

# The Benefits of Wind Energy

**W**ind energy development has been thriving both in the United States and around the world. This reflects not only the declining cost of the resource and the improved performance of wind power plants, but also a growing awareness among utilities and other potential customers that this renewable energy technology offers many benefits for the economy and the environment.

- Wind energy can help create new business and jobs, keep energy dollars circulating in local economies and reduce reliance on imported energy.
- Wind energy can help protect utilities and ratepayers from risks associated with changing fuel prices, new environmental regulations, uncertain load growth and other unpredictable costs.
- Wind energy can reduce a utility's pollutant emissions, helping power companies meet environmental regulations and satisfy their customers' desire for clean power sources.

In the past, these benefits were not enough to outweigh the significant costs and technological uncertainties associated with wind energy; now that the technology has proven reliable and competitive, however, they are beginning to carry more weight. The greatest challenge for the future is to ensure that the benefits of wind energy continue to receive attention as the utility industry moves toward increased competition in the generation and marketing of power.

## Economic benefits

Electricity is an essential ingredient of our modern way of life: it runs our computers, appliances, factories and businesses. Without low-cost power, our standard of living would suffer. But electricity generation is also a major source of pollution and toxic wastes. Wind energy offers a way to meet the needs of both the economy and the environment by providing a source of clean, competitively priced power.

Wind energy helps our economy in other important ways. For communities and states in which wind power facilities are located, wind power plants create jobs, generate income and support economic development. Several studies have established that wind energy produces more Jobs per dollar invested or per kilowatt-hour generated than most conventional resource

*The benefits of wind energy should be considered as the utility industry moves toward increased competition.* A New York study, for example, found that producing 10 million kilowatt-hours of electricity from wind energy generates 27 percent more jobs in the state than producing the same amount of energy from an advanced coal plant and 66 percent more jobs than from a natural gas combined-cycle power plant. One reason is that much of the expense for fossil-fuel plants is incurred from buying fuel, which

**Wind energy contributes to the economy by:**

- generating jobs
- generating income
- supporting economic development
- paying property taxes and land rents

supports fewer jobs than other industry sectors, especially when the fuel is imported from other states or countries.

Wind power plants also pay substantial property taxes and land rents. A typical rent payment is a small percentage of a plant's revenues, implying that a wind plant located in an agricultural area can boost cropland rents and prices by as much as 50 percent to 100 percent. For the most part, farming operations can continue unaffected.

States and communities with the foresight to invest in wind energy can reap another benefit by fostering a home-grown wind industry that can export power to other regions. The market for wind power worldwide is growing rapidly. New companies that capture this market will develop in areas where substantial wind development already is occurring. Until the late 1980s, this was mainly California; recently, however, the United States has ceded its early lead in wind development to European competitors. Prudent investments in the domestic wind market can help reverse this trend.

## **Risk management**

Most consumers like to avoid risk: The chance that something they need, no matter how inexpensive today, will become much more costly tomorrow. Fixed-rate mortgages owe much of their popularity to this characteristic. While other loan packages may be less expensive in the short-term, many homeowners like the comfort of knowing that their monthly mortgage bill will never increase.

Like a fixed rate mortgage, investing in wind energy offers an effective strategy for managing risk, a way of buying an insurance policy against the ups and downs of the power market. It is especially effective against three kinds of risk: environmental regulation, fuel price volatility and load-growth uncertainty.

## **Environmental regulation**

The electric utility industry has been subjected to more environmental regulation during the past three decades than perhaps any other major industry. This is not likely to change in the future. Although some kinds of power plant emissions already are under strict control, several others remain to be dealt with. Two leading candidates for future regulation are toxic metals (such as mercury and cadmium) and greenhouse gases.

Toxic metals, which can cause lung disease, childhood developmental problems and other serious ailments when they enter the air or food chain, already are under consideration for regulation by the federal government. Estimates of the cost of controlling these emissions range widely, but it could be substantial for coal- and oil-fired power plants.

Greenhouse gases present an even greater regulatory risk, since they are produced by every power plant that uses fossil fuels. Because of increased international concern about global warming, the United States has made a commitment to keep greenhouse gas emissions at 1990 levels in the year 2000, mostly through voluntary means. In 1995, the Intergovernmental Panel on Climate Change, the official scientific advisory group to world governments, concluded that human-generated greenhouse gases already are measurably affecting the earth's temperature. This finding is likely to increase pressures on significant greenhouse-gas emitters like the United States to enact more stringent controls.

To appreciate how environmental regulatory risk could affect utility investment choices, compare a hypothetical coal-fired power plant with a hypothetical wind power plant. Suppose that the projected cost of electricity from the coal plant, assuming no change in environmental regulation, is 4 cents per kilowatt hour (kWh), whereas the projected cost of electricity from the wind plant is 4.5 cents per kWh. Under normal circumstances, the coal plant will be chosen over the wind plant. Now, suppose that a series of exceptionally hot and dry summers forces the United States to reduce greenhouse gas emissions by

means of, for example, a fee of \$15 for every ton of carbon dioxide (CO<sub>2</sub>) emitted (a low estimate for the cost of controlling CO<sub>2</sub>). This could lead to an increase of 1.5 cents per kWh in the cost of electricity from the coal plant, while the cost of the wind plant-which emits no CO<sub>2</sub>-stays the same. The wind plant becomes the better investment.

Of course, no one can predict the likelihood that significant CO<sub>2</sub> controls will be imposed in the future or how much they will cost. Given this uncertainty, how can a power company manage the risk of greenhouse-gas regulation? In the past, the company might have assumed that any such risk would be passed on to its ratepayers, who were by and large "captive" customers-customers with no choice of power supplier. In a competitive power market, however, where customers can choose their suppliers, any substantial increase in electricity rates could put the company's profitability in serious jeopardy. A better strategy would be to gradually reduce the utility's reliance on greenhouse-gas emitting sources by making prudent investments in low-cost, non-fossil fuel resources like wind power.

*Wind energy is an effective strategy to manage risk in environmental regulation, fuel/price volatility and load growth uncertainty. Fuel price volatility*

In the 1970s and early 1980s, oil and gas prices skyrocketed, making utilities and their customers keenly aware of their reliance on fuel sources. Since then, oil and gas prices have plunged to low levels, resulting in construction of more gas-fired power plants.

But this drop in fuel prices may only be temporary. The apparent costs of a resource option depend heavily on assumptions about future fuel prices. For example, one could assume that gas prices will rise at an average annual rate of 3 percent over the next 30 years. With this assumption and today's low prices, a typical combined-cycle gas unit will produce power at a cost of approximately 4 cents per kWh, making it-seemingly-a better investment than the wind plant described previously, still below our hypothetical wind plant cost. But what happens if gas prices increase more rapidly over the next 30 years, at an average rate of 5 percent? The extra cost, over the life cycle of the plant, will once again make the wind power plant the better investment.

How likely is the higher gas price scenario? In the wake of the oil embargo and gas deregulation in the 1970s, gas prices rose at an average rate of 16 percent per year, but with oversupply in the 1980s, they fell at an average annual rate of 4 percent. Given this disparity, it is difficult to make a confident prediction about future prices. A sound strategy, therefore, is for the utility to minimize fuel-price risks by taking low-cost steps to ensure a suitably diverse resource mix. Wind energy should receive close scrutiny under such a strategy.

**Load growth uncertainty**

One of the most serious financial problems encountered by electric utilities in the 1970s and 1980s resulted from the construction of too many power plants, which was caused in turn by the failure of economists to anticipate a drop in electricity demand due to higher prices and conservation. Because of this mistake, customers in some parts of the country now pay rates that are much higher than the national average to pay for the unneeded capacity.

Uncertainty surrounding future demand for power continues to be a significant risk for power suppliers. It is a risk that is likely to increase as once-captive markets become prey to increased competition. One approach to managing this risk is to build power plants in small increments with short construction lead times so that power

**Advantages of wind power plants**

- *Can be built in less than one year*
- *Can be built in phases timed to need*
- *Have lower interest costs during construction*

companies can respond quickly to changing circumstances.

Wind power, along with some other generating options such as gas-fired combustion turbines, meets this need almost perfectly. The typical wind power plant takes less than a year to build, once the site is selected and licenses and permits approved. By contrast, conventional large power plants may take three to four years to build with the result that if loads do not increase as expected, a utility may be left with a substantial excess cost.

Another advantage of wind power plants is that they can be built in phases timed according to need. Finally, interest costs are lower during the construction of wind projects.

## **Reducing pollution**

Opinion polls rank wind as one of the most popular energy resources, far ahead of fossil fuels and nuclear power. The reason is simple: it produces no pollution or hazardous wastes. This is a very real benefit, for pollution can have a serious effect on our health, the economy and our sense of well being. Air pollutants such as carbon monoxide, nitrogen oxides, particulates and volatile organic compounds have been shown to reduce lifespans and increase the incidence of debilitating illnesses, especially among the elderly and those with respiratory impairments. Some pollutants, such as sulfur dioxide and ozone, damage wildlife and plants and even reduce crop yields. Finally, greenhouse gases (which are emitted primarily by fossil-fuel combustion) are implicated in global warming, which may cause major changes in climate during the next several decades.

Wind power's popularity with the public can be a competitive advantage for power companies that invest in this technology. Municipal utilities, large industrial consumers, and perhaps even residential consumers in some locations soon may be able to express a preference for clean power by their choice of electricity supplier. Utility-sponsored market surveys show that a significant number of consumers are willing to spend more on their monthly utility bills to purchase power from renewable sources. Companies that want to attract and keep such customers should give careful attention to wind power.

## **Conclusions**

Whether utilities continue to be tightly regulated or the industry moves into a more competitive phase, the significant benefits of wind energy should play an increasingly important role in deciding what kinds of new power plants will be built.

In the traditional regulated utility setting, regulators could simply require utilities to consider benefits such as lower pollution, reduced risks and job creation in their resource planning. As competition in the power industry increases, new mechanisms must come into play. On the one hand, the wind industry must aggressively market the benefits of wind power to potential customers. At the same time, state policymakers must take steps to ensure that the move to competition does not jeopardize the public interest. So long as regulations and the market value environmental protection, long-term price stability, economic development and other benefits, wind power will receive the attention it deserves.

## **For further reading**

Christopher Flavin and Nicholas Lenssen, *Power Surge: Guide to the Coming Energy Revolution* (New York: Norton, 1994).

For information about the economic comparison between wind and other resources: A.K. Sanghi, "Economic Impacts of Electricity Supply Options," New York State Energy Office, July 31, 1992.

Utility Wind Interest Group, "Wind Power and the Environment," Electric Power Research Institute, August 1993.

M.C. Brower, M.W. Tennis, E.W. Denzler, and M.M. Kaplan, *Powering the Midwest: Renewable Electricity for the Economy and the Environment*, chapter 6 (Cambridge, Mass.: Union of Concerned Scientists, 1993).

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### **National Wind Coordinating Committee**

The content and form of the papers in this series have been reviewed and approved by the National Wind Coordinating Committee. Committee members include representatives from investor-owned utilities, public utilities, state legislatures, state utility commissions, state land commissions, consumer advocacy offices, state energy offices and environmental organizations. The purpose of the National Wind Coordinating Committee is to ensure the responsible use of wind power in the United States. The committee identifies issues that affect the use of wind power, established dialogue among key stakeholders and catalyzes appropriate activities.

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*The Wind Energy Series is a product of the National Wind Coordinating Committee (NWCC). The NWCC is a collaborative endeavor that includes representatives from electric utilities and support organizations, state legislatures, state utility commissions, consumer advocacy offices, wind equipment suppliers and developers, green power marketers, environmental organizations, and state and federal agencies.*

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