Date: November 28th, 2018

Human Health and the Environment
Assessment and Management of Chronic Complex Conditions
13069 Keele Street
King City, Ontario
L7B 1G1

Hon. Sam Oosterhoff, Niagara West, Parliamentary Assistant to the Minister of Education
Mowat Block, 22nd Floor, 900 Bay St., Toronto, ON M7A 1L2, sam.oosterhoffco@pc.ola.org
Dr. Shanker Nesathurai, MD, MPH, FRCPC, Medical Officer of Health.
Haldimand Norfolk Health Unit, 117 Forest St. E., Dunnville, ON, Shanker.Nesathurai@hnhss.ca
Dr. M. Mustafa Hirji, Medical Officer of Health,
Niagara Public Health Unit, Thorold, ON , L2V 4T7, mustafa.hirji@niagararegion.ca
John Burnett CPHI, Team Leader, Environmental Health
Niagara Region Public Health, Thorold, ON, john.burnett@niagararegion.ca
Paul Widmeyer, District Manager (A), Hamilton District Office – West Central Region, Ministry of the Environment, Conservation and Parks, 199 King Street West, Hamilton ON L8P 4Y7,
Paul.Widmeyer@ontario.ca
Jason Hoffman, CIH, Health and Wellness Manager, Hydro One Networks Inc.
Jason.Hoffman@HydroOne.com

Dear Honourable MPP Oosterhoff, colleagues,

I am writing to express concern about the potential for harm for human health represented by Ontario's Industrial Wind Turbines (IWTs) and their supporting infrastructure. I have shared these concerns with your colleagues on a provincial level, but, given observations by residents shared with me, I am also specifically interested in the potential hazards represented for those living within and near the Niagara Regional Wind Farm.

Research has demonstrated how various various forms of pollutant from IWTs can adversely affect human health.[1] These emissions include noise, infra-sound, dirty electricity, and ground current which can each, along with shadow flicker, contribute to ill health among those who live near wind turbines.[2]

Havas and Colling's research draw on Frey and Hadden's work to note that "most people who live near wind turbines and complain of ill effects blame the effects on the noise generated by the turbines."[3] Indeed, research globally has suggested that noise from turbines does indeed contribute to ill-health, and the literature suggests best practices for IWT placement to avoid noise issues.[4] [5]

Havas and Colling also draw on existing research to note that "pressure waves at levels outside the range of human hearing can also have unpleasant side effects". The combination of low-frequency noise and infra-sound may produce, in patients, "a set of symptoms that include depression, irritability, aggressiveness, cognitive dysfunction, sleep disorder, fatigue, chest pain/pressure, headaches, joint pain, nausea, dizziness, vertigo, tinnitus, stress, heart palpitations, and other symptoms."[6] This combination of symptoms has been described by Pierpont as 'wind turbines syndrome'[7] and elsewhere

[1] Havas, M. and D. Colling (2011) Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. Bulletin of Science Technology & Society. 414-26. DOI: 10.1177/0270467611417852

[2] Ibid

[3] Frey, B. J., & Hadden, P. J. (2007). *Noise radiation from wind turbines installed near homes: Effects on health–With an annotated review of the research and related issues*. Retrieved from http://docs.wind-watch.org/wtnoisehealth.pdf

[4] Chouard, C.-H. (2006). Le retentissement du fonctionnement des eoliennes sur la sante de l'homme [Repercussions of wind turbine operations on human health]. *Panorama du medecin*. Retrieved from http://ventdubocage.net/documentsoriginaux/sante/eoliennes.pdf

[5] Shepherd, D and Billington, R. (2011) Mitigating the Acoustic Impacts of Modern Technologies: Acoustic, Health, and Psychosocial Factors Informing Wind Farm Placement. Bulletin of Science Technology & Society. 389–398.

[6] Havas, M. and D. Colling (2011) Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. Bulletin of Science Technology & Society. 414-26. DOI: 10.1177/0270467611417852

[7] Pierpont, N. (2009). *Wind turbine syndrome: A report on a natural experiment*. Santa Fe, NM: K-Selected Books.

as vibroacoustic disease.[8] [9] They note how U.S. Military research has also demonstrated that acoustic infrasound can have dramatic and serious effects on human physiology.[10] This research states that:

> Acoustic, infrasound: very low frequency sound which can travel long distances and easily penetrate most buildings and vehicles. Transmission of long wave- length sound creates biophysical effects, nausea, loss of bowels, disorientation, vomiting, potential organ damage or death may occur. Superior to ultrasound because it is "inband," meaning it does not lose its properties when it changes mediums such as air to tissue. By 1972 an infrasound generator had been built in France, which generated waves at 7Hz. When activated it made the people in range sick for hours.[11]

A significant impact on human health from IWTs can also result from electromagnetic pollution. The inverters and other technologies present within the turbines generate high levels of electrical distortion on the 60HZ sine wave of electrical current put on to the electrical grid by the renewable source.[12] This research around high levels of electrical distortion is confirmed by research by the Wind Plant Collector System Design Working Group, a part-industry organization, and published by the Institute of Electrical and Electronics Engineers (IEEE).[13] Also resulting from power generation in IWTs are increased levels of ground current often measured as voltage and often described as 'stray voltage.'[14] The circulation of these levels of distorted high-frequency signals, also known in the vernacular as 'dirty electricity,' as well as ground current or stray voltage in areas extending kilometers beyond individual IWT sites can contribute to electromagnetic injury and sensitivity to electromagnetic emissions.

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[8] Castelo Branco, N. A., & Alves-Pereira, M. (2004). Vibroacoustic disease. *Noise & Health*, *6*(23), 3-20.

[9] Castelo Branco, N. A. (1999). The clinical stages of vibroacoustic disease. *Aviation, Space, and Environmental Medicine*, *70*(3, Pt. 2), A32-A39.

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[11] Ibid.

[12] Lobos, T., Rezmer, J., Sikorski, T., & Waclawek, Z. (2008). Power distortion issues in wind turbine power systems under transient states. *Turkish Journal of Electrical Engineering & Computer Sciences*, *16*, 229-238.

[13] Bradt, M. Badrzadeh, E. Camm, D. Mueller, J. Schoene, T. Siebert, T. Smith, M. Starke, R. Walling (2012). Harmonics and Resonance Issues in Wind Power Plants. IEEE PES Wind Plant Collector System Design Working Group. *IEEE*.

[14] Havas, M. and D. Colling (2011). Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. *Bulletin of Science Technology & Society*. 414-26.

Sensitivity to EMF has been termed Electromagnetic Hypersensitivity (EHS).[15] It is thought to occur in 3-20 per cent of our population and poses the greatest risk to patients with pre-existing cardiac, neurological, dermatological and immunological conditions.[16] [17] [18] [19] [20] However, healthy individuals are often affected as well and those affected complain of sleep disturbances, headaches, fatigue and difficulty concentrating. Symptoms are reduced by avoidance measures. Long-term and serious health effects can also result for those not immediately experiencing initial sensitivity.[21] [22]

This cumulative effect of these various health impacting factors combined with the prevalence of IWTs across the province suggest that significant steps at various levels and in various areas need to be taken to:

1) widely acknowledge the potential risks that IWTs represent
2) fully respond to the thousands of demonstrated complaints of adverse effects of IWTs across the province[23]

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[17] Baliatsas C, Van Kamp I, Lebret E, Rubin GJ. Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): a systematic review of identifying criteria. BMC Public Health 2012, 12:643.

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[19] McCarty, D. E., Carrubba, S., Chesson, A. L., Frilot, C., Gonzalez-Toledo, E., & Marino, A. A. (2011). Electromagnetic hypersensitivity: evidence for a novel neurological syndrome. *The International Journal of Neuroscience,* 121(12), 670–67.

[20] Slottje, P., van Moorselaar, I., van Strien, R., Vermeulen, R., Kromhout, H., & Huss, A. (2016). Electromagnetic hypersensitivity (EHS) in occupational and primary health care: A nation-wide survey among general practitioners, occupational physicians and hygienists in the Netherlands. *International Journal of Hygiene and Environmental Health*.

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[22] Pall, M. L. (2014). Microwave electromagnetic fields act by activating voltage-gated calcium channels: why the current international safety standards do not predict biological hazard. *Recent Res. Devel. Mol. Cell. Biol*., (7).

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3) carefully measure noise, infrasound, and electromagnetic emissions in and around all of Ontario's IWT installations
4) follow mitigative steps around electromagnetic pollution (high frequency distortion, ground current/stray voltage) as suggested by the wind industry's own publications and by other non-invested experts
5) re-site IWTs to other locations without human populations when mitigation cannot be effectively undertaken

The risks for the short and long-term health of Ontarians of not undertaking such mitigating and remediating steps is significant.

Sincerely, Riina Bray

Riina Bray

Riina I. Bray BAsc, MSc, MD, FCFP, MHSc
Medical Director, Environmental Health Clinic, Women's College Hospital
Assistant Professor, Department of Family and Community Medicine, University of Toronto
Cross-Appointment Dalla Lana School of Public Health

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APPENDIX A

Summary of references in alphabetical order

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