

Rise and Shine

The clouds of high costs haven't darkened the solar promise.

BY GLEN ANDERSEN

The sea of solar panels at the Blue Wing Solar field near San Antonio, Texas, spans 114 acres and silently produces enough emissions-free electricity to power 1,800 homes.

The field, the third largest solar photovoltaic installation in the United States, is expected to produce electricity reliably for 30 years. So why did the utility choose solar?

"CPS Energy has worked to include solar power in our generation portfolio in an effort to expand our low-emission resources," says Richard Peña, senior vice president of energy development at CPS Energy, which purchases the energy generated at the site.

Utilities across the nation—in response to government incentives, mandates, their own goals and customer interest—are increasing the amount of solar electricity in their portfolios. The United States has some of the richest solar resources in the world, with enough potential to supply the nation's electricity needs many times over.

The challenge is tapping that resource efficiently and at a cost that will be comparable with conventional electricity prices.

"Today, we have a very diverse fleet that includes nuclear, coal, natural gas, wind, and small amounts of solar and landfill gas," says Peña. "Our bills remain among the lowest of major cities across the country, and we continue to look for ways to ensure diverse energy resources, because it's proven to be in the best interests of our customers and community."

State lawmakers have been helping enlarge both residential and utility solar markets through tax rebates, renewable energy requirements and financial assistance. Those who support incentives cite a number of reasons.

"Solar systems are quick to install, use a fuel that's free, gener-

ate electricity during peak demand, need no water, and are extremely versatile in where they can be used," says Texas Representative Drew Darby. "Texas needs to use every homegrown resource we can find. We have a lot of gas, we have a lot of wind, and we have a whole lot of sun."



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Texas

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Ohio Senator Kris Jordan, however, thinks state policies promoting the use of solar are not needed. Jordan, who introduced a bill to roll back Ohio's clean energy requirements, says the "mandate unnecessarily distorts the energy market and forces power companies to use expensive new technologies that have been shown to drive up energy costs."



Senator
Kris Jordan
Ohio

Booming U.S. Market

Despite the high-profile bankruptcies of a few U.S. solar companies this year, by most measures the solar market is healthy and growing. It increased 67 percent, from \$3.6 billion in 2009 to \$6 billion in 2010, and the rapid growth continued through the first two quarters of 2011. Although solar contributes less than 1 percent of the nation's electricity needs, nearly 9 percent of all new electrical generation capacity installed this year is expected to be solar.

One of the drivers for solar is the ease and speed at which installations can be built. Compared with conventional power plants, solar facilities can be built much more quickly, since they can be spread out in many different places and located near where energy is used—rooftops, fields, parking structures and highway medians. The lack of emissions also makes them much easier to site than a fossil fuel-driven power plant.

Until 1999, the United States led the world in solar panel production, although it now produces just 6 percent of the world's panels. China, which produced just 1 percent in 2001, has lever-



aged strong government support to become the world leader, now producing 54 percent of the global shipments of solar panels. China’s government mandate for 20 percent renewable electricity by 2020, supported by extremely low-interest loans from government banks and other solar incentives, has made China not just a leading exporter, but also No. 1 for solar capacity installed in 2010. The United States is now fifth.

The U.S. solar energy industry is rising again, however, competing on a global scale and increasing its global share of the solar market. Last year, the nation exported \$1.9 billion more in solar equipment than it imported. Solar technology is one area where the United States enjoys a trade surplus with China. To challenge the competition in a rapidly changing market, U.S. manufacturers are developing high-quality, internationally certified solar panels using highly automated processes.

Cost of Solar

Electricity costs from new utility-scale solar projects built in 2011—including the federal government subsidy—were about 11 to 12 cents a kilowatt hour and are expected to fall to about 8 cents by the end of 2012, which will make them cost competitive with

natural gas in some regions. Rooftop-mounted solar costs about 13 to 19 cents a kilowatt hour, while electricity from new coal and gas plants is 7 to 12 cents, and 7 to 10 cents respectively. Wind is 4 to 8 cents a kilowatt hour. Without federal subsidies, utility scale solar would cost about 15 to 17 cents a kilowatt hour.

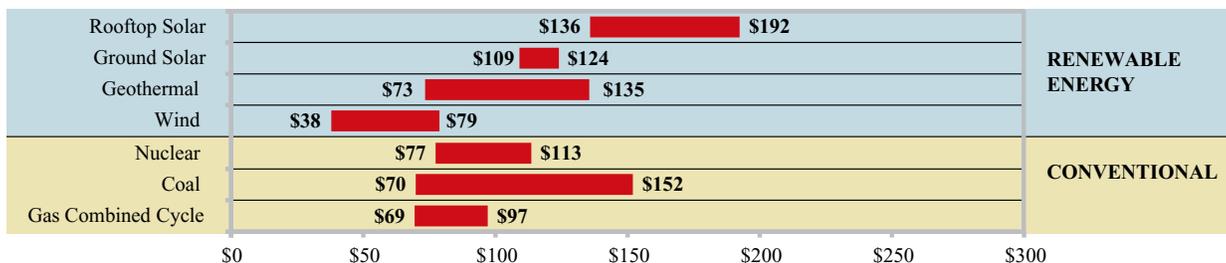
Less expensive systems and streamlined installation drove down solar costs by 17 percent in 2010 and another 11 percent in the first six months of 2011, according to the Lawrence Berkeley National Laboratory. There is still much room for price drops. In Germany, streamlined regulations and a larger solar market make the cost of rooftop solar about 40 percent less than in the United States.

In states with the most aggressive requirements for solar and other renewable energy, electric rates have increased by 1.4 percent or less. Many states cap the rate increase from renewable requirements at 1 percent to 4 percent, according to the Lawrence Berkeley National Laboratory. These cost increases do not account for future energy security risks. Solar power can provide utilities and homeowners with a hedge against increasing prices since, after installation, solar electricity prices are not subject to rising fuel costs.

Comparing the Cost of Energy

This comparative look at the costs of conventional and renewable energy per megawatt hour includes financing, operating and fuel costs. The range of prices for individual fuel sources reflects the varying costs of siting, permitting, land and construction costs.

The cost of renewable energy includes federal incentives.



Source: Lazard Inc., 2011

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—Ohio Senator Kris Jordan

Policy Drives the Industry

State and federal policies have spurred much of the demand and market growth, which has driven innovation and increased economies of scale, resulting in steadily decreasing prices. The federal government offers a 30 percent tax credit for purchase of solar energy equipment through 2016. As part of the American Recovery and Reinvestment Act, businesses and homeowners can choose to receive a 30 percent cash rebate instead, although this option expires at the end of 2011.

State policies to support solar and other renewable sources are seen by some policymakers as a way to level the playing field. “The thing that distorts the energy market the most is monopolies,” says Representative Tom Murry of North Carolina. “I want to see real competition and innovation, and encouraging innovation can be part of the incubator [for the industry].”

The role of state policy in pushing the market is significant. The top seven states for solar installations all have major incentives and were responsible for more than 80 percent of the growth in 2010. Incentives include tax rebates, renewable electricity requirement, financing options and grants.

Twenty-nine states require utilities to sell a certain percentage of electricity from renewable resources by a specified date. Colorado, for example, requires 30 percent of the electricity sold by investor-owned utilities to come from renewable sources by 2020.

Since these requirements tend to prefer the lowest cost renewable energy, which usually is not solar, 16 states have specific requirements for solar or on-site energy generation. Policymakers in those states reason the benefits of local generation—such as quick deployment, lack of transmission requirements, and a lowering of peak electricity demand—are not captured in the market price. Still, as solar prices drop, solar projects are more competitive with wind and other renewables. Although much of solar capacity has been installed in sunnier states, New Jersey’s aggressive policies made it second in the amount of solar installations in 2010.

Murry introduced a bill to double North Carolina’s solar requirement. “There’s a recognition that the cost of solar has gone down and that we could double the requirement without additional cost.”



Representative
Tom Murry
North Carolina



The proposed legislation builds on an existing solar requirement that has been surpassed and has created remarkable job growth, Murry says. He notes the incentives are temporary. “Costs will go down for everybody, and incentives are only needed until there is cost parity.”

Darby authored legislation in Texas that would have provided solar rebates, though it did not pass. “There are very few forms of electric generation that can be installed quickly, require no environmental permitting, and use no water.”

Darby also saw potential economic benefits in the policy that far outweighed the costs. “There are hundreds of companies all over the world looking to spend billions of investment capital in the solar industry. We had companies such as Barclays Capital, GE Financial Services, Union Bank, and Citi ready to invest if the legislation would have passed,” he says. The bill also would have created up to \$6 of private investment for every \$1 of rebate, while generating up to \$480 million in sales tax, Darby says.

One challenge with solar energy is that the upfront cost of the components is quite high. If financed—as part of the cost of a mortgage, for instance—the cost of residential solar power can be reasonable because the amount saved on an electricity bill can be greater than the loan payment, depending on the location, local solar incentives and other factors. To help, many states offer low-interest financing as part of the utility bill or



financing through special property tax assessments. This allows municipalities to use bonds so homeowners can install solar on their houses and repay the loan through monthly payments added to their property tax or to their electric bill, depending on the program. The tax option, called property assessed clean energy financing, has been authorized in 27 states, although it is on hold because of the concerns of federal housing administrators and mortgage backers Fannie Mae/Freddie Mac.

“Solar will not replace nuclear power or other baseload power, but will help meet peak energy needs,” says Murry. “It’s all part of the mix.”

The Sun Always Rises

Solar power’s intermittent nature can present a challenge and add cost when integrating it into the electric grid. System operators must balance energy supply with demand continuously every day as consumption rises and falls because of the changing needs of industrial, office and home users, and to deal with equipment failures and power outages. A cloud can cause a dramatic drop in solar output, requiring immediate response from the system. Still, new grid technologies and planning allow solar to be integrated without significant cost, according to the experience of many utilities across the nation and analysis by Lawrence Berkeley National Laboratory.

Although sunshine is intermittent, improvements in solar fore-

casting have made it easier to plan for changes in output and incorporate solar power into the energy mix. Although it isn’t always available when needed like natural gas, coal, hydropower and some other generation sources, solar can reduce the electricity load at peak times of the day when the cost of meeting energy demand is highest, diversify the mix of energy sources and reduce fuel consumption, which drives down fuel prices and energy costs.

Subsidies and the Free Market

The explosive growth in solar, and the state policies that promote it, have not been championed by all. Some feel the cost of solar could drive up electricity prices, placing extra burdens on ratepayers.

“When it comes to mandating the use of more expensive energy sources that cannot stand on their own, that doesn’t make economic sense, and that should not be something we force on our families and businesses,” says Ohio’s Jordan.

Darby disagrees. “Policymakers in Texas have consistently supported incentives to help industry that is homegrown and utilizes Texas’ natural resources for decades,” he says. “The oil and gas industry has been the primary beneficiary of those incentives, and I don’t believe they have distorted the market.”

All large U.S. energy industries receive subsidies, despite the fact that many are mature, competitive technologies. The federal government awarded \$3.4 billion for clean coal research and construction under the stimulus bill. Clean coal technologies also receive billions of dollars in federal loan guarantee. Nuclear energy and natural gas also receive significant support from taxpayers in the form of research dollars, loan guarantees and tax credits.

States also provide incentives: Maryland, Ohio, Virginia and West Virginia, for example, provide a \$3 a ton coal tax credit to corporations that burn coal mined these states. This tax credit is worth nearly \$45 million a year in West Virginia and more than \$70 million a year in Ohio.

Solar subsidies are declining; states that offer incentives and rebates have decreased them by 60 percent since 2004. These subsidies will continue to decline as solar becomes more competitive in more electricity markets in the next few years. Some are predicting parity in some regions with current electric rates between 2013 and 2015.

“Cost will go down for everybody,” Murry says, “and incentives are only in place until there is cost parity.”

Sunset on Solyndra

The bankruptcy in August of Solyndra, a solar panel maker in California, received significant media coverage. It does not, however, indicate so much a failure of the U.S. solar industry as much as the success of competition in driving down prices.

Solyndra manufactured panels from copper indium gallium selenide, a nonsilicon technology. While the technology was expensive, it was competitive in 2008 when silicon prices were high. When the cost of silicon supplies dropped, so did the price of silicon solar panels, leaving Solyndra’s more expensive technology behind.

The question as to whether government analysts in 2008 should have known that silicon prices would plummet, and whether Solyndra misled the government, are different questions and have no bearing on the overall health of the industry in the United States. There are ongoing congressional investigations into the government’s handling of Solyndra.

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