



Why the sunny, windy
United States
is so far behind calm, cloudy
Germany
in renewable
electricity generation.

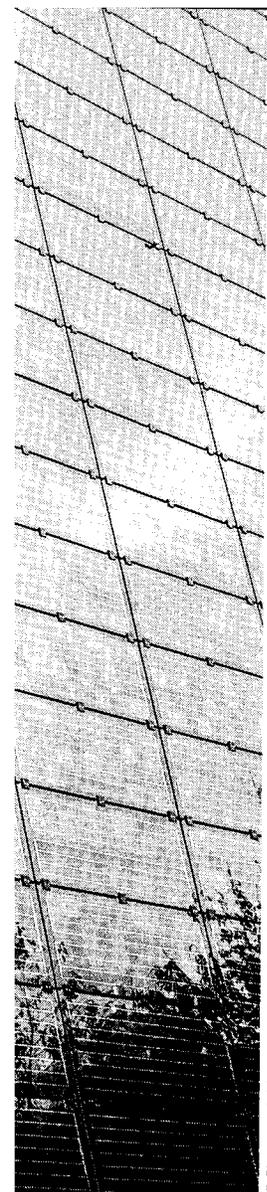
by *Craig Morris and Nathan Hopkins*

Georg Schürer lives in a suburb of Freiburg, a 900-year-old city perched on the fringe of Germany's Black Forest. Herr Schürer's house, sturdy and comfortable, is fairly indistinguishable from the others surrounding it in the Vauban community. The three-story townhouse has large south-facing, triple-glazed windows, a small garden, a shed—and solar panels

covering the entire southern exposure of the roof.

While Freiburg is held to be the warmest city in Germany, the country is hardly famed for its sunniness. Yet the solar panels on Schürer's roof are not all that unusual, thanks to a German energy policy called "feed-in tariffs" (FITs). FITs have democratized energy policy, allowing both ordinary homeowners and corporations to invest directly in renewables. The United States also has policies to promote renewables, but they have largely favored utilities, shutting out the little guy. Though some German solar power plants, scattered from Saarbrücken to Saxony, are the size of football fields, the average solar installation in 2006 only had around 20 panels, each the size of a small tabletop. Clearly, Germany's leadership in solar energy stems not just from large utility plants but from the roofs of ordinary homeowners like Georg Schürer.

Other nations have taken notice. With rising energy prices and an increasingly precarious supply of oil, a diverse group of nations has turned to FITs to promote renewable energy. According to Miguel Mendonca, author of the book *Feed-in Tariffs* (2007), some 46 countries worldwide have implemented FITs. FITs are now the most commonly used mechanism for the promotion of renewables.



Even in the United States, FITs have gained a toehold, at least at the state level. The states of Washington and Wisconsin have established policies close to Germany's FIT in recent years, and other proposals are based explicitly on the German model, especially a bill introduced in Michigan last fall. A similar bill was presented to the Illinois and Minnesota legislatures in February. And renewables trend-setter California is also discussing how to implement FITs.

Can German FITs be made to fit America?

It would be ironic if they could not; feed-in tariffs are an American idea. In the wake of two oil crises in the 1970s, President Jimmy Carter called for conservation and alternative energy. California responded in 1983 by establishing standard offer contracts (SOCs), a forerunner of Germany's FITs.

SOCs required utilities to purchase power from qualifying independent generating facilities for 15 to 30 years, and at a fixed rate for the first 10 years of a facility's operation. The policy was a boon for the wind industry, giving it the necessary security to invest, and large forests of wind turbines soon covered the Tehachapi and Altamont Passes in California. Only a few years later, California was getting 1 percent of its electricity from wind turbines. A turning point had been reached.

Or so it seemed to Paul Gipe, who, as executive director of the Ontario Sustainable Energy Association, helped implement Canada's first FITs. Back in 1984, Gipe went to California to join the fledgling wind industry. He had already been working on wind turbines since the 1970s, when wind generator designs were decades old. Many farmers built their own makeshift rotors, either from specially made blades or even old oars and other unused boards, to charge car batteries. Such devices were important sources of electricity on remote farms back in the 1930s, when private utility companies said it was simply too expensive to expand the grid into sparsely populated areas.

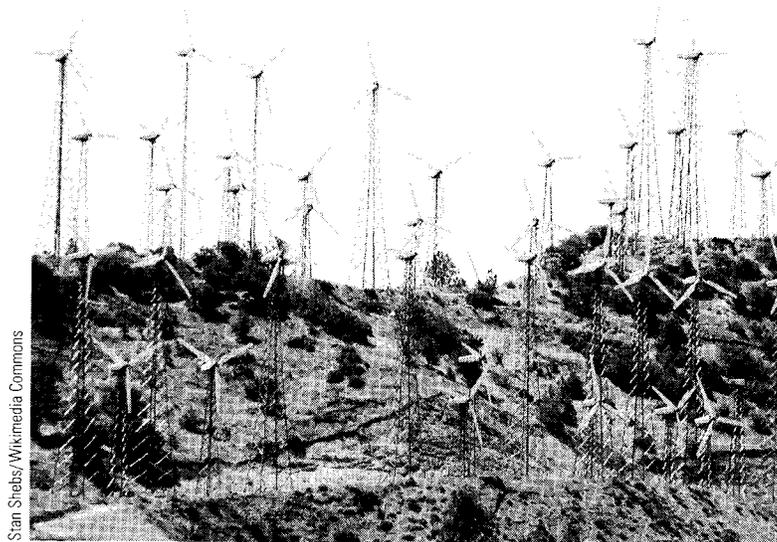
Gipe, communications director in the 1970s for Zond Systems, envisioned turbine designs being quickly improved,

with major advances coming from the United States. The next year, however, Zond was forced to lay off just about its entire staff, including Gipe. Many other wind firms suffered the same fate, as did other fledgling industries such as solar thermal—the famous Solar One pilot project, though promising, did not spur a new industry. Instead, falling natural gas prices led to a boom in gas turbine construction.

The country's mood had changed, along with its attitude toward energy consumption. California let its SOC expire as oil prices bottomed out. Gipe was left standing between towers of turbines, many of which were poorly designed early models. He tried to get power companies to clean up their act and at least dismantle the unsightly, broken turbines that increasingly made the once-futuristic Tehachapi site look more and more like a ghost town, but his efforts were in vain. Wind companies told him that there was simply no money to take down broken turbines.

When Gipe later visited a Danish wind farm, he learned that the Danes had set aside enough money at the outset to eventually dismantle the facility. After all, the turbines belonged to the community, not to a company that, like Zond, could later be taken over by a global player such as Enron with no local ties. The whole time he was in Denmark, Gipe never once saw an abandoned wind turbine. "I should give the towers a fresh coat of paint soon," the Danish project manager mumbled, as Gipe squinted to find the problem.

Gipe couldn't help but think that the Danish were carrying forward his dream of families and communities investing in wind energy: "It sounded far-fetched back in California, but it was commonplace in Denmark, where farmers are raising a new cash crop: electricity." The gigantic, modern turbines on this Dane's farm were a far cry from the propeller-to-battery models that American farmers were still stuck with several years after the California Wind Rush.



Stan Shebs/Wikimedia Commons



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The Danes used a mechanism similar to California's SOCs. Then, in 1991, Germany quietly borrowed the idea behind California's old SOCs from Denmark and passed the country's first FIT for wind and small hydropower. Expanded in 2000 to cover all renewables, this energy policy has made Germany the current leader in both solar and wind and has invigorated its biomass sector. "All the experience we built up, all the enthusiasm, all the hopes—we threw those out the window, and it's been a two-decade-long wandering in the desert here in North America. Thank God for the Danes and the Germans," Gipe says. Now, just 17 years after Germany implemented its first FIT, 18 of 25 European Union (EU) countries have adopted the policy.

In contrast, the United States has relied primarily on two state-level policies to promote renewable energy: net metering and renewable portfolio standards. With net metering, which has been implemented in 42 states and the District of Columbia, energy produced by a utility customer can offset the power it consumes from the utility-fed grid—a bit like being able to obtain store credit by selling your home-grown plums back to the grocer.

Typically, however, no matter how much "fruit" a customer can produce, the most he/she can do is break even, and any unused credit expires at the end of the year without compensation. The compensation for "excess" electricity production is similar. States from Maryland to Arkansas and California credit excess production (when a generating customer produces more than it consumes) in one month to the next month's bill. If the customer ends up with excess at the end of

the year, however, the utility does not have to pay anything, even though the customer offset peak power purchases for the utility by producing most of its solar power in the early afternoon, right when electricity is needed most. Instead, the utility gets whatever is left over at the end of the 12-month billing cycle for free.

What all of the state schemes share is the idea of "store credit." Utilities that actually pay customers back for excess production are few and far between. One of the most advanced net metering schemes in the United States is probably Austin Energy's. The municipal utility in the capital of Texas does not, however, pay the full retail rate for excess production, much less the peak rate generating customers are offsetting for them. They pay a "fuel rate" (commonly known as "avoided cost") for the fuel they did not burn, which is about one-third of the retail rate for electricity.

For utilities, avoided-cost schemes make sense because renewables generally offset natural gas consumption in generating plants. But for homeowners investing in solar panel generation, such schemes make no sense at all: the cost of natural gas has nothing to do with the cost of solar panels. As investors, they need compensation to cover expenses and yield a slight profit—exactly what German FITs do.

The second common renewables policy instrument in the United States, renewable portfolio standards (RPSs), set minimum shares of total electricity generation that must be met with renewable energy. Nevada, for instance, has man-

dated that 20 percent of its electricity be derived from renewables by 2015. California wants 20 percent by 2018. Texas has set its target as an absolute amount: 5,880 megawatts of capacity by 2015.

Under RPSs, a utility can meet its renewable energy obligation by securing tradable renewable energy credits in three ways: by producing renewable energy itself, via wind farm, solar power plant, or other renewable facility; by contracting for the longterm purchase of credits or renewable power; or by buying credits on the spot market. In theory, competition to provide utilities with the requisite credits is supposed to lower electricity prices.

Both the United States and Europe are embracing renewable energy. The European Commission has set a binding target of 20 percent of the EU's total energy supply from renewables by 2020. U.S. President George W. Bush has candidly stated that Americans are addicted to oil, while state and local governments have implemented a range of policies to promote renewable energy. Europe and the United States are both going in the direction of necessity. But Europe is moving faster.

And Germany is moving fastest of all. A country with only moderate wind and solar potential has become a global leader not only in renewable energy generation but also the manufacture of related hardware—a success largely attributed to the FITs in the German Renewable Energy Act. The basic principle behind Germany's FITs is consistent with the SOC's established in California in the 1980s: German utilities enter into 20-year contracts to purchase power from nonutility power

producers. But there are two key differences: California's SOC's were based on longterm projections of energy prices, whereas Germany's compensation depends on the actual cost of each renewable source. And in Germany, ordinary citizens can become producers and compete with utilities.

With this FIT, your home-grown plums don't earn you store credit, but cash. To extend our analogy, if the government decides to increase organic fruit production from suppliers, it could require grocers to purchase organic plums, pears, and bananas at set prices that would cover reasonable costs and ensure a small profit for producers. Of course, the cost of growing each fruit is different, so the price the grocer guarantees varies, with each fruit ultimately showing roughly the same potential profit margin. Just as this policy gives similar incentives to grow plums and bananas, the FIT promotes solar and wind equally. The result is something of a renewable energy fruit salad.

Compare this to the RPS, which essentially shuts out the small producers that have been crucial to Germany's success. Imagine you bring a basketful of home-grown plums to a grocer and ask that they be purchased as part of the store's effort to have, say, 20 percent of its produce organically grown (much in the way Nevada wants 20 percent renewables). In all likelihood, the manager would politely remind you that you are a customer, not a supplier: "We only buy from wholesalers," he would say, and explain how inefficient it would be to have to process all these small suppliers coming in with single baskets.

Proponents of RPSs praise the U.S. approach for being more efficient; after all, FITs make relatively costly small projects just as profitable as big ones. In the process, however, RPSs stymie investments by homeowners and small busi-



Steven Clark

nesses, leaving renewable power generation up to wholesalers. The largest U.S. wind farm in 2006, Horse Hollow in Texas, has as much generating capacity as a large coal-fired plant and is owned by a single company, FPL Energy. In contrast, although Germany had twice the renewable generating capacity of the United States in 2006, the largest German wind farm is less than one-seventh the size of Horse Hollow, and ownership is spread across numerous local companies and individual investors.

Of course, despite the successful expansion of renewable energy under the FIT, Germany is still dependent on fossil fuels. Germany is the third-largest oil importer in the world, behind the United States and Japan, and precariously relies on Russian natural gas. However, Germany benefits from FITs in several key ways. First, 14 percent of Germany's total electricity supply (or 8.4 percent of total energy supply) is already accounted for by renewables. Second, Germany is progressing rapidly toward even larger shares (Germany was striving for 12 percent renewable electricity by 2010, and got only 3 percent of total energy supply from renewables as recently as 2002). Third, the policy has helped avoid the emission of mil-

come knocking on Germany's door for the equipment. The United States may have more wind and sunlight than Germany and it may all be free—but the technology isn't.

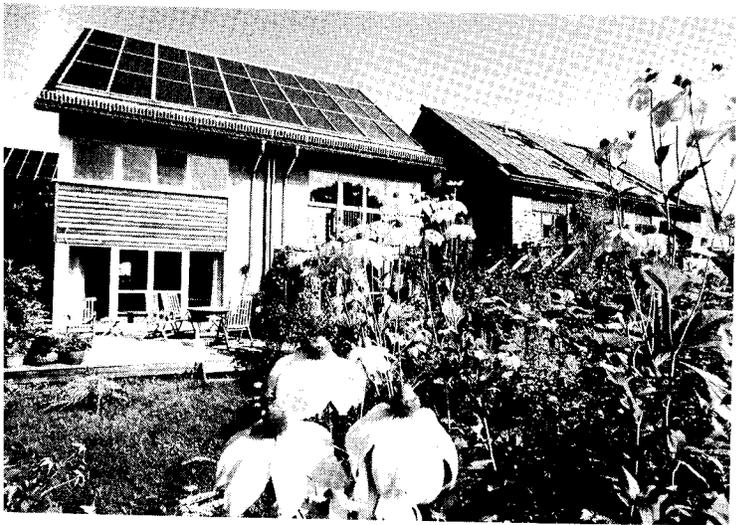
FITs have had more success than RPSs in promoting renewable energy, but at what cost? Production of any commodity—even hand-carved wooden DVD players—can be expanded if a profitable market is guaranteed. Furthermore, *The Economist* criticized the German FIT and its “madly generous subsidies” for allegedly raising the price of solar cells for sunny countries where such technology could be more usefully employed. Prices of solar panels were admittedly temporarily high as the industry scrambled to keep up with demand, but they have fallen as industry has cleared the backlog. And in 2007 sunny Spain was the main culprit, not Germany; the Spanish implemented revised FITs for solar and wiped the market clean, even slowing down installations in Germany.

Based on the majority of policies currently implemented, the United States nonetheless seems to believe that FITs are too expensive. RPSs are often touted as more market-oriented than FITs because utilities will attempt to meet their quotas by purchasing the cheapest renewable energy. Competition, therefore, is created not only among, say, different solar companies, but also among the geothermal, solar, and wind sectors. As a result, RPSs give the biggest boost to wind energy because it is already the cheapest renewable energy source on a kilowatt-hour basis. The British government acknowledged as much when its department of Trade and Industry concluded in a May 2007 review of Renewables Obligations (quota systems similar to RPSs): “As a technology-neutral instrument, the RO has thus far proved less successful in bringing forward development of less well developed renewable technologies.”

While a score of U.S. states have RPSs, seven have at least specified a separate target for solar energy to make sure that wind does not take up the entire pie. In Nevada, for example, 5 percent of the target established by the RPS must be generated from solar technology. But even this two-target approach ignores the potential diversity of renewable energy. No wonder the U.K. recently proposed to reform its RO by creating four different levels of subsidies, with the more speculative technologies, such as tidal power, garnering the most support.

A common feature of all quota systems, from the U.K.'s dynamic RO to Nevada's two-target RPS, is the role of utilities and governmental bodies. As the American Wind Energy Association states, the role of the government in RPSs is to “certify credits, monitor compliance, and impose penalties if necessary.” The British Wind Energy Association even reports its annual statistics on credits in three categories: submitted, approved, and refused.

But German FITs know no such bureaucracy; no approval is required. If people like Georg Schürer wish to put solar panels on their roof, they need not request forms for govern-



Joerg Boethling/Peter Arnold, Inc.

lions of tons of CO₂—more than 100 million tons in 2006, according to government estimates. In comparison, EU emissions trading is estimated to have practically offset no carbon emissions because the system, now being revised, was poorly designed. The United States still does not have a mandatory emissions trading scheme, but the website for the voluntary Chicago Climate Exchange says that in 2006 “offsets for the year totaled 1.5 million tons” of CO₂. U.S. annual CO₂ emissions are around 6 billion tons.

But the ultimate benefit of Germany's FITs is the technology, industry, and infrastructure that are being created for the global turn to renewable energy, which Germans are betting is inevitable. When the world is forced to switch, it will

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policy would eventually lower prices, while an April 2007 report by Photon Consulting says it's already happened. The cost of solar electricity is expected to fall below the retail power rate in sunny areas as early as 2010.

The dream of clean-energy independence that began in California in the 1980s may yet conquer the United States. Indeed, in the spring of 2007 Al Gore described to a Senate committee a vision for America that closely resembles German reality when he called for a law to allow people to sell renewables to the grid "without any artificial caps, at a rate that is determined not by a monopoly"—that is, Gore explained, "You can have the tyranny of a single seller; you can also have the tyranny of a single buyer, and if the utility sets the price then it'll never get off the ground."

In the 1930s, when many U.S. farmers depended on their rickety, homemade windmills for electricity, the big sellers (utilities) were reluctant to expand the grid to rural areas.

The Roosevelt administration stepped in to ensure grid connections for all Americans. Now RPSs are being used to encourage the big sellers to switch to renewables instead of letting Americans make the changes themselves.

FITs could move the United States closer to free markets and enhance individual liberty, as well as replace energy imports with clean, domestic energy and create well-paying jobs. No longer would power production be left up to large corporations; they would have to compete with the little guy. U.S. citizens place great stock in personal freedom, but today a growing number of Europeans enjoy a freedom many Americans are not even aware they lack: the freedom to make—and sell—their own juice.

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 For more information about issues raised in this story, visit www.worldwatch.org/ww/juice.



ential subsidies and hope for approval and quick processing. German homeowners simply call a local solar contractor to set a date. In this way, German FITs leave everything but price up to the market. The result is that all worthwhile projects can go online, not just a select few deemed by utilities to be most efficient.

Ultimately, because of such uncertainty and bureaucracy, quota systems have proven not only less effective in promoting renewable energy but also more expensive than FITs. This conclusion is shared by many policy-neutral bodies. The EU Commission, which does not impose energy policy on member states, stated in a 2005 review of member policies that FITs "have proven to be 'in general cheaper and more effective than quota systems.'" The U.K.'s Sir Nicholas Stern concluded his *Review on the Economics of Climate Change* that FITs "have larger deployment at lower costs." And the International Solar Energy Society agrees: "To date, feed-in policies have achieved the greatest market penetrations of renewable energy, produced the most cost-effective renewable energy, established local industries, built domestic markets, created jobs, and attracted small and big private investors as well as farmers." Even *The Economist* acknowledges that Germany's