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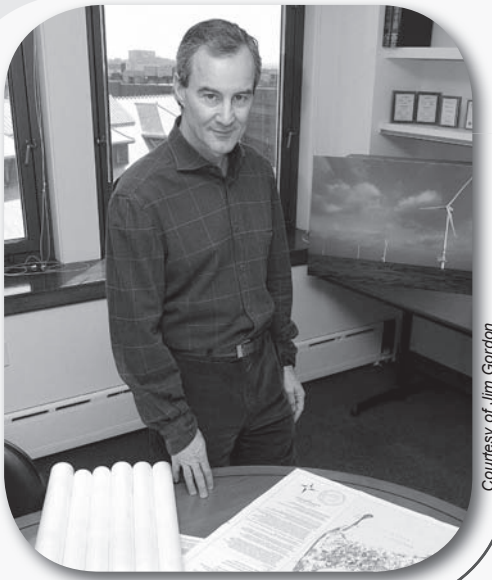
Cape Wind

Jim Gordon



Courtesy of Jim Gordon

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One of the windiest places in America is near the coast of Massachusetts, near Cape Cod and the neighboring islands of Martha's Vineyard and Nantucket. Having one of the fastest-growing populations in the New England, its electric power demand continues to soar. To help satisfy this growing demand, my company wants to harness the energy of all of that wind. We plan to build an offshore "wind farm" of 130 giant windmills that will provide electricity for the area. But, before we can start building, we have to convince people that a wind farm is a good idea. I'm Jim Gordon, president of Energy Management, Inc., and my company has spent almost thirty years pioneering new directions in electricity generation. We've faced hurdles to every single one of our projects during that time, but we've always been successful. We plan to make this project a success as well.

Selling Technology

When I was in college, in 1973, the United States faced an energy crisis. Israel and Egypt were at war. The Organization of Petroleum Exporting Countries (OPEC), an international group of countries that includes Saudi Arabia, Kuwait, the United Arab Emirates, and several other nations decided it would no longer export oil to countries supporting Israel. Because we were an ally to Israel, the OPEC countries banned the sale of oil to the U.S. This oil embargo caused a serious oil shortage. With oil in short supply, its price began to skyrocket. Because we burn oil to power our factories and run our vehicles, the cost of transportation, goods, and services soared as well. The higher prices severely damaged our economy.

At the time, it seemed to me that if we could reduce how much oil we use, our economy would not be as vulnerable to such shortages. So I started a company to help factories cut costs by reducing fuel use. Over a ten-year period, from 1975 to 1985, my company developed systems that successfully improved the efficiency of oil-fired power plants.

Building Power Plants

When oil prices fell in the mid-1980s, we decided to start building our own power plants. At the time, power plants in New England used oil, coal, nuclear energy, and flowing water to produce electricity. Not one plant used natural gas, even though emissions from burning natural gas are much less toxic than using coal or oil. We thought our natural gas plants could be profitable and at the same time reduce harmful emissions. So we started building natural gas power plants.

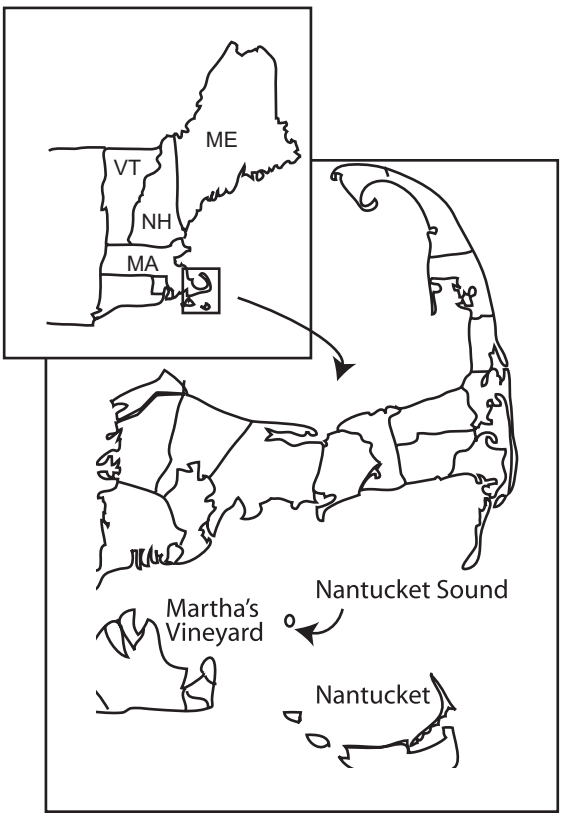
Using new technologies, we constructed six "combined cycle" gas plants. Unlike a typical power plant, our plants use the leftover hot gases that are usually exhausted into the atmosphere. The hot exhaust gas from one combustion chamber is piped to an additional generator to produce even more electricity. The efficiency of a combined cycle plant—the amount of electricity generated for a given amount of gas—can be double that of a standard gas plant. One of our early plants was located near a paper mill and another near a food processing plant. We sold them the leftover steam, which they used in their industrial processes. This boosted their efficiency and ours, because they didn't have to make their own steam. This type of plant is usually called a "cogeneration" plant, which means it produces both heat and electricity.

With experience, we further improved the efficiency of our plants and even their production capacity. Our first gas plant produced a peak of 40 megawatts (MW) of power, which is enough to power around 40,000 homes. Our last two plants each produced 265 MW. Other companies got into the game, and by the late 1990s almost half of New England's electricity came from burning natural gas.

Why Wind?

In 1999 we started focusing on what we believe is the next direction of energy development in New England: renewable energy. ***Renewable energy*** refers to energy sources that renew themselves quickly, such as wind, geothermal, or hydroelectric power. After investigating the technologies currently available, our company determined that wind power was the best option.

We needed to find the best site to develop a wind project. Unlike oil, coal, and natural gas, wind cannot be transported. You have to capture the wind where it is. We spent one year looking all over New England. We discovered a very windy place in the coastal waters of Nantucket Sound. The Sound is shallow enough for building the towers and close enough to shore to run electric cables easily. We're convinced that Nantucket Sound is a great place to develop America's first offshore wind farm.



The proposed site for Cape Wind in Horseshoe Shoal, Nantucket Sound

The Benefits of Wind

In addition to providing electricity, building wind farms could help in fixing our air pollution problems. The American Lung Association has documented that the area has the worst air quality in Massachusetts. The Cape Wind project will provide 75 percent of the area's electrical needs with zero pollution.

Courtesy of Cape Wind Associates, LLC

An offshore wind turbine

Our wind farm will have 130 wind turbines, each situated about one-half-mile apart. The towers, from the surface of the water to the center of the blades, will be 247 feet tall, with blades approximately 171 feet long. The base of the towers will be 16 feet in diameter. Each wind turbine will be supported by a hollow steel pipe that will be driven 80 feet into the sandy seabed. The rotating blades spin an electrical generator inside the head of the turbine. Electric cables, embedded on the ocean floor, will connect the turbines to the distribution grid. The wind farm will be capable of producing a maximum of 420 MW in a strong wind, the peak electric demand of the Cape and Islands. Based on our calculations of the average wind speed, we expect to provide approximately 170 MW of the region's average demand of 230 MW. Even with a small breeze, the electricity from the wind farm will be added to the grid.

The Impact

Some of our opponents complain that the wind farm will cause environmental damage, endangering birds and marine life. Turbines may disrupt bird migration patterns, or birds may fly into the turning blades. We believe that the turbines will be safe for birds, because the towers are designed so that birds cannot nest on them or get caught in wires. And the blades on the turbines rotate slowly, presenting little harm to flying birds.

Others are concerned that Cape Wind will disrupt marine life, fishing, and boating. We're confident that our state-of-the-art construction technologies will minimize disruption to the seabed. The foundations of the turbines will even act as artificial reefs that attract fish. And with the turbines spaced one-third to one-half mile apart, it will be easy for both fishing and recreational boats to get around.

You don't have to take my word about the environmental impact of Cape Wind. The United States Army Corps of Engineers has led a team of 17 federal, state, and regional agencies in a full, comprehensive, and rigorous permitting review. That review indicates that there will be a minimal negative environmental impact.

Yet there are people, including an opposition group called the Alliance to Protect Nantucket Sound, who have publicly stated that they don't want this wind farm. They don't want to look at the wind turbines, even though they will be located five miles away from the closest beach. People using the beach will see what looks like tiny sailing masts on the horizon. Still others think that property values and tourism will be affected, but in Denmark, property values and tourism have risen in the communities near an offshore wind farm.

Energy Future

If you talk to my opponents, they will tell you, "We support renewable energy—just not here." Well, if everybody said that, we wouldn't have renewable energy sources anywhere! I think that we all have the responsibility of supporting renewable energy technologies—even if they are in our own backyards.

I've spent most of my career helping to reduce fuel consumption, pollutant emissions, and developing the cleanest power facilities in New England. What motivates me is the ability to push new technologies to the limit to boost productivity and cost competitiveness. Given the choice, I believe that informed citizens would prefer to purchase clean energy, which will reduce pollution and increase their health and the health of their children.

What's the Story?

1. Why does Jim want to build a wind power plant off of the coast of Nantucket?

2. Describe two features that increase plant efficiency in the combined cycle power plants that Jim developed.

Designing with Math and Science

3. Using what you know about turbines, explain with words and drawings how a wind turbine generates electricity.

Connecting the Dots

4. What advantages does wind power generation have over coal-fired power plants? What are the disadvantages?

What Do You Think?

5. Use the library and the Internet to research other types of renewable energy sources.

6. Based on what you know about electricity generation, how might falling water, found in a waterfall or a stream flowing downhill, be used to generate electricity?