



PORT COLBORNE

Subject: Memorandum to Council – Multi Municipal Wind Turbine Working Group Correspondence-Ontario's Energy Plan and Wind Turbines

To: Council

From: Environmental Advisory Committee (EAC)

Meeting Date: September 13, 2022

Recommendation from the EAC for Council consideration:

That the Environmental Advisory Committee supports the views expressed by the Working Group and recommends that Council write the Minister of Environment, Conservation and Parks (MECP) requesting the Province:

1. The City reaffirm its 2017 resolution that it is an "Unwilling Host" for wind turbine projects until it has been demonstrated they do not pose an adverse effect on the environment and the health and safety to the public.
2. The City recognizes that wind powered hydro generation is a green source of energy and the Province should support research and development of wind turbines that are more efficient and have performance characteristics that mitigate any adverse effects.
3. The Province establish a moratorium for all new applications for wind energy projects until it has been demonstrated that all adverse effects can be mitigated.
4. Update the direction provided in terms of setbacks between wind turbines and other activities;
5. The Province needs to take more aggressive action in enforcing the terms of approvals for existing wind turbines before authorizing the construction of any new turbines;
6. Bar operators of projects with these compliance failures from participating in any of the contract extensions or opportunities to bid on capacity expansions that are envisioned in the recent Ministerial directive; and

7. Where ongoing MECP review of compliance and land use compatibility policy is concerned, the Province continue current Environmental Protection Act compliance requirements where wind turbine noise is concerned on both existing and new facilities;

Further that Council support EAC's recommendation that the Planning Department staff liaise with Planning Departments of the Turbine Working Groups (Bruce, Huron and Grey Counties) to determine appropriate land use compatibility guidelines and setbacks used in these municipalities and where appropriate, consider their usage in Port Colborne's Official Plan and Zoning Bylaw

Attached: - Memorandum to Council – Multi Municipal Wind Turbine Working Group Correspondence-Ontario's Energy Plan and Wind Turbines



Memorandum

Date: August 11, 2022

To: Nicole Rubli, Acting City Clerk

From: Janice Peyton, Executive Assistant, DPW

Re: Environmental Advisory Committee
Multi Municipal Wind Turbine Working Group
Correspondence

At the Environmental Advisory Committee meeting of June 8, 2022, the Environmental Advisory Committee reviewed the correspondence from the Multi Municipal Wind Turbine Working Group that was referred by Council on March 22, 2022.

Two reports were produced and reviewed by an EAC subcommittee. Copies of the reports are attached.

The Committee resolved as follows:

Moved by Katherine Klauck
Seconded by Jack Hellinga

That the overview of Wind Turbine Issues and the Memorandum to Council on Multi Municipal Wind Turbine Working Group Correspondence – Ontario's Energy Plan and Wind Turbines be forwarded to Council for consideration.
CARRIED.

Please place this item on the next Council agenda for consideration.

Janice Peyton

Signed:

Janice Peyton
Executive Assistant, DPW
Recording Secretary, Environmental Advisory Committee

9(a)



OVERVIEW OF WIND TURBINE ISSUES



Roderick Tennyson, PhD., P.Eng.

**Submitted to the Environmental Advisory Committee
City of Port Colborne**

May 2022

1. Purpose of Report

The growth of wind turbine farms (windmills) to reduce energy dependence on fossil fuels is increasing each year. At first sight they appear to be a clever means of using wind energy to rotate a propellor system, to turn a turbine to produce quiet electricity and are harmless to the environment (except for birds that do fly into these towers). However, with all technologies, there are drawbacks and problems when it comes to interaction with people and communities, common with most new technological advances. Figure 1 shows the growth of power and size of current wind turbines.

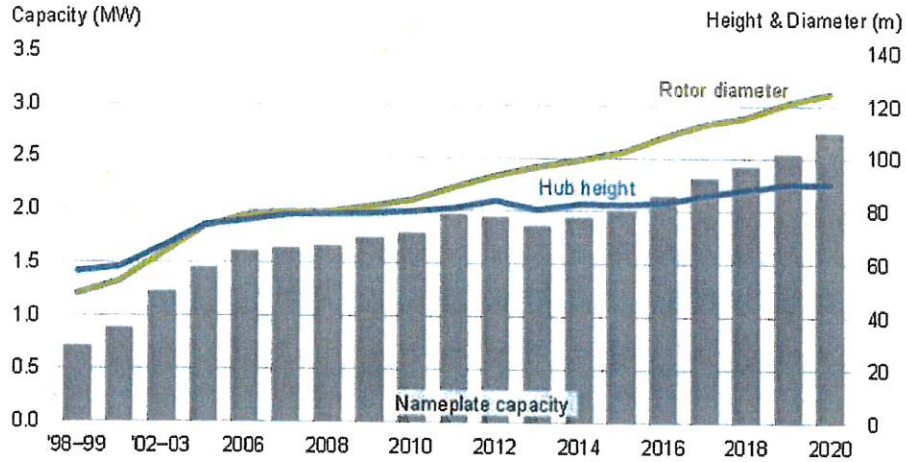


Figure 1

Average turbine hub height and rotor diameter (in meters), and nameplate capacity (how much power they produce) for land-based wind projects are shown in Figure 1. The chart was copied from the "Edition: Land area requirements".

Note that the rule of thumb is 60 acres per megawatt for wind farms. For example, a 3 megawatt farm would occupy about 180 acres of land. A "megawatt" of power is equal to a million watts of electrical power. To put that into perspective, most common light bulbs in a house are only 60 watts of power.

Figure 2 illustrates the terminology and performance characteristics of wind turbines. Note that the "cut-in" wind speed is the lowest speed that starts the turbine turning and generating power.

Cut-in wind speeds as a function of wind turbine power to start power generation

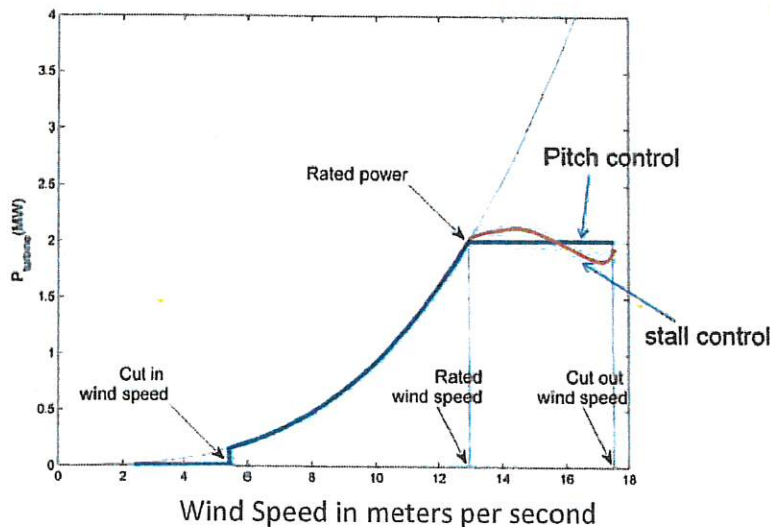


Figure 2

The major drawback to wind turbines relate to the sound they produce. Sound emanating from the propellers, the mechanical systems turning the turbines and infrasound arising from the interaction of rotating blades as they pass the main tower all cause issues in terms of proximity to the turbines. It is the low frequency infrasound that is barely detectable by human ears that is the critical issue. Why? It is known that such sound frequencies can cause health problems when people are exposed to these levels for prolonged periods of time. The answer to these problems has been to employ setbacks of the wind turbines from residences and communities.

Let us now review the essential principles of sound as perceived by humans to clarify the problem with low frequency noise (known as infrasound) and its effects on humans.

2. How to Measure Sound Effects on Humans

Human perception of sound can be quantified by the **loudness** and **pitch** of the sound. Loudness refers to the magnitude of the sound heard, and pitch is related to the frequency of the sound. Loudness, in common terms, is referred as the volume. The cartoon below (Figure 3) illustrates the differences between loudness (sound volume or amplitude of the sound wave we hear) and the pitch of the sound (low frequency known as infrasound) and high frequency, known as ultrasound.

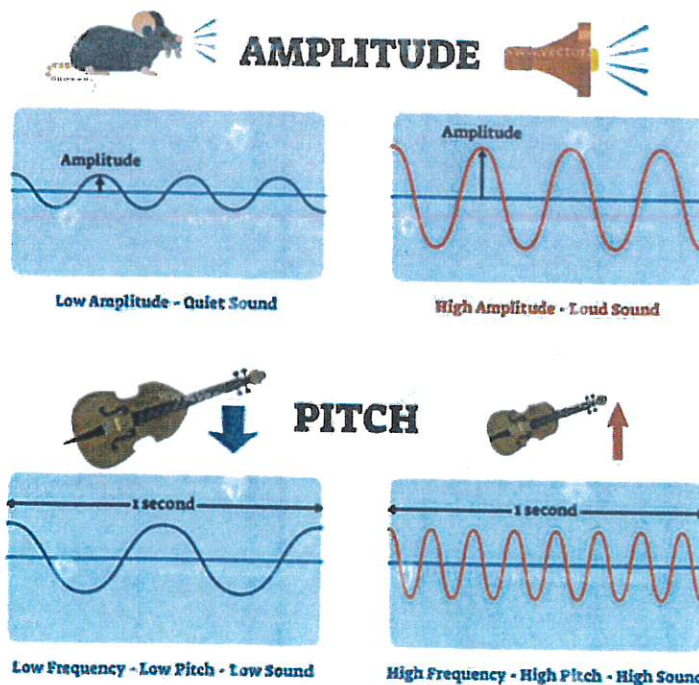


Figure 3

The frequency of the sound waves is measured in Hertz (Hz) or “cycles per second”. For example, the frequency of electricity coming to your home is 60 Hz.

For measuring loudness of the sound, engineers use the complex term called “decibels” (dB). It is not important for readers of this report to understand what a decibel is, save to say for interested people, the dB

is a logarithmic way of describing a ratio. The ratio in this case is different levels of sound. For human perception of sound loudness, a modified rating of the dB scale is used, called a dBA. So what is a dBA and why use it to measure loudness? It is a weighted value of the dB adjusted for what the human ear actually hears.

The dBA reading for different sources of sound is useful to know, since it allows the reader to correlate the dBA scale with common sounds they experience. In other words, it informs them of how much noise they hear based on common experience.

The following quotation describes why we use dBA;

Measurements in dBA are decibel scale readings that have been adjusted in an attempt to take into account the varying sensitivity of the human ear to different frequencies of sound. In general, the perceived loudness is reduced as the human ear is less sensitive at low audio frequencies than at high audio frequencies. Indeed, the ear of a healthy person is more sensitive to frequencies between 2 and 5 kHz. It should be noted that dBA measurements underestimate the perceived loudness and possible stress-inducing capability of such noise sources with low frequency components at moderate and high volumes. The high frequencies are given less weight than on the standard decibel scale. Humans do not hear all frequencies equally.

The chart below (Figure 4) illustrates typical sound levels in dBA for various sources to which humans are exposed.

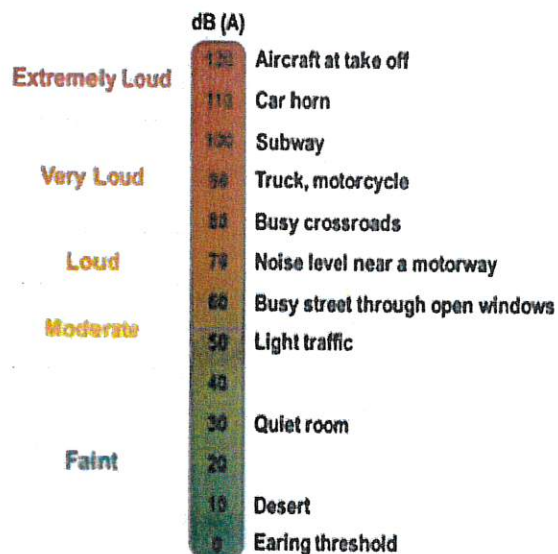


Figure 4

In general, for people's comfort, sound levels around 40 dBA are often used in selecting sites for noise generating systems.

3. Effect of Wind Turbine Noise on Humans

Wind turbines as noted earlier generate noise. Noise emanates from three sources; mechanical associated with the operation of the turbine and operating mechanisms; the "swooshing" aerodynamic sounds emanating from the rotating propellers (known as amplitude modulation); and infrasound (sound below 20 Hz) and known as low frequency noise (generally sound from 200 Hz to 20 Hz). This latter source relates to the sound pulses generated as the blades pass the tower in the infrasound range (typically about 0.75 Hz, 1.5 Hz, etc.). People have reported that these pulses can be "felt or sensed" more than "heard" by the ears. Research

has demonstrated that continuous exposure to infrasound can result in a physiological response from various systems within the body for some people.

It has been established that at typical levels (about 25-45 dBA outdoors), the main effect is annoyance which can be enhanced by the amplitude modulation associated with the aerodynamic effect of the moving blades. At higher levels, say ≥ 45 dBA outdoors and ≥ 30 dBA indoors, many people report that their sleep quality is affected. Many farms and homes have been abandoned in south west Ontario due to their proximity to wind turbine farms and their associated harmful effects.

The major concern in locating wind turbines is the potential harmful effects of pulsating infrasound (arising as the rotating blades pass the tower at rates dependent on wind speed), which can be detected inside homes near operating wind turbines. These sound pulses do not attenuate quickly and have been measured as far away as 10km! Long term exposure even at low levels of infrasound can affect the nervous system. Current research reports indicate that these infrasonic pulsations can cause people to report chronic sleep disturbance, dizziness, tinnitus, heart palpitations, vibrations and pressure sensations in the head and chest.

4. Ground Current Effects

It is not common knowledge that there are electrical currents that run through the ground due to various sources. Electrical systems and possibly wind turbines, can generate what is called "stray voltage-uncontrolled electricity". These are known to also pass along in the earth's surface and can cause serious problems to pastoral animals for example. What is not known is the effect of wind turbines on increasing such ground currents near farms and pastures close by wind turbine farms. This phenomenon could be easily assessed by measuring such currents before and after the wind turbine farms are turned on. Such information is not known to the author at this time.

5. Ontario Setback Requirements

As shown on the dBA chart, outside sound levels around 40dBA would seem acceptable, although community annoyance is a mitigating factor and might influence wind turbine site locations. However, the adverse effects from low frequency infrasound pulses have been reported extensively and should be taken into account in offset distances.

Currently the government of Ontario has established longer setbacks than have been used in the past to try and mitigate these problems. At present the set back is 550 meters for smaller wind turbines or groups of wind turbines, and 1500 meters for larger wind farms. This is intended to reduce noise to WHO / ISO standards of about 40 dBA in the closest bedrooms.

6. References Used in Compiling This Report

1. A review of the human exposure-response to amplitude-modulated wind turbine noise: health effects, influences on community annoyance, methods of control and mitigation; Michael J B Lotinga , Richard A Perkins, Bernard Berry , Colin J Grimwood , Stephen A Stansfield; WSP | Parsons Brinckerhoff, Bristol, U

2. Measurement In Decibels: What Is the Difference Between dB and dB(A)? by softdb, May 14, 2019, In General Acoustics
3. <https://www.wind-atc.org/documents/infrasoundlow-frequency-noise>
4. Propagation thresholds and measurement of infrasound to establish separation distances from wind farm turbines to residences; Bob Thorne, Noise Measurement Services Pty Ltd, Australia
5. Ontario keeps safe distance rule for giant wind turbines ...;
<https://www.canadianmanufacturing.com/CT9hQ>
6. Adverse health effects of industrial wind turbines; Roy D. Jeffery, MD FCFP, Carmen Krogh, Brett Horner, CMA; Can Fam Physician. 2013 May; 59(5):473-475.
7. <https://www.farmfoodcareon.org/uncontrolled-electricity/>
8. Legal battle over Ontario wind turbine farm may redefine 'harm'; Sean Fine, London, Ont., Nov.21,2014
9. <https://www.duttondunwich.on.ca/sites/default/files/case%20study%20%20-20wind%20turbines.pdf>
Case Study: Impact of a Wind Turbine Project on a Rural Community, Magda Havas

**Re: Memorandum to Council on Multi Municipal Wind Turbine Working Group
Correspondence – Ontario’s Energy Plan and Wind Turbines**

Introduction: On March 22, 2020, Nicole Rubli, Acting City Clerk, referred correspondence from the Multi Municipal Wind Turbine Working Group to the Environmental Advisory Committee (EAC) to bring a report to Council.

EAC reviewed correspondence, regulations and policies under the Environmental Protection and Planning Acts, announcements by Minister of Energy Todd Smith, and selected research on ***issues related to*** wind turbines. Two reports were produced and reviewed by an EAC subcommittee comprising Katherine Klauck, Harry Wells, Rod Tennyson, Trent Dolan and George McKibbon.

Dr. Rod Tennyson authored the first report entitled Overview of Wind Turbine Issues¹. George McKibbon authored the second entitled Memorandum to Council. If we are to transition from carbon based fuels to renewable energy, we will need renewable energy projects like wind and solar energy sources. Given the Province is projecting we will need new generation capacity by 2025, the issues working group raises are important and need to be resolved.

This memorandum summarizes policy and regulation history associated with wind turbine noise and adverse effects. At its June 8th meeting, EAC will review and forward both reports to Council.

Recommendations: EAC supports the views expressed by the Working Group and recommends that Council write the Minister of Environment, Conservation and Parks (MECP) requesting the Province:

- 1. The City reaffirm its 2017 resolution that it is an “Unwilling Host” for wind turbine projects until it has been demonstrated they do not pose an adverse effect on the environment and the health and safety to the public.*
- 2. The City recognizes that wind powered hydro generation is a green source of energy and the Province should support research and development of wind turbines that are more efficient and have performance characteristics that mitigate any adverse effects.*
- 3. The Province establish a moratorium for all new applications for wind energy projects until it has been demonstrated that all adverse effects can be mitigated.*
- 4. Update the direction provided in terms of setbacks between wind turbines and other activities;*
- 5. The Province needs to take more aggressive action in enforcing the terms of approvals for existing wind turbines before authorizing the construction of any new turbines; and*

¹ The issues raised in Dr. Tennyson’s report may be addressed by the next generation of wind turbines, possibly Vertical Access Wind Turbines. This is a matter we have not examined and hope MECP will.

6. *Bar operators of projects with these compliance failures from participating in any of the contract extensions or opportunities to bid on capacity expansions that are envisioned in the recent Ministerial directive.*
7. *That City Council direct staff to respond to the Multi-Municipal Wind Turbine Group March 2, 2022, correspondence acknowledging receipt and support of their efforts.*

Given MECP's ongoing compliance policy and land use compatibility reviews, EAC recommends an additional comment:

Where ongoing MECP review of compliance and land use compatibility policy is concerned, the Province continue current Environmental Protection Act compliance requirements where wind turbine noise is concerned on both existing and new facilities.

Further EAC recommends that Planning Department officials liaise with Planning Departments of the Turbine Working Groups (Bruce, Huron and Grey Counties) to determine appropriate land use compatibility guidelines and setbacks used in these municipalities and where appropriate, consider their usage in Port Colborne's Official Plan and Zoning Bylaw.

Analysis of Policy and Related Regulations: In 2009, the Green Energy Act was passed. This legislation provided many renewable energy generation and conservation initiatives. The legislation also exempted renewable energy projects from Planning Act requirements: no municipal planning approvals were required. Instead Regulation 359/09 under the Environmental Protection Act set out comprehensive approval requirements for renewable energy project approvals.

Regulation 359/09 sets very high standards for a successful appeal of an Environmental Director's approval: appellants must prove a wind farm approval will have health or ecological adverse effects. To our knowledge, that standard has been met in only one environmental tribunal appeal. That appeal was subsequently upheld by the courts. This decision involved Blanding's turtle habitat: an endangered species.

Wind turbine noise effects were addressed in two reports by HGC Engineering one for the industry in 2007 and a subsequent report in 2010² for MECP. MECP proposed substantial setbacks from residential sensitive uses (550 metres and more³) and noise standards linked to wind velocities. Dr. Tennyson's report describes this approval scheme.

In 2016, MECP amended Regulation 359/09. The Ministry applied a more stringent set of standards which clarified separation distances where multiple turbines were developed as wind

² HGC Engineering, Low Frequency Noise and Infrasound associated with Wind Turbine Generator Systems; A Literature Review, Ontario Ministry of the Environment RFP No. OSS-078696, September 10, 2010.

³ The setback distances prior to and after amendments to OR 359 vary from a minimum of 550 metres to 1500 metres depending on the number of turbines in the wind farm and the sound power level of the wind turbine (dBA).

farms and enhanced noise standards together with reporting requirements. These changes were significant. They also addressed land use compatibility issues where vacant lots and planned developments exist. These matters were not addressed in the previous requirements⁴ and are important because renewable energy project approvals were exempted from municipal planning approvals where land use compatibility is addressed.

At the same time, the amended regulation exempted the application of these more stringent noise standards to existing and approved wind farms unless a tower was being moved to a different location or the rated capacity of the tower was increased.

Understanding the public health effects of wind turbine noise on sensitive receptors is a work in progress. *“Wind turbine noise has presented some of the greatest challenges to environmental noise specialist in recent times. These challenges have included technical, political, emotional and ethical issues that have tested experts, the courts and lay-citizens, at times fraying relationships and trust in people and organizations.*

“One of the most controversial acoustic issues has been the reports and perceptions of the modulation in the amplitude of the noise emitted by the turbines. To a degree this is a largely inescapable feature of any rotating sound source relative to a static measurement source. The amplitude modification of the wind turbine noise has been shown to exacerbate the annoyance some people feel in response to hearing it and this may contribute to the greater negative perception of wind turbine noise at similar exposure levels.”⁵

This quote comes from ongoing research commissioned by the United Kingdom for consideration of wind turbine project planning approvals. From this research, it appears the issue is how many people experience an adverse effect and is that effect more than trivial.

In 2019, the Province rescinded the Green Energy Act. Among other actions, the Province enacted transitional regulations under both the Energy and Planning Acts⁶ to manage the transitions bringing renewable energy projects back under the jurisdiction of municipal Planning and the Energy Acts. Municipal approvals are required under the Planning Act except for approved and existing wind farms.

Where existing wind turbine farms exist, those approvals allow for qualified modifications of the generation facilities in the future. No existing generation capacity exists in Port Colborne,

⁴ An undated MECP document entitled “Summary of Proposed Changes to the 2008 “Noise Guidelines for Wind Farms” describes 9 separate areas in which the standards pre and post 2016 are different.

⁵ Page 1, in Lotinga, Mike., Richard Perkins, and Toby Lewis (WSP) updated and extended version of an article that appeared in the Acoustics Bulletin Vol 42 No 2, Mar-Apr 2017

⁶ Ontario Regulation 121/19 provides for transitional matters associated with renewable energy generation facilities approved prior to rescinding the Green Energy Act. It is dated May 30, 2019 and amends subsection 62.0.2 of the Planning Act. Renewable energy projects approved prior to rescinding the Green Energy Act continue to be exempt from the Planning Act. These facilities can be subject to an extension, alteration, renovation or addition provided certain conditions are not exceeded.

so these provisions do not appear to apply to our knowledge. New renewable energy projects in Port Colborne will require municipal planning approvals.

The setback requirements in Ontario Regulation 359/09 as amended in 2016 are substantial, e.g., 550 metres and more where wind farms are proposed. Sizable land areas are required to buffer wind turbine farms. We recommend Port Colborne's Planning Department enquire of Grey, Bruce and Huron Planning Departments to determine what planning measures those municipalities are incorporating into planning policy. Further we recommend staff review these policies with Council in the future.

By comparison with Ontario's experience, EAC observes solar renewable energy projects are common in Upstate New York, especially in fairly densely populated metro areas like Erie County, New York. Why are we not developing more solar generating capacity?

Why is all of this important?

1. Appendix #1 to the correspondence from the Working Group documents the results of project compliance with Noise Audits required by Ministry renewable energy project approvals. MECP's compliance approvals have a substantial work backlog. 43% of the projects have achieved compliance monitoring requirements. 2% have not achieved compliance and their renewable energy agreement has been amended. Another 7% have demonstrated non-compliance and are under review. 17% have submitted monitoring reports which are deemed incomplete and 30% are under review, some of these have been submitted to MECP up to 6 years ago.
2. In 2019, MECP announced it was reviewing the Environmental Protection Act compliance where complaints are received⁷. That review will examine ways to rationalize MECP's compliance work load. Recently an updated draft Compliance Policy has been produced⁸. The document is silent where wind turbines are concerned. Where incidents specific to human health are under investigation if the provincial officer cannot determine that the alleged source of pollution is likely to cause any health impact, the individual (who laid the complaint) may be asked to provide confirmation from a health care professional, e.g., Medical officer of Health, Public Health Inspector or family doctor.
3. The MECP D Series Land Use Compatibility Guidelines⁹ are clear, where land uses were approved by municipal Planning Act decisions within recommended setbacks, MECP

⁷ A subsequent notice was posted on May 4, 2021 entitled Modernizing environmental compliance practices of the MECP, ERO #019-2972.

⁸ MECP, Ontario's Environmental Compliance Policy, 2021

⁹ EAC has commented on the Land Use Compatibility Guidelines separately. Where noise, odour and air contaminants are concerned, Planning and Environmental Protection Act decisions go hand in hand where the management of environmental quality and risks are concerned.

isn't responsible for noise complaints unless the facility is noncompliant with its Environmental Protection Act approval.

4. The PPS 2020 defines major facilities that may require separation distances. The definition includes energy generation facilities".¹⁰ Unless the renewable energy project is a Hydro One or Ontario Power Generation Project subject to the requirements of the Environmental Assessment Act, renewable energy projects will require municipal Planning Act decision after the Green Energy Act was rescinded.
5. The planning problems facing municipalities are these: the required setback areas are substantial and large areas are covered including lands not owned by renewable energy facility or the land owners who leased the lands for renewable energy projects; while renewable energy projects were exempt from municipal approvals prior to 2019, PPS 2020 land use compatibility policy apply where sensitive uses are proposed; and since 2019 new wind turbine projects require municipal planning approvals.
6. In March 2021, MECP released a Draft Land Use Compatibility Guideline¹¹ intended to replace the D Series Land Use Compatibility Guidelines. That Draft Guideline uses the PPS definition of "major facilities". The Draft was withdrawn for further review.
7. Since 2009 at least 5,800 incident reports prepared by MECP Provincial officers have resulted from complaints about turbine noise of which 39% include references to adverse human health.
8. Turbine noise is a very difficult technical topic to design for, monitor and address from a public health perspective, especially the barely audible noise and infrasound generated by wind passing through the turbines and the central tower. Some members of the public can hear this sound and of that percentage, some are affected adversely. Additional research is needed to quantify who is affected and how. When this research is available we will need updated land use compatibility guidance.
9. By 2025, the Ontario Minister of Energy will need new generating capacity some of which may come from new wind turbine renewable energy projects, possibly within Port Colborne.

¹⁰ Province of Ontario, Provincial Policy Statement 2020, May 1, 2020, page 46.

¹¹ Ministry of the Environment, Conservation and Parks, Draft Land Use Compatibility Guideline, March 2021.