

The Dangers of Wind Power

By Simone Kaiser and Michael Fröhlingsdorf

Wind turbines continue to multiply the world over. But as they grow bigger and bigger, the number of dangerous accidents is climbing. How safe is wind energy?

It came without warning. A sudden gust of wind ripped the tip off of the rotor blade with a loud bang. The heavy, 10-meter (32 foot) fragment spun through the air, and crashed into a field some 200 meters away.

The wind turbine, which is 100 meters (328 feet) tall, broke apart in early November 2006 in the region of Oldenburg in northern Germany -- and the consequences of the event are only now becoming apparent. Startled by the accident, the local building authority ordered the examination of six other wind turbines of the same model.

PHOTO GALLERY: BLOWING IN THE WIND



[Click on a picture to launch the image gallery \(9 Photos\)](#)

The results, which finally came in this summer, alarmed District Administrator Frank Eger. He immediately alerted the state government of Lower Saxony, writing that he had shut down four turbines due to safety concerns. It was already the second incident in his district, he wrote, adding that turbines of this type could pose a threat across the country. The expert evaluation had discovered possible manufacturing defects and irregularities.

Mishaps, Breakdowns and Accidents

After the industry's recent boom years, wind power providers and experts are now concerned. The facilities may not be as reliable and durable as producers claim. Indeed, with thousands of mishaps, breakdowns and accidents having been reported in recent years, the difficulties seem to be mounting. Gearboxes hiding inside the casings perched on top of the towering masts have short shelf lives, often crapping out before even five years is up. In some cases, fractures form along the rotors, or even in the foundation, after only limited operation. Short circuits or overheated propellers have been known to cause fires. All this despite manufacturers' promises that the turbines would last at least 20 years.

Gearboxes have already had to be replaced "in large numbers," the German Insurance Association is now complaining. "In addition to generators and gearboxes, rotor blades also often display

defects," a report on the technical shortcomings of wind turbines claims. The insurance companies are complaining of problems ranging from those caused by improper storage to dangerous cracks and fractures.

The frail turbines coming off the assembly lines at some manufacturers threaten to damage an industry that for years has been hailed as a wild success. As recently as the end of July, the German WindEnergy Association (BWE) crowed that business had once again hit record levels. The wind power industry expanded by a solid 40 percent in 2006, according to the BWE, and it now provides work for 74,000 people.

Germany, moreover, is the global leader when it comes to wind power: More than 19,000 windmills now dot the countryside -- more than in any other country. Green power has become a point of pride in Germany in recent years, and Environment Minister Sigmar Gabriel would now like to construct vast new wind farms along the country's North Sea and Baltic Sea coasts.

No Time for Testing

Generous government subsidies have transformed wind power into a billion-euro industry within just a few years. Because energy providers have to purchase wind power at set prices, everyone, it seems, wants in.

But it is precisely the industry's prodigious success that is leading to its technological shortcomings. "Many companies have sold an endless number of units," complains engineer Manfred Perkun, until recently a claims adjuster for R+V Insurance. "It hardly leaves any time for testing prototypes."

Wind power expert Martin Stöckl knows the problems all too well. The Bavarian travels some 80,000 kilometers (49,710 miles) across Germany every year, but he is only rarely able to help the wind farmers. It is not just the rotors that, due to enormous worldwide demand, take forever to deliver, but simple replacement parts are likewise nowhere to be found. "You often have to wait 18 months for a new rotor mount, which means the turbine stands still for that long," says Stöckl.

"Sales Top, Service Flop" is the headline on a recent cover story which appeared in the industry journal *Erneuerbare Energien*. The story reports the disastrous results of a questionnaire passed out to members of the German WindEnergy Association asking them to rank manufacturers. Only Enercon, based in Germany, managed a ranking of "good." The company produces wind turbines without gearboxes, eliminating one of the weakest links in the chain.

Even among insurers, who raced into the new market in the 1990s, wind power is now considered a risky sector. Industry giant Allianz was faced with around a thousand damage claims in 2006 alone. Jan Pohl, who works for Allianz in Munich, has calculated that on average "an operator has to expect damage to his facility every four years, not including malfunctions and uninsured breakdowns."

Many insurance companies have learned their lessons and are now writing maintenance requirements -- requiring wind farmers to replace vulnerable components such as gearboxes every five years -- directly into their contracts. But a gearbox replacement can cost up to 10 percent of the original construction price tag, enough to cut deep into anticipated profits. Indeed, many investors may be in for a nasty surprise. "Between 3,000 and 4,000 older facilities are currently due for new insurance policies," says Holger Martsfeld, head of technical insurance at Germany's leading wind turbine insurer Gothaer. "We know that many of these facilities have flaws."

Flaws And Dangers

And the technical hitches are not without their dangers. For example:

- In December of last year, fragments of a broken rotor blade landed on a road shortly before rush hour traffic near the city of Trier.
- Two wind turbines caught fire near Osnabrück and in the Havelland region in January. The firefighters could only watch: Their ladders were not tall enough to reach the burning casings.
- The same month, a 70-meter (230-foot) tall wind turbine folded in half in Schleswig-Holstein -- right next to a highway.
- The rotor blades of a wind turbine in Brandenburg ripped off at a height of 100 meters (328 feet). Fragments of the rotors stuck into a grain field near a road.

At the Allianz Technology Center (AZT) in Munich, the bits and pieces from wind turbine meltdowns are closely examined. "The force that comes to bear on the rotors is much greater than originally expected," says AZT evaluator Erwin Bauer. Wind speed is simply not consistent enough, he points out. "There are gusts and direction changes all the time," he says.

But instead of working to create more efficient technology, many manufacturers have simply elected to build even larger rotor blades, Bauer adds. "Large machines may have great capacity, but the strains they are subject to are even harder to control," he says.

Even the technically basic concrete foundations are suffering from those strains. Vibrations and load changes cause fractures, water seeps into the cracks, and the rebar begins to rust. Repairs are difficult. "You can't look inside concrete," says Marc Gutermann, a professor for experimental statics in Bremen. "It's no use just closing the cracks from above."

The engineering expert suspects construction errors are to blame. "The facilities keep getting bigger," he says, "but the diameter of the masts has to remain the same because otherwise they would be too big to transport on the roadways."

Not Sufficiently Resilient

Still the wind power business is focusing on replacing smaller facilities with ever larger ones. With all the best sites already taken, boosting size is one of the few ways left to boost output. On land at least. So far, there are no offshore wind parks in German waters, a situation that Minister Gabriel hopes to change. He wants offshore wind farms to produce a total of 25,000 megawatts by 2030.

Perhaps by then, the lessons learned on land will ward off disaster at sea. Many constructors of such offshore facilities in other countries have run into difficulties. Danish company and world market leader Vestas, for example, had to remove the turbines from an entire wind park along Denmark's western coast in 2004 because the turbines were not sufficiently resilient to withstand the local sea and weather conditions. Similar problems were encountered off the British coast in 2005.

German wind turbine giant Enercon, for its part, considers the risks associated with offshore wind power generation too great, says Enercon spokesman Andreas Düser says. While the growth potential is tempting, he says, the company does not want to lose its good standing on the high seas.

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