RENEWABLE ENERGY SOURCES
WIND POWER

What is wind?

Wind is actually a form of energy converted from solar energy. The sun's radiation heats different parts of the earth at different rates—most notably during the day and night, but also when different surfaces (for example, water and land) absorb or reflect at different rates. This in turn causes portions of the atmosphere to warm differently. Hot air rises, reducing the atmospheric pressure at the earth's surface, and cooler air is drawn in to replace it. The result is wind. These conditions are why most wind turbines are located near large bodies of water, such as the Great Lakes, or on mountain ridges where there is a greater amount of wind.

Electricity can be generated from the wind when it turns two or three propeller-like blades around a rotor that is connected to a tower and spins a generator. This unit is called a turbine. Wind turbines are usually mounted on a tower from 100 feet to 400 feet above ground so they can take advantage of faster and less turbulent wind.

The most economical application of wind electric turbines is in groups called "wind power plants" or "wind farms." For example, a 107-megawatt wind farm near the community of Lake Benton, Minn., consists of turbines situated far apart on farmland along the windy Buffalo Ridge. The wind farm generates electricity while agricultural use continues undisturbed.

Wind power plants are "modular," which means they consist of small individual modules (the turbines), that can easily be made larger or smaller as needed. Wind turbines can range in size from a few kilowatts or be combined to make a wind farm producing hundreds of megawatts. A megawatt of wind generates enough electricity to serve 240-300 households. If wind power is the only source of power for homes, a storage system would be needed because the wind does not blow all the time. However, storage typically is not needed because wind generators make up only a portion of the power on a utility system, and other fuel sources are used when the wind is not blowing.

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Additional turbines can be added as electricity demand grows. Today, a 50-megawatt wind farm can be completed in 18 months to two years. Most of that time is needed to measure the wind and obtain construction permits. The wind farm itself can be built in less than six months.

Ohio's current and future outlook

According to the American Wind Energy Association (AWEA) Ohio currently ranks 25th for total megawatts of wind energy produced. Through 2014, Ohio increased production of wind energy to 432 megawatts, a drastic improvement from the eight megawatts produced in 2009. Ohio is the number one leader in the nation for wind-related manufacturing, with more facilities producing products for the wind energy industry than any other state. There are currently 62 facilities producing wind energy for more than 100,000 average homes.

Steps have been taken to increase renewable energy, including wind, in Ohio. Renewable energy standards were written into law that will require 12.5 percent of all electricity sold in Ohio to come from renewable energy by 2025.

Other wind turbines operating in Ohio include one 7.5-kilowatt turbine at the Glacier Ridge Metro Park in central Ohio to help educate Ohioans about the benefits of wind power and provide power for the park; the Great Lakes Science Center in Cleveland has a 224-kilowatt turbine to help power the center; and a 50-kilowatt WindCube at the Lake Erie Business Park in Port Clinton.

National outlook

The United States continues to expand its efforts on wind power generation. At of the end of 2014 the wind energy capacity was an estimated 65,879 megawatts producing approximately 4.44 percent of all generated electricity in the United States.

Texas, California and Iowa lead all other states in wind energy production and account for nearly 40 percent of all the wind-generated electricity in the United States.

Most of the wind turbines in use today are on land. However, more off-shore wind sites are being built. Recent reports indicate that wind energy could provide at least 20 percent of the nation's electricity by 2030, which would be enough electricity for 90 million homes.

Pros and cons of wind power

Wind is a free, renewable resource that does not send any pollutants into the environment. As much as 5,000 tons of carbon dioxide can be prevented by a wind turbine each year. To absorb that much carbon dioxide, it would take 500 acres of forest.

Wind power also can create jobs to manufacture turbine parts and build the wind turbines. Ohio has already created nearly 3,000 jobs because of investments in wind energy. This could climb higher if investments in wind power are strengthened nationally.

Additionally, wind turbines can provide extra income for farmers. A farmer in Ohio could make $11,000-$14,000 per year for each utility-scale wind turbine leased on the land, according to the Ohio

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Farm Bureau Federation. The land around the turbine can continue to be used for growing crops or grazing livestock.

One of the main issues with wind power is its variability and the need for constant wind to generate measurable amounts of electricity. Many people also have expressed little desire to have wind turbines near their homes because of the visual impact that they have on the landscape, and other issues. Lastly, there are reports each year of birds and bats killed after flying into a turbine's rotor blades. However, in many cases, research is performed on migratory flight patterns before building wind turbines to decrease the possibility of this occurring.

Additional resources

For additional information on wind power, visit these websites:

www.awea.org

http://development.ohio.gov/bs/bs_renewenergy.htm

www.greenenergyohio.org

www.nrel.gov

The Office of the Ohio Consumers' Counsel (OCC), the residential utility consumer advocate, represents the interests of 4.5 million households in proceedings before state and federal regulators and in the courts.

The state agency also educates consumers about electric, natural gas, telephone and water issues.

For more information, please visit the OCC website at www.occ.ohio.gov.

The Office of the Ohio Consumers' Counsel is an equal opportunity employer and provider of services.