

# Preaching the green-power gospel

## Evangelists for renewable energy sources coming out of the wilderness

By Alan Boyle  
MSNBC

Solar-power activist Mike Nelson and his wife Chris live on a Seattle houseboat that's off the electricity grid. Nelson is proud of his "wind-built guitar," which was constructed with tools powered by wind-generated electricity.



SEATTLE, July 24 — Mike Nelson broke free of the power grid 22 years ago, and he didn't have to become a Luddite survivalist to do it. His solar/wind/gas-powered houseboat boasts all the consumer conveniences, including a microwave oven, a VCR and even a Web server. What sets him apart from his neighbors is that he's operating on homemade electricity. Nelson's not kidding himself about the difficulties most Americans face in following his lead. But like other green-power prophets, he believes that time and economics are on his side.

AFTER YEARS of crying out in the energy wilderness, America's green-power evangelists are addressing their message to America's mainstream — and they're drawing more listeners, in large part because of this spring's power crunch in the western United States.

Nelson has already seen a sea change in the public's response as the director of Seattle's Western SUN Cooperative, a group affiliated with Washington State University that helps Pacific Northwest electric utilities develop small-scale solar and wind power systems.

"I've seen a 600 percent increase in phone calls over two years ago," he says. "I'm having significant problems just answering the phone."

The surge of new interest is also hitting with full force 1,000 miles away, at the Rocky Mountain Institute in Snowmass, Colo., where Amory Lovins advises the likes of Dow Chemical and DuPont on new energy technologies that make economic sense, part of a philosophy he calls "natural capitalism."

"The way we are spreading natural capitalism ... is just to work with early adopters, and help those firms achieve such conspicuous success that their rivals are forced to choose whether to follow suit or lose market share," Lovins says.

Nelson and Lovins concede that they're facing an uphill battle. Today, renewable energy sources — excluding hydroelectric — account for just 2 percent of U.S. electricity production. And it's still cheaper to produce electricity using gas, coal, oil or nuclear. Nevertheless, they see signs of a quiet revolution:

- **Concern** over the long-term environmental impact of fossil-fuel generation has spawned a host of green-power incentives, including rebates, tax breaks and low-interest loans for solar and wind power equipment.
- **Energy deregulation** has spread to half the 50 states, giving consumers more say about where their power comes from. This provides an economic opening for new players in the energy marketplace, including green-power marketers.
- **The costs** of solar power and wind power are dropping dramatically.

“Once you put in the wind farm or solar cells, the price of the electricity will never go up,” Lovins explains, “because the ‘God utility’ doesn’t send you a bill for sun and wind, and there’s no fluctuating fuel price to worry about.”

### Green power gallery (sidebar)

How do renewable energy technologies compare? Click to learn more about green-power possibilities.

#### Introduction

"Green power" actually takes in a range of renewable energy technologies. Click on the headings above for quick facts on the leading technologies for generating electricity. Cost comparisons: The cost of gas-fired electricity is estimated at 3-4 cents per kilowatt-hour, coal at 2-6 cents and nuclear at 2-14 cents. The average home might use 12,000 kilowatt-hours per year.

#### Solar electric

*How it works:* Arrays of photovoltaic cells convert solar rays to electricity.

*Where it's at:* A must for folks who want to live "off the grid." Thin-film technology and economies of scale are reducing the relatively high cost of manufacturing solar arrays.

*What it costs:* 12 to 40 cents per kilowatt-hour.

*More info:* National Center for Photovoltaics

#### Wind power

*How it works:* Wind currents turn turbines that generate electricity.

*Where it's at:* Technological advances have made wind power competitive with fossil-fuel generation – if you have the right site for your turbine farm. Wind generates about 1 percent of America's electricity, 15 percent of Denmark's.

*What it costs:* 3 to 9 cents per kilowatt-hour.

*More info:* National Wind Technology Center

#### Small hydro

*How it works:* Water currents turn turbines that generate electricity.

*Where it's at:* Hydro produces 7 percent of America's electrical power, but only 2,400 of the nation's 80,000 dams are used for hydro. Small, environmentally sound facilities could help boost capacity.

*What it costs:* 5 to 12 cents per kilowatt-hour.

*More info:* International Small-Hydro Atlas

#### Fuel cell

*How it works:* Hydrogen and oxygen are combined to produce water and electricity.

*Where it's at:* Stationary fuel cells can produce electricity for homes and businesses, but the infrastructure for hydrogen fuel still has to be developed. Today's fuel-cell facilities still use carbon-containing fuel such as natural gas.

*What it costs:* 8 to 15 cents per kilowatt-hour.

*More info:* "Surviving the Greenhouse"

#### Biomass

*How it works:* Organic waste and vegetation, ranging from straw to landfill gas, are burned to power turbines that produce electricity. Ethanol and "biodiesel" are produced for cars.

*Where it's at:* Co-firing with conventional fuels is a low-risk, low-cost power solution.

*What it costs:* 3 to 9 cents per kilowatt-hour.

*More info:* Biopower

#### Geothermal

*How it works:* Steam from beneath Earth's surface turns turbines to produce electricity.

*Where it's at:* Power generation is feasible only in certain areas, and environmental concerns limit its application. Heat pumps are used more widely for home heating and cooling.

*What it costs:* 4 to 6 cents per kilowatt-hour.

*More info:* "Cool alternative to energy crunch"

#### Wave power

*How it works:* Coastal waves compress air in chambers, powering turbines to generate electricity. Deep currents can also turn the turbines.

*Where it's at:* Several companies are pursuing projects, but can the expensive-to-build facilities stand up to rough seas?

*What it costs:* 4 to 9 cents per kilowatt-hour.

*More info:* "Waves run this power plant"

## LIVING THE REVOLUTION

Like many green-power gurus, Nelson and Lovins practice what they preach.

Lovins and his wife, Hunter, built their 4,000-square-foot home/office complex in the heart of Colorado's ski country, with energy efficiency as the top priority: The windows are designed to use the sun's rays for heating in the wintertime, making a furnace unnecessary. Excess heat is funneled into a central greenhouse that stays warm enough to grow bananas.

“We’ve harvested 27 banana crops in the middle of this building,” Lovins says.

If the building's solar panels generate more electricity than needed, the excess power can be fed back into the utility grid to reduce the Lovins' total electric bill.



Rocky Mountain Institute

The Rocky Mountain Institute's Amory Lovins says the power bill for the household portion of his 4,000-square-foot complex is \$5 a month. Solar panels feed power back into the grid, canceling out that cost, but the office electrical expense brings the total bill back to a positive number.

Nelson's green-powered houseboat on Seattle's Ship Canal is a similar study in self-reliance: South-facing photovoltaic arrays and a wind turbine charge up the barge's onboard batteries. For the long, rainy winter, Nelson has to fire up a propane-fueled stove — but even that concession to fossil fuels is equipped with thermophotovoltaic cells, converting heat to electricity. The whole houseboat operates on a generating capacity of a kilowatt, the equivalent of 10 ordinary light bulbs.

Nelson, who has been building his own energy systems since the '70s, realizes that he's not your typical consumer.

"I spend my 'mad money' on solar panels," the 56-year-old environmentalist admits.

And that's one of the big challenges for green-power promoters: Building a solar- or wind-powered system isn't as easy as, say, building a deck. It's only now that the green-power industry is providing the same kinds of plug-and-play solutions that brought personal computers to the masses in the '80s. Nelson has mounted an example on the wall at Western SUN's office: On one side, he displays a tangle of circuit boxes and conduit — the kind of wiring once required for a home solar-power system. On the other side, there's one sleek cabinet that does the same job.

Such a system could serve as a backup power source for the home, he says, appealing to the same self-reliant types who buy sport-utility vehicles so they can handle snowy suburban streets. "The next target is the SUV crowd," Nelson says.

Lovins' Rocky Mountain Institute is targeting the same mass-market clientele. In fact, one of the institute's spinoff projects is the Hypercar, a commercial effort to develop a zero-emission, hydrogen-powered SUV that would get the equivalent of 99 miles a gallon using fuel-cell technology.

One of Lovins' colleagues at the institute, managing director Karl Rabago, says green power can't be limited to the 4 to 8 percent of the population who consider themselves "true-blue greens."

"The big 20 percent who actually spend a bunch of money has to be approached," Rabago says. "We don't really have what I would call an effective 'retail environmental movement' here yet."

To give that movement a boost, the institute has cataloged more than 100 potential benefits to be gained from smaller-scale energy resources.

Rabago says renewable energy should be sold using the kind of multimarketing approach employed for any new product. "Obviously conservation is the best solution, but if I can sell you a solar system for \$15,000 because you think that's what it takes, I'll do it," he says.

## **DEREGULATION GONE AWRY**

No matter how user-friendly such systems become, not everyone is going to put up a roof's worth of solar panels — which is why so many green-power marketers have pinned their hopes on energy deregulation. Nelson, for example, believes that people should be able to buy different flavors of electricity with the same ease that they buy bottled water.

"We're seeing that happen with green electrons," he says. "Instead of buying 'tap electricity,' you'll buy 'Perrier electricity' — and it'll come in a green bottle." In this ideal energy supermarket, consumers could ask their utility to deliver premium electrical power certified as coming from wind farms in the Northwest, or from solar arrays in California.

California's energy crunch, however, showed how deregulation could actually hurt the market for renewable energy.

Green-power marketers fell victim to a complicated pricing system that turned out to be a "disaster designed by a committee," Lovins says.

When prices skyrocketed, many of those who started out with green-power providers switched back to the seemingly safer harbor of the big power companies.

"Unfortunately, as often happens, the heroes get punished, and the villains are rewarded," Lovins says.

Similar problems have arisen with Pennsylvania's energy deregulation effort. But Rabago is more optimistic about the process under way in Texas, where a pilot deregulation program will begin Jan. 1 with 5 percent of the state's retail power customers.

## **CLEAN-POWER CRYSTAL BALL**

Looking further ahead, visionaries like Lovins, Nelson and Rabago foresee a brave new world where:

■ **Home energy systems** negotiate electronically with suppliers to get the cheapest rate. "The virtual utility," Rabago says. "Back then, everyone made fun of us, but now it looks like something that could happen."

■ **Environment-conscious** rebates, low-interest loans and net metering — already widely embraced in Europe — combine to turn personal power generation into a money-maker. "Who doesn't put in a solar (power) system when it turns a profit like this?" Nelson asks.

■ **"Microgrids"** of homes and businesses band together to complement each other's electrical needs, independent of the regional power grids.

Such systems are “big enough to get the advantages of sharing loads and generation,” Lovins says, “but not so big that you have to hook onto the main grid and pay (for) the obsolete stuff that tends to get charged to you through your use of the wires.”

Lovins believes the main force behind such green-power initiatives will be private industry rather than the federal government. That’s why he’s optimistic about the future, despite the Bush administration’s focus on boosting fossil-fuel production.

He adds that he has to repeatedly reassure his European colleagues, who “look in horror” at developments like the White House’s rejection of a climate treaty.

“I have to try to explain, ‘Watch what we do, not what we say,’” he says. □