

# Rocky Mountain News

## No place like (a green) home

By Gargi Chakrabarty, Rocky Mountain News  
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You've bought flat-screen plasma TVs, Blu-ray DVD players, -iPods, Bluetooth cell phones and BlackBerrys to enhance your lifestyle.

Now it's time to bring your house up to speed by adding some high-tech, energy-saving gadgets.

Think hydronic heating, electrochromic windows, desiccant cooling and LED or light-emitting diode bulbs. If that's not enough, you could always go for tankless water heaters or combined photovoltaic and hot-water panels.

The items are not necessarily cheap, and some are hard to find. But they could come in handy as fuel prices rise, and they could help the environment.

"Some people like new gadgets. They get satisfaction in being the first one in their neighborhood to adopt a technology even if it is not cost-effective but has environmental benefits," says Howard Geller, executive director of the Boulder-based Southwest Energy Efficiency Project. "Early adopters are a good way to get a technology started in the marketplace."

The big push to conserve energy is slowly but surely gaining ground, and experts say that in a few years the high-tech, energy-saving gadgets will become more accepted - much like hybrid cars and compact fluorescent bulbs.

Once conservation takes hold, those gadgets will become cheaper and more available. That, in turn, will drive up demand from average customers and lead to their widespread adoption. At least that's how scientists and conservationists see it.

Simple energy-saving items such as double- or triple-glazed windows, thicker insulation and a better furnace can cut the electricity bill in half for an average home or business, researchers say. Installing high-tech gadgets could stretch savings even further, they say.

The United States lags behind other developed countries such as Japan and Germany in energy savings.

For example, the U.S. in 2004 consumed energy equal to an estimated 5.4 tons of oil per person, compared with Japan's 2.8 tons per person and Germany's 3.2 tons per person. Many Japanese families power their homes with fuel cells or reuse bath water for laundry - ideas that probably sound futuristic or just plain weird to most Americans.

Energy savings in the U.S. have a checkered history. The idea gained acceptance during the oil

crisis of the 1970s, but the zeal tapered off as oil prices fell.

Today, energy efficiency is in vogue again.

"Installing more energy-efficient devices now may prove to be a very wise investment if the upward trend in energy prices continues," says Ron Judkoff, director of buildings and thermal systems at the National Renewable Energy Laboratory in Golden. "These technologies reduce energy bills and carbon emissions."

Given that oil prices vacillate and gas prices have flirted with \$3, Americans understand the consequences of depending on foreign oil and the importance of conservation, experts say. President Bush has promised to break what he calls the nation's "addiction to oil" by switching to renewable energy and becoming more energy-efficient.

Environmentalists including former Vice President Al Gore who made the documentary *An Inconvenient Truth* are drumming up concern about global warming, making more people aware of their energy choices and what impact those choices have on the environment.

"People are becoming aware that climate change needs to be addressed," says Yael Gichon with Boulder's office of environmental affairs. "Since it is not happening at the federal level, it's left to local governments and individuals to do what they can."

Gichon should know.

In November, Boulder became the nation's first city to pass a "carbon tax" aimed at reducing heat-trapping gases in the atmosphere. The tax takes effect April 1 and will run through 2012. Average homeowners will pay \$16 more per year on their electricity bills, and businesses \$46 more. Officials hope the tax will generate more than \$6 million over the next six years.

Revenue from the tax will be used to promote higher energy efficiency in buildings, alternative fuels and reduction in vehicle miles traveled, Gichon says.

Xcel Energy, Colorado's largest utility, plans to spend \$196 million through 2013 to save or reduce peak power production by 40 megawatts each year, or 320 megawatts over the next seven years.

Xcel will spend the money in rebates and incentives to customers to encourage efficient lights, furnaces, air-conditioners and energy-efficient building designs.

One megawatt serves the electric needs of about 1,000 customers. The utility saved 39 megawatts in 2005.

"Saving energy is an important part of the overall power production process and allows us to delay the building of new power plants," said Xcel spokesman Tom Henley.

The state legislature is debating a bill that would make homes and other buildings more energy-efficient by requiring local governments to incorporate energy codes that meet or exceed the standards in the 2003 International Energy Conservation Code. Sponsor Rep. Claire Levy, D-Boulder, says if the bill passes, Colorado utility customers could see annual savings of up to \$260

in their heat and electric bills.

Coloradans are using a variety of technologies to conserve energy.

Tom Polikalas, of Montrose, lowers his utility bill during summer and winter with a geo-exchanger.

The technology relies on the Earth's natural thermal energy to heat or cool, and uses a small amount of electricity to concentrate that energy and circulate heating and cooling throughout the home.

Polikalas' Christmas lights this year were LEDs, which use a fraction of the electricity needed by typical lights.

"I have changed out virtually all the lights in my house to compact fluorescent lights, even the chandelier in my kitchen," Polikalas says.

If customers replace the five most-used incandescent bulbs in their homes with CFLs, or compact fluorescent bulbs, they could save up to \$55 a year in electricity costs, says Xcel Energy.

Stephanie Gill-Kelly's home in Morrison has solar films on the windows. The films block the heat from sunlight during summer, and insulate the home during winter - reducing her electric bill throughout the year.

The films - like many other energy-efficient home improvement items - qualify for a tax credit of up to \$500, or 10 percent of the cost.

Greg Dean, who installed the solar films at Gill-Kelly's home, says his business has grown 50 percent each year for the past few years.

Conservation is catching up with business owners, too.

Kay Larson, whose Boulder company sells fuel cells to universities and research labs throughout the world, pays her employees to use ride-sharing and public transportation. Larson herself walks to work most days, unless "there are glaciers in the middle of the street," she says.

Fuel cells, Larson says, could become commercially available in the U.S. in a few years. And that lead time is true for other technologies too, such as polymer solar hot water heaters, vacuum insulations and advanced building materials that store heat from sunlight for later use.

"For large-scale adoption, technologies need to be cost-effective," says Geller of the Southwest Energy Efficiency Project. "Then technologies can get started, economies of scale can begin, and technologies can improve over time."

Some energy-saving features

### **Tankless water heater**

Unlike typical water heaters that store hot water in 40-to-50-gallon tanks, a tankless heater heats

water instantly when a faucet or shower is turned on.

### **Condensing furnace**

The highly efficient furnace extracts so much heat from the burning fuel that water vapor in the flue gases condenses. These furnaces tend to be about 90 percent to 96 percent efficient.

### **Polymer solar water heater**

Similar to currently available solar hot-water heaters, the polymer or plastic solar heater is expected to lower the installed cost from about \$4,000 to about \$1,000 a unit once they go into large-scale production. The products likely will be available within a year.

### **Vacuum insulation**

Still in a research stage, a vacuum insulation panel consists of a special panel enclosed in an airtight envelope to which a vacuum is applied. The product gives three to seven times as much insulation as the same thickness of materials such as rigid foam boards or foam beads. It could be available in markets three years from now.

### **LED light**

LED or light-emitting diode technology currently is used to light up car dashboards and is very efficient for colored lights. LED lights can last up to 30 years .

### **Electro-chromic window**

Smart windows that change optical properties with outside conditions. During summer, the windows become darker to reduce the sunlight entering a room. During winter, they remain transparent to allow the heat of sunlight to warm up a room.

Profiles in homeenergy savings

John Avenson, Westminster

"Rex, I am home."

As soon as Rex hears Avenson's announcement, it quickly turns on the living room lights or raises the kitchen window shades.

If Avenson asks for a DVD movie, Rex turns on the projector in his home theater.

Rex remembers to switch off the lights after Avenson leaves a room, or to pull down the shades during summer to cool the house.

No, Rex is not the butler.

Rex is a computer that recognizes Avenson's voice and helps him save energy in his house. Avenson has thermometers in rooms and instruments on the rooftop that track temperatures, solar

heat and wind speed. Rex analyzes that information and makes decisions.

"When *Star Trek* came on the television, a computer controlled the starship Enterprise," Avenson says. "I have a computer that runs my home."

Avenson, who works for Lucent Technologies Inc., has made his 2,000-square-foot home so energy-efficient that he sent back electricity to Xcel in June and got a \$2.83 credit on his bill.

In January, he paid only \$91 for his combined gas and electric bill. By comparison, an average Xcel Energy customer paid \$216.

Yet, "I am embarrassed about my bill," Avenson says. "Most of it is because of (higher) natural gas use in winter."

Avenson installed hot-air panels on an outside wall. The panels take colder air from the rooms, heat it outside, and return the hot air back into the rooms - helping cut natural gas use. He fixed solatubes to light the hallway, bathroom and his office with sunlight during day time.

More efficient than skylights, solatubes redirect sunlight into a room through highly reflective tubing that look like normal ceiling lights.

Ron and Gretchen Larson, Golden

Those who know Gretchen and Ron Larson also know their passion: to experiment with ways to save energy.

Their latest experiment is annual cycle thermal energy storage.

What that means is a huge tank that holds 10,000 gallons of water. The tank gets heated by sunlight during summer, and the hot water is used in the cold winter months for various purposes. Besides the shower, laundry and other household uses, the hot water also runs through pipes under the floor and keeps the Larsons' home warm in winter.

The system needs fine-tuning, but Ron Larson is optimistic.

"We still got problems there . . . but it will work," Larson says.

Larson, who has a doctorate in electrical engineering, says his stint at the National Renewable Energy Laboratory in Golden made him more energy conscientious.

The Larson home on Lookout Mountain doesn't use natural gas - heating and cooling are done primarily by solar photovoltaic panels, although the couple has two backup wood stoves.

"The wood stoves are pretty small," says Gretchen Larson. "They really are more for aesthetics than anything else."

Their energy-efficient refrigerator runs on solar energy - a technology Ron Larson believes could be used by rural communities in poor countries with shoddy electrical infrastructure.

Gretchen Larson says her husband's dream is to live in an energy-efficient house, and she doesn't mind when some experiments don't work.

"We just put a lot of our savings into building a house that would be efficient," Gretchen Larson says. "I'm all for it, Ron is learning and other people are learning from it."

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