

# The Solar Capital of the Midwest

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The Stelle community phone system (foreground) utilizes 2,900 watts of PV.

**S**telle, Illinois may well have become the solar capital of North America, if not the world. Over a third of the homes in Stelle have some or all of their electricity provided by photovoltaics (PV). The town water, phone, and internet service is powered by renewable energy (RE). In total, twenty RE systems on forty acres of land in rural Illinois must qualify Stelle as a most unique hub of RE technology.

Stelle (rhymes with bell) was first recognized as a centerpiece of solar activity in 1996. This small unincorporated village of 110 people is located among thousands of acres of cornfields about an hour and a half south of Chicago. In the last four years, it has manifested even more evidence of an unspoken philosophy of living which seems to be shared by most residents here.

## **Solar Phone Company**

First let's look at the town's infrastructure. North America's first off-grid solar-powered phone company is celebrating five years of 100 percent system reliability. Each resident of Stelle owns a share of the Stelle Telephone Company, a rural mutual cooperative. Every phone call made from Stelle is in fact a solar-powered phone call.

The decision to go solar was made because of power quality and availability problems with the electric utility serving the community. The electricity supply to rural locations is more susceptible to lightning strikes, ice storms, and other natural phenomena. The 200-line digital phone switch would be severely impacted every time a glitch occurred, and no phone calls could be made or received.

That problem has been solved with a 2 KW peak array of Solarex MSX-64 solar modules, and a large bank of sealed absorbed glass mat batteries (1,400 amp-hours at 48 VDC) in conjunction with a backup propane generator. The generator was designed to run approximately 150 hours per year (one oil change/maintenance interval), and it has fallen within 5 percent of the designed run time.

Perhaps the owners of Stelle Telephone have not seen a direct economic payback, per se. However, can you put a price on having a reliable phone system when you need to make a call? The system has been a definite winner.

### Internet Connection

Another challenge to a remote community and a rural phone company is access to the Internet. Any phone call made from Stelle to any location outside of Stelle is a long distance call. This little fact of life posed a great challenge to many community members and home-based businesses wanting to use the Internet as an information and communication source. In the summer of 1998, Stelle Telephone became the world's first off-grid solar-powered Internet service provider (ISP). Residents now have extremely reliable Internet connection via two-way satellite TCP/IP connectivity.

The system is supported by a 24 hours per day, 7 days a week network operation center hosting our Internet servers, with data warehousing and backup facilities near San Francisco, California. An additional 900 watts of Siemens solar modules on a Wattsun dual-axis tracker were added to the Stelle Phone Company's central office system. This offsets the additional electrical loads of the on-site equipment, which includes a Cisco server, sixteen 56K modems, and a desktop computer.

These two solar applications have made it possible for many home-based businesses to thrive in Stelle. They have also opened the door for a regional office of the New York based SunWize Technologies to use Stelle as a base of worldwide business development activities. SunWize employs three residents of this small town, and supplies a Stelle-based dealer, Tim Wilhelm of Wilhelm Engineering, with his wholesale solar needs. Tim also runs Stelle Telephone, and teaches electronics and *NEC* courses at a local community college in his spare time.

### Central Water Plant

Most rural residents live with an individual well and pump. Stelle has a central water plant, instead of 44 individual wells and pumps. (There are 44 living units in Stelle, a mixture of single family, duplex, and quadplexes.) The water plant is owned and run by the Stelle Community Association (SCA). A typical water bill is US\$40–60 per month.

Not only is the efficiency of water delivery from one 300 foot (91 m) deep well improved, but the pumps for operation of the plant are all powered by a 10 KW Bergey wind turbine. The wind system was originally set up as a grid-intertied system, so excess power would be sold back to the utility. But since Illinois has



**The 10 KW Bergey Excel powers the town water supply.**

yet to enact a net metering law, the cost and hassle of selling back to the electric company did not make the exercise worthwhile. With a grid-tied system, the load goes down when the grid goes down, so the town has decided to take the water plant totally off-grid.

The association just completed the installation of a battery bank along with a stacked pair of Trace SW5548s and all the hardware in between. With the new incentives (grants and rebates from the state's Department of Commerce and Community Affairs) to use PV in Illinois, a solar-electric system is being considered to add to the reliability of the power supply.

Commonwealth Edison, the state's largest utility, has committed to a net metering policy with hopes of having it enacted by Spring, 2000. The new people in the utility's renewables division are hardworking individuals committed to facilitating a sustainable solar business throughout their service territory. Stelle has been mentioned by one of ComEd's T&D managers as a probable site for using renewables for end-of-grid support. These folks deserve a hand for energizing the



**Linea Bara's home sports eight Arco Solar 16-2000 PV panels.**

giant utility (one of the nation's largest nuclear utilities) to adopt new ways of thinking about energy.

#### Individual Commitment

The community of Stelle, as a whole, is obviously committed to a solar lifestyle, but what about individual residents? In this town of forty-four living units, there are fourteen homes that have all or part of their electricity supplied by PVs. Another six homes have passive solar features, which offset a good part of the winter heating requirement. More than half of the homes use wood as all or part of their heating fuel. And more PV and passive solar systems are planned.

Another recent trend is the use of propane as the primary fuel for previously electric loads. Having on-site storage allows for an extra measure of autonomy during extended power outages. To be able to use expensive photovoltaic technology appropriately, the use of propane makes sense as a starting point. Most RE system owners cannot afford to burn solar-generated electricity for cooking or heating hot water.

I view propane as a "solar enabler," since it allows us to make steps toward a full solar lifestyle. As appliances improve, fuel cells come on the market, and other technologies emerge, propane can be phased out. The total pollution or negative impact on the planet per KWH of fossil fuel or nuclear generated energy is much greater than a similar quantity of energy used from propane at the point of use.

#### Systems Large & Small

The smallest residential PV systems in Stelle have small arrays of fifteen year old Arco Solar 16-2000s. These panels were recycled thanks to the sharp eye of Steve Bell, a town resident as well as technical support specialist with SunWize.

The small systems feature eight 16-2000s (35 watts original rating), a Trace UX1112 SB, four Concorde PVX12210 AGM batteries, and a ProStar 30 charge controller with meter. The fifteen year old modules still generate over 90 percent of their nameplate rating.

The largest system in town is Steve's personal wind/PV hybrid system (see page 8). His system includes 2,980 watts of Siemens modules—880 watts on a Wattsun tracker and 2,100 watts on the roof—and a 4 KW Jacobs wind turbine. These supply 48 VDC power to a battery bank of twenty-four PVX-1225s (almost 100 KWH of storage at 48 VDC), along with two Trace inverters (a 4048 and a 5548).

Steve actually has reached a point where excess electricity is available year-round. Since there is no incentive to pump this excess back to the grid, Steve actually heats his basement in the winter by channeling the excess wind generated energy into a set of home-made resistant air heating elements. When it's sunny and windy, Steve can also pre-heat his domestic hot water. Talk about tweaking out the efficiency of a

**Steve and Jan Bell's system has 2,980 watts of PV and a 4 KW wind generator. See the article on page 8 for a complete description of the system.**



system! Steve is also pushing the envelope by experimenting with maximum power point tracking controllers and battery desulfation.

**Straw Bale Neighbor**

This unique strain of solar mania is not all contained within the borders of Stelle's 200 acres. The nearby Haeme family completed their straw bale home several years ago. It was Illinois' first bale building, and since then, Jon Haeme has built another home of straw for a resident of nearby Kankakee County.



**Russ Hardtke has eight Arco Solar 16-2000 PVs and solar hot air collectors.**



Unique to Jon's home, the solar-electric system supplied all the energy for the construction of the building. Many residents of Stelle helped with the "wall raising" on a very hot August day about four years ago. This beautiful home on a five acre farmette recently became fully operational using solar power, even though the grid is available. A total of 840 watts of PV, a Trace SW4024, and eight Concorde PVX-12210s power the entire house, including the Sun Frost refrigerator.

Simple technical descriptions of these earth-friendly power supplies hardly do justice to the way of life created in Stelle. A common observation of visitors is that we have a very special community. Indeed, it is a feeling of true community which is often lost in the urban sprawl.

**The author's home with twelve Siemens SP-75 modules.**

**Renie Emery and Kermit Wagoner have sixteen Arco Solar 16-2000 PV panels.**

After I'd lived for only six months in Stelle, there was not one neighbor who I would have hesitated to ask for help. In Stelle, you confront your issues—there is no place to hide. You know your neighbors and they know you. That may be perceived as good or bad. I think there should be a premium charged for being able to experience this kind of quality of life.

**A Community Perspective**

Stelle was founded in 1973 in a rural setting about sixty miles (97 km) southwest of Chicago. The Stelle Group, a philosophical organization chartered as an Illinois not-for-profit corporation, created Stelle. The Stelle Group set out to create a supportive environment in which individual human development would be top priority.

During the early years of building Stelle, when it was a private





**Mark and Vicki Matthews have twenty-eight Siemens SP-75s.**

community, residents stressed values such as personal responsibility, lifelong education, positive attitude, cooperation, and democracy. These values continue to influence the way of life in Stelle. As elements of its rich and unique heritage, they remain a vital part of the community's identity.

Richard Kieninger was the founder of Stelle, and author of the book *The Ultimate Frontier*. As he grew philosophically distant from the community he had founded, he moved a core group of followers down to Texas in the early '80s. Those who remained were more mainstream idealists. They re-created Stelle without forgetting the foundations of self reliance, and the goals of sustainability. This re-creation was a natural step in the evolution of the community.

**Dianne Obernuefermann has eight SP-75 and four SP-36 PV modules.**



Today, Stelle is an open community where people from diverse backgrounds make their home. The values mentioned previously seem to serve as an unspoken beacon, which tends to attract new residents and maintain the ties with those who move away. Individual initiative and creativity are welcomed, and no single organization oversees all aspects of community life. Instead, different groups play various roles in the community.

### **Cooperation**

Stelle is self-governing, and an elected board of directors of the Stelle Community Association (SCA, a homeowners association)

administers community affairs. The SCA operates on democratic principles and encourages all members of the community to become involved. Today, Stelle is a small and peaceful village of roughly 110 people.

Unlike many intentional or alternative communities, Stelle is based on cooperative, rather than communal principles. Residents live in the type of housing they prefer and can afford, and work at their own jobs or businesses according to their individual talents.

Some residents commute over an hour to downtown Chicago, while many operate businesses out of their homes. It is this background of diversity and strong individualism that supports the other activities that Stelle residents enjoy. Hobbies that include Tai Chi, canning, gardening, herbology, quilting, etc. seem to emerge from an underlying mutual respect for nature and the environment.

One demonstration of this respect is that Stelle is the smallest community to receive the Tree City Award from the National Arbor Day Foundation. We have just been chosen again for the year 2000, which makes fifteen years of receiving this honor. Tree City USA promotes tree planting and care programs, and calls public attention to the economic, health, and aesthetic benefits trees offer. The program encourages participation in community forestation and beautification efforts.

Combine the rural location of Stelle and the associated challenges of



**Paul and Karen Wagoner have eight roof-mounted Siemens SR-100s and twenty-four SM-55s on a tracker.**



being thirty miles (48 km) from the nearest supermarket with the earth consciousness of most Stelle residents. This gives you a community that is embracing self reliance. A winter storm can keep residents cut off for over a week at a time. Power has gone down for several days at a time regularly over the years. This aspect of rural life combined with new Illinois solar incentive money—and a new solar-friendly perspective by Commonwealth Edison—has caused a new wave of solar activity in this tried and true community.

### **Share the Dream**

On the drawing board is something tentatively named “The Midwest Center for Sustainable Living.” The Stelle Area Chamber of Commerce hopes to facilitate a more formal and productive way for Stelle to share its sustainable attributes with a broader audience by construction of this center. Several universities and other key groups are involved in the initial phase of this effort, which includes obtaining a grant from the newly established Clean Energy Trust Fund.

A business plan is being developed to make the center self-supporting with corporate eco-retreats, personal growth seminars, holistic health seminars, sustainability think tanks, and, of course, wind and PV technical training, etc. Incidentally, Stelle has served as home to Midwest Renewable Energy Association (MREA) wind/PV hybrid workshops, and hopes to further this effort. The goal will be to demonstrate new energy

technologies in a real end-of-grid support scenario, which will offer an added dimension to college-level classroom learning.

### **Visit Stelle**

You are encouraged to visit Stelle. The residents open their doors every spring to celebrate Earth Day, and every fall to participate in the National Tour of Solar Homes. If these dates aren’t convenient, someone is always available for a personal tour of the town. Tuesdays and Fridays are best, and a call ahead of time is most appreciated.

For more information, or to see the town in person, call the special line SunWize has set up for Stelle visitor inquiries (815-256-2224). We will be happy to fax directions, and we strongly advise you not venture on your own without a map. Visitors come from all over the world to see solar technology at work in Stelle.

**Tim and Susan Wilhelm have twelve Siemens SM55s.**



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