

Sunny Solitude

by REX A. EWING

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Perhaps you could call it a house for all seasons. With three fireplaces and a Vermont Castings woodstove to provide heat during cold winter nights, Roger and Kathryn Wirth's tightly-built and highly-insulated Expedition square-log home would stay toasty warm during the bitterest Montana winter. Located as it is, east of Kingman, Arizona at 5,000 feet altitude and just a whisker above the 35th parallel, the home's propane-fueled, forced-air heating system is rarely called into action, as long as someone is around to keep the home fires burning. And, like most houses designed to keep heat in, the Wirths' 2,300 square-foot, three-level home is equally suited to keeping the blazing summer heat out. Covered porches surrounding the home provide a buffer of cool air against the sides of the house, and serve as welcome refuge from the intense southwestern sun. "We have a swamp cooler for those days when the sun is especially unrelenting," Roger says, "but we rarely have to use it more than a couple of times every summer."

It's a smartly designed house from an energy standpoint, and energy has been a primary consideration for Roger and Kathryn for the past three years, owing to the fact that their secluded second home is situated on an acreage five miles from the nearest electrical utility pole. Rather than pay the power company a sum of money that would rival the cost of the land to run a conspicuous string of power poles from the main road to their home, the Wirths chose instead to

make their own electricity from the area's abundant wind and sunshine.

The lion's share of the home's electrical power generation is achieved with a photovoltaic solar array comprising a score of 64-watt *UNI-SOLAR*[®] thin-film solar modules mounted on the garage roof, for a total rating of 1,280 watts. However, because solar modules naturally operate at a higher voltage than the 24 volts the system runs on—a design feature that ensures the electrical current runs from the array to the batteries, and not vice versa—a fraction of the amperage is lost and the actual wattage achieved at high noon on a sunny day rarely exceeds 1,050 watts. Still, this is enough power to satisfy the home's energy demands on most days. A 400-watt Southwest Windpower Air-403 wind turbine, mounted on the garage beside the array, provides an additional source of power from the frequent winds that blow across the elevated landscape surrounding the Wirths' home.

A pair of Trace C40 solar charge controllers prevent the incoming current from the solar array from overcharging the batteries. The wind turbine, on the other hand, needs no such components, since its clever electronics detect the batteries' state of charge and instruct the propeller to stop spinning once the batteries reach a preset voltage. A stalwart bank of 24 Rolls S460 solar batteries—providing over 2,100 amp hours at 24 volts, or the equivalent of 50 kilowatt hours of stored power—

hold enough reserve power for several days with minimal sun and wind.

To ensure that their home never draws more instantaneous power from the energy reserves than their system can safely manage, Roger and Kathryn decided to install a pair of Trace SW4024 sine wave inverters, which together can meet surge demands of over 150 amps of 120-volt current, and continuous output of over 75 amps. Although the home itself is admirably energy-efficient, the couple's two refrigerators—one a standard GE, the other a high-efficiency ConServ—have proven demanding. In fact, these two appliances alone can easily consume over a third of the total output of the solar and wind systems. Add to this a well pump that draws water from a 273-foot well, and the need to conserve power whenever possible becomes apparent.

“We only wash clothes on sunny days,” Roger confides, “and, of course, we never leave a room without turning out the lights.” The lights, wisely, are compact fluorescent bulbs, which provide the same degree of luminosity as incandescent bulbs, yet use only one-fifth the wattage.

For those times when the energy demands are high and the sun and wind are uncooperative, the Wirths have a 12-kilowatt Cummins propane-fired backup generator wired into the system. Whenever the batteries reach a preset level of discharge, the generator starts up automatically to charge the batteries back to a safe level. At other times, the generator can be started manually, and whatever power is not needed to run the house and its appliances goes into charging the batteries. In this way, if the generator is used to wash clothes, the batteries will be at a higher state of charge when the wash cycle is finished, than before it started.

It's been a learning experience for Roger and Kathryn from the start, and not always an easy one. Roger recalls one time when “Kathryn and I were sitting on the porch watching a lightning storm when ‘Boom!’ A bolt of lightning above the array sent a massive voltage spike through the

system!” Though the array itself was undamaged, the surge of power sent through the lines fried the electronics in one of the power inverters and burned out the motherboard in the Cummins generator. As they later discovered, the original installer of the system had neglected to ground the solar array to the main house grounding system, leaving the sensitive system components easy prey for a quick surge of errant voltage.

They've since found a new solar and wind energy technician who has properly grounded the system, and fixed several other mistakes and oversights of his predecessor. The Wirths' confidence in their system is higher than ever now, though with a coy grin Roger quips, “You would think this renewable energy business would be an exact science, but at times it seems like more of an arcane art.”

Yet it's an art Roger and Kathryn will doubtless master. Says Kathryn, “The system is a bit intimidating, especially for someone like me, with no real understanding of the technical aspects of solar power. But we have enjoyed the challenge of learning to live with solar power, especially knowing that we are not dependent on the utility companies, and that we're doing what's right for the environment.”

With such newfound appreciation for the sun and wind, Roger and Kathryn can now sit on their porch in the late afternoons and enjoy the fiery red Arizona sunsets with a kindred sense of wonder.

BYLINE: Rex Ewing, author of two books on renewable energy (LOGS, WIND AND SUN, and POWER WITH NATURE) has just completed his newest book on hydrogen energy (HYDROGEN—Hot Stuff Cool Science; PixyJack Press). He lives with his wife in a handcrafted log home powered by the sun and wind in the foothills of Colorado. He can be reached at www.pixyjackpress.com.