

***Findings and Recommendations
Orleans Citizens Wind Committee***

Environmental / Health & Safety Considerations



Part Two

- C. Electronic & Electromagnetic Interference***
- D. Stray Voltage AKA Ground Current***
- E. Construction Disruption***
- F. Earthquake Seismic Effects***
- G. Fire Risks & Fire Department Needs***
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III. Article IV Local Law Small Wind Conversation Systems

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I. Introduction to Orleans Citizens Wind Committee Recommendations Part Two

The members of the Orleans's Citizens Wind Committee were given the charge of reviewing the existing Orleans wind law; Local Law No 1 2007 for Wind Facilities and determine if this law may or may not adequately protect residents in the Orleans community that will reside adjacent to industrial turbines in the designated "**overlay district**". Orleans Local Law or Zoning Ordinance has one purpose and that is to **protect the health, welfare and public safety of residents living in an industrial wind farm**. The citizens Wind Committee was not given the charge to determine the existence of and/or provide the economic potential for a wind farm in Orleans.

After thoroughly studying the existing wind law and wind development this committee has determined through substantiated scientific facts that the Local Law in its present format does not adequately protect the Orleans community. Through the course of eight months this committee has determined that the present local law protecting the residents is based on wind developer's basic "industrial wind development standards". These "standards" set in the present local law are the setbacks and noise levels. This committee had to determine using scientific research and substantiated facts as to whether these "standards" can coexist within the Orleans environment and still protect the community from potential industrial turbine impacts.

The Committee had to address recommendations on the most critical concerns in the Local Law on noise levels and turbine safety setbacks first. These two categories have been documented in Part One, "Shadow Flicker/Safety Setbacks and Noise/Sleep Interference". This document was submitted to the Town Council on August 13, 2009. In document Part One this committee also included the committee's; Introduction and Scope, Committee Members Biography, Work to Date, Information on Committee Research, Recommendation for a Complaint Resolution Board, Catalog of Referenced documents, Terms and Definitions and a Suggested Wording for Noise Ordinance for Orleans Wind Ordinance using the Committee's recommendations. These categories are not repeated in this document.

During our course of study and research of wind development it was determined that the Orleans's Local Law lacked other areas of potential concerns that affected the health, welfare and public safety for residents in Orleans that will live in and/or adjacent to the wind overlay district. The consensus of this committee felt a responsibility to address these concerns and provide recommendations to the council for consideration to be included in Orleans Local Law No 1 2007 for Wind Facilities.

This document "Part Two, Environmental Health and Safety Considerations" includes the following categories of research for your review:

Electronic & Electromagnetic Interference, Stray Voltage, Construction Disruption, Earthquake Seismic Effects, Fire Risks & Fire Department Needs, Ground Water Impacts & Protection of Aquifers, Lightning Protection, Lighting Turbine Towers, Storm Water and Runoff Erosion, Road Upkeep & Repair, Security (Vandalism/Terrorism) and Radon.

The recommendations by this committee follows each category. References pertaining to each of these categories has been converted to either one or two formants; (1) in a pdf document designated in light blue then placed on a cd for your review. (2) a website address is listed in dark blue.

Included in this document, the committee reviewed and has commented on the existing provisions in Article IV for Small Wind Energy Conversion Systems for Orleans.

In addition, you will find at the end of this document a category "Summary Orleans Citizens Wind Committee Recommendations". This section lists both Part One and Part Two of the committee's recommendations submitted to the Council.

The Committee fully realizes that the Town Board may want to discuss and understand the Wind Committee's Recommendations and Findings with the Committee and encourages the Board to meet with them to discuss the Findings or Recommendations.

J. Stephen Bingeman Chair

Judy Tubolino, Vice Chair

Patricia Booras-Miller

Rosemary Forbes

William Di Trinco

Darryl Hyde

Date

II. Environmental Health & Safety Considerations Part Two

A. Shadow Flicker/Safety Setback - See Part One

B. Noise/Sleep Interference - See Part One

C. Electronic & Electromagnetic Interference

Telephone reception, both land line and cell phone, along with adequate television reception is vital to any community. Both of these tools are a part of our everyday life. Telephones are used to contact emergency services for help. Television broadcasting informs homes for school closings and employed workers when severe weather is in our area. Residents in rural areas are located many miles from schools and employment.

Research shows that electronic and electromagnetic interference are problems that can occur inside or close to WECS locations. The problems found were:

Static interference or "ghosting" which occurs when the signals are reflected off the turbine towers. Following turbine construction, an increase in the amount and severity of ghosting was seen. Then there is the dynamic interference caused by the production of a secondary or interference signal reflected from the rotating turbine blades, seen as a periodic variation in picture brightness or color.

A recent article was written in the Thousand Islands Sun on April 29, 2009 "Channel 7, Fox 28 Expecting Interruptions" which explained in detail this concern.

Based on previous studies, North America's video signal standard called NTSC, suggests that interference may occur with HDTV. It is expected that HDTV would be less likely to suffer the static (tower-related) effects but more likely to suffer dynamic (blade spinning) interference which would take the form of frozen frames and pixilation. Research papers suggest that other wireless and/or broadcast consumer services would suffer similarly, including cellular and wireless networking services. ("A Simplified Guide to the NTSC Video Signal", pdf <http://www.seanet.com/~bradford/ntscvideo.htm>).

Electronic (cell phone and TV) interference is the second highest major complaint by residents. In the Town of Eagle near Buffalo, the community of Bliss New York which has 67 turbines (height is 265 ft with setbacks of 1000 ft) has a severe impact with electronic and electromagnetic interference. Committee member Judy Tubolino had the opportunity to speak directly with Town of Bliss Supervisor J. Kushner. Supervisor Kushner states that this is the number one complaint by their residents. This complaint supersedes even the noise complaints. Supervisor Kushner's advice is that Orleans perform an extensive review with developers preconstruction regarding tower placements and signal interference locations. Their developer is Noble.

Preventative measures can reduce or even eliminate these issues, but they must be taken during WECS project planning stages. Wind energy companies need to factor in the location of all local radio communications towers, over-the-air RF links and areas of served populations. In Trempealeau County WI their local law states that their developer must provide sites of communication towers and TV transmission corridors along with the turbine sites on their pre-construction maps for any proposed wind project. Trempealeau County Local Law requirements to avoid potential reception impacts are: (a) A one thousand (1,000) feet microwave communication corridor between turbines must be maintained if the turbine facility is located between transmission towers. (b) Communication tower – Wind turbine setback shall be at least one (1) mile to prevent signal interference. (Trempealeau County WI Wind Ordinance 11/28/07, Page 9 (231) #20; [pdf](#)).

One mitigation measure, when signal degradation results from wind turbines for TV interference, is replacing off-air reception with cable or satellite systems. The Town of Orleans has many locations that do not offer their residents the capability of connecting to a cable broadcast system. The town may consider this an option as part of the application process with a proposed developer. Mitigation measures for telephone interference must be done pre-construction. It is the sites of the turbine machines that will indicate if this problem exists. Developers engineering and design firms have access to State and Federal communication towers that would affect broadcasts from transmitters.

Recommendation:

Town of Orleans shall require the WECS operator and at least one independent engineering firm to conduct pre and post construction signal evaluations for television, cell phone and wireless network interference. The WECS operator shall provide, in their wind development site proposal map locations of all communication towers and TV reception corridors in addition to the turbine site placements. The Town shall require the WECS operator to restore signals to pre-construction levels at its own expense or resolve at the direction of the complaint board.

D. Stray Voltage AKA Ground Earth-Current

The concern raised by this committee regarding stray voltage and earth-current from wind turbine generators impacting local dairy and livestock farms in our community was discussed.

If a system is not properly wired, the grounded point(s) at which a system is grounded can develop a voltage that can push current through the earth and end up contacting unintended objects. Hence the name "stray voltage".

No one disputes that this primarily affects cattle, whose legs are far enough apart to stand on two points where different voltage levels in the ground exist. The cow may or may not feel this voltage difference depending on the level and duration of the exposure per America Wind Energy Association (AWEA) pdf page 21"Guide for State and Local Governments" <http://maec.msu.edu/Guide%20for%20MPSC%20Rule%20web.pdf>.

Research into the existence of turbine stray voltage is worldwide and are affects from both large and small wind turbines. Livestock are ten times more sensitive to electricity and electronic interference than humans, as they are often standing in water or on moist area locations near the barn such as manure and in fields. (Each square foot of manure storage surface area would collect about 3.5 cu ft, or 26.1 gallons, of precipitation each year. Ref: Lewis County Ag Digest pg 3 July 2007)

Research informs us that the farmer bears the burden of "stray voltage" affecting his livestock. AWEA, American Wind Energy Association states on page 2 from their document "Residential Wind Systems and "Stray Voltage" (pdf) that "these problems are a direct result of poor grounding practices, improper or inadequate wiring, or the breakdown of insulation in old wires or loads. In other words, they are problems on a particular customer's side of the utility billing meter that result in electricity seeking an alternate path back to the generating source, the utility." Which of course is the turbine.

Research informs us that farmers located in wind farms with livestock have had a costly expense of the burden to fix the problem. Large dairy farms have had out of pocket expenses up to \$50,000.00 trying to correct the problem. (Pages 8 to 10 "Final Report Lincoln WI Moratorium Committee" pdf.) The side effects from impacts to livestock is damaging to farmers. It is a must that the problem of "stray voltage" be corrected

LV-S-5 Voltage Detector being used with Tester



This committee feels that the "welfare" of residents who own dairy and livestock producing farms are at risks in the Town of Orleans. It is important for the Town of Orleans to be concerned for the future of our dairy farmers. Industrial turbines are a electrical producing machine. Livestock and milk producing farmers that will be located in and adjacent to industrial turbines must be informed pre-construction of the potential hazards to their livestock prior to a wind farm development. Every farmer must be encouraged to have adequate "voltage" testing of their facilities prior to turbines being erected

around where their livestock will be. Agricultural and State Agencies have documents that can be of help to the council and farmers for preconstruction testing. There are several types of testing instruments and they vary in costs. Jefferson County has agencies such as the Cooperative Extension and Northern New York Agricultural Development Program as well as New York State Farm Bureau to seek advice for names of qualified businesses that perform stray voltage testing. Cornell also offers an article "Reduce the Risks of Stray Voltage" by Richard Peterson [pdf](#) and <http://www.ansci.cornell.edu/pdfs/pd2008aprilp39.pdf>. Some instruments are simple in nature such as a hand held voltmeter to the advanced high tech computerized systems as show below which is a mobile testing unit.



SVD2000 Mobile Contact Voltage Detection System

Conclusion:

Orleans should be concerned about stray voltage that may have the potential to affect the welfare of our dairy and livestock farmers living adjacent to the industrial turbines. In addition the developer must properly install industrial turbines according to both federal and state regulations of the National Electric Code as well as maintaining these regulations for the life of the turbines.

Recommendation:

Orleans shall require any CW ECS project to meet the latest version National Electric Code for the life of the project.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

E. Construction Disruption

Wind developers try to keep the initial construction phase of industrial wind farm installations to a relatively short period of time such as 12 to 18 months if possible. Construction disruption is a major impact to residents during this phase. Research informs us that developers work very hard to get the development done in as little time as possible. Regardless of the time element the construction phase affects the health, safety and welfare of the residents living in and adjacent to the project. Research showed this committee that the construction phase has site specific causes for concerns to our residents safety while studying the construction phase. These are addressed for your review in the following categories in this document: *H; Ground Water Impacts & Protection of Aquifers, K; Storm Water Runoff Erosion and L; Road Upkeep & Repair.*



WECS facilities, particularly the turbines themselves, are extremely large construction processes, resulting in infrastructure impacts to Orleans as well as to the individual landowners. Orleans needs to put in place rules and complaint resolution to govern this process.

(Pictured here is the pad preparation for one turbine from the Cohocton Wind Farm NY)

The Clayton Horse Creek project DEIS informs us the preparation pad for each of our turbines is 400 ft in diameter;

<http://www.iberdrolarenewables.us/horsecreek/> Appendix A - Project Construction 05030.

Considerations include:

- Roadways: Disruption to existing traffic patterns; wear and tear on roadways
- Temporary and permanent access roads
- Utilities: relocation and/or addition of power lines
- Communications lines and poles
- Possible relocation or addition of cell and/or TV transmission towers
- General: generation of dust
- Quarry operations
- Drainage issues
- Well Water impact
- Construction noise

Installation will require transporting heavy equipment and significant quantities of stone, gravel and concrete by trucks in rapid succession for each turbine base. Road dust is a

major concern by residents during construction. Wolfe Island residents have offered videos of their experience: See <http://www.youtube.com/watch?v=P-via0ec-AY>.

Wind turbine components are delivered to the installation site by "oversized" trucks. These trucks carrying turbine blades require wide turning lanes and specific routes based on bridge weight capacities. Turbine components and blades may require regular interruptions of traffic patterns. Developers have to obtain authorization by NYS Department of Transportation, the County Highway Dept. and the Town Highway Dept. to approve their traffic routes. National Grid is also involved due to overhead "electrical wires" that need to be relocated for transport of turbine parts.

Recommendation:

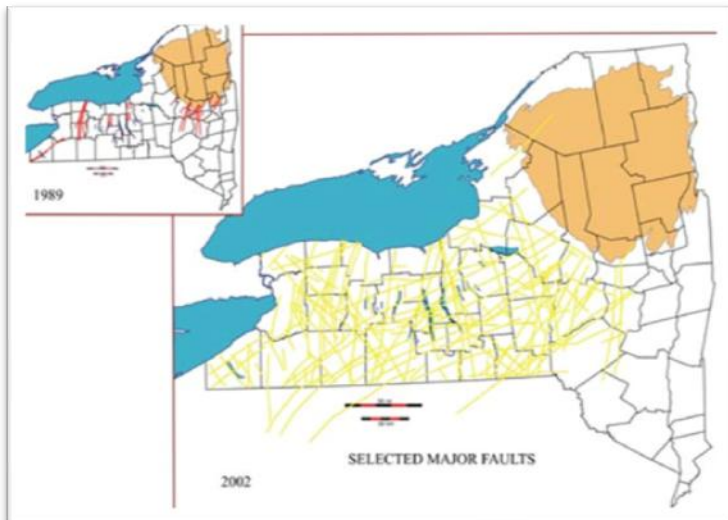
The developer shall be required to submit regular scheduling reports to the Town, indicating work completed to date, in progress and scheduled; this report shall include locations, construction routes and impacted property lots. The developer and/or an independent oversight agency should be required to actively monitor and address dust levels via standard construction techniques. Any impact reports submitted with application should address proposed routes, overhead obstructions and any necessary electrical or communications lines changes that would be made. The Town shall specify a limit on hours of heavy operation to a reasonable time frame. The Town shall consider the safe placement of new access roads.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

F. Earthquake Seismic Effects

Seismic activity is not unknown to townships located in New York State along Lake Ontario and the St. Lawrence River. In fact hundreds of earthquakes have been

recorded in northern New York. The first being recorded in 1733. The still visible results of unrecorded seismic events is apparent if you hike on Grindstone Island in Clayton, NY.



The Township of Orleans is one of many that are located in the major St. Lawrence fault zone. The St. Lawrence Fault is active. The origin of this fault begins at the northeastern part of Lake Ontario

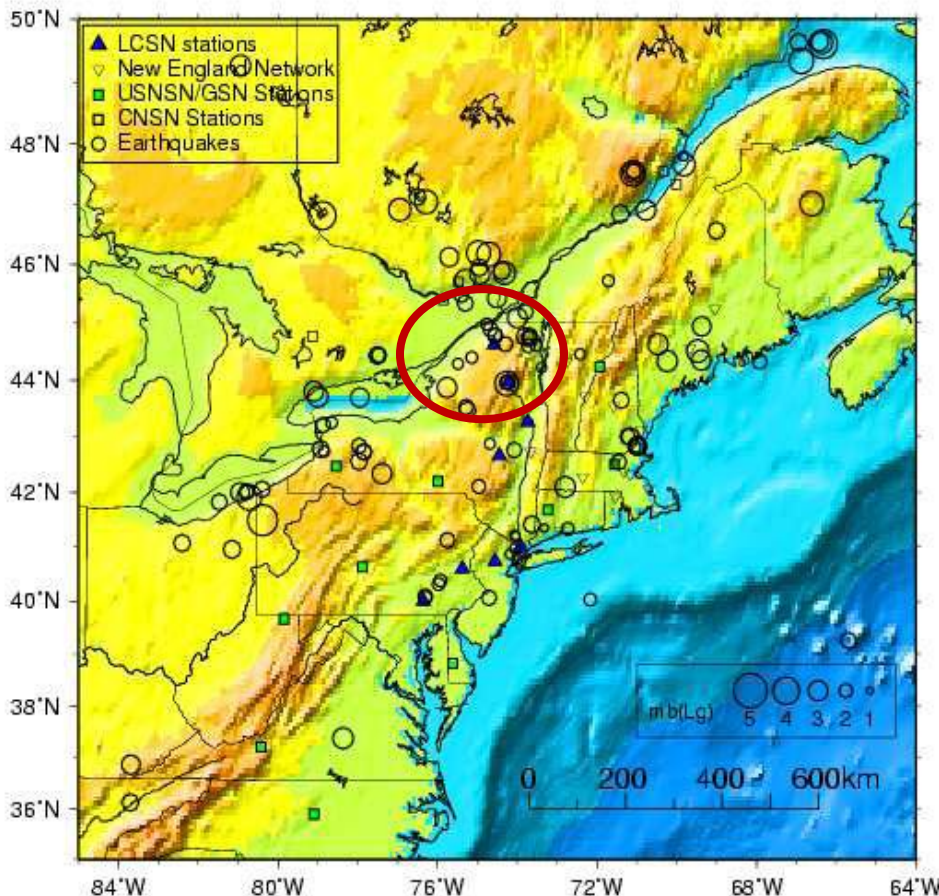
extending upstream to Massena, NY (USA) and Cornwall, Canada (Ontario Providence). In 1997, numerous submarine dives uncovered paleotectonic bedrock faults (shifting of plates from original origin).

A report by J.L. Wallach Geosciences Inc in Science Direct (Volume 353, Issues 1-4, 23 August 2002, Pages 45-74 [pdf](#)) "The presence, characteristics and earthquake implications of the St. Lawrence fault zone within and near Lake Ontario (Canada–USA) states " these attributes, combined with the large earthquakes associated with the St. Lawrence fault zone well to the northeast of Lake Ontario suggest that the seismic risk in the area surrounding and including Lake Ontario is likely much greater than previously believed".

Since 1990s with advances in modern technology and space travel, New Yorkers are part of an ongoing cooperative seismic network systems called the Lamont Cooperative Seismic Network (LCSN) which connects to the National Seismic System. New York State has seismographic stations located at the State University of New York at Potsdam and the Adirondack Community College. These are just two of the nine seismic reading stations located in New York who are continuously monitoring seismic

activity along the St. Lawrence Fault Zone.

Earthquakes Recorded by LCSN, 1998-2001



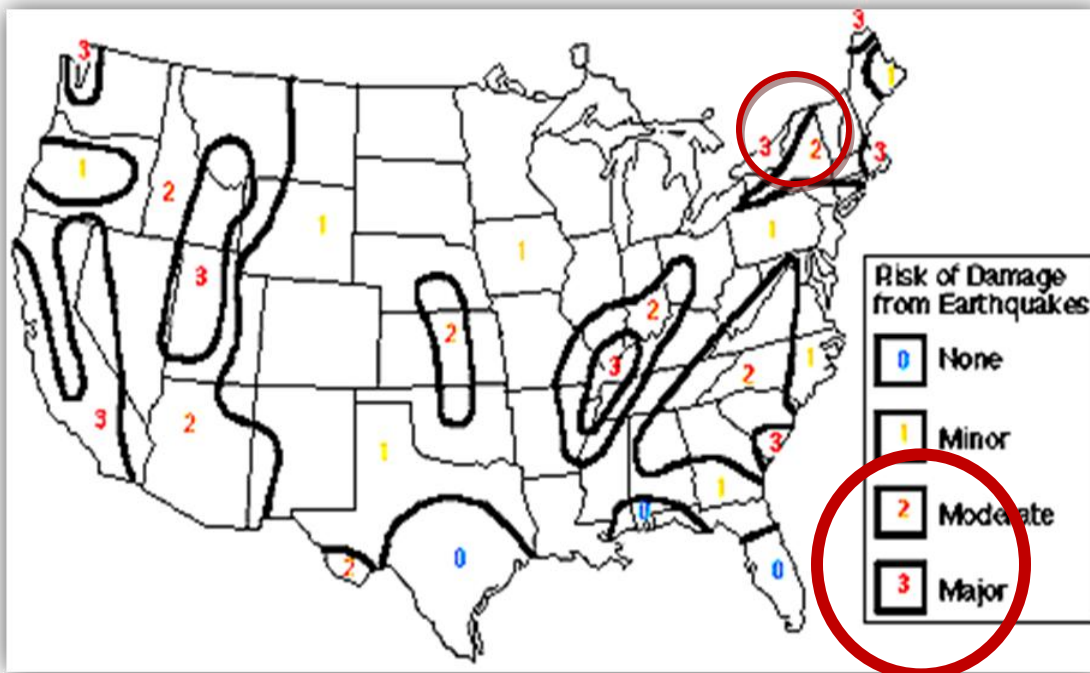
During the period of July 1, 1998 through June 30, 2001, Lamont Cooperative Seismic Network recorded over 120 earthquakes in the northeast. These earthquakes ranged from a magnitude of 1.2 to 5.4. (see figure below)

This data shows epicenters of the earthquakes that have occurred during July 1, 1998 through June 30, 2001 in the northeastern

U.S. and southeastern Canada recorded at LCSN stations (circles). The circle size is proportional to the size of the earthquakes. Seismographic stations in the region are plotted for reference: LCSN stations (solid triangles), New England Network (inverted triangles), the Canadian National Seismograph Network (CNSN) (open squares) and USNSN (solid squares). (Lamont Cooperative Seismic Network and the National Seismic System: Earthquake Hazard Studies in the Northeastern United States., pdf http://www.ldeo.columbia.edu/LCSN/Report/LCSN_Tech_Report-98-01.pdf)

A few areas of the mid-western and eastern United States are more prone to earthquakes than others. The most earthquake-prone areas include Charleston, South Carolina, eastern Massachusetts, *the St. Lawrence River area* and the central Mississippi River Valley. Others sections of this part of the country are prone to earthquakes, but can expect fewer quakes of smaller magnitude.

Below is a map showing the risk of damage by earthquakes for the continental United States. " Risks of Damage from Earthquakes" See figure below (<http://www.geo.mtu.edu/UPSeis/area.htm>) The figure below shows that we are at risk level 2 (the second highest in the nation).



The recognition of faults and their histories allows a better understanding of seismic risks and the design requirements required to prevent major collapses of bridges, buildings and other structures like wind turbines, that can be designed to be earthquake resistant. In many cases this involves designing structures which fail in a soft failure mode, that is, the structures may be damaged by the earthquake and require significant repairs or replacement, but they do not create undue safety problems during or immediately after

the quake. The fault studies are therefore extremely useful in helping to evaluate these risks.

The Department of Geology of State University of NY at Buffalo monitors the earthquakes and acquires data which promotes active participation of educational institutions and emergency management organizations in the northeastern U.S. and collaborates with these organizations in acquiring and disseminating the earthquake information for education, public earthquake preparedness and hazards studies.

Earthquakes typically last a relatively short time, usually measured in seconds. This means that the likelihood of completely stopping a rotating turbine in this period of time would be questionable. Therefore a static analysis is an incomplete analysis. The dynamics of a Rotating Turbine Field caught in a 100 year worst case Seismic Event should be analyzed by an independent professional, and funded by the developer, to determine if the proposed design and proposed spacing of Turbines should be modified in any way to preclude undue Health and Safety Risks to Orleans Community.

The committee has viewed video of recent turbines that have been toppled due to excessive loading and/or from vibration induced into the turbine blades, causing a blade to clip the tower at its base, bringing the whole rotating assembly to the ground. It is concerned that a major seismic event could be an extremely dangerous situation.

Applicants should be required to have unbiased professionals analyze and provide documentation to Orleans of their analysis of the best practices required to minimize the serious results of a major seismic event on an operating Wind Farm, and document the likelihood of this resulting in serious Safety Risks to citizens living in or adjacent to the proposed wind farm.

Developers must prepare a earthquake preparedness manual available for the town of Orleans.

The committee is also concerned that seismic activity, which causes shifting of land masses below ground, can be a potential hazard causing stress to turbine foundations. The committee believes that the applicant should consider establishing a computerized communication network link from the Orleans power station to either the Potsdam seismic activity station or directly to the data link in Buffalo to be kept aware of seismic activity.

Conclusion:

This committee findings are that Orleans lies in close proximity to a major seismic fault with activity which indicates that developers must be prepared for the possibility of impact to our environment and their industrial turbines if a major earthquake should occur.

Recommendation:

Orleans shall require that the Town of Orleans select and the WECS developer fund an independent Engineering Study and produce a complete report on the likely effect of seismic activity consistent with historical data on all the Wind Farm Facilities.

Due to the fact that Orleans environment lies on the St. Lawrence seismic fault the developer must submit an earthquake preparedness manual to the Town for protecting the residents in the event of an earthquake of sufficient magnitude to affect the operation of any part of the wind farm.

It is recommended that the Developer educate and share with the Town of Orleans volunteer fire department and the department of public works their safety mechanisms and protocol for continued quality assurance on safety standards when seismic events occur.

G. Fire Risk & Fire Department Needs

In the “Summary of Wind Turbine Accident data to 31 March 2009“, by Caithness Wind Farms Information Forum (www.caithnesswindfarms.co.uk/accidents.pdf) it shows that fires are the second most common related accidents in industrial wind farms. A total of 129 fire incidents were found with 2 fire accidents badly burning wind industry workers.



The biggest problem with turbine fires is that, because of the height, the fire dept. can do little but watch it burn itself out. In a storm, burning debris can be scattered over a wide area causing damage to forest areas and buildings or structures.

The Bethany report refers to one incident where burning debris was thrown 495 ft. setting the hillside and public right of way on fire. (page 16, Report From The Bethany Wind Committee") [pdf](#)

According to the “Emergency Management Guidelines for Wind Farms“ (http://www.cfa.vic.gov.au/documents/CFA_Guidelines_For_Wind_Farms.pdf & [pdf](#)) Fire can arise from a number of sources such as malfunctioning turbine bearings, inadequate crankcase lubrication, electrical shorting or arcing occurring in transmission and distribution facilities.

Recommendations:

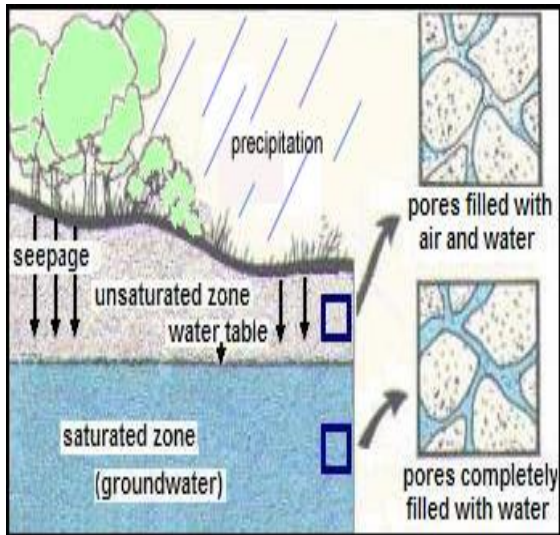
The Town of Orleans requires any WECS developer provide necessary fire-fighting equipment and fire department training at its own expense. The WECS developer must also submit a fire protection and emergency response plan acceptable to the Orleans Town Board, created in consultation with the Orleans Fire Department having jurisdiction over the proposed district.

Orleans requires that each turbine be clearly labeled with a postal address compatible with the 911 emergency system to facilitate locating the fire.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

H. Ground Water Impacts & Protection of Aquifers

A. Ground Water and Environment in Orleans:

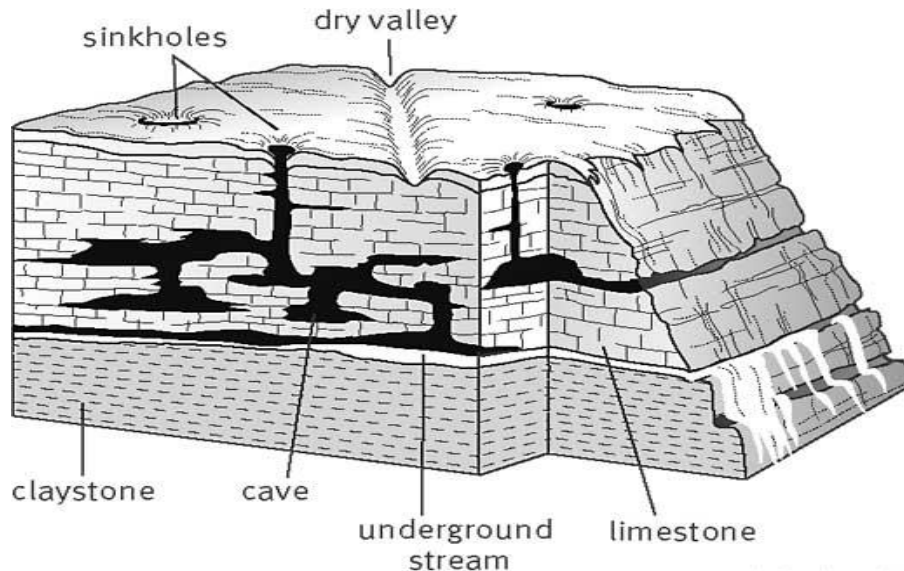


Orleans is inundated with numerous wetlands. The ground coverage is an average of 1 to 3 ft of soil and then carbonate - sandstone rock layers are formed which sits on an aquifer system.

We contacted the NYS DEC department at their head Environmental Office in Troy, NY. Both the Federal USGS (U.S. Geological Survey), US Department of Interior and the NYS DEC work together. They were helpful in providing us with guidance and statistics in locating information on the geology of the Orleans Environment.

B Krast Topography

A key environment description in the geology of our land in Orleans is Krast topography (Figure 3). Orleans has multiples of Krast ground water feeds throughout our township. The Stone Mills (Tamarac) river has Krast movement. Tamarac runs on surface then takes a dive into an underground cave. In addition we have "sink holes" in our area. Krast topography lies above the aquifer system.



Elizabeth Morales Figure 3 Krast topography

C Blasting for Foundations Ground Water Impacts

Unless carefully considered, blasting for turbine foundations will occur due to the existence of shallow limestone in the Town of Orleans. This is a serious issue/problem that can affect drinking well water and damage underwater aquifers.

Since the topsoil is so thin, it is possible that fracturing the rock below the soil may allow seepage into the aquifer.

It is recommended to apply constraints that the foundations have to be dug without the use of blasting. Workers are to use pneumatic hammers, rather than blasting. New York State Department of Environmental Conservation, Division of Environmental Permits responded to the Clayton's Horse Creek DEIS their concerns regarding "impacts" on the environment in the Horse Creek project. Their comments on page 16 and 17 on "Geology and Ground Water Impacts" ([pdf](#)) recommends that due to the Krast environment here that a comprehensive survey of Krast features be performed

pre-construction. The potential for aquifer damage by blasting is evident in this report. NYS DEC recommends (page 17 paragraph 3) "that a plan be prepared that specifies procedures for conducting detailed subsurface investigations at turbine site locations"

During the construction phase of wind development, the rural roads in Orleans will have to be widened to 20 ft plus to accommodate large heavy road equipment. Developers must use contaminants to reduce dust control which increases by 100 percent "road runoff" contaminants mitigating ground surface and wetland waters resulting in:

- Turbidity (due to land clearing, excavation)
- pH changes due to concrete spills and infiltration into ground water
- road deicing (used during cold weather on roads)
- herbicide use (used to kill and control over grown vegetation)
- dust suppression (chemical used to keep road dust down)

The Town of Cherry Valley, NY hired an engineering firm to perform a pre-construction survey for ground water impacts. (Reference on cd with [pdf](http://otsego2000.org/documents/NikPressleyReport.pdf). <http://otsego2000.org/documents/NikPressleyReport.pdf>)

Conclusion:

A high percentage of residents in the Town of Orleans rely on their ground water for survival. Even though we have only a superficial review of existing geological information on the town it warrants a major field of investigation for impacts if the Town of Orleans has industrial turbines constructed. The Horse Creek industrial wind project received a response from the NYS DEC on the project which states "geology describes underlying bedrock in the project area as Ordovician Limestone of the Black River Group. It states that PPM Energy's offered very little review and very inadequate geological engineering study on foundation construction impacts to ground water from construction of the turbines which in NYS DEC words states "will likely encounter". NYS DEC states that the local municipalities that rely on this aquifer water system include LaFargeville, Black River, Brownville, Evans Mills and Theresa. NYS DEC indicated that PPM Energy's DEIS lacked adequate plan by prepared engineering firms with expertise and experiences in construction projects that include Krast areas. NYS DEC response to Clayton and Orleans on the Horse Creek wind project is valuable to this committee because this State authority has informed us of the potential concern for our residents from ground water impact by turbines construction in Orleans.

Recommendation:

To ensure the protection of surface and ground water resources surrounding wind project area(s) in the Town of Orleans:

Limit Blasting. It is recommended to apply constraints that the foundations have to be dug without the use of blasting. Workers are to use pneumatic hammers, rather than blasting.

Ground water investigation, survey, fate and impact analysis of identified contaminants relative to identified wells, and wetland impact analysis.

A comprehensive preconstruction survey of Krast features be conducted in the Town of Orleans by a qualified engineering firm experienced and knowledgeable in Krast geology. This survey will include the proposed wind district and extend to one mile geologically beyond the surrounding wind project.

Well testing be performed preconstruction of all wells within one mile of the project area by a unbiased firm chosen by the Town and paid for by the developer applicant.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

I. Lightning Protection

The protection of industrial turbines from lightning damage is increasingly important as turbines increase in size and are placed in locations where access to carry out repairs may be difficult. Turbine blade manufactures are constantly working with new technology to improve blade tips. Blade tip destruction by lightning is costly for developers as well as a high risk maintenance problem for workers. This committee encourages Orleans lease owners to investigate fully the developer's history as well as the turbine manufacture for past history of the number of post-construction blade and gear box changes. This can be costly to our leasers due to the fact that heavy equipment (cranes and etc) will potentially be necessary to repair the problem.

As blades are the most common attachment point of lightning, they must be adequately protected. In addition, the passage of lightning current through wind turbine bearings introduces a risk of lightning damage to these vital components.

Lightning strikes are a wind turbines worst enemy. Without effective lightning protection, both the blades and the turbine itself can be severely damaged by the powerful energy surges in lightning. In the US the National Lightning Safety Institute " Lightning Hazard Reduction at Wind Farms; pdf www.lightningsafety.com/nlsi_lhm/wind1.html



Severe damage to a blade (left)

A lightning strike on an unprotected blade can lead to temperature increases of up to 30,000°C and result in an explosive expansion of the air within the blade. This can cause damage to the blade surface, delaminating, cracking on both the leading and trailing edge, as well as melted glue. Lightning strikes can also cause hidden damage that over time will result in a significant reduction of the blade's service life. "Taming The Power of Lightening" by

LM Glassfiber manufactures of turbine blades, pdf <http://www.lmglassfiber.com/Products/Lightning.aspx>.

Investigations relating to the improvement of blade lightning protection systems have been carried out, including experiments designed to address the difficult problems involved in the protection of hydraulic cylinders used for tip brake control.

Work has also focused on the ability of lightning current to cause damage to wind turbine bearings. The work has been a mixture of computer simulations and experimental testing using high-voltage and high-current facilities.

Recommendation:

The Town shall require adequate conducting path from the tip of each turbine to the ground, using a multi-receptor system, to minimize lightning damage to turbines. The Town shall require turbines be sited at 3000 ft or 10 times the diameter of rotor blade, whichever is greater, from residential, historic, schools and wildlife refuse areas.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

J. Lighting Turbine Towers

American Wind Energy Association publication; "Wind Turbine Lighting" 5/14/05, (Ref: pdf on cd and <http://www.nrel.gov/docs/fy02osti/31115.pdf>) states that lighting the perimeter of wind projects with simultaneously flashing lights is sufficient to indicate one large obstacle to pilots and that only one light is needed on each turbine nacelle. On February 1, 2007 the US Department of Transportation Federal Aviation Administration has amended the Federal Aviation Administration's standards for marking and lighting structures to promote aviation safety "FAA Advisory Circular: Obstruction Marking and Lighting" pdf www.windaction.org/documents/7912.

There is an avian concern as steady burning red lights can attract birds and place them in danger. Night-migrating birds are attracted to the lights and fly in circles around the towers. The FAA is testing simultaneously flashing red lights that do not appear to attract night-migrating birds.

Residents near communication towers find that red lights are less intrusive than white lights, because white lights can direct a significant amount of light to the ground.

Development of Obstruction Lighting Standards for Wind Turbine Farms (Reference: www.airtech.tc.faa.gov/safety/downloads/TN05-50.pdf -and on pdf: pg 16 and 17) states that obstruction lights within a group of hazardous objects should have unlighted separations or gaps of no more than ¼ to ½ mile if the group appearance is to be maintained. This is especially critical if the arrangement of objects is essentially linear, as is the case with most groupings of wind turbines.

Recommendation:

The Town require the WECS developer to select a configuration of minimal lighting which meets FAA requirements. Use red lights being tested by FAA. Any strobing light will be required to be equipped with an RF choke and an adequate neutral pursuant to National Electric code IEEE 519 standards. Minimum downward directed security lighting for ground level facilities shall be allowed as approved on the site plan.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

K. Storm Water Runoff, Erosion & Sedimentation

Clearing and soil disturbance is required in order to erect the turbines, access roads, foundation excavation, laying underground cabling, the erection of the overhead

transmission lines and the formation of areas to be used for storage areas, and a site office, etc.

Water quality issues of concern include increases in runoff, erosion and resulting sedimentation. Adverse impacts include:

- Degradation of high quality waters, failure to meet water quality standards,
- adverse habitat impacts, such as loss of habitat
- loss of wetland functions and values.

Construction for access roads need to be relatively wide in order to accommodate the size of machinery and equipment needed to erect wind turbines. Access road construction may involve extensive grading, cuts, and fills.

The amount of cleared vegetation area may be significant, and must be analyzed for aesthetic impacts and wildlife impacts as well as erosion and water quality concerns.

Stream crossings may be a concern. Stream crossing can cause erosion and sedimentation resulting in water quality impacts. The Town may want to request the installation of bridges rather than culverts for crossings of permanent streams in order to minimize stream and riparian impacts. Pertinent information on erosion and sedimentation control can be found in " Section 3-H Erosion and Sedimentation Control Plan, including Phosphorus Impact Analysis and Control Plan " ([pdf http://www.maine.gov/doc/lurc/projects/Evergreen/Part%20H%20Erosion%20and%20Sedimentation%20Control.doc](http://www.maine.gov/doc/lurc/projects/Evergreen/Part%20H%20Erosion%20and%20Sedimentation%20Control.doc))



This photo is from the Highland Wind Farm construction project in Cambria, PA.:

<http://www.braymanconstruction.com/pdf/HighlandWind.pdf>.

The Highland Wind Farm project consists of 25 turbines.

<http://highlandwindfarm.com/project.htm>.

This environment closely resembles that of upstate New York (numerous wetlands and streams).

Requirements set in the New York State's "Standards and Specifications for Erosion and Sediment Control" mandate that an erosion and sediment control plan be prepared when industrial disturbances are imminent. (Reference [pdf http://www.dec.ny.gov/chemical/29066.html](http://www.dec.ny.gov/chemical/29066.html)).

Recommendations:

Construction site monitoring and inspection by a professional, who is independent of the project developer, is essential for effective storm water and erosion management control. Because of the hydrologic variability, a standard site-specific EIS (Environmental Impact Study) should be required. The WECS Applicant should be required to provide a description of the impacts that the proposed Wind Energy Facility may cause and a description of how the Applicant will mitigate impacts. This analysis shall include: a description of baseline conditions and the impacts that the proposed use may cause. The Applicant should be required to provide a preliminary plan showing any existing and proposed grading for the Wind Energy Facility site. A drainage and erosion control plan should be required, accompanied by a description of practices that will be utilized to prevent erosion and run-off during construction. If there are any modifications to this plan, the Applicant will provide a final drainage and erosion control plan prior to commencement of construction. Soil loss predictions for each turbine location must be made using RUSLE (*Revised Universal Soil Loss*) equations. Some state required studies require a full year data set using a plan to address all points covered by the Storm Water Pollution Prevention Plan (SWPPP) check list as per New York state standards.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

L. Road Upkeep & Repair

Components delivered to the installation site by truck would be of significant weight.



Nacelles, typically delivered on two sections, can have a total weight of 80 tons. Unassembled cranes, typically transported in as many as 15 trucks, can weigh as much as 450 tons.

Construction photo from Cohocton.

Due to the weight of parts and equipment, it is likely that damage would occur to any roads used by the WECS developers, even with infrastructure reinforcement

improvements prior to construction.

WECS developers are often required to submit proposed construction routes and timetables to the Town for approval. The Town may choose to have construction routes posted primarily on county roads or primarily on a few central roads to contain the damage.

Construction photo from Cohocton.



Developers are typically required to return the roads to town/county specifications once the project is completed. Standard language in ordinances suggests that roads should be completed to the satisfaction of the Town Highway Supervisor and that a surety bond or other financial instrument should be established to ensure the completion of this task. The State of Kansas offers excellent example of this recommendation in their book; "Wind Energy Handbook: Guideline Options for Kansas Cities and Counties" Pages 23 and 24. ([pdf](#)

http://www.kansasenergy.org/Kansas_Siting_Guidelines.PDF).

Developers should construct the smallest number of turbine access roads it can. Access roads should be low-profile roads so farming equipment can cross them. Where an access road is to cross a stream or drainage way, it should be designed and constructed so runoff from the upper portion of the watershed can readily flow to the lower portion of the watershed. Also, FEMA regulations pertaining to building a structure in a flood zone for Region II (New York) should be followed. (FEMA Region II Hazard Mitigation Plan Toolkit: Risk Assessment, <http://www.fema.gov/about/regions/regionii/mitigation.shtm>).

Recommendations:

The town require the WECS developer to submit proposed construction routes to the town for approval, restore all roads to county and town specifications, within one month of the developer's last use of such road, and submit a surety bond or other financial instrument to ensure that road repair is completed. The town require the WECS developer to submit an analysis of impact on local transportation regarding impacts anticipated during construction, reconstruction, modification or operation of WECS. Transportation impacts to be considered shall include potential damage to local road surfaces, road beds and associated structures, potential traffic tie-ups by haulers of WECS materials, impact on school bus routes and visitors to the WECS facility.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

M. Public Access At Turbine Sites - Security (Vandalism / Terrorism)

During visits by the committee to the Maple Ridge Wind facility in Lowville the committee has concerns regarding the physical security by the developer around the turbine sites. The Maple Ridge facility is 29 miles long and has a sparse population of full time residents. However Maple Ridge does have seasonal visitors participating in outdoor recreation; ATV trails, snowmobiling, hikers and hunters. Maple Ridge also surrounds a vast State Recreational Park which allows accessibility for recreation.

The Orleans community including the Amish farmers is highly populated more so than the Maple Ridge facility. The Orleans wind "overlay" district is much smaller than Maple Ridge. Orleans community has a large number of hunters, ATV and snowmobile participants. Our Amish community lives off their lands. Orleans land owners have freely allowed with permission their neighbors, friends and family to participate in these activities. It concerns this committee to question the welfare of citizens who will have access to participate in recreational activities in close proximity of turbines. It is recommended by this committee that the developer hold informational meetings to the public, the Amish community and the schools regarding participating in recreation and hunting activities in close proximities to turbine sites. The developer needs to inform the citizens of the necessary



precautions that the community must adhere to in order to participate in hunting and recreational activities while living next to turbines.

The committee recommends that applicants should have each turbine secured and provided with remote intrusion monitoring as well as the central monitoring point. Each turbine *base* should be enclosed by a 12 ft chain link fence.

General Electric, Harrisburg, PA has released a patent for a wind turbine monitoring system having a central monitoring device for one or more wind turbines. The central monitoring device is capable of receiving signals from one or more wind turbines. The wind turbines each include one or more cameras arranged and disposed to provide visual signals transmittable to the central monitoring device. The visual signals generated by the cameras provide sufficient information to the central monitoring device to determine whether maintenance to the wind turbine is required. A method for providing maintenance to a wind turbine is also disclosed. Visual signals include images wherein vandalism is visible. General Electric Corp., Harrisburg, PA "Wind Turbine Maintenance System" (Ref: <http://www.faqs.org/patents/app/20090153656>, and [pdf](#)).

Research from the Bethany Wind Committee Report; section 15, page 30 describes their committee's research while visiting Maple Ridge Wind facilities in 2006 ([pdf](#)); "During our trip to Maple Ridge, committee members walked right into the central monitoring station unchallenged. Such lax physical security is not acceptable for a facility providing electricity to our national grid. Each turbine should be secured and provided with remote intrusion monitoring as well as the central monitoring point." Committee members, Patricia Booras-Miller and Judy Tubolino participated in a Maple Ridge tour in 2008, hosted by the Planning Board of the Town of Clayton and found PPM Energy/Iberdola has in effect this recommendation by the Bethany Wind Committee. They informed the tour that no unauthorized personnel is allowed in the central computerized monitoring station.

Recommendation:

The Town shall require the WECS operator, in addition to randomized two-token authentication for Internet protection, to enact and maintain physical security protocols including locks and remote intrusion monitoring of the control center.

The town shall require the WECS operator to place visual monitoring devices on turbines.

The town shall require the developer to install a 12 foot high chain link fence surrounding the concrete base of the turbine.

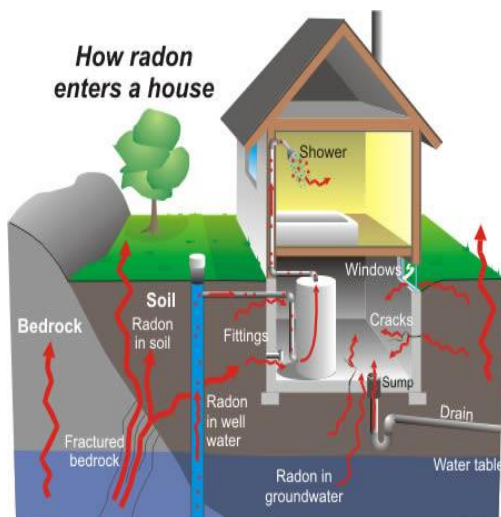
Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

N. Radon

On September 22, 2009 The World Health Organization Press Release: " Radon gas has been identified as the leading cause of lung cancer for non-smokers according to recent studies conducted throughout the world. The World Health Organization states that as many as 14% of the lung cancer cases in many countries (including the United States) are caused by exposure to radon gas. These recent findings have led to the establishment of a new standard for action of 2.7 for indoor radon levels". The World Health Organization has released their Handbook on Indoor Radon which strongly validates the worldwide threat of exposure to radon gas. According to handbook, WHO has been studying the effects of radon exposure since 1979. (WHO Radon Handbook, [pdf http://whqlibdoc.who.int/publications/2009/9789241547673_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241547673_eng.pdf)).

Radon is a colorless, odorless, radioactive gas which is created naturally by the breakdown of uranium and radium. Radon gas is continuously released from rocks and soil containing these two elements. Uranium and radium may be found in almost all soil and rock, but are most often associated with those containing granite, shale, and phosphate. Once formed, radon itself decays into other radioactive elements, known as "radon daughters" or "progeny". The rate at which a radioactive element decays is expressed as its half-life. (A half-life is the time it takes for half of a radioactive element in a sample to decay into another element.) Radon has a half-life of about three days; its daughter particles all have half-lives of less than half an hour. NYS Attorney General Andrew Cuomo "Radon: The Invisible Intruder" (Ref [pdf http://www.oag.state.ny.us/environmental/radon_brochure.pdf](http://www.oag.state.ny.us/environmental/radon_brochure.pdf))

The Surgeon General has declared radon exposure to be the second leading cause of lung cancer deaths in the United States, after smoking. Exposure to natural radon is estimated to be responsible for 7,000 to 30,000 lung cancer deaths each year in the United States. As with other forms of cancer, lung cancer resulting from exposure to radon may develop over many years before it is diagnosed. New York State Department of Health: Dr. Michael Kitto and Dr. Charles Kunz, Laboratory of Inorganic and Nuclear Chemistry (Ref [pdf http://www.wadsworth.org/databank/aug-00.html](http://www.wadsworth.org/databank/aug-00.html))



A. Exposure to Radon:

Radon gas continuously seeps into the air from uranium- and radium-bearing soil and rock. Outdoors, due to dilution in the ambient air, concentrations are generally so low as to be insignificant. However, if the gas becomes trapped in a poorly ventilated, enclosed space, the concentrations will build up. This can be a problem in any structure built on rocks or soil naturally emitting this gas. Any home may have elevated radon levels.

Figure 1

Conclusion:

Radon exposure to humans has become a serious concern by the World Health Organization, the EPA and the United Nations ([pdf](http://www.unscear.org/docs/reports/2006/09-81160_Report_Annex_E_2006_Web.pdf) http://www.unscear.org/docs/reports/2006/09-81160_Report_Annex_E_2006_Web.pdf).

Radon is found throughout Northern Jefferson County Townships which includes Orleans and Clayton. The naturally occurring radon can be disturbed when the developer blasts during construction for each turbine, underground cables and for above ground transmission line poles.

Recommendation:

The town shall require the developer to perform pre and post construction of not less than 6 months testing for radon gas in homes that are located within one mile of all blasting locations. The developer will provide results of both the pre and post construction testing to the Town and to the resident. If radon testing is positive from the post construction testing, the developer is financially responsible to pay all radon mitigation fees.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

III. Small Wind Energy Conversion Systems Article IV Local Law

Orleans Local Law No 1 2007 for Wind Energy Facilities includes a separate section, Article IV, for the application of small wind energy in the Orleans wind overlay district. Like large wind applications, restrictions apply to small wind as well.

To meet our nations rally for increasing alternative energy resources small wind turbines are included in this demand. There are increasing numbers of residents who want to erect small wind turbines on their properties. The costs incentives for these applications are increasing in all states across the US. In New York, we have New York State Energy Research and Development Authority also known as NYSERDA has "On Site Small Wind in New York-Cash Incentives Available".

<http://www.powernaturally.org/Programs/Wind/incentives.asp?i=8>

Many townships are considering small wind facilities in lieu of large wind. New York NYSERDA states: "An on-site or small wind power energy system can provide consumers in windy locations with a cushion against electric power price increases.

Wind energy systems not only help customers reduce their electricity purchases from utilities, they also help reduce U.S. dependence on fossil fuels, and they are nonpolluting. Cash incentives for installing wind energy are available in New York and vary between 15-70% depending on the installation". Power Naturally: http://www.powernaturally.org/Programs/Wind/OnSite_SmallWind.asp?i=8

In addition to NYSERDA, the American Wind Energy Association know as AWEA offers instructions and guidelines for applications for small wind facilities. AWEA 2008 publication "In the Public Interest How and Why to Permit for Small Wind Systems A Guide for State and Local Governments" ([pdf](#)) offers the town and residents helpful information.

As with large wind turbines, small wind turbines generate noise and shadow flicker. Review of the Orleans local law on small wind facility generators show that protective measures for residents is adequate. Our Local Wind Law has protection for residents living adjacent to small wind turbines from noise impacts. Our Local Law stipulates the use of the New York State Environmental Conservation (DEC) noise guidelines "Assessing and Mitigating Noise Impacts" ([pdf](#)) ". Orleans noise ordinance states: "a Small WECS shall be designed, installed, and operated so that noise generated by the system shall not exceed ambient noise levels (exclusive of the development proposed) by more than 6 dBA at the nearest property line to any proposed Small WECS". (Orleans Local Law page 14 [pdf](#)).

One of the concerns by the committee has in review of the qualifications is the height requirements. This was due to the fact that NYSERDA cash incentives are on towers 80 up to 100 ft tall. After consulting with the with the town zoning officer, variances can be issued and as we have Article V for waivers in the local law, this is not a problem.

The second concern is that of compliant and mitigation measures therefore, the committee recommends that small wind facilities are to be included in the Complaint Board process..

Recommendation:

Complaint Board: Complaint resolution including mitigation and any fines assessed to the owner of the small WECS to be handled at the discretion of the Complaint Board and the Town Board.

IV. Catalog of Referenced Document

(Research is listed according to categories)

Numerous documents were reviewed by the committee to substantiate the committee's conclusion for the recommendation. The committee offers the council two formats for referencing the documents; a CD with a pdf of each document (the pdf on cd is identified in [light blue](#)) and URL of the website location is referenced in dark blue..

C. Electronic & Electromagnetic Interference

1. "A Simplified Guide to the NTSC Video Signal", [pdf](#) and <http://www.seanet.com/~bradford/ntscvideo.html>
2. Thousand Islands Sun on Wednesday April 29, 2009 "Channel 7, Fox 28 Expecting Interruptions"
3. Trempealeau County WI Wind Ordinance 11/28/07, Page 9 (231) #20; [pdf](#).
4. Boston Scientific "Electromagnetic Interference (EMI) and Implantable Device Systems [pdf](#);
http://www.bostonscientific.com/templatedata/imports/HTML/CRM/A_Closer_Look/pdfs/ACL_EMI_and_Implantable_Devices_080408.pdf

D. Stray Voltage AKA Ground Current

1. America Wind Energy Association (AWEA) [pdf](#) page 21 "Guide for State and Local Governments"
<http://maec.msu.edu/Guide%20for%20MPSC%20Rule%20web.pdf>.
2. AWEA, American Wind Energy Association states on page 2 from their document "Residential Wind Systems and "Stray Voltage" [pdf](#)
3. "Final Report Lincoln WI Moratorium Committee" Pages 8 to 10 [pdf](#).
4. "Reduce the Risks of Stray Voltage" by Richard Peterson, Cornell [pdf](#) and <http://www.ansci.cornell.edu/pdfs/pd2008aprilp39.pdf>

E. Construction Disruption

1. <http://www.iberdrolarenewables.us/horsecreek/> Appendix A - Project Construction 05030. Horse Creek DEIS
2. Wolfe Island dust <http://www.youtube.com/watch?v=P-via0ec-AY>
3. Town of Bethany, Wind Committee Report; [pdf](#), pages; 12-13

F. Earthquake Seismic Effects References:

1. "The presence, characteristics and earthquake implications of the St. Lawrence fault zone within and near Lake Ontario (Canada–USA)", [pdf](#), and <http://www.ScienceDirect.com> Volume 353, Issues 1-4, 23 August 2002, Pages 45-74

2. Lamont Cooperative Seismic Network and the National Seismic System: Earthquake Hazard Studies in the Northeastern United States., pdf
http://www.ldeo.columbia.edu/LCSN/Report/LCSN_Tech_Report-98-01.pdf
3. "Risks of Damage from Earthquakes", pdf and
<http://www.geo.mtu.edu/UPSeis/area.htm>

G. Fire Risk & Fire Department Needs References:

1. Summary of Wind Turbine Accident data to 31 March 2009, pdf and
<http://www.caithnesswindfarms.co.uk/accidents.pdf>
2. Emergency Management Guidelines for Wind Farms, pdf and
http://www.cfa.vic.gov.au/documents/CFA_Guidelines_For_Wind_Farms.pdf
3. Town of Bethany, Wind Committee Report; pdf. page 16

H. Ground Water Impacts & Protection Aquifers

1. U.S. Geological Survey, US Department of Interior, Ref;"Ground Water Quality in the St. Lawrence River Basin 2005-06" pdf
2. New York and New England Carbonate-Rock Aquifer;
http://pubs.usgs.gov/ha/ha730/ch_m/gif/M085.GIF
3. NY State Department of Conservation Comment Report on the DEIS Horse Creek Wind Farm PPM Energy/Iberdola 2007; pages 16-18 pdf "Geology and Ground Water Impacts".
4. The Town of Cherry Valley, NY hired an engineering firm to perform a pre-construction survey for ground water impacts, pdf and
<http://otsego2000.org/documents/NikPressleyReport.pdf>
5. Town of Bethany, Wind Committee Report pdf, page 17
6. Town of Union, WI Large Wind Turbine Citizens Committee Report; page 88 pdf

I. Lightning Protection

1. The National Lightning Safety Institute "Lightning Hazard Reduction at Wind Farms; pdf www.lightningsafety.com/nlsi_lhm/wind1.html
2. Severe damage to a blade "Taming The Power of Lightening" by LM Glassfiber manufactures of turbine blades, pdf
<http://www.lmglassfiber.com/Products/Lightning.aspx>
3. When lightning strikes wind turbines II pdf and www.wind-watch.org/news/2009/04/14/when-lightning-strikes-wind-turbines-ii/
4. Town of Bethany, Wind Committee Report; pdf, page 25

J. Lighting Turbine Towers

1. American Wind Energy Association publication; "Wind Turbine Lighting" 5/14/05 pdf <http://www.nrel.gov/docs/fy02osti/31115.pdf>
2. FAA Advisory Circular: Obstruction Marking and Lighting pdf www.windaction.org/documents/7912
3. Development of Obstruction Lighting Standards for Wind Turbine Farms pdf www.airtech.tc.faa.gov/safety/downloads/TN05-50.pdf -pg 16 and 17

K. Storm Water Runoff, Erosion & Sedimentation

1. Section 3-H Erosion and Sedimentation Control Plan, including Phosphorus Impact Analysis and Control Plan - pdf www.maine.gov/doc/lurc/projects/Evergreen/Part%20H%20Erosion%20and%20Sedimentation%20Control.doc
2. Highland Wind Farm Construction and project <http://www.braymanconstruction.com/pdf/HighlandWind.pdf>.
3. The New York State Standards and Specifications for Erosion and Sediment Control pdf www.dec.ny.gov/chemical/29066.html
4. FHWA/Environmental Review Toolkit/project development/ NEPA- pdf www.environment.fhwa.dot.gov/projdev/docueis.asp
5. Developing your Storm Water Pollution Prevention Plan pdf <http://128.113.2.9/~kilduff/Stormwater/EPA%20swppp%20guide.pdf>
6. Erosion and Water Quality Concerns for Industrial Scale Wind Turbines and Wind Test Towers pdf www.vermontwindpolicy.org/workingpapers/erosion.pdf
7. "Wind energy and the environment" pdf www.awea.org/faq/wwt_environment.html

L. Road Upkeep & Repair

1. "Wind Energy Handbook: Guideline Options for Kansas Cities and Counties" Pages 23 and 24. (pdf http://www.kansasenergy.org/Kansas_Siting_Guidelines.PDF).
2. FEMA Region II Hazard Mitigation Plan Toolkit: Risk Assessment, <http://www.fema.gov/about/regions/regionii/mitigation.shtm>
3. Town of Bethany, Wind Committee Report; pdf Page 29

M. Public Access at Turbine Sites - Security (Vandalism / Terrorism)

1. General Electric Corp., Harrisburg, PA "Wind Turbine Maintenance System" pdf <http://www.faqs.org/patents/app/20090153656>, pdf
2. Town of Bethany, Wind Committee Report; pdf Page 30

N. Radon

1. World Health Organization "Radon Handbook", pdf http://whqlibdoc.who.int/publications/2009/9789241547673_eng.pdf
2. NYS Attorney General Andrew Cuomo "Radon: The Invisible Intruder" (Ref pdf http://www.oag.state.ny.us/environmental/radon_brochure.pdf)
3. New York State Department of Health: Dr. Michael Kitto and Dr. Charles Kunz, Laboratory of Inorganic and Nuclear Chemistry pdf <http://www.wadsworth.org/databank/aug-00.html>
4. US Environmental Protection Agency "A citizens Guide to Radon" March 26, 2009 pdf <http://www.epa.gov/radon/pubs/citguide.html>
5. United Nations (pdf http://www.unscear.org/docs/reports/2006/09-81160_Report_Annex_E_2006_Web.pdf).

III. Small Wind Energy Conversion Systems Article IV Local Law

1. NYSERDA "On Site Small Wind in New York-Cash Incentives Available". <http://www.powernaturally.org/Programs/Wind/incentives.asp?i=8>
2. In the Public Interest How and Why to Permit for Small Wind Systems A Guide for State and Local Governments" (pdf)
3. New York State Environmental Conservation (DEC) noise guidelines "Assessing and Mitigating Noise Impacts" (pdf)
4. Orleans Local Law page 14 pdf

Referenced: Community Wind Law/Ordinances *Used in all Categories*

1. Town of Union Rock County, Wisconsin Ordinance No 2008-06 (pdf) <http://betterplan.squarespace.com/town-of-union-wind-ordinance/>
2. Trempeleau County Chapter 21 Law (pdf) <http://betterplan.squarespace.com/the-trempeleau-county-wind-ord/>
3. Town of Allegany, New York Wind Energy Regulations Aug 2007 (pdf) http://www.garyabraham.com/files/wind_laws/town_allegany_wind_energy_law_adopted_8-28-07.pdf
4. Town of Orleans, Local Law No 1 2007 for Wind Facilities (pdf)

V. Summary of Orleans Citizens Wind Committee Recommendations Part One and Part Two

A. *Shadow Flicker/Safety Setback Recommendation:*

The consensus of the Orleans Wind Committee is that the Turbines be set back at least 3000 ft or 10 Turbine Rotor Diameters (whichever is greater) from the property lines and from nearby affected roads/intersections to avoid significant Flicker Problems.

It is also recommended that the Town shall specify coating materials or effects in zoning.

The Town should also specify a setback distance from property lines and roadways to eliminate shadow flicker.

The Town should also require shutdown of the turbines during periods of peak flicker if that becomes a problem.

The Town should require the WECS developer to mitigate any unexpected shadow flicker effects promptly at its own expense.

B. *Noise/Sleep Interference Recommendation:*

The Wind Committee's consensus is that the Town of Orleans adopt a new noise ordinance in Local Law No 1 2007 for Wind Facilities that follows the spirit of the Guidelines written pro-bono by two well known and respected Acoustical Engineers, George Kamperman and Richard James put forth in the "Simple Guidelines for Siting Wind Turbines to Prevent Health Risks". Kamperman-James Ver 2.1

Kamperman and James recommendations have 3 major parts:

- Establishing pre-construction long term background noise levels that exist now.
- Establishing wind turbine sound immersion limits that the wind farm must meet.
- Post construction wind farm noise compliance testing.

Sound Limits:

Audible Noise Limit dBA: No wind turbine or group of turbines shall be located in Town of Orleans wind district that cause an exceedance of the pre-construction night-time background sound levels by more than 5 dBA.

Test sites are to be located at the property line(s) of the receiving non-participating property(s).

Not to exceed 35 dBA (LAeq) within 100 feet of any occupied structure.

Low Frequency Noise Limit dBC : Low Frequency Noise
Limit LAeq – LA90 = 20 dB or less

C. *Electronic & Electromagnetic Interference Recommendation:*

Town of Orleans shall require the WECS operator and at least one independent engineering firm to conduct pre and post construction signal evaluations for television, cell phone and wireless network interference. The WECS operator shall provide, in their wind development site proposal map locations of all communication towers and TV reception corridors in addition to the turbine site placements. The Town shall require the WECS operator to restore signals to pre-construction levels at its own expense or resolve at the direction of the complaint board.

D. *Stray Voltage AKA Ground Current Recommendation:*

Orleans shall require any CWECS project to meet the latest version National Electric Code for the life of the project.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

E. *Construction Disruption Recommendation:*

The developer shall be required to submit regular scheduling reports to the Town, indicating work completed to date, in progress and scheduled; this report shall include locations, construction routes and impacted property lots. The developer and/or an independent oversight agency should be required to actively monitor and address dust levels via standard construction techniques. Any impact reports submitted with application should address proposed routes, overhead obstructions and any necessary electrical or communications lines changes that would be made. The Town shall specify a limit on hours of heavy operation to a reasonable time frame. The Town shall consider the safe placement of new access roads.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

F. *Earthquake Seismic Effects Recommendation:*

Orleans shall require that the Town of Orleans select and the WECS developer fund an independent Engineering Study and produce a complete report on the likely effect of seismic activity consistent with historical data on all the Wind Farm Facilities.

Due to the fact that Orleans environment lies on the St. Lawrence seismic fault the developer must submit an earthquake preparedness manual to the Town for protecting the residents in the event of an earthquake of sufficient magnitude to affect the operation of any part of the wind farm.

It is recommended that the Developer educate and share with the Town of Orleans volunteer fire department and the department of public works their safety mechanisms and protocol for continued quality assurance on safety standards when seismic events occur.

G. *Fire Risks & Fire Department Needs Recommendation:*

The Town of Orleans requires any WECS developer provide necessary fire-fighting equipment and fire department training at its own expense. The WECS developer must also submit a fire protection and emergency response plan acceptable to the Orleans Town Board, created in consultation with the Orleans Fire Department having jurisdiction over the proposed district.

Orleans requires that each turbine be clearly labeled with a postal address compatible with the 911 emergency system to facilitate locating the fire.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

H. *Ground Water Impacts & Protection of Aquifers Recommendation:*

To ensure the protection of surface and ground water resources surrounding wind project area(s) in the Town of Orleans:

Limit Blasting. It is recommended to apply constraints that the foundations have to be dug without the use of blasting. Workers are to use pneumatic hammers, rather than blasting.

Ground water investigation, survey, fate and impact analysis of identified contaminants relative to identified wells, and wetland impact analysis.

A comprehensive preconstruction survey of Krast features be conducted in the Town of Orleans by a qualified engineering firm experienced and knowledgeable in Krast geology. This survey will include the proposed wind district and extend to one mile geologically beyond the surrounding wind project.

Well testing be performed preconstruction of all wells within one mile of the project area by a unbiased firm chosen by the Town and paid for by the developer applicant.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

I. *Lightning Protection Recommendation:*

The Town shall require adequate conducting path from the tip of each turbine to the ground, using a multi-receptor system, to minimize lightning damage to turbines. The Town shall require turbines be sited at 3000 ft or 10 times the diameter of rotor blade, whichever is greater, from residential, historic, schools and wildlife refuse areas.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

J. Lighting Turbine Towers Recommendation:

The Town require the WECS developer to select a configuration of minimal lighting which meets FAA requirements. Use red lights being tested by FAA. Any strobing light will be required to be equipped with an RF choke and an adequate neutral pursuant to National Electric code IEEE 519 standards. Minimum downward directed security lighting for ground level facilities shall be allowed as approved on the site plan.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

K. Storm Water, Runoff Erosion Recommendation:

Construction site monitoring and inspection by a professional, who is independent of the project developer, is essential for effective storm water and erosion management control. Because of the hydrologic variability, a standard site-specific EIS (Environmental Impact Study) should be required. The WECS Applicant should be required to provide a description of the impacts that the proposed Wind Energy Facility may cause and a description of how the Applicant will mitigate impacts. This analysis shall include: a description of baseline conditions and the impacts that the proposed use may cause. The Applicant should be required to provide a preliminary plan showing any existing and proposed grading for the Wind Energy Facility site. A drainage and erosion control plan should be required, accompanied by a description of practices that will be utilized to prevent erosion and run-off during construction. If there are any modifications to this plan, the Applicant will provide a final drainage and erosion control plan prior to commencement of construction. Soil loss predictions for each turbine location must be made using RUSLE (*Revised Universal Soil Loss*) equations. Some state required studies require a full year data set using a plan to address all points covered by the Storm Water Pollution Prevention Plan (SWPPP) check list as per New York state standards.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

L. Road Upkeep & Repair Recommendation:

The town require the WECS developer to submit proposed construction routes to the town for approval, restore all roads to county and town specifications, within one month of the developer's last use of such road, and submit a surety bond or other financial instrument to ensure that road repair is completed. The town require the WECS developer to submit an analysis of impact on local transportation regarding impacts anticipated during construction, reconstruction, modification or operation of WECS. Transportation impacts to be considered shall include potential damage to local road surfaces, road beds and associated structures, potential traffic tie-ups by haulers of WECS materials, impact on school bus routes and visitors to the WECS facility.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

M. Public Access At Turbine Sites - Security (Vandalism /Terrorism)

Recommendation:

The Town shall require the WECS operator, in addition to randomized two-token authentication for Internet protection, to enact and maintain physical security protocols including locks and remote intrusion monitoring of the control center.

The town shall require the WECS operator to place visual monitoring devices on turbines.

The town shall require the developer to install a 12 foot high chain link fence surrounding the concrete base of the turbine.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

N. Radon Recommendation:

The town shall require the developer to perform pre and post construction of not less than 6 months testing for radon gas in homes that are located within one mile of all blasting locations. The developer will provide results of both the pre and post construction testing to the Town and to the resident. If radon testing is positive from the post construction testing, the developer is financially responsible to pay all radon mitigation fees.

Complaint Board: Complaint resolution including mitigation and any fines assessed to the developer to be handled at the discretion of the Complaint Board and the Town Board.

III. Small Wind Energy Conversion Systems Article IV Local Law

Recommendation:

Complaint Board: Complaint resolution including mitigation and any fines assessed to the owner of the small WECS to be handled at the discretion of the Complaint Board and the Town Board.