Submission of Comment Related to

EBR – 010 – 6516
EBR – 010 – 6708

# Proposed Ministry of the Environment Regulations to Implement the Green Energy and Green Economy Act, 2009

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Submitted By

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Background:

These comments are based on the material provided in the following Ministry of the Environment Publications:

1. Proposed Content for the Renewable Energy Approval Regulation Under the Environmental Protection Act – 24 pages of notes dated June 9, 2009 "Proposed Content"
2. Fact Sheet - Noise Modeling Approach for On Shore Wind Farms – 3 pages dated June 9, 2009 "Fact Sheet"
3. PowerPoint Presentation - Proposed Renewable Energy Project Requirements – Public Information Session – 24 pages dated June 2009 "Public Information"
4. Noise Guidelines for Wind Farms – 18 pages dated October 2008 "Noise Guidelines"

Summary of Comments:

- Noise Modeling Approach
    - While good that the recommended regulations are to be based on the maximum sound power level from wind turbines, calculations of setbacks done in the proposal are not in accordance with the "Wind Turbine Noise Guidelines." Calculation of setbacks for wind turbines currently installed in Ontario shows a required setback of up to 2250 metres for a 5 turbine array to be in accordance with Ministry publications. Repeated referral to a setback of 550 metres in Ministry communications might be deliberately misleading the public. Cyclic noise from wind turbines needs to be included, and an epidemiological basis for the standard is called for.
- Setbacks from Roads, Railways, and Property Lines
    - No acceptable basis is provided for the proposed setback of the turbine hub height plus blade length from roads, railways, and lot lines. This setback is not consistent with engineering methods based on actual accident experience, on manufacturer's recommendations, or on independent review by other professionals. The proposed setback poses a risk to loss of life far higher than acceptable for other generating plants.
- Lack of Environmental Impact Statement
    - The recommended regulations need to consider the impact of installation of wind generators on the overall emission of carbon by our generating plants, and on the cost of power, as it will have significant economic impacts, and the environment and economy are linked.
- Inadequate Basis of Setbacks for Natural Heritage and Water Bodies
    - There is no basis given for recommended setbacks of 50 to 120 metres from natural heritage and waterbodies. Monitoring has shown that wind turbines result in loss of habitat far wider than this.

Specific Comments:

- Noise Modeling Approach
  - It is good that the "Proposed Content" and "Fact Sheet" note that acoustic emission levels will be based on actual sound levels. Removal of any criteria that employs the principle of a "masking" by wind speed is very important, and this action by the MOE is commended. It has been clearly shown that turbines can be at a high power level while background sound level and wind speeds at ground level may be low and not provide "masking".
  - Unfortunately, basing the criteria on the sound power level at 95% of the rated power output is not appropriate for some turbines. Manufacturer's data shows that while some turbines (for example the GE 1.5 sle – Attachment 1) do have their maximum sound level just before the maximum power level, other turbines (for example the Vestas V82 – Attachment 2) continue to increase in sound power as the wind speed continues to rise above the point that the maximum power may be reached. It would be more appropriate if the criterion were based on the sound power level equivalent to the maximum sound power level at any wind speed, not just at the 95% maximum rated power output..
  - The Setback in metres from closest Point of Reception in the "Proposed Content", the "Fact Sheet" or the "Public Information" is incorrectly calculated. Using an ISO 9613-2 sound power calculator (Attachment 3) and the assumptions from the "Noise Guidelines" for the octave band sound powers for the GE 1.5 sle turbine which has a rating of 104.0 dBA, (Attachment 1) that is the most commonly applied wind turbine in Ontario with 325 of 670 turbines (Attachment 5), the sound power levels at receptors has been calculated. The table below shows the Actual Sound Power at a Receptor for the number of turbines identified in the MOE chart, at the setback distance the MOE identifies. The results are not the 40.0 dBA that the MOE documentation would suggest they will be, but are as high as 46.7 dBA. The table shows what the required distances would be to achieve 40 dBA at receptors for the identified number of turbines, and shows the required setback distance to apply a 5 dB Cyclic Penalty (Per MOE Regulation NPC-104) to the 40 dBA result.

| Number of GE sle 1.5 Turbines | MOE Identified Distance to Receptor for 40 dBA | Actual Sound Power at Receptor | Required Distance for 40 dBA | Required Distance for 40dBA minus 5 dB Cyclic Penalty |
|---|---|---|---|---|
| 5 | 600 m | 43.3 dBA | 820 m | 1310 m |
| 10 | 700 m | 44.7 dBA | 1090 m | 1700 m |
| 25 | 850 m | 46.7 dBA | 1560 m | 2390 m |

- The MOE documentation fails to identify that a significant fraction of the turbines installed in Ontario have a maximum Sound Power Level of 109.9 dBA (see attachment 2). When a similar table is prepared for the Vestas V82, commonly applied as 159 out of 670 Ontario wind turbines, the required distances are calculated (using appendix 4) as follows:

| Number of Vestas V82 Turbines | Required Distance for 40 dBA | Required Distance for 40dBA minus 5 dB Cyclic Penalty |
|---|---|---|
| 5 | 1470 m | 2250 m |
| 10 | 1910 m | 2890 m |
| 25 | 2650 m | 3970 m |

- As the two tables show, the continual reference in MOE documentation, and in press releases, identifying a 550 metre setback to homes is not representative of the setbacks that are required using the turbines commonly applied in Ontario. Calculation by the MOE of a required setback of 600 metres for the most commonly applied turbine in Ontario (the GE sle 1.5), when the calculation performed in accordance with ISO 9613-2 using the MOE criteria as identified in the "Noise Guidelines" shows a requirement for 820 to 1310 metres for 5 turbines (and more for larger numbers) and when the second most commonly applied turbine shows a requirement of 1470 to 2250 metres for 5 turbines while the MOE continue to speak of a 550 metre setback might be considered as deliberately misleading the public.
- The proposed Noise Modeling Approach fails to recognize the cyclic nature of the sound from wind turbines, and derives noise levels without consideration of cyclic noise. The cyclic nature of sound from wind turbines is a well understood and well recognized aspect of their nature. The Ontario Ministry of the Environment Publication NPC-104 specifies that if a cyclic noise is shown to be present, then a 5 dB penalty shall be applied to the sound level produced by that source. While the MOE currently have not required that the cyclic penalty be applied to wind turbines, if the 5 dB penalty was applied to a wind turbine with a 109.9 dBA sound power level, then an array of 10 turbines located equidistant from the receiver would require a setback of over 2890 metres to bring the sound level to 35 dBA (40 dBA minus a 5 dB penalty). Cyclic noise was a characteristic recognized and reported on by a number of authors at the Wind Turbine Noise Conference - 2009 in Aalborg, Denmark, including: (see endnotes for particulars of referenced papers, available from the Wind Turbine Noise 2009 Coordinators at www.windturbinenoise2009.org )
    - Effects of wind turbine noise on humans – Eja Pedersen PhD (Sweden)[i] ... *the proportion of residents reporting sleep disturbances due to noise increased significantly at sound levels close to the highest acceptable levels at new installations ...*

- Seismic Effect on Residents from 3 MW Wind Turbines – David J. Bennett (New Zealand)[ii] *...residents ... experience ongoing noise problems, including sleep deprivation, thought to emanate from a nearby wind farm ... (closest V90 turbine is 3km away)*
- An estimation method of the amplitude modulation in wind turbine noise for community response assessment – Seunghoon Lee (Korea)[iii] ... *Wind turbine noise is known to be easily perceived even when the sound level is low. This may be concerned with amplitude modulation characteristics of wind turbine noise. ... The result clearly shows that there is a correlation between noise annoyance and amplitude modulation…This should be considered when assessing community response…*
- Prediction of Wind Turbine Noise Directivity and Swish – Stefan Oerlemans PhD (The Netherlands)[iv] ... *The Swish may explain why wind turbines are so annoying ... swish is largest at cross wind direction and at a distance of about 1 km (not closer) ... Even at large distance, swish amplitudes of up to 5 dBA can be expected for cross-wind directions.*
- A new explanation for wind turbine whoosh – wind shear – William Palmer (Canada)[v] ... *at night the atmospheric profile changes ... the sound from wind turbine blades is most concentrated at the blade tips ... when the bits are melded, a new model develops that explains how the cyclic whoosh of wind turbines can be described ... and explains why the whoosh is so different from day to night ...*
- Wind Turbine Noise Diagnostics – Werner Richarz (Canada)[vi] ... *It is shown that source motion and source directivity account for the observed pattern ... Predicted amplitude modulation ranges from 1 dB up to 6 dB. ...*
- Case Study: Wind Turbine Noise in a small and quiet community in Finland – Carlo Di Napoli (Finland)[vii] ... *Measurements and sound propagation modeling revealed that wind turbine noise has to be measured in specific weather condition in order to estimate the full impact of the sound level at immission points. .. The case also revealed the importance of correct sound level estimation for a wind turbine park in pre-engineering phase in order to minimize the developer's own risks for further complaints. ...*

- Issuance of the Draft Approval and Permitting Requirements for Renewable Energy Projects without consideration of the pre-dominant acoustical characteristic of wind turbines, the cyclical sound alternatively described as "swish", "whoosh", or "amplitude modulation characteristics" would be extremely short sighted, and would not adequately protect the public. The paper by Werner Ricardz, noted above refers to amplitude modulation ranges from 1 dB up to 6 dB. Monitoring of the Huron Wind turbines, as previously reported to the MOE in a meeting on August 31, 2006, attended by Dawn Nichols, Allan Lewis,

Tim Cane, William Palmer, John Kowalewski, Marie LeGrow, and John Westlake showed a cyclical sound variation on clear nights of 6 to 7 dB measured on the C scale during each blade passage. International Methods, as described in the Nordtest Method, NT ACOU 113 (Attachment 6) state "Noise with prominent impulses is more annoying than continuous types of noise (without impulses or tones) with the same equivalent sound pressure level. Therefore an adjustment K is added to the measured L, if prominent impulses are present in the noise, to adjust for the extra annoyance due to the impulses. " Personal communication with Noise Consultant, Carlo di Napoli identifies that this is the method used in Finland to accommodate for the cyclic nature of wind turbine noise, consistent with the intent of the MOE Publication NPC-104.

- The MOE Noise Guidelines For Wind Farms (October 2008) state:
  - *Should the manufacturer's data indicate that the wind turbine acoustic emissions are tonal, the acoustic emissions must be adjusted by 5 dB for tonality, in accordance with Publication NPC-104. Otherwise, the prediction should assume that the wind turbine noise requires no adjustments for special quality of sound described in Publication NPC-104.*
  - *No special adjustments are necessary to address the variation in wind turbine sound level (swishing sound) due to the blade rotation, see Section 4. This temporal characteristic is not dissimilar to other sounds to which no adjustments are applied. It should be noted that the adjustments for special quality of sound described in Publication NPC-104, were not designed to apply to sounds exhibiting such temporal characteristic.*
- The fact that a number of cases are in the public record, where families in Ontario are suffering due to the installation of wind turbine projects for which the Ministry of the Environment has issued a Certificate of Approval, suggests that the assumption in the MOE Noise Guidelines that unless tonal, "no special adjustments for special quality of sound described in Publication NPC-104" is required is in error. The explanation given, that the "variation in wind turbine sound level" as a "temporal characteristic" (pertaining to time) does not apply as a "Cyclic Variation" or a "Quasi-Steady Impulsive Sound" as stated in the NPC-104 (both of which refer to repetitive sounds pertaining to time) does not appear to be consistent with the intent of the procedure writers, or international practice. A cyclic sound specifically refers to sounds with a temporal characteristic. In fact, because of the "impulsive" nature of the wind turbine "slap" it may be that the applied adjustment should be in the 5 to 10 dB range. For the MOE to apply no correction is violation of their own issued publication NPC-104. At the public meetings to roll out the proposed regulations, Ministry staff, including Mr. Kevin Perry clearly stated that the intent of the Act was to ensure protection of human health and the environment. Regulations which will permit issuance of

Certificates of Approval neglecting the well recognized cyclic nature of the wind turbine sound will result in more cases of families suffering, which is not consistent with the goals of the Environmental Protection Act or the stated intent of the Green Energy and Green Economy Act to ensure protection of human health and the environment.

- The point was made during the public information meetings that the intent of the regulations was to establish a standard of 40 dBA, consistent with an average home, or a quiet library. The regulations must recognize that a cyclic noise with a variation magnitude of 6 to 8 dB, is far more objectionable than a continuous sound. When this noise level with its cyclic nature is imposed in communities that have backgrounds of 25 to 30 dBA the objectionable nature becomes even more apparent.
- A clear message was delivered to the Legislative Standing Committee hearing input to the Green Energy Act that because of identified health effects being observed near wind turbine developments, that there should be a complete epidemiological assessment done to determine what the safe sound levels should be from wind farms, prior to determining sound levels. The regulations are proposed without such a study. For that reason, there can not be considered to be adequate basis for the selection of a setback.
- At the Wind Turbine Noise 2009 Conference, after 4 papers had been presented on the effect of noise on people, I asked a question from the floor of Dr. Eja Pedersen (Sweden) who had presented – "Effects of Wind Turbine Noise on Humans" which summarizes results of Swedish and Dutch studies, and notes that while the study did not detect specific health effects, it did note correlation between sound and annoyance – although she did not know what that does to people in the long run. I asked Dr. Pedersen if she had any comment about the fact that her study had been used to show that no further health effects study was needed in Ontario (as requested by Dr. Robert McMurtry to the Legislative Standing Committee studying the Green Energy Act.) The Toronto Star had reported on May 11, 2009, *"Smitherman said his government is reviewing the scientific literature, particularly out of Europe where the wind industry is more mature. Last month, he announced that the Ministry of Environment will create and fund an academic research chair dedicated to examining the potential public health impacts of renewable energy projects, including wind. At the moment, however, there's no convincing evidence that wind turbines located a few hundred metres from a dwelling negatively effect health, Smitherman said. A 2008 epidemiological study and survey, financed by the European Union, generally supports that view."*
- The response of Dr. Pedersen was particularly clear; "You can tell them in Ontario they were wrong. We only did a small piece of the study, and we want to see a larger study conducted."

- The statement has been made by Mr. Kevin Perry, Director Program Planning and Implementation of the MOE that in Denmark, setbacks of 4 times the total height of turbine (approximately 500 metres) from nearby residences, justify that, *"In regard to other jurisdictions, Ontario continues to be a leader in renewable energy development."* This infers that the Ontario proposal is more than adequate. This justification is misleading since it fails to recognize that in Denmark, the typical land based turbine array consists of 3 to 4 turbines. There is then a separation of about 4 km before the next 3 to 4 turbine array exists. In May and June of this year, I made observations of wind turbine installations in Northern Ireland, Ireland, England, Scotland, Germany, the Netherlands, Poland, Sweden, and Denmark, to complement previous observations made elsewhere in Great Britain and France. *My observation was that in none of these countries did I see ANY case with residents having as many wind turbines in proximity of their homes as seen in Ontario.* A summary of my observations is included as Attachment 7. Ontario is not a leader, but has a lot to learn from others about not locating large arrays of turbines in close proximity of homes.
- A significant omission from the Proposed Content for the Renewable Energy Approval Regulation is any mention of actions that would be taken if a project is found to be in non-compliance with the regulations. This is significant since post installation audits taken at the Kingsbridge I wind development, the Ripley wind development, and the Melancthon I and II wind developments have identified that the installations are in non compliance, with sound levels above limits. At the public meetings, in response to a question as to what the MOE are doing about this, the MOE Regional Manager could only say that his recourse was to ask the proponent what procedure they had in place to address the concern. There was no further action taken, and non-compliant operation continued. The regulations are not complete unless they identify what actions will be taken to address non-compliant operation to protect the public. Similarly, the regulations are incomplete until they identify what action will be taken to correct present non-compliances before more installations are approved.

- Setbacks from Roads, Railways, and Property Lines
    - The Proposed Content for the Renewable Energy Approval Regulation addresses the entire subject of public safety setbacks in three lines, noting that *"It is also proposed that wind turbines must be setback a distance equal to more than the turbine hub height plus blade length from all roads, railways, and property side and rear lot lines."* It fails to provide any basis for this setback as adequate.
    - In my submission to the Ontario Legislative Assembly Standing Committee hearing input with respect to the Green Energy Act, I provided a clear statement, *"As a Professional Engineer, I am obliged to give you formal notice that undue risk to public safety is being posed by wind turbines at present setbacks. The consequence of ignoring this is increased risk of public injury or death."* (Attachment 8) I did not make that statement lightly, or without consideration of the implications it implied. As a Professional Engineer, I hold formal qualifications in engineering and probabilistic risk assessment from the University of Toronto and the Massachusetts Institute of Technology. My career has given the opportunity to gain experience as part of professional teams in conducting Environmental and Risk Assessments for electrical generating stations. I do not say this to "puff myself up" but to state that I hold dearly the professional and moral obligation to provide for the safety of my fellow man (to love my fellow mankind) through use of any "talents" I may have, to the best of my ability (The commandment says simply, to love God and love my neighbour). The MOE, who were charged with the responsibility to develop the public safety setbacks failed to communicate with me what my concerns were, yet have identified in the "Proposed Content" an inadequate setback, without providing any basis.
    - At the public information meeting in Port Elgin on June 22, I formally questioned Mr. Kevin Perry as to what the qualifications were of the Engineers who had determined the inadequate setback, and what basis had been used. He was unable to respond to my question.
    - I have repeatedly identified to the MOE, to public hearings, to the Minister of the Environment, and to the Ontario legislature that the manner that setbacks are being prepared by wind proponents is not consistent with the way public safety setbacks are prepared for other generating plants. In general, when a risk assessment is prepared, the probability of adverse consequence occurring, which can impact a member of the public, the method is to assume that a member of the public can be present in the accident zone if not prevented by means of a barrier. When one calculates the risk of an accident from a nuclear facility or a chemical plant, one assumes that a member of the public is standing at the most critical location at the boundary fence when an accident occurs. Proponents of the wind industry calculate the risk by assuming that it is not likely for a member of the public to be present at the accident site, even when the location of the accident consequence is not on the property controlled by

the wind turbine. The results are not the same. A proponent has no right to assume how a neighbour chooses to use their property, and if the neighbour will avoid the risk caused by the proponent's project by staying away.

- Attachment 9 identifies *known* cases of wind turbine blade throw in 2008 and 2009. It is well expected that this list is incomplete as there is no comprehensive public database of wind turbine accidents. Unlike other generating systems, such as the nuclear industry where proponents make a point of sharing operating experience, so that all can learn from the experience of others, the wind industry makes a point of declaring accidents as commercially sensitive, or confidential, and do not go out of their way to report incidents. As an example the country with the largest number of wind turbines in the world is now the United States. The American Wind Energy Association makes the point in their communications that they do not track failures. Even still, the list records 20 known cases since January 2008 when wind turbine blades have fallen to the ground, either through blade failure from lightening strike, overspeed, or unknown causes. These are not trivial incidents as wind turbine blades in use in Ontario are over 41 metres (135 feet) in length, weigh about 10 tonnes (22,000 pounds), have a tip speed of over 300 km per hour (188 miles per hour), and fall from heights of up to 121 metres (400 feet). In many of these documented cases, the blades have traveled over 125 metres from the base of the turbine, which is the proposed Ontario setback, and could certainly result in a fatality if a person was present. As an example, this month, in Germany, a Vestas V80 turbine lost a blade after a lightening strike. The blade traveled over 150 metres, as documented here. http://www.wind-watch.org/news/2009/07/08/wind-turbine-at-brieske-destroyed-by-lightning/ Similarly, the list identifies at least 6 cases have occurred when wind turbine towers have collapsed in the time period due to overspeed, some throwing blade pieces up to 500 metres from the turbine base.
- A reasonable treatise on risk to the public from wind turbine accidents was issued in the Netherlands in 2004[viii], when 43,000 turbine years of actual experience was documented, showing a predicted failure rate that could result in death of 8.4 x 10-4 for a person located at the tower base, and a lower failure rate at increasing distance from the tower base (based on an observed failure rate of 6.3 x 10-4) The recent international experience based on known experience shows a blade failure rate of about 20 failures in 19 months for 80,000 turbines, or an observed rate of about 1.6 x 10-4. As noted this may be lower than the previous data since there is no formal recording system that ensures the logging of all failures. Ontario is not without blade failure experience, having had at least 2 known incidents of blade failure in the 1001 turbine years of experience to date, for an observed failure rate of 20.0 x10-4. Additionally, Ontario has had its share of "near misses" since for example, the Huron Wind complex with 5 Vestas V80 turbines had to replace 5 blades within their first year of

operation due to damage from lightning strikes, and had to shut down all turbines to reinforce cracks in the tower support[ix], just after a similar Vestas V80 turbine collapsed in Germany following a tower failure at the same point.

- The Ontario blade failure rate is noted to be considerably higher than the international experience. This may be because with only a few exceptions, Ontario turbines have a high hub height, long blades, and are exposed to quite high wind shears, as well as to more severe weather temperature differentials than many turbines in Europe or the United States. As example, recent Environmental Screening Reports for the proposed CASA Engineering St. Columban wind power development identify an average wind shear at night of 0.47 in the Zephyr North Noise Assessment Report[x] submitted to the MOE, and for the AIM PowerGen Plateau wind generation project identifies an average wind shear at night of 0.61 in their Noise Assessment Report[xi], submitted by Zephyr North to the MOE. These are consistent with previously identified wind shear values shown for the Kingsbridge I wind project, the Melancthon I wind project, and the Enbridge wind power project in Ontario. A Report[xii] by Neil Kelley and Brian Smith of the National Renewable Energy Laboratory in the United States identified that *"high nighttime shear values are of concern due to the potential for high stresses across the rotor as the wind speeds are significantly different across the blades, particularly for newer turbines with large rotor diameters. The resulting load on turbine components could cause failures."*
- Hydro One Networks Inc. in a letter from Enza Cancilla, Manager Public Affairs, dated November 3, 2008 notes[xiii] that *"Hydro One has conducted a thorough review."* (Of issues of concern identified about potential risks to the Hydro One transmission corridors posed by wind turbines.) Ms. Cancilla's letter goes on, *"As part of this review, local and international experience was reviewed to arrive at a set of recommendations on the distances between wind turbine generators and Hydro One facilities. Mechanical risks (e.g., blade failure, tower collapse, ice throw) and wind-induced risks (e.g., Aeolian vibration, galloping, wake-induced, turbulence-induced) were examined. Of these the mechanical risk of complete blade failure (detachment) or wind tower collapse set the furthest limits of risk to transmission structures. To avoid these risks, we developed technical directives for a required wind turbine setback from our transmission assets. After due process, the technical directives will become a Hydro One standard."*
- The Hydro One letter continued, *"... the guiding principles have evolved over time. ... from July 2008 to the present time 500 metres from 500 kV assets, 250 m from 230 kV assets, and 150 metres from 115 kV assets."* The 500 kV assets are the critical assets of Hydro One, for which failure could cause an significant system upset. A setback of 250 metres recommended for 230 kV assets, where there is typically redundancy, or

115 kV assets for which failure would generally only pose an inconvenience show that a higher failure rate is acceptable for these less critical assets. It is considered that protection of the lives of citizens should also be a critical requirement as the lives of people are neither redundant, nor is it only an inconvenience if a person is killed or seriously injured. The public who travel along roadways, live in homes, or work fields near wind turbines should deserve protection, as human life is surely of value comparable to the physical assets of transmission towers.

- On what basis does the MOE determine that the public require less protection that the 115 kV transmission lines for which Hydro One determines that a 150 metre setback is required for which loss is an inconvenience, and significantly less than the 500 metre setback Hydro One Networks Inc. determined from their thorough review to protect their critical assets?
- Similarly, the wind turbine manufacturer General Electric identifies that for protection from ice throw, a setback of 1.5 times the turbine hub height plus blade diameter is called for.[xiv] Since this is about twice the distance that the MOE recommended setback is, just to protect from ice throw, what basis did the MOE use to also neglect this manufacturer's recommendation?
- The setback that the MOE recommends of 125 metres, places members of the public at a risk of death related to the blade failure frequency of Ontario wind turbines, currently observed at 20 x 10-4 as noted above. What basis did the MOE use to justify that this risk of death from a wind turbine accident is 2000 times higher than the risk society accepts for death from other generating systems?

- Lack of Environmental Impact Statement
    - The Renewable Energy Approval Regulation makes no mention of the need to carry out an Environmental Impact assessment before the approval of the project. Failure to do this in an acceptable manner has resulted in the situation where we are today:
        - We have installed over 1150 MW (rating) of wind turbines, and over 3000 MW of new gas generation in the last 5 years. As a result of the economic downturn, shutting down auto manufacturers and secondary suppliers, mine and mill operators, pulp and paper mills, along with cool weather that is requiring little air conditioning load, our July Ontario electrical demand has fallen from about 13,000 - 14,000 MW (night ) / 18,000 – 24,000 MW (day) in the last few years to 11,000 – 12,000 MW (night) / 16,000 – 20,000 MW (day) this year. Because some of the gas generation is "co-gen", it does not shut down at night as supplying a process load as well as electrical generation. Also, some hydro generation must run at night because the stations have no storage, and also provide the rapid maneuverability to the system operator for load changes. As nuclear units are all available this summer, the system operator is in the awkward spot of having more generation than needed at night, even before considering wind generators. Since the system operator has to be able to maintain an easily unloaded and loaded generator to accommodate wind generation that can rapidly rise and fall in output (Ontario has many examples of wind output rising from 10's of MW total to over 650 MW total to back to 10's of MW total within the same 24 hour period) this has put us in the situation of shutting down nuclear units, so that wind and gas units can be on line, even though the wind units often have a low capacity factor in the daytime. Over the last 4 years, during the summer peak hour, when we do require the most generation, on half of the days, the wind generator output ranged from zero to less than 12%. Thus, much of the time the gas generators run when the system load is highest in the daytime and the wind generator output is usually lowest.
        - This has the result of putting the most expensive "spot market" gas generators on line when the demand is highest, and the most expensive "fixed contract – but guaranteed system access" wind generators when demand is lowest, both of which increase the rates for consumers. This situation will only become worse and of greater impact as the wind generation share increases.
        - Lack of an adequate Environmental Impact Assessment has put us in the situation of shutting down non-carbon generating sources, (nuclear units) and running gas generators to be able to rapidly unload them if wind generators rapidly increase in output.

        - The Approval of renewable energy projects should require a full environmental impact assessment to prevent us being in the situation of increasing our carbon emissions, by burning natural gas, which has the shortest life expectancy of all of our generating sources. The MOE should address this situation in the approval of new projects.

- Inadequate Basis of Setbacks for Natural Heritage and Water Bodies
    - The "Proposed Content" suggests very low setbacks of 50 to 120 metres from significant areas of natural and scientific interest, significant wetlands, woodlands, valleylands, areas of wildlife habitat, Provincial Parks and Conservation areas, lakes, streams, and springs
    - There is no basis given that shows that such small setbacks are adequate to prevent adverse impact, when for example the turbine blades for some projects will already cut such setbacks in half.
    - Without doing detailed studies, observations by citizens with an interest in wildlife have already made repeated observations that after the erection of wind turbines, wildlife leaves the area, and habitat is lost. The wildlife concentrate themselves in remaining areas of habitat more distant from turbines, but with a greater density, competition for food and shelter is increased, with adverse impact. Casual observations by citizens in the vicinity of the turbines in Bruce County (my neighbours) have shown reduced wildlife sightings, while on our farm, some 5 km from the nearest turbine, wildlife (mammals and birds) have increased in the year since the turbines went into service. Such ad hoc assessments make it clear that turbines impact habitat for a distance significantly above 120 metres, and such setbacks cannot be established without a detailed study.
    - To locate turbines within 120 metres of any of these sensitive areas, including habitat or provincial parks without such a study is irresponsible to the environment that we are to be stewards of.

Attachments:

1. General Electric sle 1.5 wind turbine sound power level – as shown in Melancthon II Environmental Noise Assessment by Helimax consultants.
2. Vestas V82 wind turbine sound power level – as shown in Enbridge Ontario Wind Project Environmental Noise Assessment by Valcoustics consultants.
3. Sound Power Calculator for GE 1.5 sle turbine. (Excel file with instructions).
4. Sound Power Calculator for Vestas V82 turbine. (Excel file with instructions).
5. Wind Turbines in Ontario as of July 2009 – showing type and years in service (Excel File)
6. NordTest Method NT ACOU 113 - Acoustics – Prominence of Impulsive Sounds and for Adjustment of $L_{Aeq}$
7. Observations of Wind Turbine installations in Europe, W. Palmer, July, 2009
8. Presentation to Ontario Legislative Committee for General Government – Bill 150 – Green Energy and Green Economy Act – April 15, 2009, William K.G. Palmer
9. Known Industrial Size Turbine Failures – Resulting in Blades on the Ground, January 2008 to July 2009, list compiled from public records by William K.G. Palmer

Referenced Reports:

[i] Effects of wind turbine noise on humans
Eja Pedersen
Halmstad University
P.O. Box 823, SE-301 18 Halmstad, Sweden
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[ii] Seismic Effect on Residents from 3 MW Wind Turbines
Bennett, D.J., Kea Petroleum Limited, Wellington NZ 6012
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[iii] An estimation method of the amplitude modulation in wind turbine noise for community response assessment
Seunghoon Lee,
AeroAcoustics and Noise Control Laboratory
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[iv] Prediction of wind turbine noise directivity and swish
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[v] A New Explanation for Wind Turbine Whoosh – Wind Shear
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[vi] Wind Turbine Noise Diagnostics
Werner Richarz,
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Toronto, ON, M9W 1B3, Canada
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[vii] Case Study: Wind Turbine Noise in a small and quiet community in Finland
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