# Expensive midgets

**Small wind energy generators have it tough. High costs and problems with licensing and grid connecting are keeping planners away from them. In Europe they're marginal.**

By Nicole Weinhold

A hiss. Airdolphin flaps its tail. With a burring sound it appears to be heading straight for the camera. In actual fact the aerodynamically shaped miniature wind turbine is fixed to a mast and at most turns on its own axis while its rotor blades spin.

If the strange air dolphin burrs too loudly, the watchers of the Internet video just turn the volume down on their monitors. According to the makers of the mini turbine, the Japanese Zephyr Corporation, the real sound level is some 30 decibels (dB(A) quieter than other small rotors. But the company won't say just how loud or quiet the turbine is.

Noise emission is a major issue with small wind converters up to five kilowatts because in Europe they're usually placed very close to residential buildings to augment household power supplies. And so the spoke-wheel-shaped Swift mini turbine made by the Renewable Devices company in Edinburgh, Scotland, is even mounted on rooftops.

## Many too noisy

The issue of noise alone demonstrates that installing small turbines is no simpler than planning large wind energy farms. Surprisingly, there are hardly any noise certifications for any of the many hundreds of different models on the market. Uwe Hallenga, expert with Enveco Steinfurt GmbH & Co. KG, specialists in wind and solar generation performance certification, explains why: "If the noise study is as expensive as the turbine you think twice about having it done."

Many manufacturers don't measure their wind turbines for noise, either. Yet transparency is needed. Günther Hacker of Solar-Wind-Team, which makes small grid-feeding and battery-charging wind converters in the Black Forest town St. Georgen, estimates that "two thirds of the small plants on the market are likely to be noisier than 50 to 60 dB(A)".

On this point the French consultancy Axenne contradicts Hacker. The firm has been looking at small machines for the Wind Energy Integration in the Urban Environment (Wineur) project started by the European Commission in 2005, and comes to the conclusion: "It is important to point out that most urban turbines are almost silent."

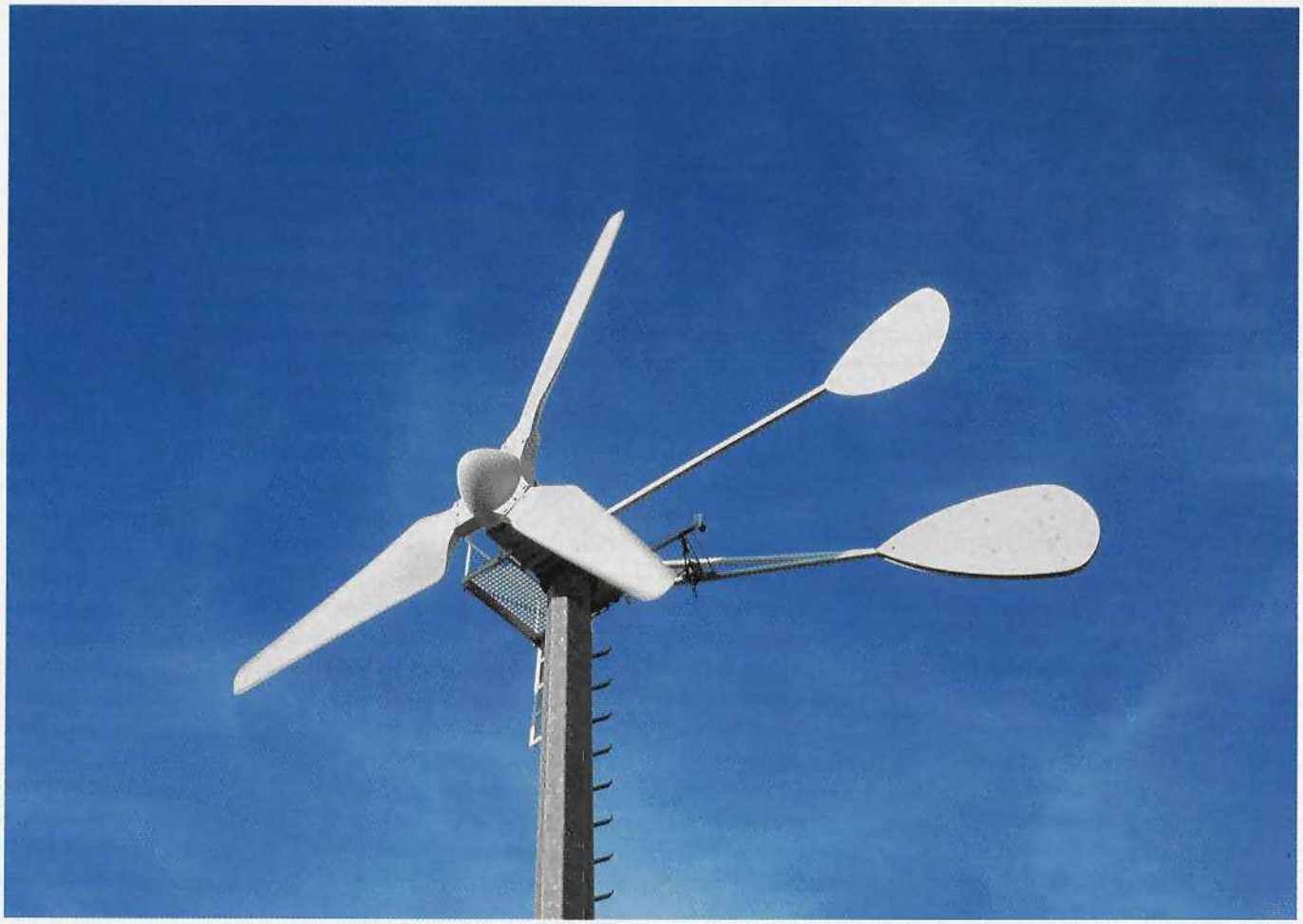
If they weren't they'd be banned from German residential areas where at night nothing is allowed to be louder than 35 dB(A). Swift is one of the few machines measured by its manufacturer and its rotors stay relatively quiet under 35 dB(A).

## Importance of stand-alone grids undisputed

Are the mini turbines on the roofs needed at all? It's agreed that small turbines can be important to powering remote places, especially in developing and emerging countries. In areas far from power lines, the small generators are to produce electricity in stand-alone grid systems. In combination with battery storage the small wind machines can assure constant supply.

In Germany, though, hardly anyone needs a stand-alone system. The German power grid is so dense that usually even garden huts have power.

But what about grid-feeding by the small machines? After all, power from thousands of photovoltaic arrays on German residential roofs is also taken in. Theoretically small turbines could be used the same way. That's already happening in some European countries. "I've just been to Scotland. You see lots of mini turbines there feeding their



This four-kW converter, a Windtechnik Geiger SG500, stands by the autobahn in the Warnow Valley near Rostock.

energy into the power grid," reports Uwe Hallenga. This is how it works: The power the small-scale producers don't need in their own households flows to the grid and the electricity meter turns backwards. So in so-called net metering the power isn't given away but cuts down the bill.

Georgina Wong of the British Wind Energy Association (BWEA) has even detected a trend to small converters. She says, "The potential for combating rising power prices is one of a range of reasons why some people may wish to consider installing a small wind system". In addition to net metering there are two more advantages for the midgets in Scotland: The optimal wind conditions produce good yields even from small turbines. But only a fraction of the rich wind harvest on the British Isles is put into the grid. The machine owners use the major part to heat their water. And because central heating is not common in the United Kingdom and the north often gets really cold, highlanders and lowlanders also use their wind-generated power for electric heaters.

Using electricity for heating and hot water is about as energy-inefficient as you can get, but purely financially it makes sense for the mini converter owners. Power is more expensive in the UK than the European average. The power costs saved and grid-feeding make the small installations profitable.

## Ignored by German renewables law

Things are a lot tougher for small turbines in Germany – at least compared with the big units. Power from the midgets would be subsidised in Germany exactly like the kilowatt-hour from multi-megawatt installations under the Renewable Energy Sources Act (EEG). But that is by far not enough for the expensive midgets. The EEG contains no special provision for them. "Small wind generators were completely forgotten," says Günther Hacker about the promotion law. "These turbines have no lobby."

So under the present conditions the small wind generators simply don't pay, for one thing because material and installation are substantially dearer than for their big brothers (see box). The experts of the Wineur project also report unanimously that subsidisation analogue to the big plants is inappropriate. That's why in France they're mulling about additional support. The consultants of Axenne note that usually small turbines tend to be equated with photovoltaic installations. And Katerina Syngellakis of Britain's IT Power, also involved in the Wineur project, concurs that promotion like in the British model for large turbines, the so-called ROC system, is out of the question for the midgets because it's simply too complicated for the operators.

As in many other European countries, the grid owners in Germany expect remuneration to operate the same way as for megawatt-scale turbines. The EEG is actually very successful, but just like the British ROC it's too complex for microgeneration and hence also too expensive. "For that the turbine owner would have to have a yield study done which for cost reasons is out of the question," explains Hallenga.

## Costly electronics for grid feeding

German grid owners in any case regard the small wind turbines sceptically. They say they fear negative impacts on grid stability. There is less resistance in the UK. "In Scotland the power sellers are probably not that critical because of the many small-scale hydropower stations and because the grid situation is difficult, anyway," Hallenga surmises.

Photos: Solar-Wind-Team G. Hacker

## As expensive as photovoltaics

Small wind energy converters come in a very wide range of prices. The machines cost from 1,500 to 5,000 euros per kilowatt of capacity. Add another 2,000 to 4,000 euros for the mast and grid connection. So the least is 3,000 euros per kilowatt.

Pilot projects cost a lot more. In France, for example, there is just one officially reported mini converter. Together with partners the government's environment agency Ademe placed the 6-kW Windwall machine on a building in Equihen-Plage, a town in northern France. The project cost a full 70,000 euros.

The only way to give the minis a chance on the market would be to introduce attractive promotion schemes. Besides the UK, initial efforts with net metering have run in Italy and California. As energy prices go up this approach could also attract interest in Germany.

Another hurdle are the high costs of connecting small turbines to the grid. The required inverters need sophisticated electronics to synchronise with it. Whereas with a solar module the voltage stays more or less constant despite fluctuating radiation, and only the amount of power changes, in wind plants the voltage changes with the speed of rotation. When the wind gusts that happens very quickly and very powerfully. These fluctuations would be too much for any solar inverter.

And then there are special requirements. In storms or grid outages the small turbine has to be disconnected from the grid. But when idling it could be damaged by a storm. So it keeps on generating and sheds the energy produced via a heat exchanger. The alternative is to stop the machine by artificially shorting the generator.

Whatever option the owner chooses, the technology is complicated. Which makes it both prone to breakdowns and expensive. Uwe Hallenga estimates that it costs about 2,000 euros to network a 1-kW turbine. On top of the approximately 3,500 euros for the machine itself that's no negligible additional cost factor (see box).

German bureaucracy doesn't make things any easier for small turbine developers, either. Most cases don't even get as far as the grid application. The licensing authorities already flunk many planners. "Hardly any construction authorities give their OK to someone wanting to install a small wind turbine," Hallenga recounts from experience. As a rule the small operators are supposed to go through the same procedures as planners of wind parks. And the costs of all the required expert certifications, adds Hallenga, drive the price of a rotor to absurd heights.

The scenario in The Netherlands is much the same. They also have no legislation specifically addressing small turbines in residential areas. Here, too, planners and au-