

Wind Farms and Alternative Energy in the North Country, New York

Katy Morrison and Paige Evans

Conservation Biology Case Study

May 4, 2007



<http://www.noblepower.com/about-us/photos.html>

Table of Contents

Summary	2	Other Current Wind Farms in the North Country	29
Problem Definition	4	Fenner	30
Climate Change	5	Proposed Wind Farms in the North Country	32
Energy Consumption	7	Clinton and Ellenburg	32
Affecting Daily Life	8	Cape Vincent and Lyme	33
Alternative Energy Sources	10	Rochester and Buffalo	33
Wind Energy	15	Local Residents	34
Maple Ridge	17	Concerns with Wind Farms	34
North Country	20	Opposition to Wind Farms	35
Who are the Stakeholders?	22	Environmental Issues	39
Government organizations	22	Information for Stakeholders	41
NYSERDA	22	Parameterizing Solutions	41
Funding	25	Identification of Potential Solutions	43
Government Energy Plans	25	Identification of Feasible Solutions	45
Wind Farm Owners	26	Best Solution	50
PPM Atlantic Renewable	26	Ease of Implementation	51
Horizon Wind Energy	27	Step-By-Step Implementation Plan	53
Noble Environmental Power	29	Conclusions	54

Summary:

Climate change is a global problem that will affect all living organisms on our planet if current energy consumption patterns continue. Carbon-emitting sources of energy such as oil, coal and natural gas are the main sources of energy for the United States in all sectors of consumption (transportation, electricity, and industry). We have become increasingly more dependant on energy with technological advances and the United States has become a sink for carbon-emitting sources of fuel. In short, we are producing far more than our own fair share of globally detrimental pollution. We need to focus on reducing energy consumption in all sectors, which will require lifestyle alterations for many Americans. We may also be able to help reduce carbon emissions, or at least prevent emissions from increasing, by focusing on alternative methods of energy production such as solar, hydro, biofuel, and wind power. In the U.S., forty percent of all energy consumption is a result of electricity production (Patel 2006). Therefore if we can reduce consumption of fossil fuels that are used in electricity production, we may significantly reduce our carbon emissions. Ideally, alternative energy use this would go hand in hand with reducing the other sectors of fossil fuel consumption in the sectors of transportation and industry.

Wind energy has been advertised as the cheapest new form of electricity production (Patel 2006). Although the upfront cost of wind farms is enormous, there are no fuel costs once the initial investment is made. The long term cost of production in addition to negative effects on human health and the environment is drastically less than non-renewable sources of energy production such as coal, oil or natural gas. Alternative energy sources such as wind are also less susceptible to price fluctuation as a result of

political or environmental instability (O'Brien et al. 2004). Increasing awareness of political, environmental and socioeconomic issues surrounding energy consumption has led to an increase in the interest in alternative energy research and development both locally and worldwide.

New York State has been a leader in promoting alternative energy exploration and use. Government programs such as NYSERDA have helped to make alternative energy production in New York more feasible for alternative energy companies, specifically wind farms, by offering incentives for renewable energy use and energy efficient products. New York State is the home of the second largest wind farm in the country, Maple Ridge Wind Farm, also known as Flat Rock Wind Power Project, located near the towns of Martinsburg and Lowville. Other wind farms in New York State are located in Madison County. There have been many other proposals for wind farm development in the North Country in towns such as Ellenburg, Cape Vincent, Malone, Altona and Clinton. The North Country is targeted for wind farm development because of ideal condition for wind turbine placement in combination with the fact that it is a particularly land rich and economically poor region. This means that any economic incentives as a result of wind turbine installation are likely to look very attractive to North Country residents. The Adirondack region and St. Lawrence River Valley has exceptionally good, open land from which to harvest wind power. The relatively sparse distribution of towns and settlements also make the North Country an ideal place for wind turbines because there are fewer people to object to the turbines' presence (Hinkleman 2007). However, the people that do live in areas where wind farms are currently and potentially located have differing opinions on the presence of wind farms in the North Country.

Many different perspectives come into play when thinking about implementing alternative energy production in the North Country. We will focus on wind power technology and wind farm development in rural towns throughout the North Country. We will examine the economic and environmental advantages and disadvantages of wind energy in the North Country. We will also identify a variety of stakeholder concerns, ranging from wind energy companies' interest in making profit to health concerns of local residents. Taking into consideration the perspectives of the stakeholders we identify, we will then outline potential solutions that address the future of energy use and production in the North Country. We hope that this paper can emphasize the importance of local stakeholder involvement in the development of solutions in the North Country in addition to increasing local awareness and sense of civic responsibility to reduce energy consumption to help preserve the biodiversity of global and local ecosystems that are threatened by climate change.

Problem Definition:

Climate Change

Global climate change is a worldwide issue that has gotten a lot of attention in recent years. Fluctuations in average global temperature from year to year and from era to era have regularly occurred throughout geologic history. However, global temperatures have far exceeded any natural fluctuations that have occurred in the past. Of the hottest twenty one years in recorded history, twenty have happened in the past twenty five years (Gore 2006). People are realizing the impact that humans are having on the environment, which is why the issue has recently gotten so much publicity.

Climate change is a direct result of human energy consumption patterns. The majority of energy that we use today is produced by the burning of fossil fuels, which emit carbon dioxide into the atmosphere, increasing atmospheric density. Sunlight energy in the form of heat and light enters the atmosphere, some of which is reflected off the surface of the earth. The increased atmospheric density results in retention of more heat energy than would normally be expected. Over a relatively short period of time, the average global temperature (average of air, land and sea surface) has increased by over 1°C (Gore 2006). Although this increase in global temperature does not seem like much, the effects of this increase are far-reaching. Impacts of global warming range from melting of ice caps in the arctic to erratic weather patterns, to massive biodiversity loss world wide. The driving force behind the problem of global climate change is human energy consumption.

The human population is currently upwards of 6.4 billion people, and is in a period of exponential increase. There are more people on the earth now than in all of history, which means that there are more people consuming energy and utilizing earth's natural resources. Individuals are also consuming more energy per capita than ever before. Advancing technology has called for greater energy consumption on a daily basis in order to obtain a lifestyle idealized by many people. The combination of the massive increase in global population and the enormous energy consumption per capita in developed countries means that humans continually increase the intensity of the problem of global warming.

Energy Consumption

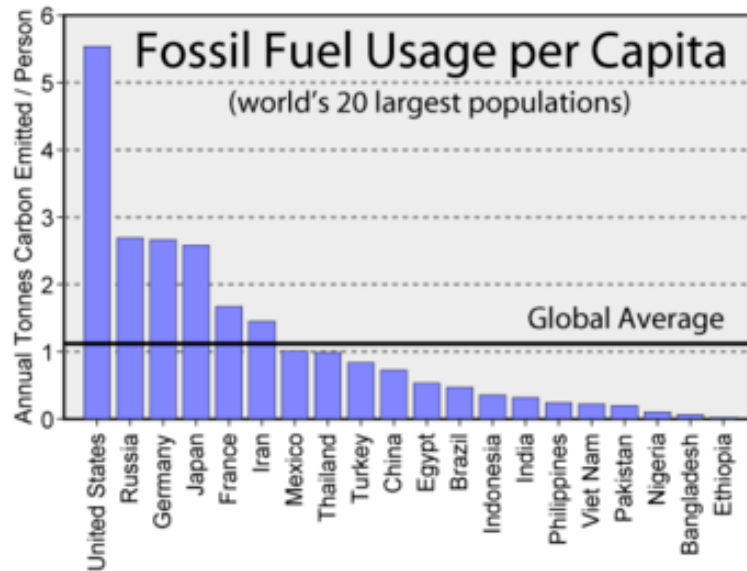


Figure 1. Fossil fuel usage per capita of the world's 20 largest populations in tonnes of CO₂ emitted annually.

The United States has almost double the per capita consumption among the countries with the twenty largest populations in the entire world, and quadruples that of the global average per capita energy consumption (Figure 1). The majority of the fuel that produces the energy we are consuming comes from carbon emitting sources, such as coal, oil and natural gas. We have been dependent on these sources of fuel for the last two centuries. The U.S. accounts for about 25% of all carbon emissions in the entire world. As a result of the longevity and intensity of our dependency on carbon fuels, the United States has deep economic and political ties with these non-renewable energy sources. Since non-renewable sources of energy are not going to replenish themselves anytime soon, the political status of these relationships in the U.S. will only become stronger in an effort to ensure a stable resource.

Each of the three main types of carbon emitting sources of fuel that are commonly used today is used for different categories of energy consumption. The U.S. divides

energy consumption into three different sectors: transportation, electricity, and industry. Transportation accounts for 33% of energy consumption and is largely powered by oil, industry accounts for 28% of energy consumption, and electricity production for 40% which is mostly fueled by a combination of coal and natural gas (Environmental Information Agency 2005). Electricity generation is the largest sector of energy consumption in the United States, therefore many sources of carbon-free energy production have focused on electricity generation. Therefore the capacity for emissions reduction through alternative electricity generation, while potentially very helpful, can not be relied on as the sole solution to the problem of global warming. In 2005, the total electricity demand was approximately 4 trillion kWh, 70% of which are generated from fossil fuels (Patel 2006). The U.S. released 2.5 billion tons of carbon dioxide into the atmosphere in 2005 alone. It is important to remember that while electricity is the largest sector in U.S. energy consumption, we need to try and reduce energy consumption in other sectors as well.

Affecting daily life

There is a deep reluctance from a lot of people throughout the United States and all over the world to change their energy consumption patterns. The idealized American way of life is centralized around purchasing goods, traveling, driving big cars, and owning large houses. Did you know that the average home spends about \$1,900 on energy costs every year? (Energy Star 2007) People do not want to sacrifice the ideal life so that they can become more conscientious global citizens. Not only do we over consume in ways that use excessive energy (frequent flyers), but as a powerful nation we

set an example for other developing nations by the lifestyles we choose. These lifestyles when extended globally are far from being sustainable which means we have to become reasonable about how we define progress and development and what kind of example we want to set for other developing nations. As we begin to see the effects of climate change at the global level, many people have begun to realize that solutions must begin to take place at the local level. Effective solutions must be revolve around recognizing our responsibility to alter our ideal lifestyles to become more energy efficient.

Climate change is a unique issue because it is a global problem that requires a local solution. There is no one governing the entire world and requiring that people limit their energy consumption. We need to take the initiative and think about ways that we can try and reduce our carbon emissions at a local level and set a good example for other people around the world. A focus on reducing individual energy consumption is an important aspect of reducing carbon emissions. However, this is only one piece of the puzzle. We need to also focus on developing clean sources of energy that come from renewable resources. Currently, less than 2% of the United States' energy production comes from renewable sources of fuel. Some of these sources include hydroelectric, solar, biofuel, geothermal, and wind energy.

Alternative energy sources

Increased awareness regarding issues of global warming and energy consumption has recently led to increased research and development of alternative energy sources both nationally and globally. Government policies and promotion of renewable energy production have been influential in the development of new alternative energy resources.

One international governmental organization is the International Energy Agency, which includes the countries of Austria, Canada, Denmark, Finland, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, the U.K. and the U.S. The IEA supports joint research projects and information exchange on wind power development. Although all of these countries have pledged to investigate renewable energy resources, Europe has been leading the way with new installations of wind power generating capacity. Germany has had the most increase in alternative energy development overall since 1995, and now produces 8% of its energy from renewable sources (Patel 2006). Denmark currently produces enough energy to provide 20% of the country's electricity needs, and is also the world's largest distributor of wind turbines (Hinkleman 2007).

Within the United States, interest in alternative energies is a relatively recent development. In 1973, the OPEC Oil Embargo raised concerns about the U.S.'s dependence on foreign oil resources (Roberts et al. 1990). These concerns led to increased interest in alternative energy sources, including wind power. The Public Utility Regulatory Act (PURPA) of 1978 also led to a great deal of renewable energy development. This act required electric utilities to connect their power grids to qualified facilities, (QFs) which are non-utility power generators that use renewable energy, and to purchase the energy the QFs produced. They were required to purchase them at a rate referred to as avoided cost, which is the amount it would cost the utility to make the same amount of energy (Patel 2006). There were also large tax incentives for investing in, researching, or implementing renewable energy. Although these incentives were removed, there are now reduced incentives available under the Energy Policy Act of 1992. Incentives from the government level increase the feasibility of implementation of

alternative energy sources by increasing individual interest in the issues of alternative energy.

The advantages of renewable energy resources such as wind and solar power include the reduction of carbon emissions. A transition to more carbon-free sources of energy will greatly reduce global carbon emissions in the future. Another advantage of alternative energy implementation is that systems such as wind and solar power are highly modular (Patel 2006). They may be expanded as energy demands increase, while it is much more difficult to build a new coal processing plant in order to meet increased energy demands. Prices of alternative energy sources are also less likely to vary widely in times of political or environmental unrest because alternative energy is generated domestically. Construction time for these alternative energy power plants is much shorter, and there are no further monetary expenditures on fuel once the alternative energy plant has been constructed.

One major disadvantage to alternative energy use is that the cost per kilowatt hour (kWh) is currently higher for most alternative energy sources, and the profit return after the initial investment occurs over a long period of time (Hinkleman 2007). People may be less receptive to construction and implementation of alternative energy in across the globe simply because it is different from what they are used to and find little reason to invest their trust in these new energy sources. The U.S., along with many other countries across the globe, is heavily reliant on non-renewable energy sources. Unless we make some serious adjustments in daily lifestyles or in energy production technology, coal, oil and natural gas will most likely prove to remain prominent in our energy portfolio for

many years to come because we have established and developed reliable energy production technologies that primarily utilize these fuels.

Several different types of alternative energy sources have been coming to the forefront of renewable energy in recent years. These energy sources include hydroelectric power, nuclear power, geothermal power, biofuels, solar power and wind power.

Hydroelectric power harnesses energy from rivers or oceans by building dams through which water flows at a high pressure which rotates turbines within the dam, producing electricity. Currently produces 7% of U.S. energy, and accounted for 73% of renewable energy production in 2005 (Environmental Information Agency 2007). There are a suite of environmental problems that result from building dams including disruption of fish breeding patterns and severe damage to riparian ecosystems. However, hydroelectric power is included in most alternative energy discussions because it is a carbon-free energy source that has the potential to provide a significant source of energy for the United States.

Geothermal power plants obtain energy from water trapped in vents that exist in the earth's crust. The steam created by these vents is transferred to a power plant with turbines where steam is intermittently released to induce rotation of the turbines. Geothermal power is also an emissions-free source of energy; however it may only be utilized in areas where geothermal vents are located, mostly around the Pacific Rim. Geothermal energy is used in the states of California, Utah, Nevada and Hawaii.

Nuclear energy was developed in the mid-20th century as an alternative to coal or oil energy production. Although it is a clean source of energy in from a climate change

perspective, the waste produced from the fission of atomic bonds is highly toxic. We have yet to find a way to deal with these wastes, therefore the future of nuclear power is limited. No nuclear power plants have been built in the U.S. since 1978 (Patel 2006) and nuclear power plants must be re-licensed every 40 years to continue energy production. If none of the existing nuclear power plants are re-licensed, then a huge decrease in nuclear power output will occur after the year 2010.

Biofuel is an alternative energy source that is currently being explored. Biomass omits gases such as methane when they are fermented which can then be turned into usable transportation fuel (Environmental Information Agency 2007). Similarly, biodiesel can be transformed into usable fuel through several chemical processes from left over vegetable oil or animal fats. These sources of energy are viable options for future use, however they require major changes in the transportation industry.

Solar power harnesses the power of the sun and transforms the heat and light energy that hits the surface of the earth into electric power. Photovoltaic (PV) cells transform the heat energy into electric energy, which can then be transported through electrical wires to an electrical draw. Solar energy is currently one of the most popular sources of alternative energy because it is completely emissions free and low maintenance once installed. PV cells are still very expensive, making it difficult for many people to incorporate this technology into their lives. Solar panels also require and a lot of surface area with consistently high light exposure is needed to maximize energy production.

Wind energy

The North Country has ideal conditions for wind turbine placement, therefore wind energy projects have been the targeted for this area. Wind energy is currently the least expensive form of new energy production both in the U.S. and nationally (Patel 2006). Wind energy could contribute to about a 20% reduction in CO₂ emission by the year 2010 (Novich et al. 2005). Although wind energy accounts for only a small portion of U.S. energy production, wind turbine technology has been in use in the U.S. for many years. The first windmill to generate electricity in the United States was installed in 1890 by Charles F. Brush (Danish Wind Industry Association 2006). In the 1930's and 1940's there were many electricity-producing wind turbines all across the U.S., mostly providing electricity for individual farmers and residences that were not within the reaches of power lines connected to the central grid. In the 1950's, the Rural Electrification Administration made a major effort to extend central power to every American household, veritably eliminating the need for wind turbines to create electricity for remote residences. As a result, the wind industry became dormant for about 20 years, with the use of coal, oil and nuclear power to generate energy in the United States and around the world.

Since the 1980's, the cost of wind energy has decreased drastically from 35 cents per kWh (kilowatt hour) to 3 or 4 cents per kWh, making it the least expensive new source of power (Patel 2006). As the supply of wind power increases and the market demand for renewable energy sources does as well, prices for wind energy are predicted to drop even further (Neij 1999). Advancing windmill technologies will also inevitably result in improved performance and energy efficiency as well as reduced operation and

maintenance costs (Neij 1999). The decrease in cost of wind energy has raised public interest in the United States for developing new wind energy production. Until the late 1980's most of the wind power plants in the U.S. were owned and operated in California.

Other states, including New York State, have recently come to the forefront in wind energy development. The intent of wind energy development is not to completely replace conventional energy production; it is to offset the increasing energy demands across the nation. Alternative energy production does not necessarily equal an emissions free lifestyle. For example, although California is the largest producer of clean energy in the United States through energy sources such as geothermal, wind, solar and biomass sources, energy consumption is as high as all of Britain with half the population (Gipe 1995). California is attempting to offset its energy demands through alternative energy consumption, however high energy consumption habits of California's citizens somewhat negates the reduction in carbon emissions provided by the alternative energy production.

Today, wind power is coming to the forefront as a potential source of "clean power" to provide energy for human consumption for a number of reasons including economic benefits, feasibility of implementation and potential for reduction in carbon emissions. Clean power refers to an energy source that does not emit carbon into the atmosphere as a byproduct of energy production (Patel 2006). In the past decade, demand for and popularity of wind energy and other clean energy sources have increased in response to growing environmental concerns.

Consumers can buy into the idea of clean power sources such as wind energy through their current power companies. Many power companies are now offering the option of purchasing green energy to their customers. Consumers pay a premium for

their electricity, which the power company then takes and invests in clean sources of energy such as solar or wind energy. However, the power that individual consumers receive at their homes is not necessarily from a clean energy source. Once energy enters the grid, one electron cannot be distinguished from another electron, therefore energy made by a wind turbine is no different from energy that is made from a coal power plant once it enters the grid. An individual consumer's investment in this type of energy increases the demand and support for green sources of power, so the power companies are obligated to supply this demand if they want to remain competitive in the market.

Table 1. The top twenty states for wind energy potential in billions of kWh per year. New York is ranked fifteenth out of all fifty states with the potential to produce 62 billion kWh per year. Figures provided by American Wind Energy Association.

	B kWh/Yr		B kWh/Yr
1. North Dakota	1,210	11. Colorado	481
2. Texas	1,190	12. New Mexico	435
3. Kansas	1,070	13. Idaho	73
4. South Dakota	1,030	14. Michigan	65
5. Montana	1,020	15. New York	62
6. Nebraska	868	16. Illinois	61
7. Wyoming	747	17. California	59
8. Oklahoma	725	18. Wisconsin	58
9. Minnesota	657	19. Maine	56
10. Iowa	551	20. Missouri	52

Source: An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States, Pacific Northwest Laboratory, August 1991. PNL-7789

The North Country of New York State has the second largest wind farm in the United States, and this area has for a number of reasons been targeted for wind farm development. As wind energy is a prominent issue in the North Country, the focus for the remainder of this paper will be on issues of wind energy in New York State and the North Country.

Maple Ridge Wind Farm:



Located in the North Country of Upstate New York, Maple Ridge Wind Farm (formerly called Flat Rock Wind Power Project) is currently the largest wind farm in the northeast with 321 megawatt (MW) of power. It ranks as the second largest in the

United States behind Horse Hollow Wind Farm in Texas with 736 megawatts. The nation's other large wind farms are located in Oregon/Washington (Stateline), two more in Texas (King Mountain and Sweetwater), Washington (Wild Horse), New Mexico (New Mexico Wind Energy Center), and Washington (Big Horn). The areas of Tehachapi (609 MW), San Geronio (616 MW) and Altamont Pass (548 MW) in California are not on this list because the projects within each wind farm are owned by many different owners (American Wind Energy Association 2007). Maple Ridge Wind Farm places New York on the map as one of the leaders in alternative energy development in the United States. Maple Ridge was initiated in 1999 by Atlantic Renewable Energy Corporation which became PPM Atlantic Renewable in 2004 and was joined by Horizon Wind Energy in a joint development project. Construction did not commence until the spring of 2005 and the wind farm was up and running by January 2006.

Maple Ridge is located on Tug Hill in the towns of Martinsburg and Lowville, about 75 miles northeast of Syracuse. Tug Hill is an ideal location for such a large scale project because it is situated at 1600-1800 feet above sea level and downwind from Lake Ontario. It has approximately 12,000 acres of pasture and cropland which provide open land for turbines without devaluing the use of the property (Maple Ridge Wind Farm 2007).

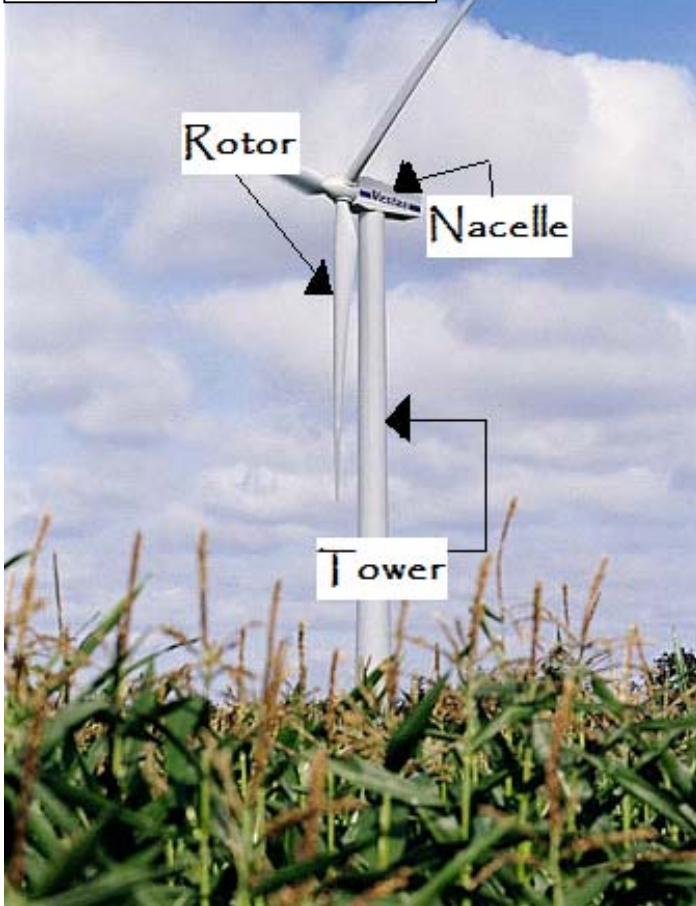
Maple Ridge has been developed in two phases and now currently has 195 wind turbines producing enough energy to run 98,000 homes (500 homes per turbine) (Hinkleman 2007).



Figure 2. Location of Maple Ridge Wind Farm in New York.

The wind turbines at Maple Ridge are Vestas 82s, and different parts for the turbines are manufactured all over the world and assembled on site in Lowville. A single wind turbine at Maple Ridge produces enough electricity to power 150 homes per year. There are three main parts that comprise a wind turbine: the rotor, the nacelle, and the tower (Figure 3).

Figure 3. Wind turbine similar to those in operation on Maple Ridge.



The rotor blades catch the wind and spin in a circle. The spinning motion then transfers into the nacelle in the gearbox, where the rotations are amplified from 14 rotations per minute at the rotors to 12,000 rotations per minute inside the gear box (Hinkleman 2007). The energy is then transferred down through the tower to an output connection, which then connects to the local power grid system. The larger the rotor blades, the more energy the turbine has the

potential to produce. The turbines at Maple Ridge are all 400 feet from tower base to the tip of the rotor blade.

Turbines are ideally located in areas where wind speeds average about 15-17 miles per hour. Consistent, relatively strong winds are optimal for wind energy production. The more consistent the wind is, the more consistent the power supply from the wind turbines will be. Wind speeds are generally more consistent and wind patterns less turbulent in flat landscapes, making flat land with minimal natural or manmade structures an ideal location for wind turbines. Agricultural land has proven to be a good

location for wind farms, as farmers may sacrifice a quarter to a half an acre for a wind turbine, yet receive a profit far greater than any other legal crop they could produce from the same land. The North Country fits all of these criteria for ideal wind turbine placement in addition to relatively low population density and a grid system for which it is relatively easy for wind farms to connect. The combination of all of these factors makes the North Country a potentially profitable location for additional wind farms in the future.

Personally owned wind turbines are also an option for people who are both connected and separate from the grid system. Wind turbine owners who are connected with the grid are paid for their energy surplus when the wind is blowing strong and fast, and they are given energy credits by their local power companies who then supply them with electricity when the electricity produced by the wind turbines falls short of the household's demands. Initial installation, care and maintenance of wind turbines may be very expensive, making personally owned wind turbines an unrealistic aspiration.

North Country

Wind power development is an ideal initiative for New York State in following with the New York State Energy Research and Development Authority's (NYSERDA) goals of increasing renewable energy use for electricity production in New York State. National Companies such as PPM and Horizon wind have recognized the wind power potential of the North County have invested research into developing project proposals in the region.

The towns of Clinton, Ellenburg, Altona, Malone, Cape Vincent have been introduced to wind farm proposals and are in various stages of the process. Town halls have been fired up with heated discussion about the pro and cons of wind farm installation on local areas. These debates bring up viable considerations for both promoting and opposing wind farms that must be considered before and implementation plan is put into action.

Who are the stakeholders?

There have been adamant concerns from various stakeholders who have been directly or indirectly involved in wind farm project development in the North County. Stakeholders include the energy companies who are proposing development projects, the investment corporations who own the energy companies, New York State government committees invested in promoting renewable energy for electricity production as well as decreasing carbon emission, farmers and local citizens who can gain money from turbines on their land, neighbors who have to live near the wind farms, school districts and towns where the wind farms will be built, the local people who can be employed by wind farms, and the wildlife and ecologies of the local areas. Concerns vary from economic, to aesthetic, to environmental, to health and well-being and vary from locally minded to globally minded, individually centered to community centered.

Government:

NYSERDA:

The New York State Energy Research and Development Authority (NYSERDA) was created in 1975 by the New York State



Legislature. Its purpose is to support public programs dealing with energy services as they are faced with the transition from a regulated electricity market to a more open and competitive market. In 1998, in cooperation with the NYS Public Service Commission (PSC), NYSERDA has managed the New York Energy \$mart program focusing on low-



in come sector, research and development and environmental protection activities by providing energy efficiency services. It has been significantly beneficial in the development of

wind power in New York State by creating an extensive educational initiative through websites and promotional material (flyers and brochures) to increase awareness about alternative energy sources in New York state. The presence of these and circulation of these materials helps to educate farmers and local citizens around the North Country. NYSERDA has also been promoting wind farm projects through significant forms of funding.

Funding

This program is funded by a System Benefits Charge (SBC) on electric transmission. System Benefits Charge was established by the NY State Public Service

Commission in 1996 to fund policy initiatives that had not been sufficiently addressed by the State's electricity market. In 2005 the PSC extended the SBC program for five years (until 2011) with increased funding to \$175 million annually. Some of this funding has gone toward the growth and development of Maple Ridge Wind Farm.

New York Energy \$mart also has a loan program that offers reduced-interest loans for home equipment that is energy efficient. State tax advantages are also offered with the purchase and installation of some of this equipment (such as solar panels). . NYSERDA provides computer modeling, design coordination, and assistance in obtaining LEED® certification. "The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality" (<http://www.nyserdera.org/programs/Green_Buildings/default.asp>).

NYSERDA offers the retail promotion of ENERGY STAR® efficiency rated appliances and equipment. Lifestyle changes involving using appliances that have earned the "Energy Star" can save \$80 a year in energy costs, while simultaneously helping to save the environment (NYSERDA 2007).

Since 1990, on hundred and seventy new energy



efficient and environmentally friendly products and services have been implemented in New York State. Goals to identify existing technologies and equipment to reduce energy cost are being planned in conjunction with more than 540 businesses, schools, and municipalities. NYSERDA outlines broad energy and environmental challenges and publicizes a range of energy and environmental topics such as ethanol fuel and wind power development. These posts are known as Program Opportunity Notices (PONS). These PONS request proposals to submit project plans that address those topics from private or institutional entities such as engineers, scientists, entrepreneurs and organizations. These people receive contracts in progressive stages and funding is usually split or has a third-party sponsorship (NYSERDA 2007).

NYSERDA also monitors energy supply, consumption and emissions in NY State and provides periodic reviews of this data to the government and to the public.

Environmental and energy improvements for NY State's energy infrastructure are also financed by NYSERDA through the sale of bonds. Basic research revenues are derived from "intrastate sales of New York State's investor-owned electric and gas utilities, federal grants, and voluntary annual contributions by the New York Power Authority and the Long Island Power Authority" (NYSERDA 2007). Additional funds are available from limited corporate funds.

NYSERDA is responsible with improving New York's environment, particularly in relation to emissions that are associated with the generation and consumption of energy. Since its founding, NYSERDA has monitored electric generation emissions, and has advanced non-polluting renewable sources of energy. Research and development of topics range from acid precipitation in the Adirondacks to fuel cells for home and for

transportation. NYSERDA originally developed from the New York Atomic and Space Development Authority. Its current involvement includes cleaning up high-level nuclear wastes under the West Valley Demonstration Project in cooperation with the Western New York Nuclear Service Center as West Valley, Cattaraugus County. NYSERDA also monitors and publishes the Low-Level Radioactive Waste Status Report and coordinates the State's activities on nuclear energy matters, including the regulation of radioactive materials (NYSERDA 2007)

Government Energy Plans:

In 2001, former New York Governor George Pataki issued an Executive Order to increase efforts toward energy efficiency, renewable energy and clean transportation and setting targets for state entities (Alliance to Save Energy). Then in 2003 Pataki announced his interest to work in conjunction with 10 other states to further this effort and develop a strategy to fight global climate change, including a regional cap-and-trade program for carbon dioxide. A cap and trade program puts restrictions on the amount of carbon emissions that the state is allowed and creates carbon credits that over-consuming states can buy from energy efficient states. This creates an economic incentive to reduce carbon emitting energy consumption. Nine out of the ten governors approved the plan (The Climate Institute 2007). Following Pataki's proposal, the Public Service Commission ordered, in 2004, that at least 25 % of the electricity sold at retail in the state needs to come from renewable sources by 2013. Currently, 18% already comes from hydropower and it is expected that the remaining 7% will come from wind (NCPR.org 03/02/2006).

NYSERDA has partnered with businesses, industries and residents to help grow the State's economy and improve its environment investing in innovative, environmentally friendly and energy-efficient technologies. It is also responsible for analyzing the effect of New York's energy, regulatory, and environmental policies on the State's business, institutional, and residential energy consumers.

Wind Farm Owners

PPM Atlantic Renewable:



PPM Energy, based out of Portland Oregon, is the U.S. competitive subsidiary of the U.K. based ScottishPower. With its acquisition of

Atlantic Renewable Energy Corporation based out of Richmond, Virginia in late 2004, it has become PPM Atlantic Renewable, one of the nation's leading developers of wind projects in the east. PPM Atlantic Renewables has 500 MW of development scheduled for between 2005 and 2010 in the Northeast and Mid-Atlantic regions. These are regions which have some of the most impressive Renewable Portfolio Standards (RPS) in the nation and have been leaders in regulations of air emissions and providing incentives for alternatives to coal and oil based generation (Johnson 2005). PPM Atlantic Renewable is already developing more than 65% of all installed wind power capacity in the US. As a business it is invested in site selection, landowner relations, local politics, and environmental issue management (Johnson 2005).

PPM's development and meteorology team evaluates potential sites using criteria such as wind resource quality, ability to obtain permits, access to transmission,

environmental impacts, and current land uses. This process requires building relationships with local stakeholders including farmers, ranchers, government entities and utilities (PPM Energy 2007). In order to create an ideal situation for everyone, wind projects focus on providing revenue for landowners while preserving existing land use. Using top of the line technology and nationally renowned wind resource experts PPM is able to determine the projected power output and the commercial viability of each potential site. Typically sites are economically viable is the average wind speed is 12-14 mph at least. Other factors that effect efficiency are intensity, duration, time of occurrence and uniformity of wind patterns.

An important factor the PPM is involved in is extensive environmental impact studies evaluating land use and impacts on wildlife such as birds, bats, rare plants and also waterways. Minimizing impacts is an important aspect for making wind farms environmentally friendly to land and communities. Construction includes roadwork, underground cabling, foundation pouring, and tower erection. Surrounding property that has been disturbed is restored as much as possible.

PPM also employs a large team of personnel to operate and maintain wind turbines in order to ensure peak performance and maximize returns.

Horizon Wind Energy LLC:

Horizon Wind Energy (formerly Zilkha Renewable Energy) has developed, constructed, and currently operates wind farms in New York, Iowa, Pennsylvania, Washington and Oklahoma, and has projects under construction in



Minnesota, Oregon, Texas and Illinois. In 2005 Horizon Wind Energy was acquired by Goldman Sachs, a leading global investment banking, securities and investment management firm. However, recently this March Horizon Wind Energy was sold to Energias de Portugal, S.A. (EDP). EDP is a utility active in the electric and gas industries involved in generation, distribution and supply in Portugal, Spain and Brazil. In Portugal and Spain EDP has over 13,500 MW of generation capacity and currently owns over 1,600 MW of operating energy capacity in Iberia and France, and by the end of 2008 is expected to have an additional 3000 MW installed or in construction. In the US Horizon expects to have more than 1300 MW of wind projects in operation by the end of 2007. It also has projects across 15 states with generating potential of over 9,000 MW (www.horizonwind.com)

Horizon Wind Energy focuses on finding the intersection of good wind resource and transmission lines and partnering with local landowner and county agencies to choose the best possible location. Construction usually takes 9 months to a year and they work to minimize disturbance on the land.

Their website provides a step by step guide to developing a wind farm which involves, finding a windy site, making sure it has nearby transmission lines, defining the boundaries, determining who owns the land, contacting the landowners, calling a town meetings, settling the contracts, drawing up a blueprint, watching the wind, getting permits, environmental assessment, testing the wires, selling the electricity, and then finally beginning constructing. This, however, is not always a smooth process. Varying stakeholder concerns impede aspects of this approach which we will talk about later.

Noble Environmental Power



Noble Environmental Power was founded in 2004 is majority owned by J.P. Morgan Partners. Noble focuses on wind farm development in the North Country. Their mission is to be a leader in supplying clean, renewable energy and create pride and benefit to the communities with which they work. Of the ten proposed wind parks owned by Noble, six of them are located in the North Country. The remaining four are in Western New York, Vermont and Michigan. The six projects that are proposed for the North Country are going to be located in Altona, Clinton, Ellenburg, Chateaugay, Bellmont and Brandon. None of the projects have commenced with construction yet, but all of them have obtained preliminary certification from the government of New York State to construct wind farms in each of these locations. Noble is an interesting company because it has focused a lot of its efforts specifically in the North Country.

Noble has encountered many questions and concerns for local citizen and stakeholders in every wind farm project they have been involved in. They find that many of these questions have been fueled by misunderstandings and rumors. They believe in addressing these questions honestly and thoroughly which is important for an increase in public acceptance of wind farms and all of the benefits associated with them. With better understanding and acknowledgment of the concerns and myths associated with each project, Noble is sure that more people will come to embrace wind power. Through town meetings, the local press, and the website, Noble hopes to provide the information

necessary to gain public confidence and further their goals of renewable energy developments.

Other Current Wind farms in the North Country:

Madison: Proposed in 2000 by Horizon Wind Energy, who bought the 11.5 MW project



from PG&E Corporation in 2005 was the first commercial wind farm in New York State. Not only does the Madison project aid in generating clean electricity in the state, but the Madison Wind Farm was key in generating interest in wind energy throughout the Northeast. Carl Stone is a Madison Wind farm land owner and

farmer. He sees the turbines as symbols of appreciation for the environment and the local agricultural tradition. Five of the seven wind turbines at the Madison farm are located on Carl’s property. Each turbine has a rated capacity of 1.65 megawatts each.

“...It surely beats a plume of smoke

Polluting all our air.

They stand as symbols to all folk

To show that we must care.

For years we all learned to take

From this world placed in our hands,

But now for all our children's sake,

We must make some long-term plans...”

-(Carl Stone), Madison, NY “Winds of Change”

Fenner: The Fenner Wind Farm, owned Canastota Windpower, LLC, a wholly owned subsidiary of Enel North America, Inc., is also located in Madison County, New York, ten minutes south of the New York State Thruway between Syracuse and Utica. Built in 2001, Fenner now has 20 (1.5 MW) turbines that make up a 30 MW wind project on an area of approximately 2,000 acres of leased land. Funding from NYSERDA offset part of the capital cost of the facility. Fenner Windpower Project is expected to annually deliver approximately 89 million kilowatt hours of green power to the New York State electric market, enough power to supply the annual energy needs of more than 7000 homes.

The Fenner Renewable Energy Education (FREE) Center is an organization made of local citizen who are extremely proud of the Fenner Wind Farm project. They are currently fund raising for two phases of design and construction. Phase one “involves the development of a visitor and bus parking area, development of walking trails and interpretive kiosks and visitor facilities such as picnic tables and restroom facilities. Phase two will involve the development of a building on site which will incorporate modern energy efficiency design concepts and will be designed with a goal of NET ZERO energy demand from the electric grid, in order to showcase the renewable energy technologies available in today’s market. The FREE Center building will house a variety of energy exhibits and displays, like the turbine blade, and will serve as an education outlet for all

ages, municipalities and public opinion leaders, schools, colleges, and civic groups.
(www.fennerwind.com)

“We’re proud of our windmills & what they do to preserve our farmland community & our environment. The birds & wildlife thrive, the small farms can sustain themselves & our beautiful rural community will not only survive, but contribute to the clean energy that is our future.”

— Laura Costello

“The Fenner Renewable Energy Education Center is a necessary vehicle to educate the public. The FREE Center will educate all generations about windpower and other renewable energy sources.”

— Sue Snyder

“The Fenner Wind Farm has enhanced our quality of life, brought more tourism dollars to our region and given neighbors a greater sense of pride in our town. Our motivation in establishing the FREE Center is in helping to spread the word about what a good choice renewable energy can be for communities everywhere. We encourage people from all over to come visit our success story and see for themselves.”

-- Joan Livingston, FREE President

These two current wind farms implemented and operating now the NC have apparent adamant supporters of wind energy but there are also local residents who haven't been able to get used to the change in their daily lifestyles. "It has been 3 years now, I must say I will never get use to the view that greets me every time I drive home from work or the grocery store or any journey that takes me out of the Town of Fenner." (Foringer). Due to these responses, many towns where wind farms are currently being proposed have undergone a lot of debate on whether wind farms are the right choice for their local area. Accurate information about the current stages of the different proposals and projects is hard to find and information seems to vary depending on which source we look at.

Proposed Wind Farms in the North Country:

Clinton and Ellenburg: The Marble River Wind Farm (located near the Marble River) is situated upon approximately 18,000 acres of land in the towns of Clinton and Ellenburg, NY in Clinton County. It will provide enough electricity to power 60,000 homes annually in the NC.

Neighbors of the North Country is a group opposed to Marble River Wind Farm, a project to build 400 foot tall wind turbines throughout Clinton County. The project manager, Charlie Turlinkski said the 109 turbines built in the towns of Ellenburg and Clinton alone will create enough power for 60,000 homes. "There is a need to create more power in this state for all the households. Earlier this summer we busted through power consumption records. So we need more power," Turlinkski said. Already eighty-seven people in the town have agreed to allow turbines to be built on their property. First

a State Environmental Quality Review (SEQR) must be completed on the project, and then the town can go ahead and issue a building permit. Turlinski expects the wind turbines to be up and running by 2008. (Horizon Wind Energy 2007)

Cape Vincent and Lyme: In the Thousand Islands Region of New York, the towns of Lyme and Cape Vincent are on the verge of enacting a six month moratorium on a wind farm proposal in order to look more into the effects that wind turbines will have on their community ([Northern](#) New York Follies 2007).

Rochester and Buffalo: Dairy Hills Wind farm (formerly known as Perry Wind Farm) is located southwest of Rochester and east of Buffalo. Horizon Wind Energies plans on erecting 60 (2MW) turbines over 7,300 acres of land leased from landowners. The land is forest habitat, and farmland used for dairy cattle grazing and hay and corn crops. The project will be 120 megawatts and serve up to 35,000 New York homes and is expected to be finished by 2008. (www.horizonwind.com)

Other proposed wind locations are in the towns of Malone, Altona, and Brandon, Chateaugay and Belmont. Accurate and/or consistent information was very hard to find for every proposed wind farm project in the North Country.

Local Residents

Concerns with Wind Farms

David Sommerstein has done a well conducted series about wind farm sentiments on North Country Public Radio. Proponents and opponents for wind farms have voiced their opinions at town meetings to discuss ordinances related to local wind farm development. There has also been the creation of several websites devoted to addressing either the pros or cons of wind energy.

Websites such as WOW: We Oppose Wind farms, and Save Western New York are greatly concerned with the effects that wind turbines have on people's health and on the environment. There are also various public groups such as the Resident Committee to Protect the Adirondacks and organizations such as Empire State Wind Energy which are standing up to ensure safe and thorough planning and implementation of wind farms, meeting the best interests of most stakeholders across NY State. Within the North Country, organizations such as the Community Energy Service help to provide informational sessions for local residents on the pros and cons of wind farm development. Another facet of their organization is to help assess homes and implement more energy efficient practices.

Opposition to Wind Farms

Opposition to wind farms has brought up a wide range of concerns. People are adamant about defending their countryside and the peace and tranquility of rural Upstate New York. The next biggest concern is from people who have been living near wind turbines and complain about the constant noise and vibrations association with the

rotation of the blades. Testimonies of people surveyed have said described that unbearable constant noise that disrupts their daily life.

“I get little sleep when the noise from the turbines is constant in its low frequency noise. I feel so depressed I want to get away and stay away until I know the wind direction has changed...Not being able to choose when I work or sit in my own garden. Not getting full nights sleep.

Waking with headaches when the noise is bad and feeling sick. Ears feel like I experience when traveling by plane- feel as if they are swollen inside. I cannot work more than 2-3 hours in the garden when the wind direction is from the east. We cannot see the wind farm from our property but at times the noise is horrendous.” (Foringer 2005)

Various other concerns include what happens if there is a fire and our fire engines don't have sufficient ladders and hoses to attend to a 260 foot tall turbine pole. People are also worried about what happens in the future when their property value is devalued due to the aesthetic disruption of turbines or the power lines that connect them to the grid. People are concerned about issues such as tower collapse, ice shedding, lightning, vandalism, trespassing, blade throw (when a blade falls from the turbine), radar interferences, and environmental impacts such as bird and bat mortality. Another apparent side effect from having a turbine near your house is something known as shadow flicker effect which occurs when the sun is behind the turbine and the blades momentarily block out the light producing a strobing effect. One resident describes

“We have some absolutely gorgeous sunrises and sunsets in Fenner. As the sun slowly rises to the east of our house it usually bathes our bedroom

wall with its rays, unfortunately, we now get a strobe effect that can drive you absolutely crazy. It's commonly called the "flicker factor". As the sun shines through the rotors it creates a shadow pattern that you would like to a strobe light. Because of the close proximity of the 4 of the towers to our house we get this light show at various times of the day as the sun travels from east to west. Most of the time I have to close our shades to prevent this from giving me a migraine" (www.windaction.org).

The flicker effect has caused some people to attribute this as a cause for health issues, including accredited physicians such as Nina Pierpont from Malone who has diagnosed Wind Turbine Syndrome and is fighting for siting standards to protect citizens who are rural, old, ill, impaired and very young. People surveyed have claimed to experience headaches, palpitations, excessive tiredness, stress, anxiety, tinnitus, hearing problems, sleep disturbance, migraines, and depression.

Some people's opposition to wind farms is based off of their skepticism that wind energy is helping to reduce fossil fuel dependence. Elizabeth Weissman from Ellenburg says that wind mills are giving people an easy out to the problem of energy over consumption. A majority of people may be for wind farms but they aren't making sacrifices to buy smaller cars or to cut down on energy use. People aren't giving things up (NCPR.org 04/17/06).

Art Pundt from Cape Vincent refutes claims made by wind energy backers that say wind power will reduce pollution.

"Some power plants are kept in spinning reserve waiting to take over when wind energy goes down. Plants in spinning reserve are not

producing electricity, but still pour out pollutants while staying hot waiting to back up wind energy. No power plant is shut off when wind energy is running. Since power plants are left running even when wind is online, wind down not reduce pollution.”

This may be true, but the initiative to develop wind energy production is hoping to reduce further growth of non- renewable energy sources by increasing growth of alternatives such as wind. This will have a significant impact on the extent of our future carbon emissions. Others ways to reduce our dependence on oil will have to involve finding alternative fuels, drive less, or drive cars with higher gas mileage (Watertown Daily Times 07/22/2006).

Many people are skeptical because they see the big companies reaping the economic benefits from alternative energy tax breaks and they feels that local towns are not getting the bargaining power they deserve to increase their prosperity and to resist the desecration of their land and surroundings.

Many of the oppositional claims have also been refuted by people in favor of wind farms. Gregory Gardner, a professor at SUNY Potsdam wrote an article in the Watertown Daily times addressing some of these issues (Unfortunately, we were not able to schedule an interview with Gardner). A 2002 study done by a private research company in Oregon showed that wind farms had no effect on property values for near by residential and commercial property. This study did not specifically look at property that was specifically valued for its scenic beauty.

A study done by European researchers found that avian mortality caused by wind turbines is minor compared to death from tall buildings, power lines, hunters, automobiles, and house cats.

The use of nonmetallic blades has reduced the interference with electrical signals for TV stations. A study done by Utility Wind Integration Group (UWIG) has shown that the electrical distribution grid in the US handles the variability of wind farm energy generation and it is able to replace power generated by coal or gas therefore it does reduce pollution (Watertown Daily Times 11/05/2006).

In order to be cautious about the imminent wind farm proposals in their areas, the towns of Brandon and Lyme now have agreed upon a one year moratorium to consider some of the more important issues of hazardous effects and environmental impact and siting of the wind farms. Residents feel that they need to be more informed about the choice they are going to make in order to better understand what they are getting themselves into for the long run. This is one way that residents can make their voices heard and effect local governmental ordinances that determine the fate of wind farm proposals in their area. Councilman Warren A. Johnson from Lyme says “My perspective is, things are moving too fast and we need to slow down” (Watertown Daily Times 02/23/2007). James H. Madden is a representative from BP Alternative Energies who is proposing a project in the town of Cape Vincent and running into the town of Lyme. Even though Cape Vincent is the lead agency for the environmental review of the project Madden said that the town of Lyme could still “control where turbines could be through zoning and that the state environmental quality review process would use input from

Lyme and its residents even if it is not the lead agency. Nothing would happen...until Lyme signed off”.

The Public Service Commission and State Department of Environmental Conservation, recommended that BP submit a scoping document for both towns, which will allow public comment on potential impacts, eliminate nonsignificant issues and focus the Environmental Impact Statement on the significant effects (Watertown Daily Times 02/23/2007).

At the recent North Country Sustainable Energy Fair held at SUNY-Canton, a resident of Cape Vincent spoke up about his concern that the wind farms being proposed in his area will someday be exploited, as have much of our highways and roadsides, for commercial and advertising space. He addressed this concern to an employee of Noble Environmental Power who was presenting at that workshop. She remarked that she had never heard of that concern before but it is certain that those regulations can be clearly laid out by residents in their town ordinances.

Environmental issues:

Bird and bat mortality due to collision with wind turbine blades has been a major concern of environmentalists with the increased development of wind farms. At the Altamont Pass wind farm in California, the California Energy Commission reported that a total of 567 birds of prey died in 1989 and 1990 (Weisman 1994). Scientists participating in the study pointed out that although these raptors have very keen eyesight, they are not necessarily looking out for the fast moving blades of the windmills (Weisman 1994). Another problem associated with this particular wind farm was that the

tower portion of the turbine was a lattice structure rather than a pole, therefore more inviting for these birds to create their nests. Initially, environmental groups were very concerned with the high mortality rate of birds in this wind farm. However, they saw the important tradeoff between bird deaths and the catastrophic potential of global warming. Rich Ferguson of the Sierra Club noted that each megawatt of energy produced at the Altamont wind farm displaces 1000 tons of CO₂ emissions from conventional power plants (Weisman 1994). In other words, the mainstream environmental groups decided to pick their battles.

A similar study was conducted in 2000 at the Buffalo Ridge wind farm in Minnesota (Osborn et al. 2000). They found that there was approximately one bird death per turbine per year. This does not exceed the harm inflicted upon bird species by other man-made structures. However, the researchers stressed the importance of proper placement of the wind farm in order to try and avoid great harm to animal species in the area. Additionally, of the 10,000 bird deaths that occur each year as a result of human activity, less than one death may be attributed to collision with wind turbines (American Wind Energy Association 2007).

The Indiana Bat (*Myotis sodalis*) is an endangered species of bat living in the North Country. Some citizens are concerned by the potential harm caused to this bat species by the presence of wind turbines. A study completed in West Virginia found that of the bats that dies due to collisions with turbines, none of them were Indiana Bats (Kerns and Kerlinger 2004). Collision of birds and bats with human-made structures is also not unique to wind turibines (Johanson et al. 1994).

Information for Stakeholders:

NYSERDA has developed “Power...Naturally” as a logo or brand for all of its renewable energy programs. “Developing a “Power...Naturally look and feel” that is uniquely associated with NYSERDA's programs has been important to stakeholders, who are sometimes confused by initiatives being undertaken by others in the state, programs offered by other states, federal programs, or by the numerous programs being offered through New York Energy \$mart” (nysERDA.org). Through home shows, open houses, brochures, media coverage, workshops, conferences and technical courses Power...Naturally has helped thousands of potential customers, designers and installers to be educated about the application of solar, electric and wind energy.

Information including wind prospecting, mapping and forecasting, State Environmental Quality Review (SEQR), on-site or small wind incentives and information on grid connection are all considered important aspects to promote wind energy in NY State and to involve and educate stakeholders in the process of wind energy development.

Parameterizing solutions:

When considering issue of alternative energy use in the North Country, a variety of stakeholder concerns must be addressed. We have outlined these concerns, ranging from environmental to economic, to health and well being. Ideal solutions must involve as many stakeholder perspectives as possible. New York State government is concerned with meeting the goals of their Renewable Portfolio Standard (RPS) by developing new sources of alternative energy as well as adhering to state regulations on reducing carbon

emissions. Therefore, solutions must address the energy initiatives driven by New York State as well as the national and global awareness for alternative energy production.

Energy companies such as Noble Environmental Power have invested a lot of their interest and money into wind farms in the North Country; therefore they would like to see further successful implementation of wind farm projects. Large corporations that own alternative energy companies have invested the up front cost of wind farm projects and are mainly interested in receiving a profit from their investments as well as maintaining a national and international reputation for their successful involvement in alternative energies. These companies want to ensure that any solutions implemented are economically profitable in the market.

Farmers or local citizens who have wind turbines on their land are concerned about environmental impacts, aesthetic value, potential for personal economic gain and impact on daily or traditional lifestyle. It is essential for these particular stakeholders to be highly involved in the installation of wind farms because these citizens' lifestyles are most directly affected every day by the presence of turbines on their land. Furthermore, these stakeholders must be sufficiently informed regarding the economic impacts that the wind farms will have on them.

Local residents who live near wind farms may be opposed to their proximity to residential areas due to health or aesthetic concerns and would also like to be involved in determining the regulations incorporated into town ordinances. Local residents who are in favor of wind farms may find that the economic benefits to the town and school system in addition to environmental concerns for climate change outweigh the negative aspects of incorporating wind farms into their local landscape. Both perspectives require that

local residents' voices and concerns are heard and considered in the process of developing solutions. Citizens' concerns also implicate issues of wind farm siting and maintenance of turbines which may directly affect the health and safety of nearby residents.

The presence of wind farms has the potential to negatively affect the land and wildlife nearby. Understanding these effects is required for avoiding and minimizing impacts on the environment. This emphasizes the importance of rigorous environmental impact assessment both prior to and following construction and subsequent operation.

The ideal solution will not only take into account individual stakeholder concerns, it will increase the communication between stakeholders and generate discussions regarding the need to decrease carbon emissions and reduce energy consumption.

Identification and evaluation of potential solutions:

Potential solutions to the issue of alternative energy use in the North Country would most likely require a collaboration of several approaches and the active participation of one or more stakeholder groups. The action of one group may greatly affect the interests of other groups. We have generated the following potential solutions in several different stakeholder categories throughout New York:

Governmental Regulations and Incentives

- a) State or federal regulation of energy consumption by limiting per capita electricity usage through massive taxation on over consumption.

- b) Attempting to reduce individual energy consumption by increasing taxation on over consumption of energy.
- c) Increased incentives for energy efficient lifestyles and practices through subsidies, loan programs, rebates and tax breaks.

Wind Farm Siting

- d) Wind farms should be placed in every possible area, and the wind farms should be opened up for development to any corporation who is willing to pay the most money.
- e) Siting wind farms along the Great Lakes area where wind is strongest and most consistent.
- f) Siting wind turbines in areas such as the ADK peaks where there are no residents nearby to object.
- g) No further wind farm development in areas that may affect any stakeholder in the North Country.
- h) All future wind farm development will be exclusively owned and operated by local residents so that maximum profits are received by North Country citizens.
- i) Collaborative effort between companies and local citizens to develop wind farms so that local citizens will reap the most benefits possible while continuing to have financial backing.
- j) Increase in private wind turbines owned by individual residents which serve their individual energy demands.

- k) More intensive environmental impact assessments that determine the precise effects of turbines on all birds, bats, plants, habitats and all ecological processes in the surrounding area.

Education and Publicity

- l) Increased education and awareness of alternative energy and the need for energy conservation in the North Country by increasing a sense of responsibility for the local landscape.
- m) Publicize innovative technologies and the environmental and economics benefits of incorporating them into daily life.
- n) Research and development of other alternative energy sources (biofuel, solar), including monetary incentives to make them more feasible for local citizens.

Identification of feasible solutions

Although there are many approaches to developing solutions to alternative energies in the North Country, not all of these approaches are feasible for the communities in the area. Economic, environmental and practical limitations are the main drivers in determining which solutions could possibly be implemented. Below is a discussion of which of the possible solutions listed above are feasible for the North Country. Feasible solutions are written in boldface type.

Governmental Regulations and Incentives

- a) **State or federal regulation of energy consumption by limiting per capita electricity usage through massive taxation on over consumption.**

- a. State or federal regulation of energy consumption by limiting per capita electricity usage through massive taxation on over consumption is not something that we see as feasible in the short term in New York State because virtually no stakeholders will allow that sort of policy in New York State government. Ideally this might be a possible solution in the far future when alternative energy becomes implemented on a much larger scale and is more accepted by the general public.
- b) Attempting to reduce individual energy consumption by increasing taxation on over consumption of energy.**
 - **This seems like an approach that could work at the state level and would provide economic incentive for New York citizens to be more energy efficient. This would require general political consent, which people like George Pataki seem to have initiated.**
- c) Increased incentives for energy efficient lifestyles and practices through subsidies, loan programs, rebates and tax breaks.**
 - **This also seems like it would motivate people through positive reinforcement to decrease their energy consumption. If people receive monetary benefits from decreased energy consumption, they are more likely to adhere to energy efficient lifestyles. This would also help to promote more awareness for the need for energy efficiency since more people would hopefully be participating.**

Wind Farm Siting

- d) Wind farms should be placed in every possible area, and the wind farms should be opened up for development to any corporation who is willing to pay the most money.
 - This is not a feasible solution because it does not take into consideration many stakeholder concerns. It actually disregards the respect that North Country citizens have for their land. If this were to be implemented at a huge scale, there would be massive exploitation of citizens' rights.
- e) Siting wind turbines in areas such as the ADK peaks where there are no residents nearby to object.
 - The Adirondack State Park region is highly valued by the people in the North Country for its "forever wild" status and its large, undisturbed area. Sacrificing such places of ecological and intrinsic value for the development of clean energy sources does not align with our conservation ethics. Any wind farm proposals for the area would surely be highly contested.
- f) No further wind farm development in areas that may affect any stakeholder in the North Country.
 - Whereas this was the solution in the past, with our knowledge of alternative energy technology today, it would be irresponsible for us to not consider a solution to wind energy development that could work for this area and would be accepted by stakeholders here.

g) All future wind farm development will be exclusively owned and operated by local residents so that maximum profits are received by North Country citizens.

- Wind farms exclusively owned and operated by local residents is not feasible because many of the residents here do not have the financial backing to finance the initial and continued costs involved in constructing and maintaining wind farms.

h) Collaborative effort between companies and local citizens to develop wind farms so that local citizens will reap the most benefits possible while continuing to have financial backing.

- **One of the concerns regarding wind farms in the North Country is that national and international corporations are reaping most of the profits from wind energy production in the North Country. This may be addressed by promoting the cooperation between local residents and wind farm owners, allowing the residents to feel like they are gaining a monetary profit from this resource near their homes or on their land. This may be accomplished at town meetings where citizens' concerns may be heard and problems discussed and resolved between both parties.**

i) Increase in private wind turbines owned by individual residents which serve their individual energy demands.

- Whereas this solution could be possible for some individuals, wind turbine installation is expensive and maintenance is cumbersome for

someone who is not trained in wind turbine maintenance and repair. Individual wind turbines would help to decrease per capita carbon emissions, however solutions we would like to implement need be accessible to all socioeconomic classes in the North Country.

j) More intensive Environmental Impact Assessments that determine the precise effects of turbines on all birds, bats, plants, habitats and all ecological processes in the surrounding area.

- **Environmental Impact Assessments are an integral component of the solution since land is highly valued by many of the stakeholders as well as conservation-minded people. If we are valuing our global atmosphere, we also have to value our local landscape, including the wildlife that inhabit it.**

Education and Publicity

k) Increased education and awareness of alternative energy and the need for energy conservation in the North Country by increasing a sense of responsibility for the local landscape.

- **Increasing awareness throughout the North Country is already taking place through school programs, energy fairs like the North Country Sustainable Energy Fair, and general advertisement. However, increasing the amount education as well as campaigning for a sense of environmental responsibility of the North Country**

citizens is a necessary step in fighting environmental degradation as an effect of climate change.

l) Publicize innovative technologies and the environmental and economics benefits of incorporating them into daily life.

- Carbon-emission reducing technologies are constantly being improved and updated. In order to minimize environmental impacts, transitions to some of these new technologies are necessary. Publicizing the new technologies is important so that people are aware of the possibilities for reducing their individual impacts on the environment and how to incorporate these new technologies into their daily lives.**

m) Research and development of other alternative energy sources (biofuel, solar), including monetary incentives to make them more feasible for local citizens.

- Continued research with regards to the development of new sources of energy is important if we are able to incorporate diverse sources of fuel to substitute non-renewable fuel sources into our energy portfolio.**

Best Solution

The best solution for the North Country involves a combination of several of the feasible solutions that we discussed previously. The best possible actions would be a combination of increased incentives for energy efficient lifestyles and practices through subsidies, loan programs, rebates and tax breaks, collaborative effort between companies

and local citizens to develop wind farms so that local citizens will reap the most benefits possible while continuing to have financial backing, more intensive Environmental Impact Assessments that determine the precise effects of turbines on all birds, bats, plants, habitats and all ecological processes in the surrounding area, and increased education and awareness of alternative energy and the need for energy conservation in the North Country by increasing a sense of responsibility for the local landscape.

We think that this multi faceted approach is needed in order to incorporate environmental values into the North Country as well as address economic issues that are of great concern to citizens and other stakeholders.

Ease of implementation

The solutions that we came up with that address the issue of alternative energy production in the North Country can be implemented through a wide variety of actions.

- Increased incentives for energy efficient lifestyles and practices through subsidies, loan programs, rebates and tax breaks.

This solution is already being implemented by New York State agencies such as NYSERDA and there is potential for further incorporation of this approach into state policy. We feel that in order to successfully develop more alternative energy sources, there needs to be further incentive that motivates citizens to participate and be invested in this initiative.

- Collaborative effort between companies and local citizens to develop wind farms so that local citizens will reap the most benefits possible while continuing to have financial backing.

Town meetings have already been an important aspect of decision making regarding wind farm proposals in the North Country. These have to continue to involve and promote communication between wind energy developers and local residents as new concerns are arising with the various wind proposals. These would be easy to implement as both local residents and wind energy developers are interested in being more educated about each others intention's and concerns.

- More intensive Environmental Impact Assessments that determine the precise effects of turbines on all birds, bats, plants, habitats and all ecological processes in the surrounding area

Environmental Impact Assessments are already an important aspect of many developmental projects and will continue as concern for the environment continues to be important. Ecological researchers, students and professors have interest in conducting survey analysis to determine environmental effects to wildlife. These studies will continue and may be increased with grants for researchers.

- Increased education and awareness of alternative energy and the need for energy conservation in the North Country by increasing a sense of responsibility for the local landscape.

Programs to educate local residents, especially farmers with the potential of having wind farms on their property, are already in practice. However, it would be a realistic goal to increase the scope of these educational programs to include more people in the North Country. Events like the North Country Sustainable Energy Fair have been highly successful in accomplishing this goal.

Step-by-step implementation plan

The first step in our proposed solution is to increase government incentives, subsidies and tax breaks for energy efficient practices in order to raise interest in the issues of global climate change and more people actively doing their part in this effort. Realistically, most people are primarily driven by economic issues. If they saw an opportunity to receive some economic benefits for positive environmental practices, they would be far more likely to try and be involved. This would also reward those people who are already environmentally conscious and are incorporating energy efficiency into their daily lives.

After overall interest and awareness increases, the second step in our implementation plan would be to educate more local residents about these incentives as well as the need to reduce energy consumption. Community organizations that already exist such as Community Energy Services could help out in this process since these people are residents of the community and are familiar with how to engage local citizens with issues of alternative energy use.

After local residents are educated about the issues surrounding wind farm development in the North Country, more productive conversations between local residents and wind energy companies will ensue. This will likely result in a better understanding between the two parties with regards to wind farm development and will also help with more stakeholders feeling like they played an important role in the decision making process.

The final step of our implementation plan would be to ensure that necessary Environmental Impact Assessments are conducted in order to avoid environmental degradation as an effect of turbine installation and operation.

Conclusions

Increases in global temperature have and will affect all living things on this planet. Environmental affects of these temperature increases include but are not limited to: ice cap melting, biodiversity loss, disruption to ocean currents, and erratic weather patterns among many others. These environmental changes have taken place over the course of less than a century, which is an infinitesimal unit of time in comparison to evolutionary and geologic history. Solutions to the problem of climate change will inevitably be multifaceted and involve the cooperation of people all over the world. If we can begin by focusing on local efforts such as the development of wind energy to reduce carbon emissions, whether through the individual reduction of carbon emissions or the implementation of alternative energy sources such as wind farms, we will hopefully overcome this problem and maintain a planet that will be viable for many generations to come.

Citations

Alliance for Clean Energy New York, Inc. <<http://www.aceny.us/index.cfm>>

Alliance to Save Energy <<http://www.ase.org>>

American Wind Energy Association. <http://www.awea.org>.

Danish Wind Energy Association. www.windpower.org. Accessed 8 April 2007

Empire State Wind Energy <<http://www.empirestatewindenergy.com/>>

Energy Star Appliances

<http://www.energystar.gov/index.cfm?c=appliances.pr_appliances>

Ferriter, S. While Administration and Congress Balk on Kyoto, Many U.S. States Move Forward on Greenhouse Emission Efforts.

<<http://www.climate.org/topics/localaction/grnhs.shtml>>

Foringer, P. 2005. "Our Wind Farm Story"

<http://xray.rutgers.edu/~matilsky/windmills/Windfarm_story.htm>

Gipe, Paul. Wind Energy Comes of Age. John Wiley & Sons, Inc: New York, 1995.

Gore, Al. An Inconvenient Truth: the planetary emergence of global warming and what we can do about it. Rodale: New York, 2006.

Hinkleman, L. 2007. "Maple Ridge Fact Sheet"

Horizon Wind Energies <www.horizonwind.com>

Industrial Wind Action Group www.windaction.org

Kerns, J and P. Kerlinger. 2004. A Study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker Country, West Virginia: Annual Report for 2003.

Johnson, G.D., W.P. Erison, M D. Strickland, M.F. Shepherd, D. A. Shepherd, S.A. Sarapo. 1994. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. *American Midland Naturalist*. 150: 332-342.

Johnson, J. 2005. "PPM Announces Acquisition of Atlantic Renewables". January 4, 2005. <http://www.ppmenergy.com/rel_05.01.04.html>

Living in New York <http://www.livinginnewyork.org/wind_farm>

Maple Ridge Wind Farm <www.mapleridgewind.com>

Neij, L. 1999. Cost dynamics of wind power. *Energy*. 24 (5): 375-389.

Noble Environmental Power <<http://www.noblepower.com/index.html>>

North Country Public Radio <<http://www.northcountrypublicradio.org/news/>>

O'Brien, Mark, Caitlin Costin, Jeffrey Novich. Winds of Change. Video. Columbia University, 2004.

Patel, Mukund R. Wind and Solar Power Systems: Design Analysis and Operation. Taylor & Francis: Boca Raton, FL, 2006.

Power...Naturally (NYSERDA) <<http://www.powernaturally.org/>>

PPM Energy <<http://www.ppmenergy.com/>>

Roberts, L.E.J, P.S. Liss, and P.A.H Saunders. Power Generation and the Environment. Oxford University Press: Oxford, 1990.

Save Western New York <<http://www.savewesternny.org/>>

State of the State Governor George Pataki January 4, 2006. January 5, 2006
<<http://www.gothamgazette.com/article//20060105/202/1700>>

The FREE Center, Inc. <<http://www.fennerwind.com/>>

The Relocalization Network <<http://www.relocalize.net/>>

Weisman, Jonathan. 1994. Tilting at windmills. *Wildlife Conservation*. 97: 52-57.

We Oppose Wind farms <<http://we-oppose-windfarms.tripod.com/>>