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# Nature's Gifts

Renewable energy is finding its way into utilities, portfolios, with wind power leading the way. Wind turbines in West Texas have a capacity of almost 1,400 megawatts of electricity. With an abundance of resources, Texas appears well suited to pursue clean energy production derived from wind, solar, and biomass.

## Renewable energy searches for a secure niche in the marketplace

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Texas is staking its turf in "green power." That's the marketing term for electricity that is all or partly generated from environmentally friendly energy sources--wind, solar, geothermal, biomass, and low-impact hydroelectric power. These energy sources produce electricity without creating the pollution associated with conventional power generation from fossil fuels or nuclear power.

Not only is green power relatively free of pollution, it is renewable--thanks to energy derived directly or indirectly from the sun.

With its size and diverse climate, Texas appears to be in a position to capitalize on energy resources drawn from wind, solar, and biomass, according to the Comptroller's State Energy Conservation Office. These resources are so plentiful, says SECO, that the Lone Star State could emerge as the U.S. leader in producing clean energy.

Thanks to the breezy plains and mountain passes of West Texas, the state already ranks second nationally in the output of wind energy, and the full potential has yet to be tapped.

Texas does not lack for sunlight, thanks to summers that seem to last half the year. More and more homeowners and landowners are turning to solar cells to supplement energy needs.

The state also has plenty of resources for potential biomass production, which is energy derived from plants or animals. One component, landfill gas or methane, is waiting to be more fully tapped.

Compared with traditional fossil fuels, the cost of converting natural resources to energy is becoming more affordable, say renewable energy proponents, and more consumers are wanting to tap into nonpolluting sources to run their appliances and cool their homes.

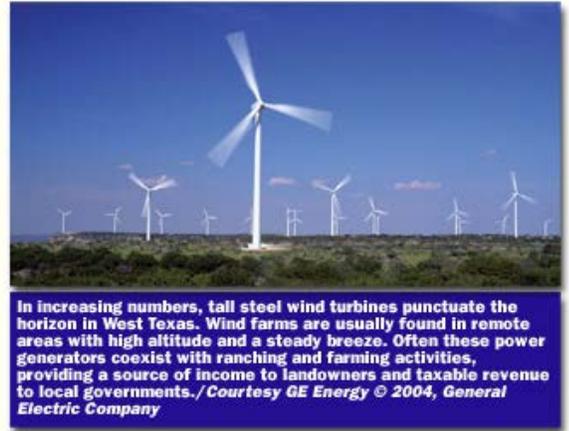
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## Wind Takes the Lead

Currently, renewable energy represents about 2 percent of the state's generation mix, but that picture may change.

With the Trans Pecos and Panhandle regions located in one of the best wind corridors in the country, 15 wind farms are taking advantage of this resource. More will follow this year, thanks to renewal of the federal production tax credit, which is a business credit that applies to electricity produced in the first 10 years of a plant's operation.

Without a doubt, Texas is in a position to harness the wind, says Tom Gray, deputy executive director of the American Wind Energy Association. "There is plenty of wind out there and plenty of energy to be tapped. It's just like

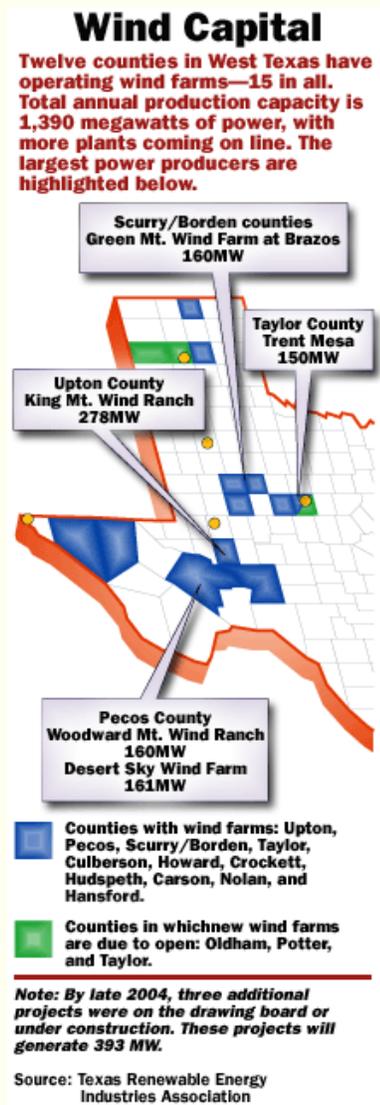


an oil field that doesn't run out."

Texas wind farms have a total capacity of about 1,390 megawatts (MW), enough energy to run 396,000 households, according to the Texas Renewable Energy Industries Association. That places Texas behind only California in wind production. Total U.S. capacity was about 6,400 MW last year.

So why build wind turbines in a state better known for its legacy in oil and gas production?

Texans got interested in wind power after the state's retail electric market was opened to competition in 1999. The state deregulation law also established a renewable market portfolio that requires retail utilities to increase their power purchases from renewable sources, reaching an overall 2,000 MW by 2009 (over the pre-existing 880 MW).



Among the technologies that qualify as renewables are: wind, solar thermal, photovoltaics, hydroelectric, and biomass, including landfill gas. Of those, wind has made the most progress in finding a commercial niche, although with intermittent starts and stops.

The federal production tax credit has been a boon to wind energy, said Gray. "But the trouble is it keeps expiring and renewing. It's been a real roller coaster. In 2003, we saw a banner year for building wind projects" until the credit expired.

"Now the credit is back in place, and we're expecting a record year of building, probably with 2,000 MW to be installed nationwide in 2005."

Fortunately, he said, the cost to buy into the wind market is in the competitive range. "It's not the cheapest energy, but it's inexpensive enough that it may make sense for a utility to buy some for the portfolio.

"And there definitely aren't the environmental issues involved with its use, including extraction and combustion," he noted. "You don't have to worry about disposing of the waste, as in nuclear and coal."

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## Greening the Portfolio

To introduce wind energy to customers and explain how it is produced, TXU Corp. sponsored an "educational tour" by hauling a giant wind turbine blade around the state on a special trailer.

At schools and public events, representatives showed off the 120-foot long blade, weighing 14,000 pounds. The blade is longer than an NBA basketball court, they explained, and some wind turbines stand taller than the Statue of Liberty.

TXU says it is the largest purchaser of wind power in Texas and the Southwest. The company receives 580 MW of electricity generated by 625 wind turbines in West Texas, enough to power almost 120,000 homes. Officials say wind is their



This zero-emissions biomass system generates electricity by capturing heat flared from methane gas at a city of Austin landfill. The city estimates there is enough methane gas at this location to keep the system going for 10 years or more./Photo by Austin Energy

renewable resource of choice because of its competitive price, availability, and the relatively short time needed to develop and build a wind farm--12 to 18 months.

Austin Energy has been so ambitious in pursuing renewable energy sales that it was designated Green Power Program of 2004 by the Environmental Protection Agency (EPA).

"Years ago we consciously decided we were going to take on a national leadership role in this field," said Roger Duncan, deputy general manager of the municipally owned utility. "We set down goals and a strategic plan. Then we hit on a (customer) pricing formula that got big industry involved. Our Green Choice program offers a fixed, 10-year charge for green power. That got companies like Motorola onboard."

The Green Choice program fulfills 100 percent of the electricity needs for 279 Austin companies and organizations, including the TCEQ.

Wind power purchases, mostly from Upton and Nolan counties, have a generation capacity of about 215 MW, enough to power 30,000 homes.

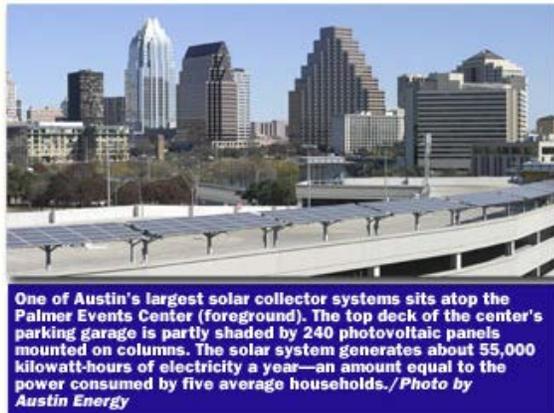
With newly signed wind generation contracts, Austin Energy expects that 6.5 percent of its energy needs will be met by renewable sources at the end of this year. Said Duncan: "Our goal is to have 20 percent met by renewables by 2020."

City Public Service in San Antonio reports that wind power supplies about 4 percent of its peak demand. Contracting with the Desert Sky Wind Farm in Iraan, CPS draws 161 MW of zero-emission electric power. CPS plans to double its use of wind energy by 2013.

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## Here Comes the Sun

Solar panels are appealing for being portable and self-contained, but installation costs still take years to be recouped. Nonetheless, some sizable projects have been built.



One of Austin's largest solar collector systems sits atop the Palmer Events Center (foreground). The top deck of the center's parking garage is partly shaded by 240 photovoltaic panels mounted on columns. The solar system generates about 55,000 kilowatt-hours of electricity a year—an amount equal to the power consumed by five average households. / Photo by Austin Energy

One of the biggest is at the University of Texas Health Science Center in Houston—65 kilowatts (kW) of generating capacity constructed atop the parking garage. A solar-to-electric installation also is planned nearby at the UT School of Nursing.

In Dallas, the college-preparatory Winston School erected a commercial-scale 58-kW solar array with the help of Green Mountain Energy Co.

In Austin, some of the larger solar panel installations feed electricity into the electric grid. Among those are projects at Austin-Bergstrom International Airport, a city library, and a city parking garage.

Last year, Austin helped fuel interest in solar installations by creating rebates—among the largest in the country. The program pays \$5 per watt for new residential and business solar systems, or \$6.25 per watt for installations using solar equipment manufactured in Austin.

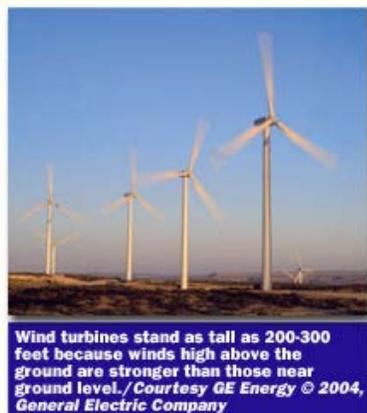
San Antonio's CPS also has had an ambitious solar agenda. Its Northside Customer Center has 2,000 square feet of photovoltaic solar panels on the roof with a capacity of 20 kW that supplies much of the building's power. About 5,000 square feet of solar thermal collectors help heat the building's water. In addition, 17 kW of solar-based electricity is located at the CPS primary control center.

CPS-installed solar panels at UT's Institute of Texan Cultures produce 10 kW. An interactive exhibit at the San Antonio museum demonstrates the benefits of solar technology.

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## Obstacles to Overcome

EPA has recognized Texas' leadership in green power programs, congratulating the scores of businesses and organizations that support further development of cleaner forms of power.

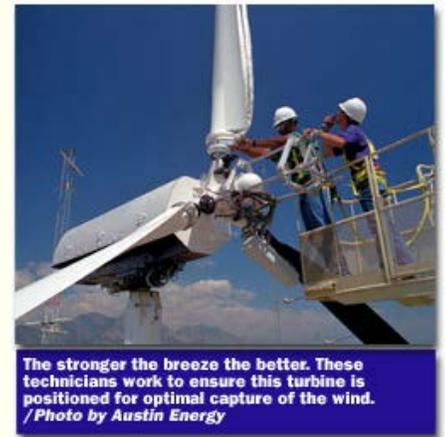


Wind turbines stand as tall as 200-300 feet because winds high above the ground are stronger than those near ground level. / Courtesy GE Energy © 2004, General Electric Company

But many problems plague this fledgling segment of the energy industry. For one, users of wind power say they would buy more if not for a shortage of transmission lines to move the power. Most wind farms are in remote areas, long distances from cities and transmission lines.

Storage is a problem too, says Austin Energy's Duncan: "Wind and solar energies are not dispatchable. You only get the energy when the wind is blowing or the sun is out. So the storage problem has got to be solved."

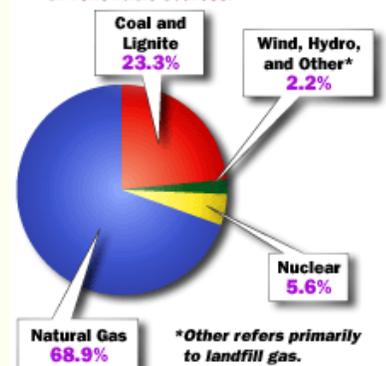
Technology costs continue to be a problem, he added, particularly with solar and biomass.



The stronger the breeze the better. These technicians work to ensure this turbine is positioned for optimal capture of the wind. / Photo by Austin Energy

## Generation Mix in Texas

As of 2003, about 2.2 percent of the state's generation capacity was based on renewable sources.



Source: Public Utility Commission of Texas

Then there is the on-again, off-again federal production tax credit, which expires at the end of 2005. Will it be renewed, and for how long?

While renewables are not expected to replace the traditional power sources, this form of energy is touted as a cleaner way of supplementing the state's ever-growing demand for electricity and doing so in a manner that does not create more problems for the environment.

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## Primary Sources of Renewable Energy in Texas

### Wind

Harnessing the wind is one of civilization's oldest technologies. The kinetic energy of wind can be turned into mechanical or electrical power for many different jobs.

However, the sleek steel turbines of today have little resemblance to the windmills of the past. The massive blades, 100-200 feet long, are mounted on towers as tall as 300 feet.

To capture the stronger currents far above the ground, most wind turbines are located on hilltops. Wind speeds of 16-20 mph are best for commercial use and can be found in West Texas and the Panhandle.



Photo by  
Austin Energy

### Solar

Photovoltaic cells are devices that convert light energy directly into electricity without creating any air or water pollution.

Although it is clean, solar power has not caught on as a bulk power resource because it remains more expensive than conventional power.

Typically, solar projects spring up in self-contained projects: on rooftops of homes, shopping centers, factories, and parking lots. Thousands of school crossing lights are powered by this method, as are gate openers and freeway call boxes.

Some urban homeowners and businesses opt for solar power to guard against power disruptions. Rural landowners turn to solar in the absence of a nearby power source--say, to power electric fences or pump jacks that water cattle.

Supporters say the industry is developing cheaper and more dependable technology.

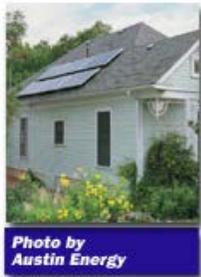


Photo by  
Austin Energy

### Biomass

Biomass refers to the chemical energy stored in plant and animal materials. The practice of burning wood and agricultural wastes is as old as burning a fire to cook food or heat a home.

The materials most often burned for energy include wood chips, sawdust, rice hulls, straw, animal manure, peanut shells, and surplus corn. These biomass fuels often substitute for fossil fuels--without the complications of air emissions.

Many farms and ranches produce their own energy in this manner, as do some on-site industrial generating facilities, such as pulp and paper mills that burn waste wood and other byproducts.



Another important type of biomass energy can be found in landfills.

Consumer products derived from plants or animals contain energy. This includes food waste, diapers, newspapers, and yard trimmings, all of which eventually decompose and produce methane, which is the principal component of natural gas.

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## Green Power Leaders

These recent award winners have been tapped by the Environmental Protection Agency and the Department of Energy for their leadership in the emerging field of renewable energy.

### Austin Energy, Green Power Program of the Year, 2004

For three years running, Austin has had the No. 1 utility-sponsored green power program in the United States, with more than 7,600 customers and annual sales of 380 million kilowatt-hours (kWh) a year. The program boomed when the utility began allowing customers to lock in green power prices--for as long as 10 years--as a hedge against the rising cost of fossil fuels. The Austin school district became the largest subscriber when it signed up for 45 million kWh, almost one-third of the district's annual usage. The utility's renewables portfolio is wind, 80 percent; landfill gas, 19 percent; and hydro and solar, 1 percent.

**Dyess AFB, Purchasing**  
***Partner of the Year, 2003***

In 2003, Dyess Air Force Base near Abilene became the largest purchaser of green power at a single site in the United States. It was also the largest military purchaser of green power at the time.

The base modified an existing contract with TXU Corp. in order to convert to 100-percent renewable energy. As a result, all of the base electricity is wind-generated--almost 80 million kWh, or enough electricity to power 8,000 homes a year. By making the conversion, Dyess estimates it eliminated the annual production of 105 tons of nitrogen oxide, 152 tons of sulfur dioxide, and 58,000 tons of carbon dioxide.

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Last Modified Fri, 22 Jul 2011

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