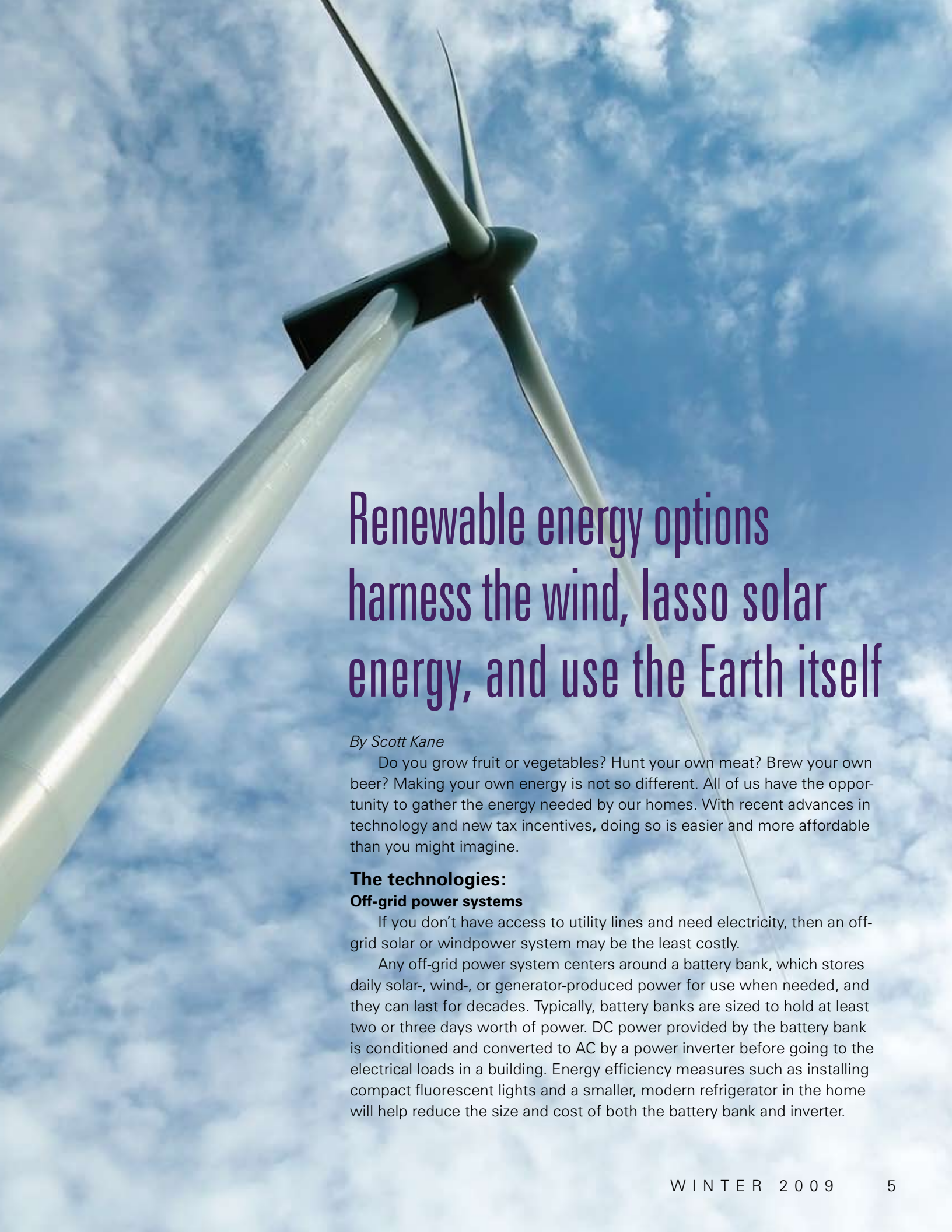

Renewable energy options harness the wind, lasso solar energy, and use the Earth itself

By Scott Kane

Do you grow fruit or vegetables? Hunt your own meat? Brew your own beer? Making your own energy is not so different. All of us have the opportunity to gather the energy needed by our homes. With recent advances in technology and new tax incentives**,** doing so is easier and more affordable than you might imagine.

The technologies:

Off-grid power systems

If you don't have access to utility lines and need electricity, then an off-grid solar or windpower system may be the least costly.

Any off-grid power system centers around a battery bank, which stores daily solar-, wind-, or generator-produced power for use when needed, and they can last for decades. Typically, battery banks are sized to hold at least two or three days worth of power. DC power provided by the battery bank is conditioned and converted to AC by a power inverter before going to the electrical loads in a building. Energy efficiency measures such as installing compact fluorescent lights and a smaller, modern refrigerator in the home will help reduce the size and cost of both the battery bank and inverter.

Homeowners investing in most types of renewable energy systems can make use of a tax credit equal to 30 percent of the cost of the renewable energy system.

Solar panels, wind turbines, and backup generators are commonly used to charge the battery bank. Of these, solar is the most dependable, and the panels can last for decades. Wind turbines can produce impressive amounts of energy with the right height and placement but on an unpredictable schedule. Wind turbines, although continuously improving in design, need periodic maintenance and do have a limited lifespan compared to solar panels.

An off-grid residence near Lander.

An off-grid power system for a highly energy efficient home – one that uses 10 kilowatt hours (kW-h) per day or less – may cost $35,000 to $50,000. As a comparison, installing a power line will cost about $25,000/mile before you receive your first electric bill! For a cabin or part-time use home, the cost for an off-grid power system will be lower. The less energy needed, the lower the cost. Cabins with just a few efficient light bulbs can operate off of a single solar panel and battery for a few hundred dollars.

Grid-connected power systems

Most renewable power systems today are grid-connected. Grid-tie electric systems harvest energy from the sun or wind, which is converted to match the characteristics of the utility grid and sent to the main electric panel in a home. If a system is producing more energy than consumed, the excess is exported to the utility grid. You get credit for this "export" through a utility meter that tracks energy flow in both directions. In the event of a power outage, a grid-tied system is required to shut down so no power is sent toward the grid, so you might still want to incorporate a battery backup.

Depending on your power usage and budget, you can choose to fulfill all of your power needs or a certain percentage. Expect a system that includes 10 solar panels or 2 kilowatt (kW) capacity mounted flat to a roof and producing about 10 kW-h per day or 300 kW-h per month to cost roughly $19,000 installed. A 22 solar panel system (4 kW) and producing about 21 kW-h per day (630 kW-h per month) should be $36,000. The average American home uses about 20 kW-h per day.

Solar hot water heating

Solar thermal systems, those using the sun to gather heat rather than electricity, can be used to produce hot water or provide space heating. Solar water heating is efficient and widely used. Solar space heating is not common and faces the challenge that the times when buildings need heat the most is when the sun is not available – in the middle of winter and at night.

Solar hot water systems typically utilize one or two collectors mounted on the roof. A pump circulates a freeze-protected fluid through the collectors and back to a heat exchanger on a large hot water tank. For a typical family of four, expect a fully installed system to cost $8,000 to $10,000.

Wind power

If you also have an acre or more of land and no height restriction, you might consider a wind turbine. These can charge batteries for an off-grid system or can feed power to a grid-tied system. Wind towers need to be tall – 30 feet at least – to get the turbine up into the zone of high-quality wind. The initial investment for a wind power system tends to be lower than for solar power – $15,000 to $60,000 for a home-scale grid connected

system; however, when system longevity is factored in, the long life and low maintenance of solar is hard to beat.

Ground source heat pumps

Thanks to Earth's relatively constant temperature, geothermal heating and cooling systems offer an efficient and cost-effective alternative to conventional furnaces and air conditioners. Fluid pumped through buried, looped pipes is warmed in the winter and cooled in the summer by the ground and delivered to the building through conventional ducting or radiant floor heating apparatus.

No larger than a conventional furnace, a geothermal heat pump can be retrofitted in existing homes. Its heating efficiency is two to three times higher than standard systems, and its cooling capacity is 20- to 40-percent higher than available air conditioners.

Incentives for renewable energy systems

Federal investment tax credit

Homeowners investing in most types of renewable energy systems can make use of a tax credit equal to 30 percent of the cost of the renewable energy system. For solar electric, it becomes valid in 2009. For solar thermal and geothermal systems, it is capped at $2,000, and for wind it is capped at $500 for each half kW of rated capacity.

The Wyoming Business Council Solar Grant

Every year the Wyoming Business Council (WBC) makes funds available for residential solar panel grants, helping offset the cost of a system. The WBC grant cycle begins each year in early June and runs for two weeks. At the time of publication, the 2009 rules were not finalized. To learn the rules for the 2009 grant year, contact the WBC at (307) 777-2800.

Individual needs and market conditions may vary

There is no simple general rule for which technology should be used. The solution is different for each technology and for each home. Much also depends on whether energy prices increase or decrease in the future. Ideally, if someone: a) makes serious energy efficiency upgrades on their home, b) puts in a small, high-quality renewable energy system to fulfill the small amount of energy still needed, c) maintains that system properly, and d) makes good use of grant and tax credit programs, it will be a sound investment.

In conclusion

Whether you plan to get energy from the sun, wind, or the ground, remember to keep your energy priorities straight. Energy conservation comes first! After that, reduce your remaining energy needs through energy efficiency improvements. Once your energy needs are as low as possible, then consider your options in capturing renewable energy.

A 2.4-kilowatt grid-connected wind turbine near Jackson.

An off-grid power system on a ranch near Farson. The battery enclosure is at bottom, with four 3,000-watt inverters on the wall, with solar and wind power controls on the wall at right.

Scott Kane is co-owner of Creative Energies in Lander. He can be reached at (307) 332-3410 or info@cesolar.com.