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Masthead

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01 Foundation of the Transatlantic Climate Bridge in Berlin



A Bridge for the Future

Germany, the United States and Canada are jointly championing climate protection. A Transatlantic Climate Bridge is set to deliver innovative solutions and new networks to tackle the problem of climate change

By Rainer Stumpf

The plan: for a political idea to strengthen international policies to protect the climate. The strategy: the Transatlantic Climate Bridge, giving Germany, Canada and the United States a leadership role in climate protection together. This is the vision which German Federal Foreign Minister Frank-Walter Steinmeier is busy putting into practice with his North American colleagues. In April 2008, in a lecture given at Harvard University the German Foreign Minister first proposed establishing this transatlantic climate bridge. He felt it was the right way to respond to the challenges of climate change. Climate policy, he proposed, had to become a central element in a new transatlantic agenda that tackled the shared tasks of tomorrow by pursuing forward-looking foreign policies. On September 29, 2008, together with German Federal Environment Minister Sigmar Gabriel, Steinmeier fleshed out the idea in an article in the renowned *Frankfurter Allgemeine Zeitung* daily: "Who if not us? Together with the United States, we can make the technological breakthroughs required and successfully negotiate a follow-up treaty to the Kyoto Protocol. Only if we work closely with our partners on the other side of the Atlantic will we succeed in convincing emerging countries such as China, India and Brazil, as well as Russia, to opt for a sustainable growth model that spares the climate."

Only one day later, on September 30, 2008, the foundations for the Transatlantic Climate Bridge were laid in Berlin. At the invitation of German Federal Foreign Minister Steinmeier and German Federal Environment Minister Gabriel around 300 American, Canadian and German scientists and politicians as well as representatives of foundations, cities and the business community gathered at the German Federal Foreign Office for an international conference at which they sought to identify innovative solutions for tackling climate change.

Their goal: to herald a new era in transatlantic climate and energy policymaking. The first result: a new Transatlantic Climate and Energy Initiative that first saw the light of day at the summit in Berlin. The participating countries intend to build climate protection networks, expand contacts among scientists, and give even greater depth to cooperation at the political level. Today, there are already partnerships in place, such as that between Fraunhofer Institute for Solar Energy Systems and the Massachusetts Institute of Technology. In 2008, they jointly founded the Fraunhofer Center for Sustainable Energy Systems in the United States. In Berlin, a "Marketplace of Ideas" and "Climate Speed Dating" served to ensure entrepreneurs and research scientists sat down together at the same table to move forward the search for investors and business partners. And in 2009, a US roadshow will showcase innovative climate-protection technology made in Germany and other European countries. Moreover, international environmental treaties such as the Kyoto Protocol and the UN's Framework Convention on Climate Change are set to benefit from the German-North American undertaking.

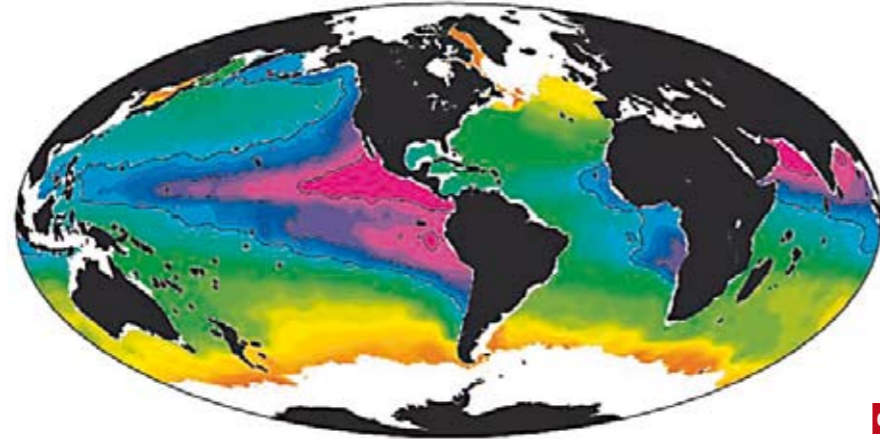
On December 16, 2008 the Transatlantic Climate Bridge was launched in the United States with a top-level gathering. Numerous politicians and businessmen, representatives of NGOs and think tanks took up the invitation extended by Klaus Scharioth, German Ambassador in Washington. At the conference in the German Embassy, the latter declared that it was time to overcome the reliance on fossil fuels. The Ambassador urged people to take a long-term view on energy and climate change, despite the enormous economic challenges the world is now facing. Should the world not succeed in concluding a follow-up treaty to Kyoto, he said, this would place a massive strain on the world in which our children and grandchildren live. This key event already scored an initial success: A joint statement was signed with the State of Virginia identifying firm areas of cooperation in the field of climate protection.

The Climate Bridge's beginnings reach back as far as spring 2007, when, on the initiative of the German and US federal governments, CEOs of major corporations and scientists met for a US-EU CEO Energy Forum on Energy Technology and Climate Protection. At the US State Department the participants called for an increase in joint basic research, for greater production of sustainable biomass and for advances in new technologies, such as fuel cells. At the time, German Federal Foreign Minister Steinmeier stressed that the European Union and the United States were not only leading developments in climate-friendly technologies but they should also make these available to the emerging markets. Steinmeier commented: "The United States and Europe can be trailblazers. Together, we can show we are tackling the energy-policy and ecological challenges politically, technologically and therefore also economically. The United States and Europe are among the world's most innovative economies and most important markets. We can and indeed must reverse the trend through energy and environmental policy – and the key to achieving that is already in our hands."

- 01 Interdisciplinary approach: Kiel-based scientists research the oceans
- 02 Scientists know less about the oceans than about the surface of the moon
- 03 More than two-thirds of the Earth's surface is covered in water

Understanding the Oceans – Interdisciplinary Oceanography in Kiel

The Future Ocean Excellence Cluster at Kiel University



03

million euros in funding from the German Research Foundation (DFG) until October 2011.

The experts from the Excellence Cluster are focusing on 13 key topics, which include, among others, the rise in sea level, marine medicine, the consequences of ocean acidification, a sustainable fishing industry, international maritime law, coastal protection and the potential and dangers in storing CO₂ on the seabed. Naturally, training scientists for the future is also crucial and a special postgraduate unit for talented young researchers, the Integrated School of Ocean Sciences, has been established for that purpose. The researchers also maintain a dynamic scientific dialogue across the Atlantic Ocean. American scientists regularly visit Kiel for research purposes and, likewise, German colleagues are invited to attend conferences and pursue research in the States. For example, the spokesman of the Excellence Cluster, Professor Martin Visbeck, is already planning a trip to the United States in 2009.

A specially conceived traveling exhibition for schools and a “children’s university” project on the subject demonstrate that the Excellence Cluster does not see itself as an ivory tower of research but can also arouse enthusiasm for its work among a wider public.

The Oceans cover over two-thirds of our planet’s surface. Yet today we still know more about the surface of the moon than about the world’s oceans. For two years scientists at Kiel University have been working on closing this research gap. In “The Future Ocean Excellence Cluster” scientists are looking at the opportunities and risks global climate change holds for the oceans and searching for ways to achieve sustainable management of the resources our oceans offer.

The Cluster has adopted a research approach unique in Germany: oceanographers, geoscientists and economists as well as doctors, mathematicians, lawyers and sociologists bundle their know-how to jointly examine changes in the oceans and climate. The Kiel Excellence Cluster also makes a special point of incorporating specialists not previously involved in oceanography into its interdisciplinary concept.

In the Baltic Sea area, and particularly in Kiel, oceanography has a long tradition and enjoys a high standing worldwide. More than 140 scientists from six departments of the Christian-Albrechts-University Kiel, the Leibniz Institute for Marine Sciences, the Kiel Institute for the World Economy and the Muthesius Kunsthochschule have teamed up and will receive some 35



01



02

Electric Cars: Germany Is Pushing Ahead with Our Electro-Mobile Future

Electro-Mobility



01

By the year 2020 there will be about one million electric cars running on Germany’s roads. This may still be a vision, but it is also the ambitious target that the German Federal Government set in its National Development Plan for Electro-Mobility. Published in November 2008, it outlines the intention of accelerating the pace at which we enter the automobile’s electric future. Long considered off-beat, in an age of climate change and ever scarcer resources, the electric car is set to take the limelight and contribute to environmental protection. For this reason the German Federal Government included electro-mobility in its energy and climate change package in December 2007. In pursuit of these goals, the government is working closely with major German carmakers and energy corporations – and aspires to take a decisive step toward the post-gasoline age.

This year the project will gain significant momentum in Berlin: the German capital will become the test track in 2009. Volkswagen, Daimler and BMW all intend to test the everyday viability of autos with electric engines (using hybrid, battery or fuel cell technology). Some 100 electric Smarts will thus grace Berlin’s roads. In this context, the Daimler corporation has forged an alliance with power utility RWE, which

intends to set up its own filling-station network in the capital. This year, Volkswagen intends to test several vehicles in Berlin that boast its so-called “twin-drive” power system – a combination of electric and combustion engine.

Moreover, BMW has announced that in the spring it will be deploy 50 of its electric Mini Es in Berlin. When the Mini runs out of power after about 250 kilometers, it can recharge “green electricity” at one of the stations run by the Vattenfall power company. “The large-scale trial will be eco-friendly across the entire process chain,” BMW CEO Norbert Reithofer states emphatically, and suggests the company will also be running a 500-strong test fleet of electric cars in the United States in the year 2009.

German Federal Environment Minister Sigmar Gabriel, whose ministry is supporting the BMW and Vattenfall project, believes the collaboration is a good example of modern environmental and industrial policy in Germany. “When powered by electricity from renewable sources, electric vehicles provide modern, climate-friendly and resource-sparing mobility,” Gabriel said. An electric car powered with green electricity emits a mere 5g of CO₂ compared with 115g

- 01 Electric cars will provide mobility in the future
- 02 Simple recharging at an electricity fueling station in Berlin
- 03 On the road in the US: BMW’s Mini E is environmentally friendly



02



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if it runs on conventionally generated electricity.

Yet politicians, businessmen and scientists also know that in order to tread the path to low-emission electric cars further technical innovations are necessary, above all in battery technology, a field being supported by the German Federal Ministry of Education and Research. At present, the high price tag and comparatively low battery range deter many drivers from buying electric cars. Nevertheless, many now believe in this vision and agree with Wulf Bernotat, the CEO of Germany’s largest power corporation E.ON, when he says “There is certainly no question that one day we will drive electrically powered cars. The only question today is when exactly this will happen.”

- 01 Wind power for ships: German SkySails technology provides added propulsion
- 02 Atlantic crossing: Beluga SkySails tests the new kite technology

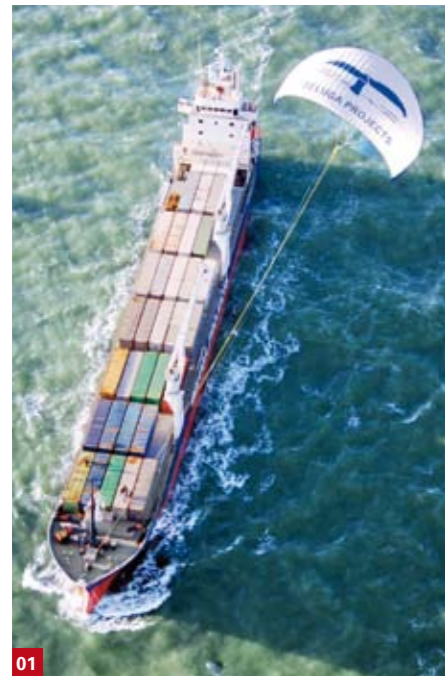
Under Wind Power: An Eco-Friendly Way to Cross the Oceans

Beluga Sky Sails

NEWS



02



01

High in the skies and well above the waves, the kites billow in the wind, pulling the heavy freight ship along behind them. Thanks to modern shipping technology and wind power. SkySails is the name of innovative technology that relies on the wind for additional propulsion – saving fuel and thus generating less climate-killing CO₂. The brainchild of Hamburg-based SkySails is reminiscent of sailing ships of the past. But instead of a mast and sail the tankers and freighters are pulled along by towing kites that resemble paragliders.

In 2008, on board the Beluga SkySails, the world's first new ship built using a SkySails propulsion system, the new technology passed its first protracted trials with flying colors. The 132-meter long freighter (it has a deadweight of 10,000 tons and is run by Beluga Shipping, based in Bremen, Germany), crossed the Atlantic twice on its maiden voyage. And during the passage from the Mediterranean to America's East Coast at times exploited the winds for extra power provided by a 160-square-meter large towing kite.

Beluga Shipping CEO Niels Stolberg is banking on the new technology, as costs have been rising for years now, forcing many a shipping company to look for ways of avoiding direct exposure to the price of oil: "The SkySails system offers such freedom, and is innovative and sustainable into the bargain; unlike other alternative propulsion models, it is well-suited for permanent commercial operations."

"Wind will always be cheaper than oil," says SkySails MD Stephan Wrage. He is confident that an increasing number of shipping companies will be convinced by the power delivered by his cost-effective and climate-friendly propulsion system. "Depending on the routes traveled and ambient weather conditions, wind power will in future enable

us to cut fuel consumption by 10-35 %." Trials using a second freighter have proved just how much potential the technology offers. "By using SkySails, in good weather conditions we were in fact able to cut fuel consumption by well over half," reports Gerd Wessels, CEO of the Wessels shipping company in Haren/Ems, Germany.

SkySails is riding the wave of enthusiasm, and intends to put the propulsion system into mass production before the end of 2009, following the completion of additional tests to improve the towing kite's power. Production capacity is already booked out a year in advance, SkySails states on its website. The company estimates that worldwide around 60,000 of a total of 100,000 vessels, including fishing trawlers and large yachts, can be retrofitted with the system – and if used consistently around the globe would slash damaging CO₂ emissions by over 150 million tons a year.

Niels Stolberg is well aware that he has taken the right tack by opting for the towing kite technology. Many companies are lining up to have their goods forwarded by his Beluga SkySails in order to say that they use a low-emission transport system. Space on his ship is as good as booked out for the year 2009. ■

www.sky sails.com | 2

Ulf Andersen/Getty Images

Leading the Way to the Third Industrial Revolution

By Jeremy Rifkin

OPINION

While oil, coal, and natural gas will continue to provide a substantial portion of the world's and the European Union's energy well into the 21st century, there is a growing consensus that we are entering a twilight period where the full costs of our fossil fuel addiction is beginning to act as a drag on the world economy. During this twilight era, the 27 EU member states are making every effort to ensure that the remaining stock of fossil fuels is used more efficiently and are experimenting with clean energy technologies to limit carbon dioxide emissions in the burning of conventional fuels. These efforts fall in line with the EU mandate that the member states increase energy efficiency 20 % by 2020 and reduce their global warming emissions by 20 % (based on 1990 levels), again by 2020. But, greater efficiencies in the use of fossil fuels and mandated global warming gas reductions, by themselves, are not enough to adequately address the unprecedented crisis of global warming and global peak oil and gas production. Looking to the future, every government will need to explore new energy paths and establish new economic models with the goal of achieving as close to zero carbon emissions as possible.

Renewable forms of energy – solar, wind, hydro, geothermal, ocean waves, and biomass – make up the first pillar of

the Third Industrial Revolution. While these sunrise energies still account for a small percentage of the global energy mix, they are growing rapidly as governments mandate targets and benchmarks for their widespread introduction into the market and their falling costs make them increasingly competitive. Billions of euros of public and private capital are pouring into research, development and market penetration, as businesses and homeowners seek to reduce their carbon footprint and become more energy efficient and independent. Today, renewable energy manufacturing, operations, and maintenance provide approximately two million jobs worldwide. In Germany, alone, the renewable energy industry boasted an annual turnover of 21.6 billion euros and 214,000 workers in 2006, and the industry projects to grow to between 244,000 and 263,000 jobs by 2010, 307,000 to 354,000 jobs by 2020, and 333,000 to 415,000 jobs by 2030.

While renewable energy is found everywhere and new technologies are allowing us to harness it more cheaply and efficiently, we need infrastructure to utilize it. This is where the building industry steps to the fore, to lay down the second pillar of the Third Industrial Revolution. Buildings are the major contributor to human induced global warming. Now, new technological breakthroughs make it possible, for the first time, to design and construct buildings that create all of their own energy from locally available renewable energy sources, allowing us to reconceptualize the future of buildings as "power plants."

The introduction of the first two pillars of the Third Industrial Revolution – renewable energy and "buildings as power plants" – requires the simultaneous introduction of the third pillar of the Third Industrial Revolution. To maximize

renewable energy and to minimize cost it will be necessary to develop storage methods that facilitate the conversion of intermittent supplies of these energy sources into reliable assets. There is one storage medium that is widely available and can be relatively efficient. Hydrogen is the universal medium that "stores" all forms of renewable energy to assure that a stable and reliable supply is available for power generation and, equally important, for transport. The fourth pillar, the reconfiguration of the power grid, along the lines of the Internet, allowing businesses and homeowners to produce their own energy and share it with each other, is now being tested by power companies in Europe.

The central question that every nation needs to ask is where they want their country to be in twenty-five years from now: in the sunset energies and industries of the second industrial revolution or the sunrise energies and industries of the Third Industrial Revolution. The Third Industrial Revolution is the end-game that takes the world out of the old carbon and uranium-based energies and into a non-polluting, sustainable future for the human race. The shift from the second industrial revolution to the Third Industrial Revolution is going to require a carefully constructed long term transition plan. The EU understands this, and has committed itself to pursuing a two-track process: track one, increasing the energy efficiency and reducing the carbon footprint by 20 %, respectively, by the year 2020, in order to clean up the mature fossil fuel energies of the second industrial revolution; track two, aggressively pursuing a 20 percent renewable energy target and laying down the foundation for a Third Industrial Revolution during the first half of the 21st century. We need to aggressively pursue both tracks simultaneously if we are to ease the transition to a post-carbon era. ■



Jeremy Rifkin

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Sunny Partnership

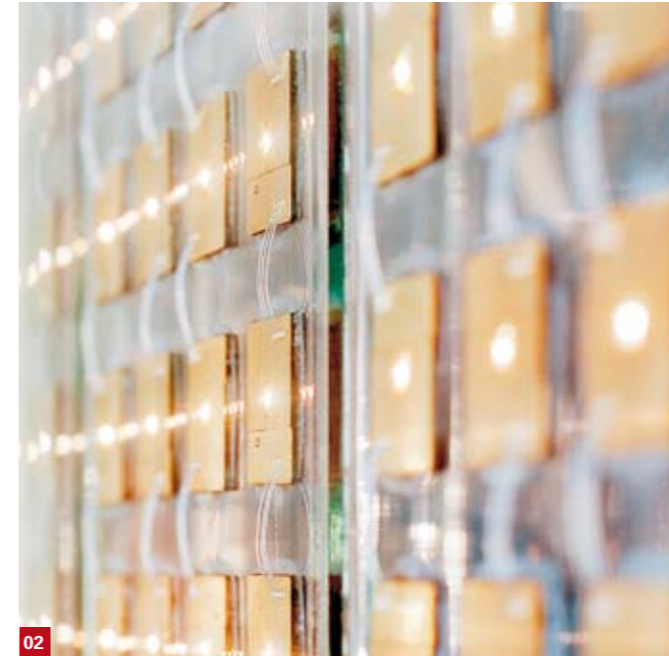
Cooperation in the field of renewable energies: scientists from the Fraunhofer Institute for Solar Energy Systems and MIT are to research the environmentally friendly energies of the future

By Bernward Janzing



01

- 01 Expert for Solar Energy: ISE Director Weber
- 02 Clean future: collaboration will target the effective use of solar energy



02



Transatlantic Excellence

Two of the world's largest research institutions, the Research Center Jülich and the Oak Ridge National Laboratory, have agreed to work together in the field of fuel-cell technology

Their research findings regularly make headlines around the world, their names stand for scientific excellence – and now they want to work together on the propulsion systems of the future: Both research institutions intend to jointly develop materials and methods that will make possible cheap and powerful fuel-cell systems for use in vehicles and electricity generation. In concrete terms, the two partners want to help each other in the analysis of materials. The Oak Ridge National Laboratory offers outstanding

capabilities in imaging processes for materials research and in chemical analyses of solid bodies and surfaces, while the Research Center Jülich is a leading authority in direct methanol fuel-cell technology – in other words, in the development of materials, the production of cells and cell stacks as well as the construction of complete systems. Jülich has the largest group of scientists worldwide working in public fuel-cell research. In 2007 the Research Center presented a prototype of its fuel-cell system for palletlifting carts. A fuel cell directly converts the chemical energy of liquid methanol into electrical current for the motor. Long charging periods are no longer required and the cart can be refueled in a few minutes.

The concentration of expertise in the field of solar energy is greater in the south-west of Germany than anywhere else in Europe. The Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg, on the Black Forest foothills, is the largest solar research institute on the continent. More than 600 scientists, including some 140 doctoral and diploma students, work here on an area covering more than 18,000 square meters. Now the Freiburg-based solar experts have launched a transatlantic collaboration project on an unprecedented scale. Together with the Massachusetts Institute of Technology (MIT), the ISE researchers have founded the Fraunhofer Center for Sustainable Energy Systems. It will be located adjacent to MIT. Professor Hans-Jörg Bullinger, President of the Fraunhofer Society, regards the German-American science partnership as proof of the quality of German research: "This new collaboration shows that our know-how is highly regarded – even at the elite universities in the United States."

According to Eicke Weber, Director of the ISE, the market for solar energy is still somewhat underdeveloped in the US, and this is why they want to "make a contribution that could generate dynamic growth" together with the researchers at MIT. The new center is also designed to open up new prospects for the German solar industry. As Roland Schindler, one of the heads of the new institute, explains: "It will also help German enterprises enter the US market." Nolan Browne, Director of Business Development

for Energy Sectors at the new Fraunhofer facility, is convinced that MIT will benefit from this cooperation: "We aim to build a bridge between research at MIT and successful commercialization."

This is an aim that the ISE has already achieved. The Freiburg scientists have been extremely successful in linking highly professional basic research with industrial contracts. Only a fifth of the annual budget of over 30 million euros is still covered by institutional funding. The rest comes from project funds provided by either public investors or industry; the latter now generates a third of turnover.

The whole spectrum of solar energy

For ISE head Eicke Weber the close cooperation with the USA is a logical continuation of his previous German-American career. He lived in the US for 23 years before taking over as head of the ISE in July 2006. From 1983 Eicke Weber, who is now 58, taught materials science at Berkeley University in California. Former colleagues are now the institute director's cooperation partners at MIT.

The Fraunhofer ISE covers the whole spectrum of solar energy – from photovoltaics to solar heat, from energy storage to building-services engineering, from optics to materials research and the optimization of manufacturing processes in the solar industry. The first joint research projects with the US partners will involve

intelligent switches and software programs that optimize the output of solar modules. The two partners also want to simplify the production and installation of solar energy plants to make solar energy generation more economical. Moreover, the scientists at the future Fraunhofer Center for Sustainable Energy Systems intend to devote their attention to alternative energy technologies such as fuel cells.

One focus of research at the new institute near Boston, however, will be energy-efficient construction techniques. Experts believe that US demand for advanced building technologies will grow in the coming decades because of rising energy prices. The ISE has the expertise to take on such a task, says Roland Schindler. "We have years of experience with new buildings and refurbishing old ones – especially in the fields of heat insulation and reducing electricity and heating costs." Up to now the ISE's research and work has been limited to Europe. In the USA "we will have an opportunity to get to know and learn to deal with very different and very varied climatic conditions," Schindler explains.

The institute's building, completed in autumn 2001, is an excellent example of this. The design looks simple from the outside, but in fact it's a highly ingenious scientific project. Energy consumption per square meter has been considerably reduced compared to conventional new buildings. The energy required for heating is only about 50 kWh per square meter per year, and the

construction costs were similar to those of conventional buildings. A geothermal heat pump provides warm air in winter and cool air in summer. Outside air is fed into the rooms through plastic ducts buried six meters underground – a depth that is pleasantly cool in summer and still relatively warm in winter.

Sunlight could be used for heating

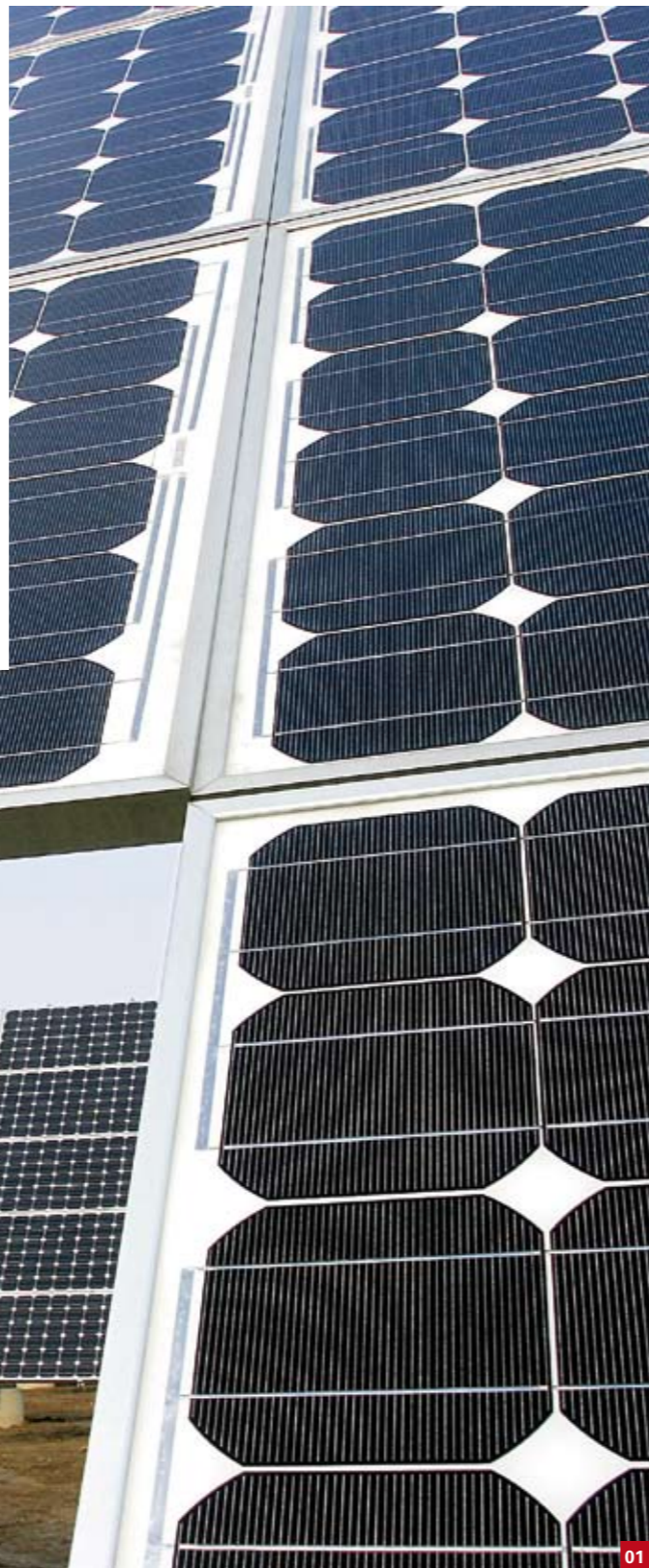
Of course, solar energy is also used in a wide variety of ways. The hot water in the canteen comes from solar panels, 200 square meters of photovoltaic modules are enough to provide all the power needed for electric lighting. Thanks to the architectural design, the solar cells were creatively integrated into the building: framed in glass on the south-facing façade, they prevent the rooms from becoming overheated in the summer, while still letting in daylight. The rooms were also designed to optimize the use of daylight and minimize the need for artificial light. For one thing, the favorable proportions of the rooms mean that none of the offices are wider than five meters. For another, the special glass skylights in the ceilings redirect incident sunlight to lighten up the workplaces. The ideal positioning of windows was very precisely simulated during the planning phase so that sunlight could also be used for heating.

All in all, the building features some smart ideas that save the Freiburg institute enormous costs – and are bound to cause a major stir in the USA, too. ■

Sunny Prospects for Solar Valley

Eastern Germany is attracting increasing numbers of international investors. Above all, North American companies have discovered the advantages of the region for the production of state-of-the-art solar installations

By Hans-Christoph Neidlein



Investing in the Power of the Sun

The Schott technology group will be producing more photovoltaic cells in the United States in future. The German company is investing 500 million dollars in a New Mexico plant

The United States is one of the world's fastest growing markets for renewable energies. The German Schott Group has decided to increase its business commitment in America through its subsidiary Schott Solar: photovoltaic cells and modules as well as solar receivers for solar-thermal power plants will be assembled in a new production facility in Albuquerque, New Mexico, from 2009. The Group has announced that it will be creating up to 1,500 jobs and investing a total of up to 500 million dollars in the American Southwest.

Opening a production plant is nothing unusual for an ambassador. Nonetheless, the appointment in mid-July 2007 in Germany's "Solar Valley" between Frankfurt/Oder, Dresden and Halle left US Ambassador William R. Timken highly impressed: "In the course of my career I have opened more than 40 factories, but I have never experienced such a strong sense of optimism about the future as I have here today," said Timken. The top diplomat had traveled from Berlin to Frankfurt/Oder to be present at the opening of the new First Solar production plant. Bruce Sohn, the President of First Solar, explained that the listed US company has invested 115 million euros in the "world's most modern" plant for thin-film solar cells. The verdict in favor of producing in eastern Germany "is a decisive step in our company's history." It is also a decision that more and more investors from the United States and Canada are making: at least ten solar plants founded by North American firms are currently being constructed in Germany or will shortly begin producing solar modules. Total investment in 2005 and 2006 amounted to far more than 300 million euros. Some 3,500 jobs have been created by North American businesses.

Favorable investment climate

The most important reason for choosing the location, explains President Bruce Sohn, was the "favorable investment climate created in Germany as a result of the solid promotion of environmentally friendly energy sources by the Renewable Energy Act (EEG)." Other important factors were the availability of qualified and motivated personnel, the excellent infrastructure and "great support from local, state and federal authorities." The operating license was granted without any bureaucratic hurdles. Sohn does not see the sometimes "very strict German environmental regulations" as an obstacle to investment. After all, the US company First Solar itself has made a "major commitment to environmental protection."

Investors from other high-technology industries are also putting their money into eastern Germany. American semiconductor producer AMD, for example, has already invested some eight billion dollars in its plants in Dresden, where 2,800 highly qualified engineers, technicians and specialists work for the company. Dr. Hans Deppe, Vice-President and General Manager of AMD in the Saxon capital, says there were several good reasons for selecting this loca-

tion: "Important trump cards are the excellent network of highly qualified and motivated people, very good universities and research institutions and, not least, an accommodating and location-friendly public administration." The list of investors is very long. It includes, for example, Federman Enterprises from Israel, which has invested in the production of base substrates for lasers, light-emitting diodes, mobile telephones and wireless communication networks in Freiberg. Then there is the American Atmel Corporation that is developing the latest generation of data storage systems and semiconductor solutions for the automotive industry in Dresden.

Marc Faber, Vice President of Evergreen Solar, also thinks very highly of Germany as a production location. "We have enormous opportunities here and were welcomed with open arms." The second EverQ solar module plant began operating in Thalheim, Saxony-Anhalt, in the middle of June 2007. Some 900 new jobs are being created in the joint venture involving Evergreen Solar, German company Q-Cells, and Renewable Energy Corporation from Norway. "Due to the high demand, we are already thinking about an additional factory," says Faber.

A lot of know-how available

Another US company has set a new record in the field of solar electricity: Signet Solar is producing the world's largest thin-film solar modules, measuring 2.2 by 2.6 meters, in Germany. Production began in Döbeln near Dresden in May 2008. The firm is investing 50 million euros in a production facility and a research and development center. There are plans for 130 new jobs. The decision in favor of a location in Saxony was due to the know-how available in the region and support from economic development agencies. Signet Solar was able to gain US manufacturer Applied Materials as a partner in the new plant. The producer of semiconductor equipment already has an operation in Dresden.

Nanosolar, a company headquartered in Palo Alto, is also coming to Germany's new federal states. Europe's biggest production plant for solar modules is being set up in Luckenwalde near Berlin. The firm wants to create at least 100 new jobs at its first European production facility. Nanosolar has developed a low-cost roll-print production process for thin-film solar cells. The investors also include the Google founders Larry Page and Sergey Brin. "The region around the capital city Berlin has major solar research institutes with which we would like to collaborate," is how CEO Martin Roscheisen explains the choice of location.

The growing number of producers is also making Germany an interesting production location for North American components suppliers. Canadian firm 5N Plus will soon begin operating a processing plant for the materials used in thin-film cell production in Eisenhüttenstadt. It seems the present boom in "Solar Valley" is set to continue well into the future. ■

- 01 Successful technology: wind power systems
- 02 Made in the USA: Siemens produces in Iowa
- 03 Solar cells are produced in a vacuum oven
- 04 Looking to the sun: renewable energy technology from Germany



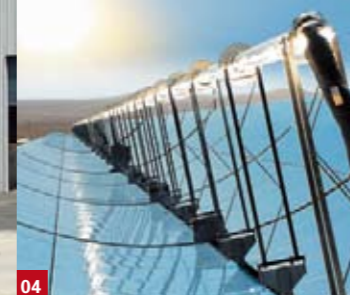
Fresh Impetus for Clean Air

Renewable energies are experiencing an unprecedented boom in North America. The relevant technology is often supplied by German companies

By Holger Schmidt

The United States has joined the long list of countries that are increasingly turning their backs on fossil fuels. “America is on the verge of technological breakthroughs that will enable us to live our lives less dependent on oil,” announced President George W. Bush in his Seventh State of the Union Address. To replace oil and gas, there is growing demand for renewable energies, which usually supply electricity and heat generated by solar and wind power. The United States is also relying on technology from Germany for this major energy shift. One example is America’s ecological showcase project, the Nevada Solar One solar thermal power plant. For 250 million dollars, one of the world’s largest solar power plants has been built in Boulder City, south of Las Vegas, to supply 15,000 households with electricity. Enormous mirrors focus the sunlight at a receiver in which oil is heated to 400 degrees Celsius. The hot oil is used to produce steam that eventually drives the turbines to generate electricity. “That’s high-technology made in Germany,” says Gilbert Cohen, Project Leader of Spanish plant operator Acconia Solar Power. After all, the mirrors stem from Nuremberg, from Flabeg, the specialist glass firm. Siemens supplied the generating unit and Schott, the Mainz-based producer of special glass, contributed most of the receivers.

German businesses can hope to receive further orders from the United States because work has already begun on Nevada Solar Two, which is planned to be even bigger. The dry and hot South is very eminently suited for solar energy. “The power plant proves



that the time is ripe for large-scale solar energy generation,” says Mark Finocchiaro, President and CEO of Schott Solar in the United States. “We expect that the reliability and cost-effectiveness of solar thermal power plants, along with the Southwestern United States’ vast solar resources, will help make solar thermal power one of the United States’ leading sources of renewable energy by 2025.” Project Leader Cohen envisions a future market with 50,000 megawatts of generating capacity in the Southwestern United States alone.

California invests several billion dollars

Even in this sun-rich region, solar electricity is still more expensive than conventional electricity from coal or nuclear power plants, but the climate debate has meanwhile also forced Americans to change their minds. Like approximately half of all American states, Nevada has placed its electricity utilities under a legal obligation to use renewable energy sources. By the year 2013, at least 15% of the electricity in Nevada is to stem from renewable energy sources – and 5% of that figure from solar energy. Sunshine State California is going even further: Governor Arnold Schwarzenegger wants to invest several billion dollars in renewable energies.

These are plans that offer great opportunities for Germany’s energy specialists: “In our estimation, the market for renewable energies in the United States will at least double in the next five years,” explained Udo Ungeheuer, Chairman of the Board of Management of Schott AG, at the groundbreaking ceremony for

a production facility for solar technologies in Albuquerque, New Mexico. Photovoltaic cells and modules will be produced here from next year for additional solar thermal power plants. The Mainz-based company is initially investing 100 million dollars in the new site; in the long term, 500 million dollars will be spent on the production plant to satisfy the growing demand. Albuquerque is Schott’s second US location, because the company already produces photovoltaic modules in Billerica, Massachusetts.

SolarWorld, the Bonn-based solar technology group, is also investing in America. The company is building the American continent’s largest solar factory in Hillsboro, Oregon, where it is converting a previously unused microchip plant for 300 million euros. The integrated solar silicon wafer and solar cell production facility will reach a capacity of 500 megawatts by 2009. The new production capacities will significantly strengthen SolarWorld’s position as the leading supplier and producer of solar electricity technology in the rapidly expanding American market. SolarWorld also plans to double the capacity of its solar module plant in Camarillo, California, to 100 megawatts.

Expanding wind power market

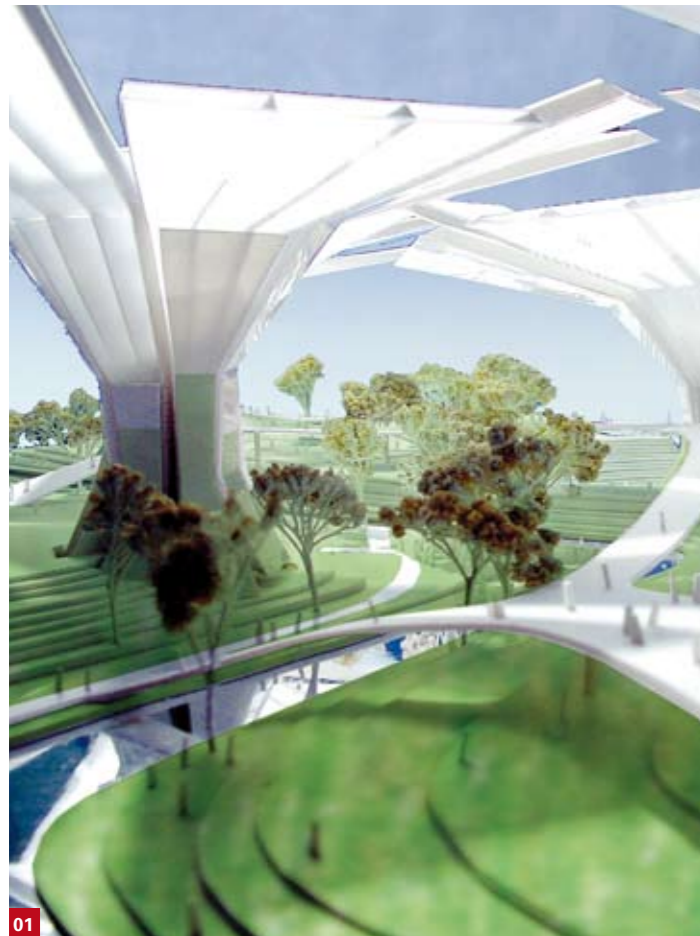
In addition to the sun in the South, many companies are relying on wind in the North. “The stampede has begun,” says Tod Lantz at the Leaning Juniper I wind project in the Northwestern United States. “The utilities are buying more and more energy from alternative sources, and most of it is wind energy.” Currently, no other country is expanding the production of this energy faster. By 2020 the wind power market in the United States is expected to treble to 7,500 megawatts in order to achieve the agreed target of meeting 6% of total electricity needs with wind power. German companies have become involved here too. Siemens, for instance, is now the second largest producer of wind power systems in the United States. In order to meet the demand, Siemens has opened a new rotor blade plant in Fort Madison, Iowa, which plans to produce more than 600 rotor blades a year for wind power projects. The factory is the first production facility for wind power components that Siemens has put into service in the US.

Ecological energy also enjoys increasing popularity further to the north. Canada is planning a tenfold increase in wind power capacity to 150,000 megawatts by 2012. The Canadian province of Ontario has agreed input fees, similar to those in Germany, which guarantee producers fixed prices for every kilowatt hour of wind-generated electricity for a period of 20 years. German wind power firms like Enercon are very welcome here. “German technology is popular in Canada,” explains Bernd Schneider, founder of SchneiderPower, the wind farm developer that initiates wind power projects in Canada. It would appear that German energy firms have already written the first chapter of another success story. ■

Ecological Visions in Glass and Steel

Stuttgart-based architectural firm Behnisch Architects has made a name for itself in the United States with sensational projects. Leading partner Stefan Behnisch knows the reasons for their success

Interview: Rainer Stumpf



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- 01 Concept for an Amusement Park in Las Vegas
- 02 The Terrence Donnelly Center for Cellular and Biomolecular Research at the University of Toronto
- 03 The Genzyme headquarters in Cambridge
- 04 Spa Baths in Bad Aibling, Germany



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Mr. Behnisch, when an American client asks you about your ideas on architecture, what do you say?

Our principle is to search for the right solution – for the construction assignment, the cultural background of the location, the zeitgeist. We consciously avoid using an individual style and try to keep out of the style debate. But we always focus on sustainability and ecological design. That's our true conviction, really. No client today would dream of asking us for a building that has nothing to do with sustainability. It's seen as an important aspect of our architectural identity. Fortunately, we have had clients in the past who explicitly asked us for this or supported us in its realization. If we had just regarded sustainability as a passing fashion, we would never have been so successful.

This concept seems to be very popular in the United States and Canada. And with offices in Los Angeles and Boston your presence in North America is greater than any other German architectural practice. Why do you find this market so interesting?

I lived in Los Angeles for a year, about 20 years ago, and felt very much at home there. People were very friendly, and we got on really well together. That's when I started dreaming of realizing a project in the United States. Then there were a lot of coincidences: one of my father's former colleagues married an American woman and went to Los Angeles. I developed our Californian office with him. Of course, the market is commercially interesting too. The North American market is very interested in foreign architects. It has something to do with developments in the American construction sector during the 1970s and 1980s. That was when the architectural profession became a pure service provider. Architects increasingly retreated from their responsibilities. We discovered that for these reasons there was an increasing demand for architects who are in the position to manage the entire construction process and are willing to assume responsibility. German architects have an all-embracing concept of design and realization. It basically has to do with contracting law: we owe the client the plans for a constructible design. In addition to this, there's a definite interest in sustainable buildings in the United States and Canada. And the German construction industry is the world leader in that field – for instance, in façade technology or building management systems. So we're also interesting for technology transfer.

You design and build sensational research facilities, residential complexes and even whole city districts in both countries. Which is your most important project on the American continent?

The Genzyme Center in Cambridge of 2003. We were able to realize many innovative solutions for the biotechnology company's headquarters, thanks to a client who was very open to uncompromising ideas. The design included the installation of

seven heliostats on the roof. These are movable mirrors that capture sunlight and transfer it to the foyer, where 15-meter-high mobiles with reflectors distribute the daylight in all directions. The willingness to try out something new like this really is very American. But, of course, the Science Complex for Harvard University is also important, because we can realize other technologically and architecturally innovative ideas.

How does a project that you plan for a client in North America differ from others – for instance, in Germany?

We have to strike a balance between their and our working methods and expectations. On the one hand, we can't plan as if we were an American practice. After all, our clients choose us because we come from abroad. This exotic status should not be underestimated. On the other hand, we have to be well aware, that we can't do everything the same way as we do in Germany.

What kinds of buildings will you be proposing for your American clients in ten years' time?

One thing is certain: architecture will change a lot, just like the society in which we live. Flexibility is incredibly important in the knowledge society. And that's why it's gaining more and more significance in the design of buildings. Architects have to keep a close watch on changes in society. That's the only way to design the appropriate buildings. At the moment, planners think in 20-year time frames, and architects think in five-year time frames. The danger here is that when a building is completed it is already out of date. That's why I'm sure we can't afford to stipulate: this is an administrative building, this is a laboratory, and that's a housing complex. We'll see buildings with very flexible structures. The trend goes back to the loft idea. We can already sense this in one of our projects in downtown Los Angeles. It's a residential tower with 160 living units – where all elements of prescribed uses are kept to an absolute minimum.



Stefan Behnisch

Since founding the office of Behnisch Architects in 1989, Stefan Behnisch has directed the design of dynamic, award-winning buildings that promote sustainability within the built environment.

Solar City Freiburg

Freiburg im Breisgau is the home of solar technology pioneers. The sunny university town has been writing solar success stories for 30 years

By Bernward Janzing

The view on one side takes you to Schlierberg; on the other, it stretches as far as the meadows and forests of Schönberg. On top of this long office and shop building in Merzhäuserstrasse, solar architect Rolf Disch has built a number of penthouses. They aren't normal penthouses. Barbara Schweer, who has now lived in one of the houses for three years with her husband Martin Hoyer and their daughter, produces some impressive energy figures: the family need less than 4,000 kilowatt hours a year for heating and hot water, which corresponds to the heating value of less than 400 liters of oil. The heat is piped in from a nearby wood-fired power plant. "In the first year we only had heating costs of 300 euros," says Schweer. That is really an achievement in a house with 167 square meters of living space. Optimal heat insulation is part of the recipe for success. Even on January days when temperatures fall to around freezing point, the house often doesn't need any heating once the sun comes out from behind the clouds for a while. That's because the south-facing glass façade captures the oblique winter sunlight, while later in the year the high summer sun is prevented from shining directly into the rooms – the house has been very intelligently designed. And the family all agree that the interior climate is ideal inside a building that contains large amounts of wood.

"Plus Energy House" is the name Architect Rolf Disch uses to describe the building, because over the year it produces more energy than its inhabitants consume. The solar electricity generating unit on the roof feeds nearly 9,000 kilowatt hours of electricity a

year into the grid. If you deduct the family's own electricity needs as well as the heating energy they use, you're left with an annual surplus of some 2,000 kilowatt hours. That's also well worth it financially: the monthly costs of just under 100 euros for electricity and heating are offset by income of almost 400 euros from the solar generator. Architect Disch speaks self-confidently of a "monthly energy income" and prophesies: "Additional costs for housing will eventually be transformed into additional income." Disch has already built 47 of these plus energy houses at the foot of the Schlierberg in Freiburg – some as penthouses, some as terraced houses.

A house follows the sun

Not far away stands the Heliotrop – yet another innovation from Disch's office. It is a revolving solar house that follows the sun, thereby enabling it to draw the maximum benefit from the incoming rays. It was the first plus energy house in Germany and is now one of Freiburg's most frequently visited solar projects. Freiburg really doesn't have any shortage of solar innovations. They also include the solar factory. During the mid-1990s, when the future of the solar industry in Germany was still rather uncertain, Georg Salvamoser boldly founded a solar module factory in Freiburg and was able to celebrate the nationwide launch of a highly promising industry in February 1996. Although other German solar firms overtook it long ago in terms of size, Freiburg im Breisgau can still claim it was the pioneer – as is so often the case when innovations in the solar energy field are concerned.

The main pacesetter for Freiburg's solar progress is the Fraunhofer Institute for Solar Energy Systems (ISE). With a total of over 500 employees and more than 18,000 square meters of offices, laboratories and test areas, the ISE is the largest solar research institution in Europe today. The Fraunhofer Institute is also so successful because the staff here steadfastly maintained their belief that solar energy would eventually make a breakthrough. The new institute building, which was only opened in fall 2001, soon became too small again and some of the scientists and equipment have already moved to the neighboring building and the Solar Info Center (SIC). The SIC is another highlight of Solar City Freiburg: the modern building near Freiburg's exhibition and conference center is considered a nationwide competence center for the solar industry. Its 14,000 square meters of space allow various firms to work together under one roof in a variety of different ways on the subjects of renewable energy, solar construction and energy-efficiency. The spectrum ranges from one-person firms with 20 square meters of office space to large, internationally renowned businesses.

One of these is Concentrix Solar, a company that was founded in 2005 as a spin-off from the ISE. Since February 2006, Good Energies, one of the leading strategic investors in the field of renewable energies, has held a stake in the young firm that produces concentrator power plants for sunny locations. An optical system consisting of Fresnel lenses, very thin lenses, concentrates the sunlight onto a small high-performance solar cell. These solar cells trans-

form the light, which has been concentrated almost 500 times, directly into electrical energy. Using its Flatcon technology, Concentrix was the first company to develop a terrestrial application for the high-efficiency solar cells that had previously only been used in space. Today these solar cells already achieve excellent efficiency rates of 35%. "By using high-efficiency solar cells, the concentration of light and high precision in positioning the solar cells, Concentrix realizes module efficiency levels of more than 26%," says CEO Hansjörg Lerchenmüller. Compared to conventional silicon technology, Concentrix has been able to almost double the all-important module efficiency. Concentrix is now regarded nationwide as a highly innovative solar specialist – and a solar success story. At the beginning of 2008, the company was honored with the Innovation Award of the German Economy. The new modules have been produced in Freiburg since the middle of 2008, which is considered a success for the solar city, because other regions had made strong attempts to attract the innovative solar specialists away from Freiburg.

A soccer club generates energy

Yet this is by no means the end of the list of Freiburg's solar projects. For example, no other German city is more committed to advancing solar climatization, and Freiburg offers not one, but two pilot projects in this area: at the Chamber of Industry and Commerce (IHK) building and the university hospital. Furthermore, for many years now Freiburg with its 200,000 inhabitants has been at the top of the "Solarbundesliga", the ranking of solar energy use in German towns and cities. Although in harsh reality, its professional soccer club SC Freiburg may only play in the second division, even in its struggle for goals and points it fulfills its solar obligations. Some 2,200 square meters of photovoltaic cells on the roof of the Dreisam Stadium generate roughly two million kilowatt hours of solar electricity a year. In combination with the environmentally friendly Stirling engines that form part of its heating strategy, SC Freiburg generates more than half of its entire electricity needs itself – emission-free.

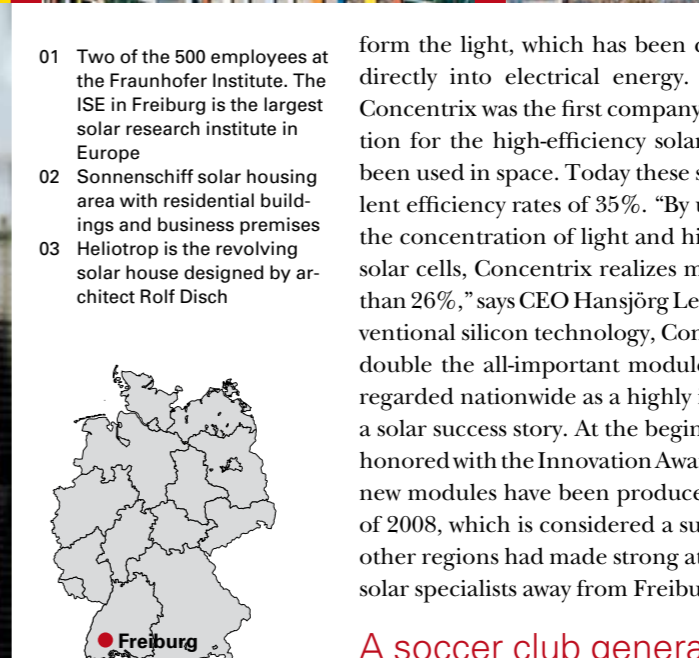
Why has solar energy developed in such an exemplary way in Freiburg? Why are there so many innovative solar projects here? Perhaps because the city is located in one of Germany's sunniest regions. Perhaps also because solar energy has always been linked in Freiburg with the image of ecological quality of life. Most probably, however, the main impetus came from events that occurred over three decades ago: in the 1970s there were plans to build a nuclear power plant before the gates of Freiburg. But the people of the region opposed it. However, the campaigners did not stop at protest, they also developed alternatives. Only a year after the occupation of the construction site, a first solar energy fair was held in the nearby wine-growing municipality of Breisach. That represented the birth of Solar City Freiburg. ■



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- 01 Two of the 500 employees at the Fraunhofer Institute. The ISE in Freiburg is the largest solar research institute in Europe
- 02 Sonnenschiff solar housing area with residential buildings and business premises
- 03 Heliotrop is the revolving solar house designed by architect Rolf Disch



Spohrer/Lair (3)
Geofflicher/Visum, Rauch/Lair

Strategies for More Sustainability

What can stop climate change? Which forms of energy will we use in the future? How can everyone be assured access to enough water? These important questions are closely linked to environmental and climate protection

By Martin Orth

In 2008 Time Magazine ran the headline “Lessons from Germany”. In the article that followed, the renowned US magazine gave detailed answers to the question: “What can Americans learn from Europe’s most populous country?” It informed its readers about how Germany saves energy, lowers carbon dioxide emissions and generates power from renewable energy sources. “Germany cut its greenhouse-gas emissions by 18% between 1990 and 2005,” the magazine writes, “while emissions in the USA rose by 16% in the same period.” Time Magazine paints a picture of a new Germany where wind farms, biogas plants and solar roofs have become a normal part of the landscape. The main point made by the article is that the German Federal Government paved the way for change early on. It introduced an eco-tax to reduce oil consumption. It built up a recycling system to conserve resources and re-use raw materials. And above all, it passed the Renewable Energies Act (EEG).

The EEG, which came into force in 2000, is at the heart of German energy and climate policy. It encourages citizens, businesses and local authorities to generate electricity for themselves from renewable sources and to sell any excess on to the power utilities.

Some people have been making a tidy profit out of this program. And the proportion of power consumption generated by renewables has risen to 14% within a few years. The target is 25 to 30% by 2020. In the meantime, 47 countries have themselves passed legislation modeled on the German Renewable Energies Act. After all, not only the climate benefits from the program of market incentives, but also the economy. One in three solar cells and almost half the world’s wind turbines are made in Germany. The German “greentech” industry is the technology leader. According to a recent study, by 2020 it will have the potential to take over from the successful mechanical-engineering and automotive industries as the biggest employer in Germany. “Environmental protection and jobs are not a contradiction. On the contrary, the two are mutually dependent on a global scale,” says Sigmar Gabriel, Germany’s Federal Environment Minister. People are already talking about the “third industrial revolution.”

The idea is not as utopian as it may sound, because protecting the environment and climate is one of the greatest global challenges of the 21st century and will require enormous efforts. How can climate change be stopped? What will be our sources of energy in

the future? How can an equitable and sufficient supply of water and food be assured for the world’s growing population? These are the most pressing issues of our time. Consequently, environmental protection has become an important part of German foreign policy. Diplomats speak of “foreign policy for environmental protection,” and mean a three-pronged approach consisting of “future provision, conflict prevention and active security policy.” After all, environmental issues (e.g. unfair distribution of water) can lead to considerable social and political tensions. The Federal Foreign Office is therefore promoting international environmental protection on many levels, be it in negotiations on international environmental agreements or by organizing conferences. For example, 150 business and political leaders from the five Central Asian countries were guests of the Federal Foreign Office in Berlin in 2008 for the “Water Unites” conference. This meeting launched the Central Asia Water Initiative, which comprises a wide range of collaborations and support measures to counteract the negative consequences of water shortages in the region.

Preparations for Copenhagen

Energy and climate policy was at the center of the environmental issues discussed – a field in which Germany is assuming a pioneering role with its ambitious reduction targets in the fight against climate change. Germany is already very close to delivering on the commitment it made in the Kyoto Protocol to reduce greenhouse-gas emissions by 21% by 2012. Furthermore, Germany is second only to Sweden in the 2008 global Climate Protection Index, which rates the performance of 56 countries in climate protection. In its efforts Germany applies a dual strategy of improving energy and resource efficiency and expanding the use of renewable energies and renewable primary products. The country is also taking the lead within the European Union. If other countries are prepared to follow suit, Germany has said it is prepared to aim for even higher targets than some of those specified by the EU, which envisage a 20% reduction in greenhouse gas emissions by 2020 compared to the figure for 1990, raising renewable energy’s share of the energy mix to 20%, and reducing energy consumption by 20%. On Germany’s initiative the heads of state and government of the eight leading industrial nations (G8) have agreed to halve CO₂ emissions by 2050. The aim here is to limit the rise of the average global temperature to two degrees Celsius. Germany is also intensely involved in the preparations for the 2009 Copenhagen Climate Conference. The key issue there will be reaching an agreement on a new, comprehensive climate-protection regime to avoid international climate protection efforts coming to a standstill after the 2012 Kyoto Protocol runs out. The integration of economically advanced NICs (newly industrializing countries) such as China, India, South Africa, Brazil and Mexico will be high of the agenda. After all, the global challenge of climate protection cannot be mastered without these partner countries.



Benedikt Luff, Hans-Christian Palmbeck/Luff, Joe Riedel/Gettyimages News, picture-alliance/ZB

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