

## SMALL WIND SYSTEMS

# Living Lightly

By Mick Sagrillo

Jane Koger is probably not who comes to mind when you think of the typical cattle rancher. Koger owns several thousand acres of rangeland and native tall grass prairie in the Flint Hills of Kansas. On this land, she free-range grazes her cattle, raising about 80 head of organically fed calves every year.

Koger is working on the Homestead Range Renewal Initiative to help restore and renew the tall grass prairie that once covered her ranch and the surrounding area. Partners in her efforts include the Nature Conservancy, the U.S. Fish and Wildlife Service and the Natural Resources Conservation Service.

But what Koger does for a living is only a part of her story. It's how she has chosen to live that really demonstrates this cattle rancher's values.

### Design Makes Most of Midwest Sun

Koger lives in a straw bale house, the straw harvested from her own land. She designed the passive solar super-insulated house, then hired a local contractor to help execute the plans in the summer of 2000. Not one to sit still for long, Koger got her hands dirty helping on the construction, including the concrete stucco exterior. Koger and a handy-gal friend did all of the finish work.

Koger lives far off the grid, so building and powering her home was a challenge.

### Clean Choices

Highlights of Jane Koger's near-zero-energy home follow.

**Photovoltaic array:** The 2-kilowatt system feeds a 24-volt battery bank, with AC supplied by a Trace SW 4024 inverter.

**Wind generator:** A 1-kW Bergey xl.1 wind turbine from Bergey Windpower is mounted on an 80-foot tilt-up tower.

**Gray water system:** Gray water is used in the attached greenhouse.

**Solar thermal collection system:** Fifteen Morningstar Corp. panels heat the home and all domestic water.

Her first project was not her house, but a combination garage, tool and power shed and roof to support 2 kilowatts (kW) of photovoltaic (PV) panels. The PV system feeds a large, 24-volt battery bank, with AC power supplied by a Trace SW 4024 inverter. The PV system, batteries and inverter were installed by four Solar



Women's PV Workshop participants used solar power alone to build Jane Koger's straw bale house, located in rural Kansas.

Energy International (SEI) Women's PV Workshop alumnae, along with three of SEI's PV instructors. With the power system up and running, Koger's straw bale house was built using only solar power.

The house is built on an insulated slab with hydronic heating tubes running throughout the concrete. On Koger's roof are 15 solar water heating panels, which pump hot water into a 350-gallon tank. The harvested sunshine in that tank is what heats Koger's home, along with all of her domestic hot water. Because it's not always sunny in Kansas, another energy input, for both the battery bank and the water heater, were required.

### Wind Power Outpaces Needs

Blessed with an excellent wind resource, Koger decided to install a wind turbine to supplement the PV system during the cloudy months of December through February. In October 2001, another SEI all-women's workshop installed a Bergey xl.1 wind turbine on an 80-foot tilt-up tower. The workshop participants poured concrete for the guy anchors, assembled and wired the tower, installed the 1-kW wind turbine, completed the wire run to the existing battery bank and tilted the tower with the wind generator into the "breeze"—all in one frenetic week.

The 80-foot tower has an anemometer at the 70-foot level, and records 50 mph winds "so regularly that it's not a big deal," according to Koger. The Bergey xl.1 is so productive that Koger uses a 30-gallon electric water heater and a whirlpool tub as dump loads for excess electricity that the battery bank cannot store.

That doesn't mean that Koger squanders her renewable electricity. All of her appliances are high-efficiency options, including the microwave and kitchen appliances. And Koger has never had problems powering her computer, television or stereo with her off-grid power system. Koger proudly states that, in the three years of living in her home, she has never once used a gas generator for backup electricity. Yet another endorsement for the compatibility of resources powering an off-grid wind/PV hybrid system.

Though the PVs have performed flawlessly, the Bergey xl.1 has not. Six months after it was installed, it quit running. Upon tilting the tower down, Koger discovered that the alternator had burned up. Koger drove the wind turbine to Bergey Windpower Co., Norman, Oklahoma, for an evaluation. A techie at Bergey discovered that several wires had vibrated loose and shorted out against each other. Bergey replaced the complete unit with a new one covered under warranty.

The new Bergey xl.1 has operated flawlessly. In fact, if she had to do it all over again, Koger says she would have installed a bigger wind turbine and fewer PV panels to supply electricity to her battery bank. Grouses Koger, "The damn wind blows constantly on this hill!"

Other gentle lifestyle choices that Koger lives with include a composting toilet and gray water system. The gray water is used in the attached greenhouse to water plants. Supplementary heat comes from a woodstove that burns the oak and hackberry harvested from her fencerows. With the exception of the liquefied petroleum gas used to fire her stove, refrigerator and dryer, all of Koger's energy inputs come from renewable sources. The result is a near-zero-energy home.

Jane Koger is a shining example of how one can live lightly in a pristine environment using renewable energy to serve virtually all needs for profession, avocation and lifestyle. ●

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