



featured

Sun, wind power weans

Bob McGovern is full of surprises.

A soft-spoken man with crates of books scattered about in his home, he moved to Wyoming to obtain a graduate degree in English but now operates a professional carpentry shop and lives in a self-designed (and mostly self-built) home – both completely “off the grid.”

“Off the grid” can mean buildings not connected to a public utility infrastructure. Philosophically, “off the grid” might mean freedom from the tether of society.

To McGovern, his 1,300-square-foot house 15 miles west of Laramie is simply a home. He says the only way energy-independent living will ever catch on is if it’s comfortable and makes good, practical sense.

In McGovern’s case, being “off the grid” made a lot of sense when faced with the cost of running power to his house. Putting in power lines would have cost an estimated \$25,000.

In off-the-grid living, “production is sexy, but the real difference is made on the consumption side,” says McGovern.



McGovern operates a professional carpentry shop powered entirely by solar and wind energy. The shop is constructed from insulated concrete forms (ICF), which consist of concrete sandwiched between layers of Styrofoam. This ICF-constructed building has an R value of 50 and is heated almost entirely by passive solar radiation from windows. A wood stove is used for heat backup.

He uses about one-seventh the electricity of an average household, or 4.5 kilowatt-hours per day, even while supplying electricity for his professional carpentry shop. Much of the savings can be achieved by switching standard incandescent light bulbs for compact fluorescent bulbs, which use one-third the energy and last 10

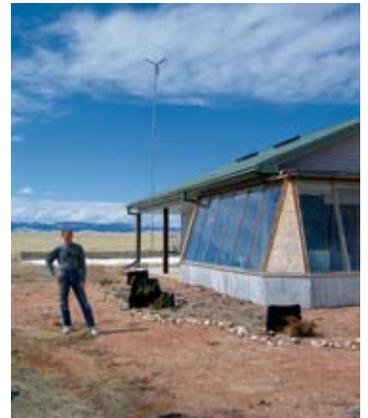
times longer. Equally important is upgrading appliances, such as refrigerators, to new, energy-saving models.

McGovern achieves efficiency in heating through innovative construction methods. The steel-framed house does not contain load-bearing walls, so the vertical 6-inch metal studs can be placed at 24-inch center spacing, which allows for fewer breaks in the soy-based spray foam insulation.

Spray-in insulation (one of the few things he hired done) makes the place very air tight. Six inches of spray foam gives an R-value (insulation factor) of about 24. This compares to a typical R-19 for 6-inch-thick fiberglass insulation placed between 6-inch-wide studs. The concrete foundation is also on top of a 2-inch foam insulating pad and contains a network of 5/8-inch PEX tubing with 12-inch spacing through which solar-heated antifreeze flows for in-floor radiant heat. More information about radiant heating is available at www.pexsupply.com.

McGovern emphasizes that the simplest practices, like caulking around windows, can bring the biggest benefits.

McGovern has found that the wind and solar system electrical components complement one another. During dark, windy winter days, the wind turbine is most important, whereas the photovoltaic



Bob McGovern stands next to his off-grid house with the Snowy Range Mountains in the background. The windows on the greenhouse and dining area provide a majority of the heat for the house, while the wind turbine provides electricity.

landowner

homeowner off the grid

(PV) panels are the major electricity producers in the longer, calm, sunny days of summer.

Both are tied into a bank of industrial batteries large enough so power is never significantly drawn down – this helps the batteries last perhaps 25 to 30 years. From the batteries, direct current (DC) power is converted to alternating current (AC) of the appropriate voltage to run household appliances and industrial saws and sanders in the shop.

The wind turbine has an 8-foot propeller on a 65-foot-tall tower and is a bit noisy, but McGovern notes it produces electricity that is cheaper than natural gas, although it requires frequent maintenance. McGovern admits he has had to replace or do major repairs on his wind turbine six times in two years because of problems associated with too much wind. But buying a high quality unit has paid off – it is still under warranty.

To heat his home, McGovern utilizes passive solar – thermal solar heating with in-floor fluid circulation – and a wood stove as back up. The house is oriented to catch passive solar energy on the south and east sides, while remaining protected from brutal westerly winds.

Twelve double-pane, patio door-sized windows allow the sun to heat the painted concrete floors and provide 80 to 85 percent of the annual heating needs for the house and greenhouse.

A single thermal solar panel outside the house captures sun to heat antifreeze that is continuously circulated through a custom-built heat exchanger in the basement. Household tap water is preheated in the heat exchanger, and the antifreeze that circulates through the concrete floors is also warmed. The radiant in-floor heating maintains a baseline of warmth throughout the colder seasons while the passive solar really makes it comfortable.

For the coldest days, a wood stove is used for comfort. McGovern estimates he uses four cords of wood a year to augment heating the house and passive solar shop.

When McGovern needs hot water, he has an in-line, liquid propane (LP) powered “flash heater” that heats water on demand. The flash heater is supplied by a 300-gallon LP tank, which also provides fuel for cooking. McGovern estimates the LP tank will need to be refilled once every 18 months to two years.

McGovern suggests making a plan to take advantage of the natural resources available if starting a project of this magnitude – siting the house for maximum sun and placing a wind turbine for maximum wind. At the same time, be aware of natural pitfalls like snow drifting patterns.

Sitting in the cozy dining area in his home looking at the Rawah Mountains of northern Colorado, McGovern says, “There is no substitute for living here. The weather, the animals – there’s no place to hide, and I have no desire to hide, I simply adjust and adapt; it’s very satisfying.”

The Web site www.realgoods.com has more information about energy efficiency.



These south-facing photovoltaic (PV) panels produce electricity from sunlight, which is then stored in large batteries for later use. The panels are on motorized bases that track the sun; this is particularly important in the summer, when there is less wind and the sun makes its largest arc across the Wyoming sky

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