

Giving Back to the Grid

St. Paul Pioneer Press by Leslie Brooks Suzukamo

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When Nancy Hone and Greg Schmidt of St. Paul added solar energy panels to their house nine years ago, they sought to help the environment by easing up on the grid. But now, in an odd way, their Merriam Park house may be becoming the grid, or at least a teensy part of it. Owning a solar-powered home isn't just about living off the grid anymore. Because they can put power back into the network, solar houses and small urban wind projects may help Minnesota meet its aggressive renewable-energy goals.

At least that's the hope of a radical innovation in energy production called distributed power that turns traditional power production on its head. Distributed power is suddenly in the spotlight. At the Minnesota State Fair's EcoExperience, fairgoers can view a home equipped with solar heating, a green roof and LED lighting that generates as much power as it consumes. And when local utilities and the mayors of Minneapolis and St. Paul unveiled plans recently to make the Central Corridor light-rail line that will connect the Twin Cities a showcase of energy innovation, distributed solar power was part of their vision.

Utilities and environmentalists caution that distributed power won't eliminate the need for conservation or for developing new sources of power, especially big wind projects. And in any case, the grid that distributes energy will need a serious upgrade. But for folks like Nancy Hone, small has always been beautiful.

THIS OLD SOLAR HOUSE

From the street, the American Foursquare house on Carroll Avenue looks more like a farmhouse on the prairie than a power plant. But the two-story 1909 home -- which will be featured on the Minnesota Renewable Energy Society's annual October solar home tour -- produces 1.9 kilowatts of power, enough to supply about two-thirds of its owners' energy needs. A peek in the back yard reveals a high-tech crazy quilt of photovoltaic panels and solar liquid heating cells hung on the roofs of the house, the detached garage and a pole pointed at the sun.

"I think the planet is in an emergency, and we felt we needed to set an example," said Hone, 60, a staunch environmentalist best known for founding a group that opposes efforts to build a garbage-burning power plant in the neighborhood. Hone and Schmidt say they have spent more than \$60,000 on their system. They got no rebates for their projects, but the couple considers the money well-spent. "We have no children -- and they say it costs \$100,000 to raise a child these days. This is our child," Hone said.

In their basement sits a meter that tells them how much power the panels are producing at any given moment, a 355-gallon water tank heated by copper coils of circulating glycerol from the solar thermal system and 16 storage batteries to collect electricity. "We get very tickled when we get a storm and everybody's power is out and we're still on," Hone said.

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For at least four years after the solar voltaic panels were installed in 2000, utility meter readers kept insisting on installing new equipment at their house because their electricity usage was not rising, Hone said. "They were saying, 'You must be tampering with them,'" she said with amusement. Solar panels have met opposition from suburban neighborhood associations that consider them unsightly, but Hone said they've never encountered resistance. "My neighbors say wow! Cool! I've never had a neighbor say it looks icky."

SELF-SUSTAINING AND BEYOND

Backers of the Energy Innovation Corridor hope other residents and small businesses will share that enthusiasm. As the Central Corridor light-rail line chugs toward reality, the cities of St. Paul and Minneapolis and community partners are kicking off an array of initiatives to encourage energy efficiency and sustainable projects along the rail line and throughout the Twin Cities.

Minneapolis-based Xcel Energy's Solar Rewards program, for example, plans to offer rebates to about 500 customers a year who install solar arrays, starting Jan. 1. A system big enough to supply a typical household's power needs now costs about \$40,000, Xcel estimates. If approved by Minnesota's Office of Energy Security, Xcel could offer rebates of up to \$10,000 per customer. Combined with state rebates and tax credits, a homeowner could recover about two-thirds of the total cost of installing a solar system.

What's in it for Xcel? Perhaps another 2 megawatts per year of distributed solar power added to the system. And perhaps a lot more customers like Chris Born. Born's 1887 Victorian in Northeast Minneapolis feeds Xcel Energy more power than he's taking from it. The 53-year-old Born said his home's 4.9-kilowatt system has allowed him not to pay an electric bill for the past year and a half. Born's not entirely satisfied with the situation, however. He estimates he's sunk about \$35,000 into his setup after tax rebates and gets only \$25 or \$30 a month from the utility. He's doing it for the environment, but he wishes Xcel would pay him a higher rate for his electricity. "We're doing them a huge favor, and we're being treated as if we were some kind of problem," he grumbled.

That's because Xcel pays homeowners a standard rate for their electricity, but Born argues the utility should be paying a higher rate equal to the wholesale cost of electricity during times of highest need. His system, he reasons, produces electricity for Xcel during the day, when wholesale power costs the most. Utilities on the grid pay a premium to other utilities for that power, he said, so why not to him? Xcel officials say it may not be as simple as that.

THE SMART GRID

To make the system work, utilities will have to build a system that can handle power flowing two ways, not simply from the utility's big power plant to the home. This will require new Internet-style technologies -- often dubbed "smart grid" technology -- to be grafted onto the grid, they say.

"I think there's little doubt we can make the technology work", said Michael Lamb, managing director of information technology operations for Xcel. "The real question becomes how much will it cost to deploy that amount of technology across a service area and what is the business case -- the cost versus the value?" he said.

The present "dumb grid" is still "the greatest engineering achievement of

the 20th century," according to the US. National Academy of Engineering, eclipsing even going to the moon. Electricity is supposed to travel one way on this grid -- from the power plant to the wall socket. The current is controlled by engineers who ring up one another from bunker-like control rooms, like the one in St. Paul's Midway that belongs to the Midwest Independent Transmission System Operator.

The grid's basic structure hasn't changed for the past half-century, said Massoud Amin, director of the Technological Leadership Institute at the University of Minnesota and a nationally sought-after smart-grid expert. Fortunately, large-scale wind projects in the Midwest and solar energy projects in the Southwest deserts have brought much-needed attention for upgrades, Amin said.

The new grid won't just be bigger but must allow for a two-way system, giving and absorbing energy. The variability of wind and solar energy will require the system to be automated to control changes in flow direction that happen faster than any human being can react to, he said.

ALL THE LITTLE GRIDS

But distributed-power advocates say the smart grid's real advantage lies at the outer edges, closest to the customer. Power created by collecting solar rooftop projects, wind turbines or even natural gas mini-generators can create a "micro-grid" within the larger grid. "The idea is to convert buildings from power pigs to power plants," said Kurt Yeager, executive director of the Galvin Electricity Initiative, a national campaign supporting smart microgrids. "What we do not need is more dumb electricity."

Even a plug-in hybrid car would look like a battery to the grid. The driver could charge his car at home, drive to work, plug in and let his car feed the grid and still have enough power to get home. Theoretically.

David Morris, vice president of the Minneapolis-based Institute for Local Self-Reliance, says that with enough home power plants, neighborhood microgrids could emerge and all the little grids could be woven together to form bigger grids, covering a city or even the state in hive-like networks. George Crocker, executive director of the North American Water Office in Lake Elmo, another distributed-energy advocate, says economies of scale are making wind turbines and solar panels cheaper and close in cost to coal plants on a per-kilowatt basis.

A national renewable energy mandate similar to Minnesota's is under debate in Congress; if instituted, it could accelerate the need for renewable energy. Small smart grids would be built cheaper and faster than a full-sized power plant or even sprawling utility-scale rural wind farms that produce as much power as a coal plant, Crocker said.

The strongest opposition to distributed energy may come not from utilities or architecture aesthetes but mainstream environmentalists. They believe distributed power is a fine idea, but not if it interferes with building large wind projects in the Midwest or solar energy farms in the deserts of the Southwest.

Distributed generation isn't going to help Xcel Energy and the rest of the state's utilities collectively produce more than 25 percent of their power from renewable resources like wind by 2025 to meet a state target, said Mary Marrow, an attorney at the Minnesota Center for Environmental Advocacy, a St. Paul nonprofit that is at the center of many battles over fossil fuels.

If Congress passes the pending Waxman-Markey energy bill, which has a national clean-energy standard, millions of watts of renewable power will be needed from large utility-scale projects to meet the law's requirements -- more than microgrids can deliver, these environmentalists say. "I think you need all of the above," said Linda Taylor, clean-energy director for Fresh Energy, a nonprofit advocacy group in St. Paul.

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