

**Wind turbine radio frequency/electromagnetic energy: exploring
the risk of harm to human health**

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By

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1.0 This submission is public and maybe shared. It's purpose is to:

- provide a brief overview regarding the potential risk of harm to human health associated with radio frequency/electromagnetic (RF/EMF) energy exposure in general and that related to operational industrial scale wind turbines (IWT);
- propose that the Ontario Government include all devices that emit RF/EMF energy and establish RF/EMF standards which are protective of human health;
- propose that the Ontario Government IWT approval process require that in addition to actual noise measurements related to IWT noise complaints, RF/EMF measurements be conducted in the homes of residents who have submitted IWT health complaints;
- urge that Ontario government health authorities, health care experts and clinicians respond and adopt a prevention and precautionary approach to potential risk factors associated with RF/EMF energy exposure;
- rescind the burden of proof of causality imposed on rural residents by the GEA (Green Energy and Economy Act) with a more realistic level, i.e., one based on environmental protection and the balance of probabilities;
- propose that the electro-sensitivity team at Women's College Hospital be expanded and appropriately funded to support referrals by family practice physicians and medical specialists in order to investigate and treat patients suspected of being negatively affected by RF/EMF exposure emitted from any device; and
- propose that the Ontario Government convene a formal Public Inquiry to hear testimony regarding the impact of the Green Energy Act and the subsequent health and social outcomes experienced by many rural families.

2.0 A brief biography:

Krogh is 1) a full time volunteer and published researcher regarding potential risk of harm (adverse health effects) associated with industrial wind energy facilities and shares information with communities; individuals; federal, provincial and public health authorities; wind energy developers; the industry; and others. 2) Author/co-author of peer reviewed

articles and conference papers presented at scientific wind turbine noise conferences. 3) Peer reviewer for a scientific journal. 4) Retired pharmacist whose career includes: senior

executive positions at a teaching hospital (Director of Pharmacy); a drug information researcher at another teaching hospital; a Director of a professional organization; a Consultant at the Bureau of Human Prescription Drugs (Health Canada); and Director (A) at Health Canada (PMRA). 5) Former Director of Publications and Editor in Chief of the Compendium of Pharmaceuticals and Specialties (CPS), the book used by physicians, nurses, and health professionals for prescribing information in Canada.

3.0 Introduction:

The topic of human risk factors to RF/EMF energy is debated globally. However, awareness of risk factors and electro sensitivity to RF/EMF energy is increasing. Currently, regulations are often limited in scope and may not include all devices that emit and/or utilize RF/EMF energy. As a result, exposure to these emissions may be higher than expected due to wide spread use of technologies such as WiFi, other wireless systems which emit these energies.

While some authorities, physicians and researchers are expressing concerns associated with exposure to RF/EMF energy in general, research specific to IWT is limited. However, testimony from residents living near IWT led the Australian Select Committee on Wind Turbines to recommend that “electromagnetic interference” be addressed [1, pg xviii].

In Ontario, concerns regarding IWT radio/electromagnetic energy are not new. During the GEA hearings (2009), the Standing Committee was advised of IWT RF/EMF energy and noise issues which were affecting the health of a group of impacted families [2]. Since that time, some Ontario residents living in proximity to IWT have taken the step to test their homes for RF/EMF energy. Some report harm they associate with the start-up of an IWT project in proximity to their home and consider that exposure to IWT emitted noise as well as to RF/EMF energy is negatively affecting them. As a result, residents are increasingly consulting their physicians and other health practitioners [3].

Additional concerns relate to vulnerable population groups such as children (fetus to youth), the elderly including those with pre-existing medical conditions, chronic disease states and special needs. However, while it is known that these vulnerable populations are potentially at risk of harm to noise and RF/EMF emissions in general, research specific to IWT exposure is limited.

4.0 Risk of harm to human health

Technology-based systems are often utilized during the generation and distribution of electricity. IWT facilities typically utilize infrastructure support such as wiring, cables, transformer stations, communication networks, remote data monitoring capability, digital and GIS interfaces [4,5]. Mechanisms that utilize WiFi for IWT remote monitoring and the use of smart meters to monitor electricity usage contribute to the overall totality of these emissions.

An Internet search reveals that authorities, professional and citizen groups have expressed concerns relating to RF//EMF energy, A snapshot of these is briefly summarized below.

Physician Lamech (2014) conducted a study on smart meters which are typically used by electricity utilities to monitor electrical usage data through R/F fields. Conclusions were based on comparisons with other research and findings indicate that “symptoms were the same as those reported by people exposed to radiofrequency fields emitted by devices other than smart meters” [6].

The International Agency for Research on Cancer (IARC) is an arm of WHO (World Health Organization). IARC has classified RFR (Radio Frequency Radiation) and ELF (Extra Low Frequency) as a possible carcinogen to humans [7].

The BioInitiatives working group advises there is little doubt that exposure to ELF causes childhood leukemia [8] and the American Academy of Pediatrics strongly supported a proposal for a “formal inquiry into radiation standards for cell phones and other wireless products” [9]. Concerns for children have been published in Redmayne 2016 [10] as well as in the comprehensive report published by the BioInitiatives Working Group [8].

Boardman reports that Women’s College Hospital in Toronto is the first Canadian hospital requiring its doctors to be trained in treating the effects of these emissions [11]. Based on personal communications, the College has a lengthy waiting list resulting in delays before a patient can be seen [3].

5.0 Conclusions

To conclude, Ontario researchers Havas and Colling 2011 comment that symptoms from electro hypersensitivity are consistent with IWT generated sound waves and that IWT:

... make pressure waves and electromagnetic waves. The pressure waves (or sound waves) generated by the moving turbines can be heard as noise and/or perceived as infrasound. The electromagnetic waves are generated by the conversion of wind energy to electricity. This conversion produces high-frequency transients and harmonics that result in poor power quality. These high frequencies can flow along the wires (dirty electricity) and along the ground, thereby causing ground current. These four types of waves—noise, infrasound, dirty electricity, and ground current—and shadow flicker are each likely to contribute to ill health among those who live near wind turbines [12].

Havas and Colling propose a number of recommendations on how to minimize “adverse biological and health effects for those living near wind turbines” including the “obvious steps” to “eliminate or reduce exposure to the agent(s) causing the illness” [12].

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BioInitiative (2012) reviewed the risks associated with RF/EMF energy exposure and emphasize the critical importance of prevention and reducing exposure to these emissions [8].

In an overview and summary fashion, during concerted efforts over a two year period of time, the Wind Plant Collector System Design Working Group considered harmonics and resonance issues associated with IWT:

This paper has presented harmonics and resonance issues for wind power plants in an overview and summary fashion. This included an introduction to series and parallel resonances, frequency scan analysis, and the harmonic source characteristics of WTGs and of utility interconnections. Further, the issue of compliance with the power quality standard IEEE Std 519 was presented, as was an overview of harmonic filters.

Reasonably, it is understood that such studies will not always insure compliance. No harmonic mitigation solution is ideal for every situation and accordingly post construction harmonics monitoring may be need to determine a viable solution should an issue arise. It should also be noted that post-commissioning harmonic measurements might be inconclusive because it is problematic to segregate harmonic currents caused by the wind plant from harmonic current flow into the plant as a result of grid voltage distortion. In the worst case, failure to comply with harmonic limits could result in a default of the terms of an LGIA, which could lead to termination of the agreement if the default is not cured [13].

Ontario has a provision in the Health Protection and Promotion Act (HPPA) [14] to investigate residents' complaints. Using the provisions in the Act, an investigation should be conducted using the already established team at the Women's College. The Austrian Medical Association has published a guideline for the "diagnosis and treatment of EMF-related health problems and illnesses (EMF syndrome) [15]. As well, in a medical journal McMurtry and Krogh provide diagnostic criteria to assist physicians with diagnosing adverse health effects associated with living in the environs of IWT [16]. Both references could be utilized during such investigations.

Ontario's GEA requires a high burden of proof during Environmental Review Tribunal (ERT) hearings. The legislation requires that rural community residents and other participants who wish to appeal the approval of a IWT project must prove the project "will cause serious harm to human health" [17] prior to the start up of WT operations.

However, proof of causality is rare in health and ranks at about 95 to 99% certainty. This is rarely possible for biological systems; the Precautionary Principle ranks at the about the 50% medium level, consistent with civil and some administrative law; and environmental protection has a low level of certainty (10 to 30%) [8]. The burden of proof imposed on rural residents and communities should be adjusted to a more realistic level, i.e., one based on environmental protection.

Regarding the burden of proof, Goldstein (2001) comments:

...the burden of proof for potentially harmful actions by industry or government rests on the assurance of safety and that when there are threats of serious damage, scientific uncertainty must be resolved in favor of prevention. Yet we in public health are sometimes guilty of not adhering to this principle [18].

WHO 1999 provides “environmental management principles on which government policies, including noise management policies, can be based” [19]:

a. The precautionary principle. In all cases, noise should be reduced to the lowest level achievable in a particular situation. Where there is a reasonable possibility that public health will be damaged, action should be taken to protect public health without awaiting full scientific proof.

b. The polluter pays principle. The full costs associated with noise pollution (including monitoring, management, lowering levels and supervision) should be met by those responsible for the source of noise.

c. The prevention principle. Action should be taken where possible to reduce noise at the source. Land-use planning should be guided by an environmental health impact assessment that considers noise as well as other pollutants.

It is proposed that the *Ontario Government for the People* adopt the WHO 1999 precautionary, polluter pays and prevention principles and take pro-active measures to protect public health by:

- Acknowledging that there are some rural families experiencing adverse health effects from living in proximity to IWT;
- Rescinding the burden of proof of causality imposed on rural residents by the GEA with a more realistic level, i.e., one based on environmental protection and the balance of probabilities;
- In addition to noise measurements, requiring RF/EMF energy measurements in homes where residents are reporting adverse health effects;
- Taking action and working proactively with those residents reporting adverse health effects in order to resolve the issues to their satisfaction;
- Establishing an independent investigative process under the HPPAct. This potentially could be conducted by the Women’s College whereby physicians can refer patients suspected of adverse health effects from living in proximity to IWT;
- Providing priority attention to vulnerable population groups such as children (fetus to youth) and the elderly, including those with pre-existing medical conditions and disease states as well as those with special needs; and

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- Convening a formal Inquiry to hear testimony from rural families regarding the health, social and other impacts of Ontario's Green Energy Act.

Respectfully Submitted,

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