Exploring Energy: Wind Warriors

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Chem.Info's *monthly Exploring Energy feature provides readers with a chance to familiarize themselves with energy technologies and processes, both new and old. In this installment, we explore wind power.*

Humans began harvesting wind's power during the Neolithic period, a time of great advances in technology, and the same epoch that marked the spread of agriculture. According to the U.S. Energy Information Administration [1] (EIA), wind was used as early as 5000 B.C to propel boats along the Nile River, and by 200 B.C., basic windmills were used to grind grain in Persia.

Word of wind's power blew throughout the world, and by the 11th century, it was used extensively for travel, food production and more.

Early American colonists used windmills, and even after electricity became common in America's cities, wind power was still used as an energy source in rural areas up until the 1920s.

Electricity eventually made its way to rural areas, but the oil shortage of the 1970s, coupled with a general interest in renewable, environmentally friendly energy solutions, created a renewed interest in wind power — an interest that is still alive and well today.

The Basics of Wind Power: Seeing Both Sides

Wind power's environmental impact is low. Turbines are emissions-free (with a few, rare exceptions), they do not use water, and they consume minor amounts of energy and other resources.

Wind turbines can be easily spotted along roadways — but while their prominence can be seen as a drawback, they provide a great deal of electricity while offering a relatively small footprint.

Just as many of wind power's benefits are environmentally related, so are its drawbacks. The materials for wind turbines must be manufactured, and that manufacturing process obviously uses energy and resources. Service roads must often be built so that operators can access wind farms. In addition, birds and bats are sometimes killed by spinning turbines.

Transmission is also an important consideration. In the United States, the country's aging electric grid would likely struggle to transmit large amounts of wind power, especially considering the often remote placement of wind farms. Therefore, increasing the nation's reliance on wind power would require an investment in the nation's grid infrastructure.

Wind’s drawbacks must be balanced against its rewards: Do wind’s benefits outweigh its drawbacks? Is reliance on wind power both financially and scientifically feasible? To date, a stalemate in the wind-energy war has yet to be reached, and these questions continue to serve as fodder for energy arguments, with both sides believing that they know the answers.

Incentivizing Wind Power

Electricity generation from wind has steadily grown in recent years. While this trend is expected to continue, recent government actions (and inactions) have incited questions about its future.

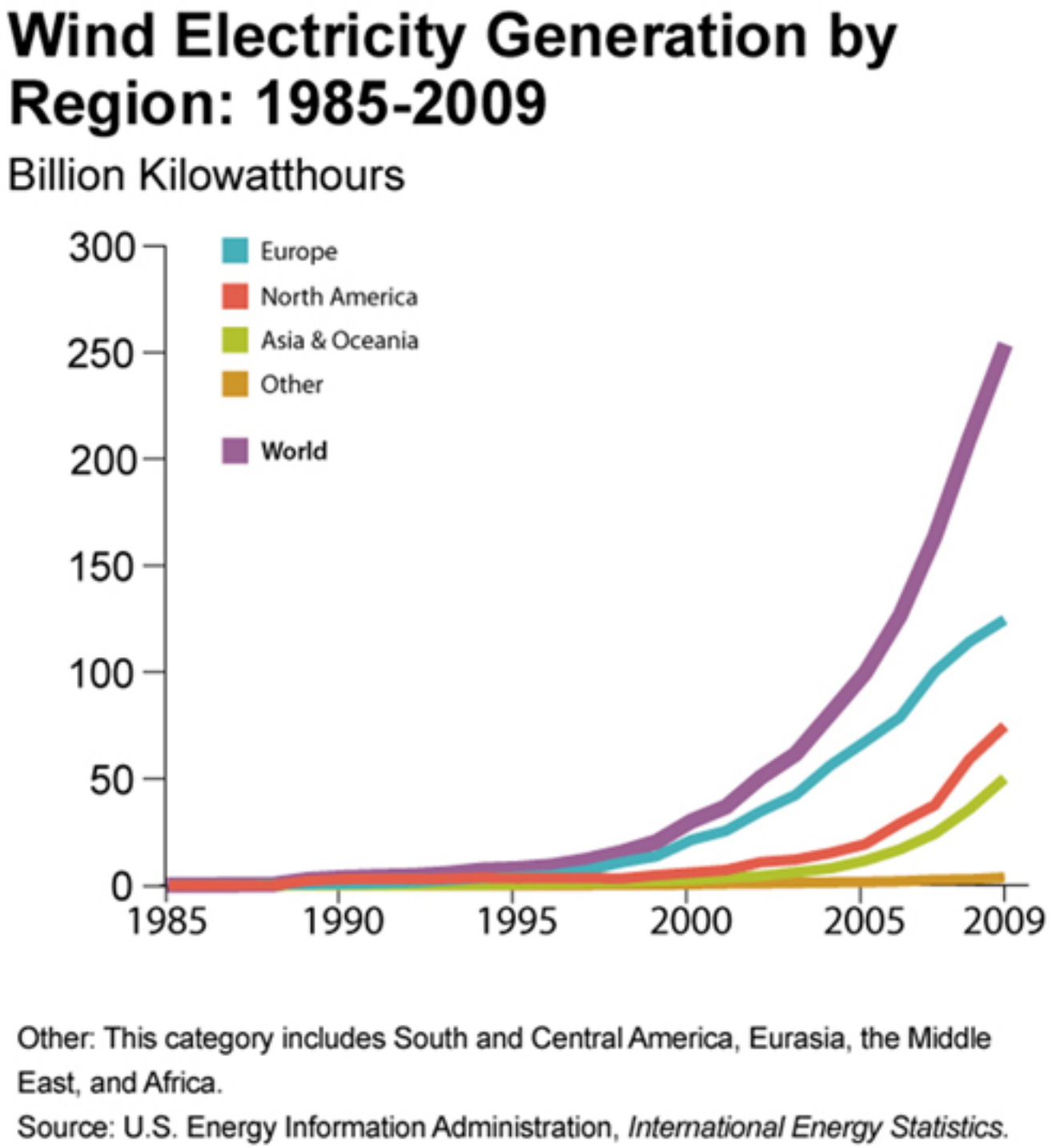

Photo Courtesy: U.S. Energy Information Administration

Although wind power often costs more than electricity from fossil fuel-burning power plants, its lesser environmental impacts have motivated many governments to offer programs that foster the growth of the wind-power industry.

“Multiple types of government support exist, including a production tax credit and state renewable electricity portfolio standards in the United States, a feed-in tariff … in Germany, and wind capacity targets in China,” according to the U.S. EIA.

Feed-in tariff programs, such as those employed in Germany, encourage the adoption of renewable electricity by offering financial incentives. Under such

programs, electric utilities are legally required to purchase renewable electricity at a higher price than the wholesale price, allowing the renewable generator to make a profit despite higher up-front expenditures.

In the United States, despite state wind-power incentives and other financial programs, wind power's future recently faced some uncertainty. The country's wind production tax credit (PTC), which was enacted in 1992 and first lapsed in 1999, was set to expire again at the end of 2012. Many companies braced themselves for the business decline that would surely follow the expiration, but in the end, Congress decided to renew the credit for one year.

Yet, this extension doesn't guarantee smooth sailing for the year ahead. A report [2] from Bloomberg says that General Electric Co. announced that, despite this move, "Declining U.S. turbine orders this year will still dampen profit."

While companies such as GE may still see some decline in business, the decline is not nearly as steep as it could have been without the credit extension. "The production tax credit is 2.2 cents for every kilowatt- hour generated by wind-farm operators," but "without an extension, installations were projected to decline to 1,500 megawatts this year, according to a Bloomberg New Energy Finance forecast."

The Future of Wind

Many manufacturers of wind turbines and other components for wind power operations say that a great deal of their orders come from outside of the United States.

An Iowa-based Siemens factory that makes turbine blades was forced to lay off workers due to a decline in orders, but was recently able to recall some of the employees thanks in part to new orders from Brazil and Chile. "The company blamed difficult market conditions, lack of congressional action on a wind energy tax credit, and increased use of natural gas-fired power plants," according to a February 2 report titled "Siemens energy plant recalls workers [3]" from the *Globe Gazette*.

Some suppliers are hoping that offshore business helps them stay afloat. "GE is introducing new products designed to expand its business in markets from Germany to Australia," says Bloomberg. "The company unveiled a 2.5-megawatt turbine … for low wind speeds that uses battery storage to help smooth the flow of power to the electrical grid, and relies on software that can help forecast wind conditions." The hope is that this machine "will help GE benefit from surging installations in southern Germany, Stephan Reimelt, chief executive officer of the Energy Germany division, said last week in an interview in Berlin."

As incentives bolster the wind power market, companies market to nations that see wind as a favorable power solution, and proponents of cleaner sources push for a change, wind's popularity may soar. On the other hand, if wind's drawbacks appear to outweigh the risks, and new solutions (such as natural gas) continue to flood the

market, it may be difficult for wind to set sail.

For more information on wind power, please visit the U.S. EIA's website *[1]*

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