masts as much as they do nuclear power. Even upgrades to existing lines can mobilise opposition, as in Quickborn, south of Niebüll. Hard-core decentralists deny that power must be transmitted over long distances. "You can put the grid development plan directly in the bin," says Matthias Willenbacher of Juwi, a big builder of solar and wind projects. Bavaria's aspirations encourage such hopes. When the federal government tried to speed up cuts in the feed-in tariff for solar power, several states put up a fight, forcing a partial retreat. The renewables lobby, like the industrial one, demands stable investment conditions. Solar power will be competitive without subsidies by 2020, the solar lobby insists.

Germany is groping for a mix of top-down direction-setting and bottom-up buy-in for its *Energiewende* to work. The federal government may limit foes of transmission projects to one court challenge. But consultation with citizens is vital, reckons Mr Matthiessen. TenneT, which operates the grid in Schleswig-Holstein, wants to extend the wind park idea to the transmission network, offering stakes in a line along the west coast. But Mr Bockholt, Niebüll's mayor, sounds a warning: Schleswig-Holstein's plans to harvest its wealth of wind will soon "reach the limits of what is tolerable".

It is hard to think of a messier and more wasteful way of shifting from fossil and nuclear fuel to renewable energy than the one Germany has blundered into. The price will be high, the risks are

large and some effects will be the opposite of what was intended. Greenhouse-gas emissions are likely to be higher than they would have been for quite a while to come. But that does not mean the entire enterprise will fail. Politicians cannot reinvent the *Energiewende* on the run, but they can stay a step ahead of the risks and push back against the costs—and they are beginning to do so. In the end Germany itself is likely to be transformed.

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