

Incentives promote a boom-and-bust pattern of development—a rush to install systems when incentive dollars are available, followed by a period of retrenchment when support fades. This phenomenon, known in the industry as the “solar-coaster,” is particularly evident in the market’s response to rebate programs.

Solar forecast: Sunny with a chance of rain

Solar-electric installs have surged in the district, but the industry remains dependent on subsidies

By PHIL DAVIES
Senior Writer

In 2008, general contractor Jim Davis saw an opportunity in the shining new world of photovoltaics—generating electricity from the sun’s rays. Increasing numbers of homeowners and businesses were interested in the technology as a way to produce their own power, and generous government incentives defrayed the high cost of solar-electric systems.

Davis and a partner founded Synergized Solar, a one-stop shop for professional installers of solar photovoltaic systems. The River Falls, Wis., wholesaler sells solar PV systems that include everything from silicon panels to motorized racks that follow the sun to wiring that ties the systems into the electric grid. Synergized has sold hundreds of systems for both commercial and residential projects to installers in Wisconsin, Minnesota and other Midwestern states.

But today the company’s prospects don’t look as bright. Competition from national solar PV wholesalers in a growing but still very small equipment market has cut into sales; last fall, 2011 revenues were on pace to fall below the \$2 million the firm took in the previous year.

In addition, cuts to a state rebate program in Wisconsin brought equipment orders from commercial installers in that state “to a screeching halt,” said Davis, the company’s chief operating officer. He isn’t sure whether the firm will turn a profit this year. “We teeter between break-even and being in the red every single day,” he said.



ILLUSTRATION: EDEL RODRIGUEZ

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Synergized’s experience in the solar-electric market illustrates both the promise and the frailties of this nascent industry. On the one hand, producing power from the sun is a growing enterprise nationwide and in some parts of the Ninth District. Both Minnesota and Wisconsin have seen big year-over-year increases in installations and capacity since the mid-2000s.

A sharp drop in the price of solar panels over the past two years has helped to make solar-electric systems more affordable, which creates opportunities for installers, vendors such as Synergized Solar and local PV system manufacturers.

On the other hand, for all this progress, the future of solar PV in the district is somewhat clouded. Despite a high rate of growth, total solar-electric capacity in the region is minuscule, producing only enough electricity to power a couple of thousand homes. Though system prices have fallen, the technology still can’t produce electricity as efficiently as alternative sources of power such as coal, natural gas and wind. The industry has long depended on government subsidies—tax breaks, grants and utility rebates—for sales. Where solar incentives are weak, very little solar development has occurred. And when strong incentive programs are put on hold, revenues and investment falter.

Arne Kildegaard, an economics professor at the University of Minnesota, Morris who has researched renewable-energy markets, calls solar PV an “infant industry” that won’t thrive until it can compete head to head with conventional forms of power.

Achieving “grid parity” will be a challenge in a region with relatively low electricity prices. And in Wisconsin and other district states, solar incentives may not last long enough for the industry to reach that goal; some policymakers have started to push back against incentives for solar PV and other forms of renewable energy.

Here comes the sun

The Great Recession dampened solar PV development nationwide. But since 2009, the industry has been on a tear; in the nation and in certain district states, installations and capacity have grown faster than at any time during the past decade.

Nationwide, over 50,000 grid-con-

nected PV systems were installed in 2010, a 45 percent increase over the number installed the year before, according to the Interstate Renewable Energy Council (IREC), a nonprofit group that tracks renewable-energy development. New systems totaled almost 900 megawatts (MW)—double the generating capacity added in 2009. Some industry analysts were expecting annual installed capacity to double again last year.

Belying the common misconception that cold places lack solar potential, the sun shines as brightly in the district as it does in many warmer parts of the country. Montana and the Dakotas receive about the same amount of annual solar radiation as Florida and Georgia, according to the National Renewable Energy Laboratory. So there’s plenty of raw solar energy in the region for PV systems to tap into. (Sunlight can also be used to heat water for washing or for space heating; this is a different technology called solar thermal.)

Since 2008, installations and capacity have surged in the eastern part of the district, which has seen modest but increasing solar PV development over the past 10 years (see Charts 1 and 2). In Minnesota, the state Department of Commerce has estimated that from 2009 to 2010, new installations more than tripled to about 250, and added capacity rose almost as fast, bringing total capacity to over 4 MW.

In Wisconsin, annual installations more than doubled between 2008 and 2010, according to data on projects receiving state rebates. Almost 60 percent of the 4.6 MW capacity increase in the state over that period came from commercial projects—panels mounted atop warehouses, retail outlets and other business establishments. (These figures exclude projects that didn’t receive rebates, but such installations are believed to be minimal.)

In Montana, solar PV growth has been more measured over the years—about 1.5 MW of generating capacity has come online since 2004—but 2010 was a bumper year for installations, according to NorthWestern Energy data on grants awarded to solar PV installers. Thirteen projects—a 50 percent increase over the previous year—received funding, adding about half a megawatt in capacity to the grid.

North and South Dakota, in contrast to the rest of the district, have seen neg-

ligible solar PV development; installations over the past decade have been too few to be tracked by government agencies and renewable-energy organizations.

Lower installation costs have contributed to the overall increase in solar PV activity. Nationwide, average installation prices for PV systems fell by about 17 percent from 2009 to 2010 and continue to fall, according to a recent report by the Lawrence Berkeley National Laboratory. In Minnesota, the Commerce Department found that the average cost of PV systems dropped from \$10 per installed watt in 2008 to under \$8 in 2010—a \$10,000 saving on a 5 kilowatt (kW) system.

Rapidly falling prices for PV modules, the panels that make up the heart of a solar array, are a major driver of cost reductions. The price of polycrystalline silicon, the raw material used to make the most common type of solar panel, plummeted from 2009 to 2010 because of slack global demand during the recession and ramped-up production before and after the downturn. (Montana is a major producer.) Larger-scale, more efficient manufacturing has also helped to lower PV module costs.

“The panel price decreases that we’ve seen have been pretty dramatic over the last couple of years,” said Rip Hamilton of Solar Plexus, an installer of solar PV and other renewable-energy systems in Missoula, Mont. He says that dropping installation costs helped blunt the impact of the recession, keeping annual revenues steady by inducing customers who would have otherwise delayed projects to go ahead with installs.

Jumping into solar

Rising demand for solar PV systems has swelled the ranks of installers in some district states and created opportunities for distributors and manufacturers of solar systems and components.

The North American Board of Certified Energy Practitioners runs a certification program for installers in renewable-energy fields. In 2008, Minnesota had only 13 NABCEP-approved solar PV installers; as of September 2011, there were 60. Over the same period, the number certified in Montana has more than doubled, to 21. (The number of uncertified installers in these states is unknown; no

district state requires special training for PV technicians.) Many of these installers are electricians who jumped into the solar market after housing construction crashed at the start of the recession, said Davis of Synergized Solar.

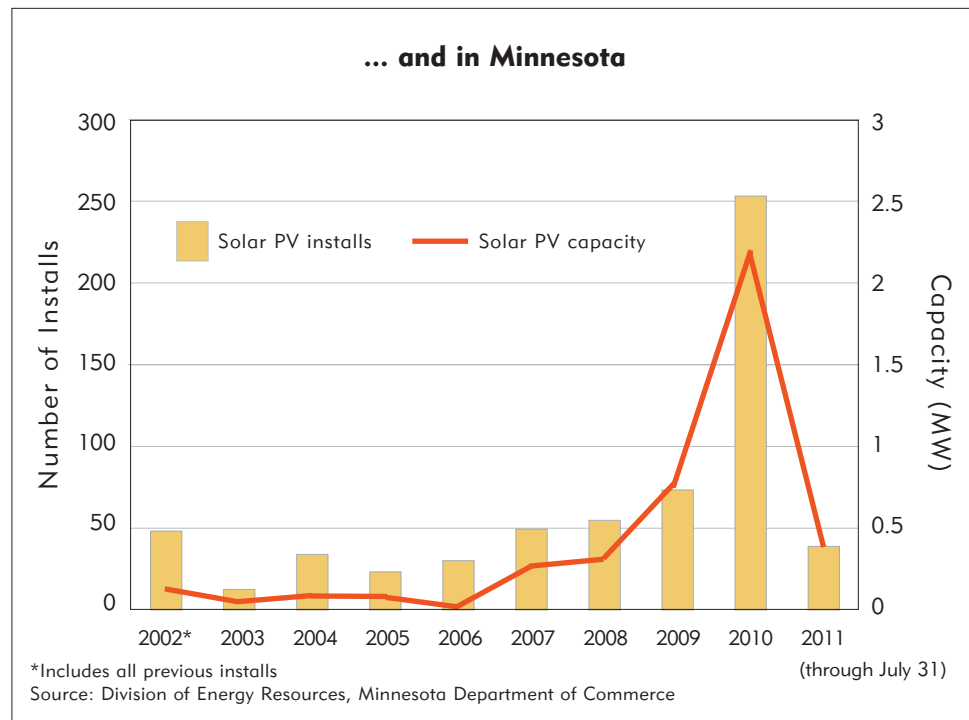
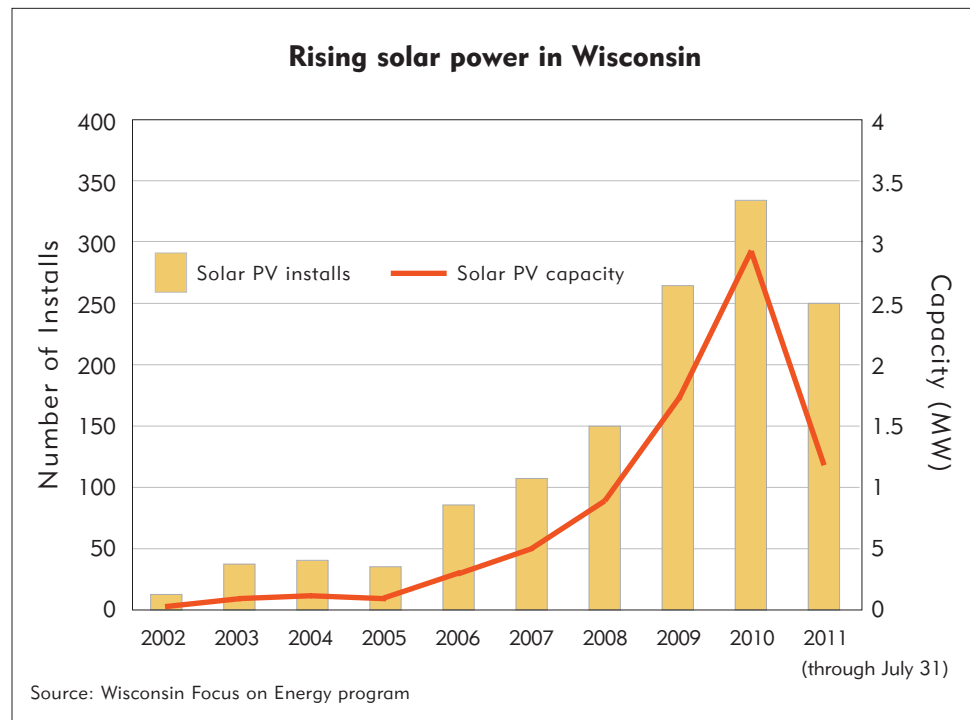
Synergized itself made that leap—initially into installer training, then into wholesaling. Today the four-employee company faces stiff competition from much larger distributors drawn to the growing solar market in Minnesota and western Wisconsin. DC Power Systems, a large solar distributor based in California, opened a sales office in the Twin Cities last year.

Most solar PV systems installed in the district are made elsewhere—China is a major exporter of inexpensive PV modules—but two PV panel manufacturers have set up shop in Minnesota. Silicon Energy, a solar PV manufacturer based in Washington state, began producing rugged, weather-resistant solar panels at a new factory on Minnesota’s Iron Range last August. TenKsolar in the Twin Cities has developed flat-roof PV modules for commercial applications that produce up to 50 percent more electricity than solar panels of comparable size. Since its founding three years ago, the company has expanded its payroll to 70 employees and raised \$11 million in capital.

Other district firms involved in solar markets supply components and fabrication tools to PV system manufacturers in the United States and overseas. In Minnesota, “many old-line manufacturers ... have looked at solar and said, ‘We can play in this market by making some fairly modest investments,’ and they’re doing it,” said Lynn Hinkle, policy director of the Minnesota Solar Energy Industries Association (MnSEIA), a trade group for solar manufacturers and suppliers.

Northfield Automation Systems in Northfield, Minn., a developer of specialized machinery for manufacturers of thin materials used in the electronics industry, has carved out a profitable niche in the thin-film PV industry—the fabrication of panels from thin ribbons of nonsilicon materials such as gallium and selenium. Darin Stotz, director of sales and marketing, said via email that sales to solar PV manufacturers have risen rapidly since 2005; today solar-related sales account for about 35 percent of company revenue.

Achieving “grid parity” will be a challenge in a region with relatively low electricity prices. And in Wisconsin and other district states, solar incentives may not last long enough for the industry to reach that goal; some policymakers have started to push back against incentives for solar PV and other forms of renewable energy.



Juiced by incentives

The solar PV industry may have made strides in recent years, but its fortunes are inextricably tied to government subsidies. That's because current PV technology is an expensive and inefficient way to generate electricity.

An average residential PV system with a capacity of 5 kW can cost over \$35,000 to install. And those expensive solar panels convert only about 10 to 20 percent of incoming solar radiation into electricity (in comparison, coal-fired power plants harness about one-third of the energy trapped in fossil fuel). Despite recent drops in system prices, the “levelized cost” of solar power—the price of electricity produced by a PV system over its 20- to 25-year operating life—still exceeds the retail price of electricity anywhere in the country.

The high cost of solar-electric power has made the industry dependent on public subsidies ever since PV panels became commercially available in the 1970s. “If you take away all subsidies from solar, then solar generally speaking is going to be more expensive than competing technologies,” said Shayle Kann, managing director of solar research for Boston-based GTM Research.

The economics of unsubsidized solar PV are even harsher in district states because of somewhat higher levelized costs and lower electricity rates com-

pared with the national average. In Minneapolis, the cost of electricity produced by a typical residential system ranges from 19 to 24 cents per kilowatt hour (kWh), according to local installers. That's about twice the average price charged by utilities in every district state, according to the U.S. Energy Information Administration.

Solar PV isn't even competitive with other renewable-energy options in the district. State renewable portfolio standards that require utilities to obtain a minimum percentage of power from renewable sources (see the July 2007 *fedgazette*) have done little to foster solar PV development because most utilities prefer more cost-efficient wind power: Electricity generated by new, large wind farms costs about the same as that produced by natural-gas plants.

Both federal and state financial incentives are necessary to make solar PV cost competitive. At the federal level, purchasers of solar-electric systems are eligible for 30 percent tax credits intended to promote the use of renewable energy—the Business Energy Investment Tax Credit for firms and a personal tax credit for homeowners.

The states with the most photovoltaic capacity aren't necessarily the sunniest, but those offering the richest incentives that can be combined with federal subsidies to lower costs. Many state incentives for solar and other renewable-energy systems have been in place for years; the state of Minnesota, for exam-

ple, has exempted the value of solar electric systems from property tax since 1992.

The most important state-level incentives are rebates on installed systems. Rebate programs largely or entirely funded by utility ratepayers spur PV sales by giving consumers cash back for every watt installed. “In the solar world, rebates drive the business,” Davis said.

Through the state of Wisconsin's 10-year-old Focus on Energy program, homeowners (but not businesses, as of July) can claim up to \$11,250 in rebates for small PV systems. In Minnesota, state government and several electric utilities have offered solar PV rebates since the early 2000s. One of the biggest rebate programs is Xcel Energy's Solar Rewards, which reimburses customers \$2.25 per installed watt for systems up to 40 kW. NorthWestern Energy in Montana also has a rebate-like grant program for solar PV, although it isn't as generous as those offered in Minnesota and Wisconsin. Solar rebates are unavailable in the Dakotas—a big reason that neither state has much PV activity. New or enhanced government incentives are responsible for much of the spurt in solar development over the past three years nationally and in some district states. Federal economic stimulus legislation allowed businesses to claim bonus tax depreciation for solar-electric installations and gave firms the option of taking a cash grant in lieu of the investment tax credit. The last pro-

vision—a significant fillip to commercial installations, analysts say—was set to expire last December.

Minnesota solar PV installs got an extra push in the spring of 2010, when the Legislature enacted a state rebate for projects using solar panels manufactured or assembled in the state. When combined with Solar Rewards, the “Minnesota Bonus” reimburses Xcel Energy customers \$5 per watt—more than double the incentive available under a previous state rebate program. Funded by Xcel ratepayers, the Minnesota Bonus is slated to provide \$19 million in rebates through 2015.

All aboard the “solar-coaster”

Incentives promote a boom-and-bust pattern of development—a rush to install systems when incentive dollars are available, followed by a period of retrenchment when support fades. This phenomenon, known in the industry as the “solar-coaster,” is particularly evident in the market's response to rebate programs. Funds allocated each year for state or utility rebates often run out after a few months, slashing demand for PV systems and crimping the budgets of installers and other solar-related businesses.

That's what happened in Minnesota last August when applications to Xcel's Solar Rewards program exhausted the \$4.6 million budget for 2011 rebates.

Lynn Hinkle of MnSEIA echoes most market analysts in observing that the livelihoods of installers, manufacturers and other solar-related firms won't be secure until the solar-coaster comes to rest. "We're not looking for endless incentives," he said. "The long-term vision is to let the market work."

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Businesses and homeowners quit ordering systems, and wholesalers like Synergized Solar saw equipment sales to installers taper off in the fall. "When the rebates run out, nobody calls, because nobody's doing projects," Davis said. "Installers are waiting for the rebate to reload." Solar Rewards was slated to receive another round of funding in January.

Uncertainty caused by the ebb and flow of incentives threatens sustained growth in the solar PV industry, said Kildegaard of the University of Minnesota Morris. "We saw the same thing happen in the wind industry. The renewal or lack thereof of federal incentives has caused a seesaw pattern in production, and that's murder on the manufacturing supply chain, and it's not conducive to investment."

There's also growing uncertainty about whether incentives for solar PV will continue at their current level. Federal tax credits seem secure for now, but at the state level, subsidies for renewable-energy development have come under increasing scrutiny. Around the country and in some district states, policymakers have pared back or proposed scrapping incentives for solar and other forms of renewable energy.

Davis and solar installers he serves in western Wisconsin worry that Focus on

Energy rebates for businesses are gone for good. In 2010, the Legislature cut the program's budget, and a new management firm appointed by Gov. Scott Walker's administration is considering reallocating funds to other types of projects such as energy conservation. Last fall, only home systems under 6 kW were eligible for awards through the program, and there was no date set for reinstating funding for commercial or larger residential projects.

Last year, the Minnesota Legislature imposed a moratorium on Xcel grants for developing renewable energy projects; new grants are on hold at least until July 1. And in Montana, Republican lawmakers in 2011 proposed charging owners of solar arrays and other small generating plants additional fees for linking their systems to the electric grid.

Solar sans subsidies?

Rebates, tax breaks and grants for solar power raise the same economic and public-policy issues that swirl around incentives for wind power (see the November 2005 *fedgazette*). Government support for solar PV development may be justified to promote the consumption of "clean" electricity as a substitute for power derived from fossil fuels. Burning coal, natural gas or oil can cause air and water pollution—societal

costs or "negative externalities" that aren't accounted for on utility bills.

It's harder to argue for public subsidies as an economic development tool, as industry advocates such as MnSEIA have done, because the job-generating capability of renewable-energy technologies is often overstated (see the October 2010 *fedgazette*). And, regardless of how many jobs subsidies help create, they distort markets by influencing the location and investment decision of businesses. Silicon Energy President Gary Shaver has said that the company likely would have built in another state if not for the Minnesota Bonus rebate (\$5.1 million in loans from the Iron Range Resources & Rehabilitation Board helped bring the firm to the city of Mountain Iron).

Time will tell how the investment pans out, both for Silicon Energy and the local economy. The enthusiasm of economic development officials for solar manufacturing may be misplaced; several U.S. solar PV manufacturers filed for bankruptcy last summer, largely due to competition from Chinese panel makers.

For solar PV to establish more than a token presence in electricity markets, it must achieve grid parity—producing power as cheaply from the sun as from other sources, sans subsidies. Sunny states with high electricity prices, such

as California, Nevada and Hawaii, are drawing closer to that point. The U.S. Department of Energy predicts that in some parts of the country, solar PV supported only by federal incentives will be cost competitive by 2015.

But getting anywhere near grid parity is likely to take much longer in district states because of the yawning gap between the cost of solar PV and average electricity rates. To break through the cost barrier, district solar PV systems must become even cheaper to install and more adept at harnessing the sun's energy. New, developing technologies that may further improve efficiency or lower costs include thin-film panels and plastic PV—flexible photovoltaic materials that can be integrated into transit shelters, shade canopies and other structures.

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