

# World Wind Generation Capacity jumps 31 percent in 2001

by Lester R. Brown

**P**reliminary data show world wind electric generating capacity climbing from 17,800 megawatts in 2000 to an estimated 23,300 megawatts in 2001 – a dramatic one-year gain of 5,500 megawatts or 31 percent. As generating costs continue to fall and as public concern about climate change escalates, the world is fast turning to wind for its electricity.

Since 1995, world wind-generating capacity has increased an astounding 487 percent, or nearly fivefold. During the same period, the use of coal, the principal alternative for generating electricity, declined by 9 percent.

One megawatt of wind-generating capacity typically will satisfy the electricity needs of 350 households in an industrial society, or roughly 1,000 people. Thus, the 23,300 megawatts of generating capacity now in place is sufficient to meet the residential electricity needs of some 23 million people – equal to the combined population of Denmark, Finland, Norway, and Sweden.

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In wind electric-generating capacity, Germany leads the world with 8,000 megawatts, nearly a third of the total. The United States, which launched the modern wind power industry in California in the early 1980s, follows with 4,150 megawatts. Spain is in third place, with 3,300 megawatts. Denmark, which is fourth with 2,500 megawatts, now gets 18 percent of its electricity from wind. Two thirds of the capacity added in 2001 was concentrated in the top three countries: Germany added 1,890 megawatts; the United States, 1,600; and Spain, 1,065. For the United States, this translates into a growth in generating capacity of some 63 percent in 2001.

Despite this spectacular growth, development of the earth's wind resources has barely begun. In densely populated Europe, there is enough easily accessible offshore wind energy to meet all of the region's electricity needs. In the United States, there is enough harnessable wind energy in just 3 of the 50 states – North Dakota, Kansas, and Texas – to satisfy the country's electricity needs. And China can easily double its current electricity generation from wind alone.

In the United States, the cost of wind-generated electricity has fallen from 35 cents per kilowatt-hour in the mid-1980s to 4 cents per kilowatt-hour at prime wind sites in 2001. (See figure.) Some recent

long-term supply contracts have been signed for 3 cents per kilowatt-hour. With the U.S. adoption of a wind production tax credit in 1993 to offset established subsidies for oil, coal, and nuclear power, growth surged. New wind farms have come online in recent years in Colorado, Iowa, Kansas, Minnesota, New York, Oregon, Pennsylvania, Texas, Washington, and Wyoming.

Low-cost electricity from wind brings the option of electrolyzing water to produce hydrogen, which can easily be stored and used to fuel gas-fired turbines in backup power plants when wind power ebbs. Over time, hydrogen produced with wind-generated electricity is the leading candidate to replace natural gas in gas-fired power plants as gas reserves are depleted.

Hydrogen is also the ideal fuel for the fuel cell engines that every major automobile manufacturer is now working on. Honda and DaimlerChrysler both plan to have fuel cell-powered vehicles on the market in 2003.

Wind power offers long-term price stability and energy independence. Not only are costs low and falling, but with wind-generated electricity there are no abrupt price hikes, as with natural gas. There is no OPEC for wind, because wind is widely dispersed. An inexhaustible source of energy, wind offers us more energy than

we can use, and it does not disrupt climate.

Investment in wind turbine manufacture and wind development has been highly profitable. While high-tech firms as a group suffered a disastrous fall in sales, earnings, and stock value in 2001, sales in the wind industry soared. For example, at Danish-based Nordex, one of the world's largest turbine manufacturers, turnover during the first nine months of 2001 was up 19 percent and new orders were up 56 percent.

Even more impressive than the recent growth in generating capacity are the plans for future growth. The European Wind Energy Association has recently revised its 2010 wind capacity projections for Europe from 40,000 megawatts to 60,000 megawatts.

France, for instance, which for years had ignored wind power, announced in December 2000 that it would develop 5,000 megawatts of wind-generating capacity during this decade. A few weeks later, Argentina announced it was planning to develop 3,000 megawatts of wind-generating capacity in Patagonia. In April 2001, the United Kingdom sold offshore lease rights for an estimated 1,500 megawatts of wind-generating capacity to several different bidders, including Shell Oil. And in May, a report from Beijing indicated that China would develop up to 2,500 megawatts of wind capacity by 2005.

In the United States, wind-generating capacity is growing by

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leaps and bounds. The 300-megawatt Stateline Wind Project under construction on the border between Oregon and Washington will be the world's largest wind farm. Texas added some 900 megawatts in several projects during 2001. In South Dakota, Jim Dehlsen, a pioneer in developing California's wind energy, has secured the wind rights to 222,000 acres of farm and rangeland in the east central part of the state. He plans to develop a huge 3,000-megawatt wind farm and to transmit the electricity across Iowa, supplying Illinois and other states in the industrial Midwest.

In Europe, offshore projects are now springing up off the coasts of Belgium, Denmark, France, Germany, Ireland, the Netherlands, Scotland, Sweden, and the United Kingdom.

A survey of some seventy wind-energy developers in Germany indicates that they plan to install 2,500 megawatts of capacity in 2002 and a similar amount in 2003. If they succeed, they will surpass the German government's 2010 goal of 12,500 megawatts by the end of 2003.

Projecting future growth in such

a dynamic industry is complicated, but once a country has developed 100 megawatts of wind-generating capacity, it tends to move quickly to develop its wind resources. The United States crossed this threshold in 1983. In Denmark, this occurred in 1987. In Germany, it was 1991, followed by India in 1994 and Spain in 1995.

By the end of 1999, Canada, China, Italy, the Netherlands, Sweden, and the United Kingdom had crossed this threshold. During 2000, Greece, Ireland, and Portugal joined the list. And in 2001, it was France and Japan. As of early 2002, some 16 countries, containing half the world's people, have entered the fast-growth phase.

Wind energy in the form of electricity and hydrogen can satisfy all the various energy needs of a modern economy. Abundant, inexhaustible, and cheap, wind promises to become the foundation of the new energy economy. We can now see the shape of this new economy emerging as wind turbines replace coal mines, hydrogen generators replace oil refineries, and fuel cell engines replace internal combustion engines. •