

Renewable Energy: Clean, Secure, Reliable



On the Streets Where You Live

As advances in renewable technologies grow and costs continue to decline, more and more U.S. communities are turning not only to solar power, but to wind and geothermal energy and bio-based fuels, as well.

When your community is involved, matters of security, livability, and economic vitality take on a special significance. You want the streets in your town to be well lit and safe. You want good air quality and healthy public buildings. And it's a safe bet that you want your town's economy to thrive and generate opportunities for local entrepreneurs to prosper.

Taking advantage of clean energy from renewable sources answers all of the above. Here's how.

Solar energy can light the streets where you and your neighbors live. It can also heat water for your city's public facilities in the most cost-efficient manner available.

Wind energy can send power to the local utility at the same time it generates income for landowners hosting the turbines. And wind power is such an attractive choice that utilities around the country are finding customers who line up to subscribe when a wind option is offered.

Alternative-fuel vehicles, or fleets of them, can pay their own way by displacing fossil fuels and the emissions associated with their use.

These same alternative fuels, such as ethanol made from corn, can provide local growers with another market for their crops.

Adopting energy efficiency measures is a proven moneymaker for both families and the larger community. How? Each kilowatt of electricity saved is one that does not need to be generated. If a community saves thousands of kilowatts, perhaps a planned power plant can be eliminated. Or energy efficiency measures can stretch supplies and bring down the cost of renewable installations.

But the bottom line is energy security. After all, can your town be truly secure if the energy that powers the necessities of life is not?

Solar's the Solution for Towns Large and Small

Right now, in midtown Manhattan across from Central Park, one of thousands of photovoltaic (PV) systems in operation throughout the country is quietly doing its job. A PV-powered call box is on duty 24 hours a day, providing an emergency phone line to anyone who needs it.

Another New York PV installation stands much taller—48 stories tall,

in fact. The upper stories of this skyscraper in Times Square feature a “skin” of thin-film PV panels that replace traditional glass-cladding material. The PV curtain wall extends along sections of the 35th to the 48th floors on the south and east walls of the tower, making it a highly visible part of the midtown New York skyline. Fox and Fowle Architects designed the building, and Kiss + Cathcart Architects designed the building's PV system.



Andrew Gordon Photography/PX10543

Called 4 Times Square, this 48-story skyscraper in Manhattan, New York, incorporates a PV curtain wall as part of the structure. The PV modules are thin-film photovoltaics laminated between sheets of tempered glass. When blended into the façade of buildings, PV power becomes more cost effective because it replaces, rather than covers, structural elements.

In Garland, Texas, city officials chose a PV-powered option when a flashing caution light was needed at a school crossing. They investigated the costs of three options: using conventional overhead service, buried utilities, and PV power. After considering a range of inputs, such as the low maintenance requirements of solar, the nod went to

PV power. The cost was comparable to the “buried-utility” option, and residents did not have to suffer the disruption and inconvenience caused by trenching the street.

Change is in the Air

As advances in renewable technologies grow and costs continue to decline, more and more U.S. communities are turning not only to solar power, but to wind and geothermal energy and bio-based fuels, as well. Waverly Light and Power, the municipal utility for Waverly, Iowa, installed the state's first utility-scale wind turbine in 1993. Now, 10 years later, Iowa boasts some 350 turbines, producing more than 500 megawatts of electricity. “We have seen a lot of good come from our renewable energy efforts. They’ve allowed us to run an efficient, effective utility, and at the same time strengthen our rural economy and provide some substantial environmental benefits for us all,” says Glenn Cannon, general manager of Waverly Light and Power.

Got Corn? Got Fuel!

The use of liquid biofuels is gaining momentum, too. Several cities in Kentucky recently joined the hundreds of communities around the country who use alternative fuels for their vehicle fleets. In Kentucky, biodiesel made from vegetable oil, soybeans, and cooking oil was recently introduced into the fuel mix of bus fleets for four of the state's school districts. A local company, Griffin Industries of Butler, Kentucky, produced the fuel. Diesel-powered vehicles can accommodate biodiesel with no modifications.

Another widely used alternative fuel is ethanol, which is produced from corn and other plants. There are currently 67 ethanol plants in the United States, with the capacity to produce more than 2.6 billion gallons annually, and 11 plants are under construction. The two newest plants are in Monroe, Wisconsin, and Caro, Michigan. “Response by area producers delivering corn to

Continued on page 4



Waverly Light and Power/PX11512

Waverly Light and Power of Iowa owns and operates three wind turbines, which provide enough electricity for more than 500 residential customers each year.

Seven Reasons to Choose Renewables

How can renewable energy sources and energy efficiency technologies add muscle to our nation's—and your community's—energy supply? They do it by...

1 Reducing our dependence on imported fuels. The United States imports more than 53% of its oil, and that percentage may reach 75% by 2010. This reliance on foreign sources for fuel threatens our nation's energy security because these foreign supplies are vulnerable to political instabilities, trade disputes, embargoes, and other potential disruptions—leaving us vulnerable to disruptions in supply based on political will, regional conflicts, and a host of other possibilities. Replacing some of these imports with homegrown liquid fuels, such as ethanol and biodiesel, puts the control back in our hands.

2 Distributing our generation facilities. Renewable sources lend themselves to decentralization, which makes for a series of smaller, less inviting targets than say, for example, one massive power plant. A dispersed energy-generation system with multiple facilities located near the point of use is inherently more secure.

3 Improving the reliability and resilience of our power supply. An attack on one segment of a highly interconnected power system can potentially ripple through the entire grid. However, we can build resilience or “hardness” into the system by including distributed generation. Solar-electric or wind generation can also improve the grid's robustness by handling high peak demands that might tax the utility's overall capacity. And when the grid goes down, renewable energy generation can provide uninterruptible backup power to critical systems and operations that require 99.9999% power reliability.

4 Increasing the flexibility of our energy supply. Renewable sources are modular and can be deployed to support the traditional power grid. Or they can provide power as stand-alone sources where no power lines exist. In the aftermath of natural or human-caused disasters, solar-powered generating units have been deployed quickly to the point of need until regular service is restored. Modularity is another feature related to flexibility. For example, solar-electric systems can be used to provide electricity wherever it is needed in any amount—from watts to megawatts. They can be used in the middle of a city, as well as in remote or extreme locations.

5 Diversifying energy resources. Experience has taught us that relying on a narrow range of options—whether in the stock market or the energy market—is unwise. Incorporating renewable sources can broaden a region's energy base, making it less vulnerable to supply disruptions or price swings of traditional fuels.

6 Decreasing our demand for electricity. Emphasizing energy efficiency measures can help conserve our current resources. The building sector, which consumes 65% of the electricity generated each year in the United States, could cut its energy use in half by incorporating high-performance design.

7 Strengthening other infrastructure. By supplying electricity reliably, even during grid outages, renewable sources help to protect other infrastructures, such as telecommunications and transportation. Earth-orbiting satellites powered by solar electricity are also crucial for telecommunications, as well as for use by the U.S. military and government agencies to gather information that's vital to our national defense.



This bus is what it says—powered by soybean-derived biodiesel. Other vehicles, while making it less obvious than this bus, use alternative fuels that save gasoline for other needs

Got Corn?, Continued from p. 2

the plant has been outstanding,” says Tony Simpson, Michigan Ethanol, LLC, general manager. “Michigan Ethanol is looked upon as a new major marketing alternative for area corn producers.” It is

projected that the plant will introduce more than \$60 million to the state’s economy. The plant will process about 15 million bushels of corn each year, which is about 6% of Michigan’s total corn crop, producing 40 million gallons of ethanol.

Ethanol is a high-oxygen additive used to make reformulated gasoline, which reduces pollution. Federal law requires 17 metropolitan areas with high air-pollution levels to use reformulated gas.



This high-performance commercial building in Silverthorne, Colorado, features roof-integrated photovoltaics, natural ventilation cooling, daylighting, diffusing skylights, and a solar wall—reducing energy use compared to buildings with standard construction. Photovoltaic systems on the rooftops of homes and other buildings are a prime example of how to decentralize power generation.

Web Sites and Information Resources

Consortium for Energy Efficiency

Topics include residential, industrial, multi-family housing, commercial, evaluation/research, gas programs, and government. www.cee1.org/home.html

Database of State Incentives for Renewable Energy (DSIRE)

For information on state, local, utility, and selected federal incentives that promote renewable energy. www.dsireusa.org

Million Solar Roofs Initiative

Describes a DOE initiative to install solar energy systems on one million U.S. buildings by 2010; state and local partnerships are highlighted on this site. www.millionsolarroofs.com

Union of Concerned Scientists

This site analyzes and advocates energy solutions that are sustainable both environmentally and economically. www.ucsusa.org/clean_energy

Bringing It Home

Renewable energy technologies are closer to home than you might think. In California, Home Depot is selling residential PV power systems, and other home-improvement retailers are likely to follow suit. Developers and homebuilders throughout the country are including energy efficiency and “green building” packages in their offerings—and finding buyers eager to embrace these technologies. Saving energy, and generating energy close to home, is something most Americans could wrap their arms around. Renewable energy is one security blanket that you’ll never outgrow.

“Homeland Security: Safe-guarding America’s Future with Energy Efficiency and Renewable Energy Technologies”

This August 2002 report by the State Energy Advisory Board (STEAB) focuses on how we can make our energy infrastructure more resilient and less vulnerable.

www.steab.org/docs/STEAB_Report_2002.pdf



The National Renewable Energy Laboratory is a national laboratory of the U.S. Department of Energy operated by Midwest Research Institute • Battelle • Bechtel Contract No. DE-AC36-99GO10337

www.nrel.gov

NREL contact: John Thornton
303-384-6469 • john_thornton@nrel.gov

NREL/BR-200-34232 • May 2003

Printed with renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste.