Top of Iowa Wind Farm

Project Owner	Northern Iowa Windpower, LLC – Members include Entergy Wholesale Operations, Midwest Renewable Energy Corporation and Zilkha Renewable Energy
Project Designer	Midwest Renewable Energy Corporation
Project Developer	Midwest Renewable Energy Corporation and Zilkha Renewable Energy

Introduction

Northern Iowa Windpower (NIW) built the Top of Iowa 80-megawatt Wind Electric Plant (wind farm) located in western Worth County, IA in 2001. The wind farm, which is approximately 100 miles south of Minneapolis and 110 miles north of Des Moines, is part of a growing effort to meet more of America's energy needs with clean, reliable, and economical electricity. The wind farm consists of 89 NEG-Micon 900 kilowatt wind turbines mounted on 237-ft (72 m) tubular towers. Each turbine blade is 85 feet (26 m) long, making the rotor diameter 171 feet (52 m). The blades turn at 15 or 22 rotations per minute, depending on wind speed. The entire wind turbine, from ground level to the top of the rotor diameter, is 323 feet (98 m) high. The wind farm covers roughly 5,900 acres of cropland on 49 separate land parcels and interconnects to the local electrical grid at a new 161-kilovolt substation installed 6 miles east of the wind farm. The wind farm's energy, equivalent to the electricity consumed by 24,000 typical Midwest homes, is sold to Alliant Energy under a 15-year Power Purchase Agreement.

Project History

Northern Iowa Windpower, LLC (NIW) was created through a joint venture of Midwest Renewable Energy and Zilkha Renewable Energy. Midwest Renewable initiated development of the project in the summer of 2000, and Zilkha provided the expertise and capital required to construct and operate the facility. Construction began in May 2001 and was completed in November 2001. Entergy Corporation then acquired a majority interest in the Top of Iowa Wind Electric Plant in December 2001, retaining Zilkha Renewable Energy as the asset manager.

NIW developed the Top of Iowa Wind Farm largely in response to Wisconsin Act 9, which required Wisconsin utilities to purchase and distribute an annually increasing percentage of renewable energy. Act 9 allows the purchase of energy from out-of-state generating facilities if the electricity is physically delivered to an in-state utility and sold at retail prices. NIW chose to develop the wind farm in Iowa instead of Wisconsin because Iowa generally has better wind resources, making it cheaper to generate wind energy. Equally important, Worth County's proximity to Wisconsin makes it possible to economically transmit the electricity from the wind farm to Wisconsin customers.

The Federal Production Tax Credit (PTC), which was created to stimulate investment in renewable energy, also played a critical role in the wind farm's development. The PTC is adjusted annually for inflation and applies to each kWh of electricity produced from wind energy and sold to unrelated parties during the first 10 years after the facility is placed into service. The PTC has the effect of reducing the cost of wind energy by almost two cents per kWh. Without the PTC, wind energy would have had to be priced higher. The PTC reduced NIW's payments of federal taxes by approximately 1.7 cents for each kWh of energy sold for the first 10 years,

lowering the price per kWh paid by Alliant enough to be competitive with traditional renewable energy resources.

The Internal Revenue Code contains a Modified Accelerated Cost Recovery System (MACRS) that allows businesses to recover investments through short term, rapid depreciation deduction of the cost of certain renewable energy systems, such as wind turbines. The current MACRS property class for renewable energy systems in service after 1986 is five years, heavily weighted to the initial years of operation, further lowering the cost of delivered energy.

Western Worth County was selected for the wind farm site due to its excellent wind resource; close proximity to growing power markets such as Chicago, Milwaukee, Minneapolis and Madison; short distance from the project to high voltage transmission lines; transmission capacity; access to energy markets; expansion possibilities, and strong community support. The wind farm is located on a high ridge in Bristol and Fertile townships in Worth County, at an elevation of 1,200 to 1,300 above sea level - one of the highest elevations in Iowa. The project site's elevation increases the wind resource dramatically, compared with the surrounding terrain at 1,000 feet or less.

In addition to the greater wind resources, legislation that allows city councils or county boards of supervisors to enact ordinances for the special valuation of "wind energy conservation property" for up to 20 years made Iowa a favorable location for the wind farm. This "Special Assessment of Wind Energy Devices (Iowa Code Chapter 427B.26)" allows for a waiver of or reduction in property taxes for the entire wind plant, including wind turbine, tower and electrical equipment, pad mount transformers, power lines, and substations. Also, as noted below, NIW was able to shorten its data collection period, resulting in significant savings, due to the existence of a long-term reference station located in Forest City, IA. This anemometer was installed as part of the Iowa Energy Center's statewide wind energy resource evaluation. Other renewable energy financial incentives are available in Iowa, and are often influential in other renewable energy projects, but did not apply to this project. In 2001, the Iowa Legislature subsequently passed a law that requires all electric utilities to offer customers the opportunity to purchase power from alternate energy sources by January 1, 2004, which may result in the future development of additional wind farms.

Pre-Construction Activities

Once NIW had tentatively chosen a site for the Top of Iowa wind farm, the first steps in project pre-construction began. Pre-construction activities included meteorological studies, negotiating a power purchase agreement, negotiating land easements, site design, soil studies, project permitting, and engineering of the project interconnection to the electrical grid.

Meteorological Studies

NIW consulted with Ron Nierenberg, a wind resource assessment specialist, to analyze all available data and calculate the wind resource at the Top of Iowa location. Mr. Nierenberg has more than 20 years experience as a wind energy meteorologist and has managed wind-monitoring programs with an aggregate value of $3 million. He managed two DOE-funded wind research projects, developed a software library for wind energy analysis, and conducted the original wind study of the Altamont Pass in California.

In Fall 2000, NIW installed three 50-meter-tall meteorological stations at several representative points on the site to collect data for a one-year period. Typically, wind data is collected for at least three years, but the existence of a long-term reference station located 15 miles away in Forest City, IA, allowed NIW to correlate the measurements at the site with long-term data, thereby shortening the period of time for which on-site data was required and reducing overall project costs.

Table 1. Electric Energy Output Estimates for Top of Iowa Wind Farm

Average Wind Speed at 72.2-meter Hub Height	Gross Capacity Factor	Net Capacity Factor	Output per Wind Turbine Generator (MWH)	Gross Annual Output for 80.1 MW Wind Farm (MWH)
8.2 Meters Per Second	32.9%	31.6%	2,590	230,510

Nierenberg's analysis compared on-site data from the Top of Iowa to concurrent and historical data from Forest City. He used the data to predict wind speeds at the Top of Iowa. Based on the wind speed distribution, Nierenberg used the wind turbine manufacturer's warranted power curve for the NEG-Micon 900 kilowatt turbine to calculate gross output on an annual, per turbine basis. This calculation yielded a gross estimate of 2,786 MWH per turbine, per year. Nierenberg then took losses into consideration, including losses for:

- local topography
- wind turbine array
- wind turbine availability
- transformer/line losses
- blade contamination and soiling
- maintenance and control hysteresis

Losses are calculated on a cumulative basis, rather than simply adding them together; the cumulative equation [((1.02 x 1.0175 x 1.01)-1) x 100] equals 4.82% loss, versus the simple sum of 4.75% loss. Net energy production is then calculated at 2,590 MWH per turbine each year. NIW assumes that availability will only reach 97% per year according to the NEG Micon guarantee during the first five years of the project's operation.

The Top of Iowa Wind farm was projected to provide substantial amounts of electricity throughout the year. Turbine production was projected to range from 180 kW to 340 kW per turbine during the year and the projected average turbine production per hour ranged from 224 kWh to 340 kWh.

Chart 1. Projected Average Turbine Production by Month

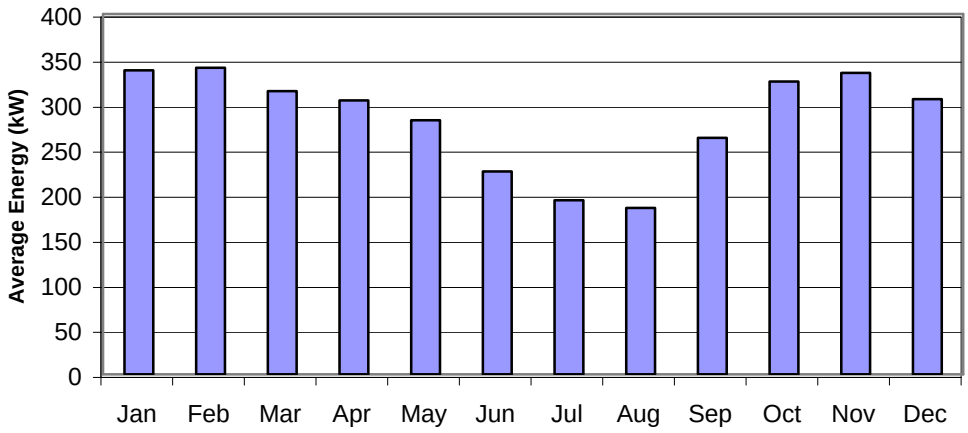
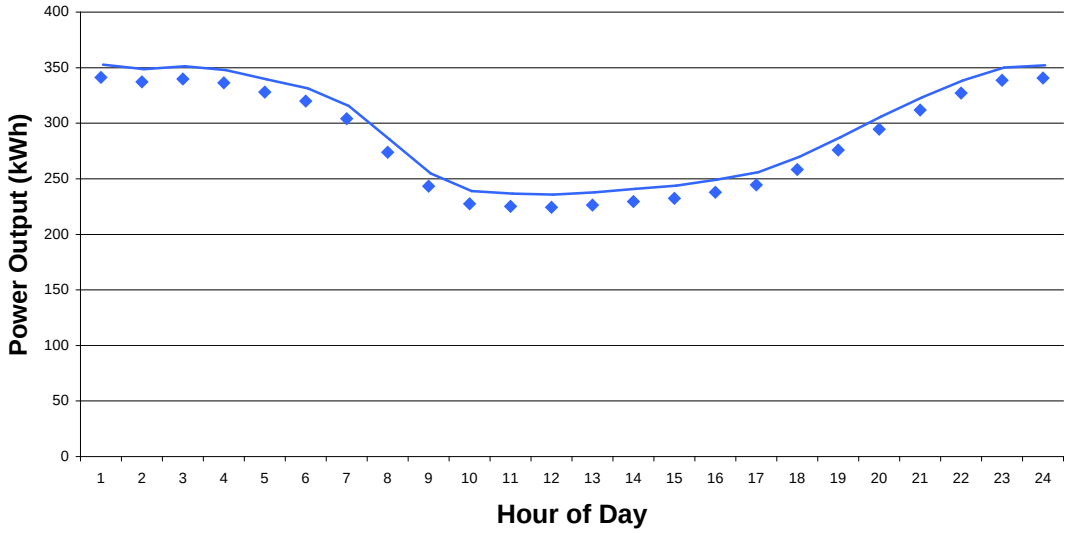


Chart 2. Projected Annual Average Turbine Production by Hour



Power Purchase Agreement

Once NIW had a good estimate of the potential output of the Top of Iowa wind farm, they began efforts to secure a purchase agreement for the power. As a first step in the Top of Iowa's marketing efforts, NIW hired Henwood Energy Services, Inc. to conduct a study of the expected long-term energy prices for the MAPP-MAIN-COMED regions. Henwood is the leading energy price forecaster in the United States. The Henwood study included a detailed forecast of electricity market prices in the Midwest region and market revenues for the wind farm project. Henwood created the forecasts using their EMSS/PROSYM modeling software, which simulates actual operation and market interactions of the regional electric transmission system and generating units located throughout the U.S. Eastern Interconnect.

Henwood prepared market prices and revenue forecasts under a Reference Case set of assumptions, which provided a reasonable "base case" forecast of future market conditions driven by various assumptions regarding the future state of power markets. The study's key structural assumptions included:

- Wholesale power markets in the Midwest, including the MAIN, MAPP and ECAR Regions, are already competitive, although they operate primarily on a bilateral basis, with no formal power pool or market clearing exchange in place.
- Midwest electricity markets will continue to operate on a competitive basis, which means that revenues will accrue to owners of non-regulated electric generation based upon market clearing prices established in regional energy markets, and regulatory support for embedded cost generation assets will end over time.
- In forecasting electricity prices, Henwood modeled the regional market as a single, all-in price electricity energy market, wherein participants freely bid prices. During times of relative scarcity of generation, participants are able to bid prices higher than their short run variable costs. The underlying presumption of this market forecast approach is that the market price will converge on an equilibrium state that equates to the long-run cost of operation for new efficient combined cycle entrants, including the return of and on capital. The actual price of electricity in the future will be subject to the actual outcome of key market drivers, such as the price of natural gas and the decisions of new generators to enter the market.

Henwood also considered the seasonal and diurnal variability in the wind resource at the Top of Iowa wind farm in determining its energy value estimates. This is an important calculation, since the project generates more of its energy during off-peak hours and winter months, when energy prices are generally lower.

After discussions and negotiations with several utilities in the Upper Midwest, NIW executed a 15-year Renewable Energy Power Purchase Agreement (PPA) with Alliant Energy's subsidiary, Interstate Power Company, for the sale of the wind farm's output in February 2001. It became clear during negotiations that Alliant was only interested in the output of a 40 MW wind project. However, meeting Alliant's price goals required the economies of scale created by an 80 MW wind project. Thus, NIW created a structure to sell 50 percent of the output as "*Green Energy*" over a 15-year term to meet Alliant's wind energy requirements and to sell the remaining 50 percent of the output as "*Energy Only*," meaning the company sold only the value of the electricity and kept the "green" value that arose from the wind-origins of the electricity, over a

10-year term. These "green" credits (per kWh) are sold to Wisconsin Electric Power Company (WEPCO). NIW negotiated a 10-year term agreement for the *Energy Only* component for several reasons:

- The 10-year term for "Energy Only" creates a contract path into Wisconsin during the time when NIW believes Renewable Resource Credits will have the greatest value.
- Currently, the project site is in a regulated market where bilateral contracts are the norm and there is no "power pool" per se. The project sponsors are confident that a pool, like that developing around ComEd will be in place by the time the "*Energy Only*" term of the PPA expires, thus providing Top of Iowa with a ready market for its output.
- NIW believes the current barriers to economical transmission of wind power will decrease over time, facilitating the sale of the Top of Iowa's output beyond year 10.

The *Green Energy* is sold on an as-delivered basis with an initial fixed price and a small escalator. The *Energy Only* is sold at different prices for peak and off-peak hours. More energy is produced during windier nighttime hours, but there are more peak than off-peak hours. Therefore, peak and off-peak energy output is split approximately 50:50. All capacity value created by the project for the Regional Transmission Operator (RTO) accreditation purposes is assigned to Alliant.

Landowner Agreements

NIW sought to garner public support and landowner cooperation early in the project development by holding six town hall meetings at the Community Center in Joice, IA. At the meetings, citizens were able to ask questions and express concerns on topics such as road construction, electric cables, effects on farming, equipment, tile drainage and fencing.

NIW negotiated easement agreements for the Top of Iowa wind farm. Forty-nine landowners over 5900 acres have turbines. Each landowner has a non-obstruction clause in his or her easement agreement. The non-obstruction clause obligates the landowner to review with and seek prior approval from NIW for constructing structures greater than 50 feet tall within 650 feet of a turbine. No landowners without turbines have a non-obstruction obligation. The easement agreements also provide unrestricted access to the turbines, a fixed per-turbine payment schedule, reasonable notice for entry and procurement provisions. Neighbors within 1,200 feet of a turbine were offered Neighbor Agreements, which allows the wind farm to cast a shadow caused by the towers and blades across the respective land. The agreements also permit the wind farm to emit audible noise in excess of 50 dBA across the land. Sound levels at the outer walls of existing, occupied homes are kept at or below 50 dBA. The right-of-way easements, encompassing 14.6 acres (24,561 feet long x 25 feet wide), are for additional properties crossed by the transmission line between the Top of Iowa Wind Farm and the substation. The exact terms of the agreements with landowners are confidential, but each landowner receives approximately $2,400 per year per turbine.

Site Design

NIW designed the Top of Iowa Wind Farm to maximize energy capture while minimizing costs of construction and operations. No major difficulties were encountered in siting the wind turbines, except that the developers of the project had to balance maximum energy output with landowner preferences, prudent setbacks, and electrical design to minimize energy losses. To

site turbines on the highest topography and to take advantage of the most wind power, NIW configured the wind turbine array in a "Y" shape, spacing the turbines four to five rotor diameters apart. The wind at Top of Iowa blows from a variety of directions. This factor was predicted to result in higher-than-typical array power losses, so NIW designed the turbine spacing to minimize these losses.

To provide a margin of safety and minimize the impact on the local community, the towers were placed at a minimum distance of 325 feet from public roads, 1,000 feet from residences, and 700 feet from the perimeter of the site. Wind turbines were sited in consideration of agriculture during construction and wind farm operation. Landowner input was the primary factor in the design and placement of new field accesses and turbine access roads. Field access culverts were sized with consultation from the county engineer.

NIW hired Don Keef, an experienced professional who has designed the electrical collection systems for more than half of the wind energy projects built in the United States, to design the electrical layout. The site electrical layout consists of a 33.6 kV underground collection system throughout the project. NIW built an 80 MVA 161kV – 33.6 kV substation approximately five miles east of the project location that connects the Top of Iowa Project to Alliant West's 161 kV transmission line. Alliant Energy provided substation design services and construction. (Attachment B. Preliminary Electrical System Layout)

Permitting/Zoning

Permits and government approvals for the Top of Iowa wind farm were relatively straightforward. NIW obtained the following permits:

1. Iowa Utilities Board Construction Approval Waiver
2. Worth County Road Access and Utility Accommodation Approval
3. Army Corps of Engineers Section 404 Wetland
4. Federal Aviation Administration - "Determination Of No Hazard To Air Navigation" FAA lighting was installed because the wind turbine blades extend above 200 feet (61 m), the maximum height limit exclusion under FAA lighting requirements.
5. National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit
6. County Drainage District Permit
7. Iowa DOT Utility Accommodation Permit – this permit was required to cross I-35
8. Iowa DOT Work within Right of Way Permit
9. Iowa DOT Haulage permits - All large truck loads of wind turbine nacelles, rotors, tower sections and transformers were cleared through the Iowa Department of Transportation. Under the construction and supply contracts, the contractors were responsible for obtaining permits.
10. Federal Energy Regulatory Commission – Exempt Wholesale Generator status
11. Worth County Zoning Permit for Substation – NIW obtained zoning permit required to build the substation
12. No Department of Natural Resources permits were required. However, NIW has entered into an agreement with the Iowa Department of Natural Resources to monitor avian mortality caused by collisions with the turbines in the area of the wind farm.

The only land where the townships in Worth County, IA have zoned is that on which the substation is located. A zoning permit was required for the substation and was granted.

Non-obstruction permits from the Federal Aviation Administration (FAA) were more complicated, due to the presence of a FAA repeater station on the project. All FAA permits were obtained, but the development team believed the FAA required more lights than were necessary. The FAA and the American Wind Energy Association are currently working on a joint study of wind turbine lighting requirements.

Interconnection
Under federal law, Alliant Energy's 161 kV line is "open" to any generator who fulfills numerous requirements on a "space available" basis. NIW negotiated an interconnection agreement with Alliant Energy over the space of several months. Negotiations went smoothly, partly because Alliant Energy had agreed to purchase the energy from the project.

Wind Farm Construction
NIW separated the construction of the wind and energy project into two contracts: one with NEG Micon USA as the supplier and erector of the project's equipment; and the second contract to The Mortenson Company of Minneapolis, as the Balance of Plant contractor. Alliant West constructed the electrical substation. Zilkha Renewable Energy's construction manager was Mark Haller. Michael Kelly was the on-site Owner's Representative for NIW to ensure safe construction practices, project success and timely completion. Mr. Kelly handled day-to-day issues throughout the entire construction. All contractors were required to adhere to strict, safe working procedures, weekly safety training, and report any injuries. The tubular, turbine tower doors were locked to restrict access by unauthorized persons. Contractors were held to strict site cleanliness standards to minimize wind-borne debris. The total project cost was approximately $80 million.

The NEG Micon contract contained numerous provisions to ensure the timely and quality construction of the wind project. Important features included the following:

- Strict milestone schedule (See Attachment C)
- Delay liquidated damages in the event one or more turbines were not commissioned on time, plus damages calculated for Federal Production Tax Credits
- Production Tax Credit liquidated damages in the event one or more turbines did not reach full commercial operations, calculated on an after-tax basis
- Guarantees for NEG Micon 900's performance at given wind speeds.

The Mortenson contract contained similar provisions, including:

- Delay liquidated damages to compensate the project for losses incurred due to missed schedules.
- Ample retainage on progress.
- Full and clear responsibility for the engineering of roads, foundations and all other required infrastructure.

The contract with Alliant West contained similar provisions to ensure the timely and quality construction of the wind project. The provisions included:

- Delay liquidated damages.
- Temporary grid power while the substation was being completed.
- Standby transformer available to the Top of Iowa if the main transformer suffered a delay or problem upon energization.
- Full and clear responsibility for engineering.

The first phase of construction included improvements to existing roads, construction of new roads, and installation of turbine foundations. It was discovered that low-slung, over-the-road "low-boy" trailers used for parts deliveries, with only a few inches of ground clearance, had difficulty on gravel roads with dips and hills. A special hydraulic dolly was fabricated for transporting trailers with a large, all-wheel-drive farm tractor.

Next, the Mortenson Company built 17 miles of new roads, consisting of 12 inches of crushed rock spread on compacted soil, in corridors for the turbine layout. Total road construction utilized 2,275 truckloads of crushed rock. Road edge elevation was maintained within four inches above the adjacent field. Culverts and tile inlets were installed where new roads could trap water. Temporary silt fencing was installed where needed.

After the corridor roads were completed, the Mortenson Company began excavation and construction of the foundations for the turbines. An octagonal, spread-footing type tower foundation, measuring seven feet deep and forty-two feet in diameter, was constructed. Each foundation was reinforced by 25,713 pounds of reinforcement steel. After the reinforcement steel was in place, 181 cubic yards of concrete was poured into the foundation excavation. The entire project required 2,288,457 pounds of reinforcement steel and 16,752 cubic yards of concrete.

The second phase of construction was installation of the electrical layout. The electrical contractor began trenching and laying 21.8 miles of 33.6 KVA underground cable and 30.7 miles of fiber optic cable. Field tiles that were disturbed during electrical cable installation were repaired and inspected by the landowner before covering. Alliant West then built the 80 MVA 161kV – 33.6 kV substation approximately five miles east of the project location to connect the Top of Iowa project to Alliant's 161 kV transmission line.

Once the electrical contractors were finished, NEG Micon delivered and erected the wind turbine generators. NEG Micon was responsible for turbine construction from the concrete foundation up and erected the turbines on the foundations. The towers are 237 feet high. Each turbine blade is 85 feet long, making the rotor diameter 171 feet. The entire wind turbine, from ground level to the top of the rotor diameter, is 323 feet high. The transportation of materials for turbine delivery and erection required 511 truckloads with a total weight of 28,312,680 pounds over a total distance of 360,000 miles.

Final Completion under the Turbine Supply and Installation Agreement is pending completion of required performance testing. The project achieved Partial Commercial Operation on October 2, 2001, when grid interconnection was completed, energized, and 25 percent of the turbines were in operation. Full commercial operation was achieved on October 20, 2001, when 75 percent of

turbines were fully commissioned and operating. Turbine commissioning was 100% complete on November 14, 2001.

Project Milestones

Date	Milestone
Summer 2000	Wind farm development initiated.
5/2/01	Construction kick-off meeting. The actual work began two weeks later due to a very wet spring.
8/8/01	The first turbine was erected.
8/25/01	kWh first supplied through the temporary substation.
10/3/01	kWh first supplied through the permanent substation.
10/3/01	Partial commercial operation was achieved pursuant to the PPA (15 turbines commissioned and producing power).
10/11/01	The final turbine was erected.
10/17/01	Balance Of Plant Substantial Completion achieved.
10/20/01	Full commercial operation was achieved pursuant to the PPA (75 percent, or 67 turbines, commissioned and producing power).
11/14/01	Final turbine commissioned.
11/20/01	Substantial Completion achieved pursuant to the Turbine Supply and Installation Agreement.
5/21/02	Final completion under the Balance Of Plant Agreement achieved.

Operations and Maintenance

NIW maintains property and commercial general liability insurance coverage. All-risk property insurance covers all events, (e.g., flood, fire, lightning, etc.), with some exclusions, such as war, etc. This policy also includes coverage for non-warranty turbine and infrastructure breakdowns. Business interruption coverage addresses potential production and tax credit revenues if the project operation is interrupted or limited. Commercial general liability covers loss or injury to third parties. Fire and theft insurance is also maintained on the maintenance building.

NIW has entered into three contracts for operations & maintenance of the Top of Iowa wind farm. All high voltage preventative maintenance and repair services are subcontracted to Alliant Energy. Wind farm management and administration services are performed by Zilkha Renewable Energy. Operations and Maintenance Services (O&MS) are provided by NEG Micon.

Zilkha provides NIW with accounting, audit, contract management, project performance analysis, regulatory compliance, reporting, warranty administration, risk management and management services. Zilkha's on-site project manager is responsible for management, administration, supervising and maintenance functions. Such activities include comprehensive accounting functions.

Zilkha Renewable Energy's responsibilities include:

- Invoicing of Interstate Power Company
- All accounting, audit and financial reporting requirements

- Marketing and administration of the project's "green credits" or "Renewable Resource Credits"
- Supervising NEG Micon's operations of the wind farm
- Community and landowner relations
- Insurance administration
- Fulfilling all statutory and permitting requirements
- Investor relations
- All warranty claims under the NEG Micon wind turbine supply agreement

NEG Micon provides the Top of Iowa wind farm with O&MS through a five-year operations and maintenance agreement at a fixed cost per year. After the five-year warranty period, it is anticipated that Zilkha Renewable Energy will take over operations and maintenance, or that the contract with NEG Micon would be renewed. NEG Micon's scope of work includes all scheduled and unscheduled inspections and repairs, including all parts and consumables; operation of the turbines; and blade pitching. Furthermore, NEG Micon agreed to use commercially reasonable efforts to provide O&MS services at off-peak times to maximize revenues to the project. NEG Micon guaranteed average availability of 97 percent per year and pays NIW an amount that compensates the wind farm for revenue that would have otherwise been generated if availability drops below this threshold level. In turn, NIW pays NEG Micon an incentive averaging $0.02 per kWh if the availability exceeds 97 percent.

NEG Micon hired the O&M team, consisting of a site manager and five to six turbine technicians and support staff, while the company's technical staff was on site constructing the wind farm. The O&M staff gained experience during the turbine erection and commissioning process and is currently responsible for day-to-day operations and preventative maintenance of the wind turbines.

The staff will perform daily monitoring of the wind farm operation through the central Supervisory Control and Data Acquisition (SCADA) monitoring and control system and visual inspection of the turbines. Routine maintenance, including lubrication, calibration, and inspection, is performed according to the equipment manufacturers scheduled plan. Occasional repairs will be performed as required. The interconnection facilities are typically inspected monthly. Routine communications with System Operation and Control is on an "as-required basis." NEG-Micon provides remote, manned, 24-hour monitoring and restarting of turbines. On site personnel are on call during non-working hours. NEG Micon will supply turbine spare parts if necessary.

NEG Micon's U.S. headquarters are located about six hours east of the Top of Iowa Wind Farm in Rolling Meadows, IL. The close proximity of these facilities will provide the project quick access to spare parts and to additional NEG Micon technicians if needed. Scheduled maintenance on the turbines is performed semi-annually, according to NEG Micon's recommended O&M procedures. The actual maintenance dates for the first year can be found in Attachment D. Maintenance outages are scheduled to minimize interruption of delivered energy. Turbine maintenance is accomplished cyclically during the project lifetime. Substation and transformer maintenance is performed annually while pole-line maintenance is accomplished bi-

annually. Maintenance power outages are scheduled during no- or low-wind periods and during off-peak hours.

Unplanned maintenance issues during the first year consisted of:

1. Replacing one gearbox due to the incorrect grinding of gear teeth during the manufacturing process. This caused pitting and ultimate fracture of several teeth.
2. An unusually high rate of bearing failures occurred in the generators. Extensive testing was done to determine the cause of the bearing failures. Preliminary results determined the problem to be ineffectiveness of the lubrication.

Table 3. Unscheduled Maintenance

Date	Wind turbine #	Component	Description
10/13/2001	T88	Generator	Defective Winding
11/1/2001	T12	Generator	Lack of Grease or Faulty Bearing
11/1/2001	T72	Generator	Defective Winding
12/8/2001	T48	Generator	Front Bearing Completely Damaged
1/18/2002	T29	Generator	Front Bearing Completely Damaged
1/24/2002	T87	Generator	Rear Bearing Failed
2/1/2002	T75	Generator	Bearing Failed
2/27/2002	T76	Generator	Front Bearing Completely Damaged
3/1/2002	T63	Generator	Front Bearing Completely Damaged
3/6/2002	T45	Generator	Both Bearings Changed
3/23/2002	T10	Generator	Front Bearing Completely Damaged
4/23/2002	T60	Generator	Rear Bearing Making Loud Noise
4/15/2002	T11	Gearbox	Intermediate Gear Has Broken Teeth
5/14/2002	T73	Generator	Front Bearing Making Loud Noise
5/28/2002	T52	Generator	Bearing Vibration Test Failed
5/29/2002	T18	Generator	Bearing Vibration Test Failed
5/31/2002	T15	Generator	Bearing Vibration Test Failed

6/1/2002	T37	Generator	Bearing Vibration Test Failed
7/17/2002	T12	Generator	Rear Bearing Making Noise
11/28/2002	T75	Generator	Rear Bearing Completely Damaged
12/11/2002	T04	Generator	Rear Bearing Completely Damaged
12/13/2002	T73	Generator	Bearing Vibration Test Failed
12/14/2002	T76	Generator	Bearing Vibration Test Failed
12/21/2002	T18	Generator	Rear Bearing Completely Damaged
12/24/2002	T87	Generator	Rear Bearing Completely Damaged

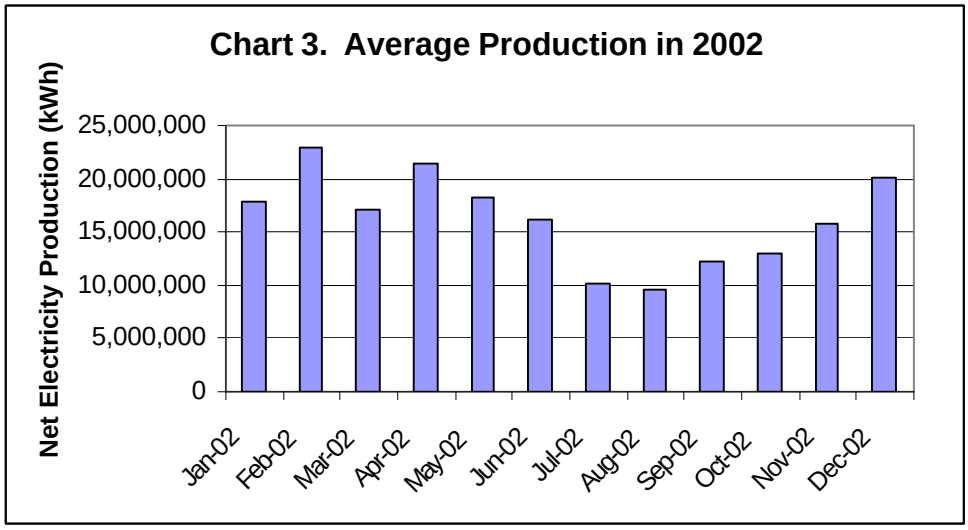
Production data

The Top of Iowa wind farm was projected to produce 240,000 MWH per year, or enough power for approximately 24,000 homes.

The turbines performed as expected for the actual wind experienced. However, the average wind speed experienced for 2002 was below the long-term average, and plant production was at 90 percent of the generation projection, producing 194,316,245 kWh. The annual project output is based upon the long-term average wind speed. Annual variations are anticipated. The first year plant availability was 96.5 percent, or slightly better than the first year forecast of 95.5 percent, and 97.4 percent for the last six months of the year.

Table 1: 2002 Net Electricity Production

Month	**Net Electricity Production in kWh**
January 2002	17,837,930
February 2002	22,978,315
March 2002	17,028,800
April 2002	21,422,100
May 2002	18,147,000
June 2002	16,173,400
July 2002	10,057,600
August 2002	9,661,300
September 2002	12,177,500
October 2002	12,972,900
November 2002	15,777,700
December 2002	20,081,700



Economic Benefits

The construction process created over 200 jobs, 20 of which went to local residents. Seven permanent operation jobs were created:

- One project administrator employed by Zilkha.
- Six operations and maintenance personnel employed by NEG Micon.

The construction process also resulted in impact payments for soil compaction or damage to crop acres, totaling more than $250,000 to landowners surrounding the turbine sites. The Top of Iowa Wind Farm pays more than $200,000 per year, which ultimately escalates to more than $350,000 by the 25th year for all ongoing payments. Since well under 100 acres of land were taken out of agricultural production for the project, landowners are receiving more than $2,000 per turbine per year for the land that they had formerly dedicated to the growing of corn and soybeans.

Even with the special property tax assessment, Top of Iowa will pay Worth County more than $6,000,000 in taxes over the next 20 years.

Federal tax revenue during the first 10 years are off-set by the Production Tax Credit (PTC) and accelerated depreciation deduction for renewable energy property. The total federal Production Tax Credits earned by the project are projected to total more than $4 million per year for the first 10 years of operation. This is calculated by multiplying the PTC by the kWh produced over time. Beginning in approximately the seventh year of the project, the federal tax burden increases to approximately $1.5 million per year and slowly escalates to more than $3 million per year, by year fifteen. The increase in projected tax revenue is largely attributable to the end of the accelerated depreciation eligibility. Likewise, state income taxes become effective in the twelfth year of the project and are projected to total several hundred thousand dollars per year in the fifteenth year.

The combination of local job creation, payments to landowners, increased property tax receipts, and utilizing alternative energy resources all produce positive results for the local area.

Environmental Issues

The Top of Iowa wind farm will displace energy ordinarily produced by coal or natural gas. Both of these fuels originate from outside of Iowa. Coal is mined throughout the United States. Domestic gas reserves in the United States are declining and the country is increasingly dependent on foreign sources of natural gas imported through liquefied natural gas (LNG) transport systems. Virtually 100 percent of new electricity generation is fueled by natural gas. Electricity generated from wind, which displaces fossil fuels, is likely to have a net benefit on the environment in terms of avian impacts and air quality benefits.

Expected avian impacts
According to the American Wind Energy Association, studies at wind plants across the country have shown that avian mortality at most potential sites is low, 1 to 2 birds per turbine per year or less. Other studies have shown that birds and bats will collide with wind turbine blades or towers and that, in some instances, it may have a significant impact on local breeding bird populations.

Avian mortality is expected to be minor at the Top of Iowa wind farm site, but NIW has agreed to participate with the Iowa Department of Natural Resources in a two-year avian impact study, starting in the spring of 2003. The Top of Iowa Wind Farm provides a unique opportunity to assess the impacts of a wind farm on resident and migratory birds in a traditionally high bird-use area. The objectives of this study are to determine bird and bat mortality during the spring and fall migration periods, determine bird and bat species abundance, flight patterns and mortality risk at turbine sites versus non-turbine sites, and determine impacts of the turbines on waterfowl use of croplands. This study will be concluded in December 2005.

Air quality benefits
Each turbine offsets more than 11,000 pounds of carbon dioxide, sulfur dioxide, and nitrogen oxides on an average day -- pollution that would otherwise be released by fossil fuel use. The wind farm offsets more than 370 million pounds of pollution linked to smog, acid rain, and green house effect annually.

Attachments

Attachment A - As-Built Site Map of the Top of Iowa Wind Farm

Attachment B - Top of Iowa Wind Farm's Preliminary Electrical System Layout

Attachment C – Top of Iowa Milestone Schedule

Attachment D – Top of Iowa Maintenance Schedule