



ENVIRONMENTAL TECHNOLOGY

Wind

Wind power set a new record in Germany during the first quarter of 2007: 15 billion kilowatt hours were fed into the grid by Germany's roughly 19,000 wind turbines – that amounted to half of the energy generated by wind power in the whole of 2006. The Federal Government has set itself the goal of achieving a 12.5% share for eco-electricity by the year 2010. Thanks to the wind power boom in Germany, however, it should be possible to meet this target before the end of 2007. As a result of the Renewable Energies Act (EEG) of the year 2000, which promotes investment in this area, some 21,000 megawatts of wind power have so far been installed. During this period, a wind power industry has developed in Germany that today leads the world. The next step will be the move onto water. By the end of the next decade, a capacity of up to 30,000 megawatts is to be established in German offshore waters – and meet one fifth of current electricity demand. Germany's largest manufacturer in this field is Enercon, a firm based in Aurich, East Frisia, that was founded in 1984. Its first wind power installations had a rated output of 55 kilowatts. So far, Enercon has installed more than 10,000 installations in over 30 countries.

Solar

Although, with a share of 0.3%, photovoltaic technology makes only a small contribution to Germany's overall electricity mix, its rate of growth is very impressive. At the end of 2006, solar electricity generating plants with a total output of roughly 2,500 megawatts were connected to the German grid, a figure that represented a tenfold increase in just four years. Last year, in Germany, some 750 megawatts of photovoltaic power were connected to the grid for the first time. That makes Germany the world champion in terms of growth. This year, the increase could even exceed the one gigawatt (1,000 megawatt) mark. The world's largest solar plant is currently being constructed east of Leipzig, in the Muldentalkreis district of Saxony. It is scheduled to be completed in 2009 and will generate 40 megawatts. In Beneixama in the



OVERVIEW

Green Champions

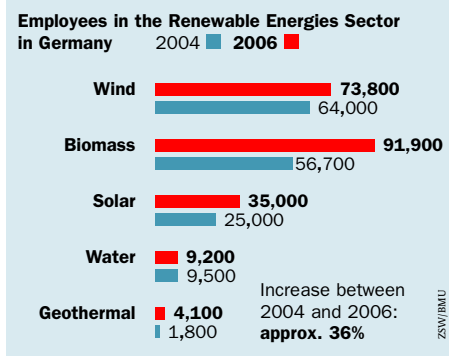
Using innovation and high-technology to combat climate change: German companies began concentrating on environmental technologies very early on as a result of political decisions. They are the champions of tomorrow, some are already world market leaders today.

The lights turn green for German industry: sales of solar, wind and water technology have emerged as an export success story and the environment industry is fast becoming the boom sector of the 21st century. "Germany is assuming the role of world leader in this field," says Burkhard Schwenker of Roland Berger Strategy Consultants. He forecasts a turnover of one trillion euros for green industry by the year 2030. He quickly lists the areas in which German firms are setting international standards: they have the largest installed wind power output, offer the most modern power plant technology, lead the world in the production of efficient household devices, and much, much more.

In fact, a third of all the solar cells and almost half of all the wind turbines worldwide are today produced in Germany. The Renewable Energy Federation registered exports worth six billion euros in 2006 – an increase of 30% compared with the previous year. "The eco-industry is becoming a key sector in Germany. It is already a job creation engine," says Roland Berger Partner Thorsten Henzelmann. On behalf of the Federal Government, a team of consultants have compiled an eco-atlas of Germany that will be officially published at the EU environmental summit in June.

The consultants surveyed just under 1,500 firms, all of them active in the environmental technology field, and analyzed a large number of studies. Their findings are rather gratifying: German green technology is creating jobs. "By the year 2020, the sector will employ more peo-

ple than mechanical engineering or the automotive industry," says Henzelmann. He makes a bold forecast: in a few years, the eco-sector will earn more money than these two traditional key industries together. Today, according to the Berger study, the environmental technology sector already employs one million people. "Their number is set to increase at the same



pace as the industry's skyrocketing sales," says consultant Henzelmann. "Companies are already complaining today that they can't find enough qualified personnel."

August Joas of Mercer Management Consulting also believes that these eco-pioneers offer Germany an opportunity to create global champions: "We have always been active on the markets of the future early on." In other words, this flourishing branch of industry has the potential to repeat the success of the automotive sector. When Gottlieb Daimler and Karl Benz built their legendary motor carriage in 1886, they laid the foundation not only for a global business enterprise, but also for Germany's favourable market position in automotive engineering, which has endured to the present. A similar success story unfolded for a handful of former IBM developers in Walldorf who established a software company called SAP. This German business start-up has meanwhile become the world market leader. Which company will be the next SAP? What is the potential of firms like Solarworld, Repower and Choren? Do these

Primary Energy Mix in Germany in 2006 (in %)

Oil	35.7
Natural gas	22.8
Coal	13.0
Nuclear energy	12.6
Lignite	10.9
Renewable energies	5.3
Others	0.3

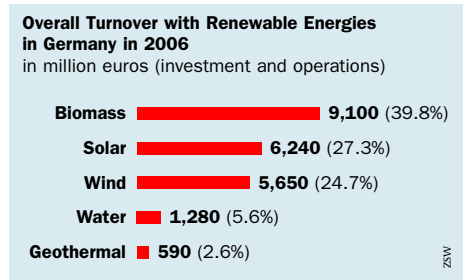
BAU



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newcomers have the makings of future world market leaders?

They certainly all have enough ambition and some interesting business ideas. Choren Industries, for example, can be considered the great hope of the automotive industry. The company's story began with a dream: it wanted to produce renewable energy using techniques modelled on



nature. It aimed to be climate-neutral, clean, sustainable and profitable. Today, the company is already one of the world's leading suppliers of processes for converting solid biomass and carbonic waste into biofuels. The process can be used to produce not only electricity and heat but also fuel. SunDiesel is the name Daimler and Volkswagen, Choren's partners, have given the fuel the firm has developed. This synthetic diesel reduces emissions of dangerous substances by 30-50% compared with fossil fuels and can be used in any diesel engine.

Germany's flagship enterprises have made even more progress when it comes to solar, water and wind energy. Solar businesses like Solarworld have made their shareholders very happy in a short period of time. And the takeover battle for the Hamburg-based company Repower shows just how attractive German wind turbines are. Although it was only founded in 2001 and only recently became profitable, two international conglomerates made bids for the wind-turbine firm: Areva, the French nuclear power group that was already a major shareholder with a 29% stake in the company, and Suzlon, the Indian wind turbine producer whose bid was eventually successful.

Conditions are becoming increasingly favourable for a flowering of the eco-industry. German engineering prowess is highly regarded. The zeitgeist is adding political impetus. There is also no lack of capital: banks are setting up green investment funds, traditional energy and oil companies are restructuring their investments, private equity firms are sending out

scouts and industrialist families are diversifying their holdings in an ecological direction. In the face of this euphoria, however, the New York Times recently warned of a new bubble – "this time green". Such fears are unfounded, because, unlike the Internet pioneers, these firms are not selling abstract business models, but concrete installations that earn real money. Repower CEO Fritz Vahrenholt stresses: "In five years at the latest, we will be cheaper with wind energy than electricity generated with coal or gas."

The demand for environmental technology is indisputably growing. Energy requirements are increasing worldwide – and so is the desire for an intact environment. In many places, the quality of air leaves much to be desired. Waste water treatment plants have to be constructed, the demand for waste disposal is enormous, billions have to be invested in drinking water supplies. German firms have recognized this demand, which forms the basis for their hopes of rapidly increasing worldwide sales. The technology they need does not still have to be invented in the proverbial garage. However new

Renewable Energies in Germany
(Share of energy consumption)

	2004	2005	2006
Electricity	9.4	10.2	12
Heat	5.2	5.4	6.0
Fuel	1.9	3.4	6.6

BMU

the eco-trend might appear, it is actually based on traditional German industries, says Joas of Mercer Management Consulting, "We have very good inputs: process engineering, chemistry, plant engineering and construction."

Accordingly, the established names are also beginning to enter the territory of these green pioneers. For example, the Siemens Group – with 160 years of history, anything but a green business start-up – has decided to put half of its research budget of 5.7 billion euros into climate protection projects. A third of the hydroelectric power generated worldwide is produced with German turbines and generators supplied by Voith, a Swabian family firm. And the world champions at producing efficient household devices are traditional German brands like Bosch-Siemens, Osram and Miele. In any event, according to Roland Berger CEO Schwenker, if the new pioneers want to become world champions, they should follow the example of these successful established companies. *Georg Meck*



province of Alicante, Spain, the first phase of a solar power station with a capacity of 20 megawatts began operating a few months ago. The modules were made by the German solar firms Tenesol, Aleo and Solon; they consist of solar cells from the German manufacturer Q-Cell, one of the world's leading producers of solar cells. The technical equipment (cable systems, transformers and inverters) stems from Siemens. Germany's largest solar business is Solarworld AG. Based in Bonn with a strong branch in Freiberg, Saxony, the company currently employs a workforce of more than 1,300 people. It brings together the entire value creation chain under one roof – from cell production to the finished modules. Its current stock-market value is in the region of three billion euros.

Biomass

Last year in Germany almost 17 billion kilowatt hours of electricity were generated from biomass, including ten billion from wood, more than five billion from biogas and roughly one billion from vegetable oil. Biomass's share of the national electricity mix was approximately 3%. A significant increase in electricity generation from biogas was achieved in 2006 – from 2.8 billion to 5.4 billion kilowatt hours. The industry reckons with a renewed doubling of this figure in 2007 to a total of roughly 10 billion kilowatt hours. It is even aiming for a figure of 76 billion in 2020, which would represent 12% of current electricity demand. At the end of 2006, Germany had 3,500 biogas plants with a capacity of 1,100 megawatts connected to the grid. Schmack Biogas AG in Schwandorf, Bavaria, is one of the most innovative companies in the German bio-energy industry. Founded in 1995 by three brothers, the company went public in 2006.

