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To whom it may concern,

In April 2018 I tested a variety of properties and locations around Niagara and Haldimand Counties (Ontario) for ground current/stray voltage and for high frequency transients and harmonics. The release of the details of each of those reports is at the discretion of the individual property owners in question.

What I can confirm is the following: in each of the properties tested, varying degrees of electrical distortion and contact current were found inside and outside the homes in question, even with the power turned off. A number of these properties had been tested before the coming online of the Niagara Regional Wind farm and at those previous times levels of electrical pollution were much lower. Clear cases of violation of existing lax ground current standards during the April 2018 testing were found with for example 10 volts of current on a downwire being discharged into the earth near the industrial wind turbine installations.

What are the sources?

Both wind and solar have major issues with complying with the Institute of Electrical and Electronic Engineers Standards, specifically the IEEE 519. In most cases the electric utilities are mandated to buy "Green Energy" such as wind and solar power. The inverters on the devices generate harmonic currents and voltages as well as high frequency transients. These harmonic currents, voltages, and transients are coupled to the electrical company's transmission and distribution system that is eventually connected to homes, business, and industry. This distorted power causes appliances to fail, motors, wires, and transformers to overheat, inaccurate watt-hour meter readings, and, according to the published peer-reviewed scientific research papers, a drop in milk production in cows and other health issues associated with exposure to higher frequencies.

The Guide for Applying Harmonic Limits on Power Systems (72) – May 4, 1996 states:

> The electric utility is responsible for the quality of the voltage supplied to its customers. This voltage can become distorted due to harmonics introduced by nonlinear loads within customer facilities, due to harmonics introduced by nonlinear devices applied directly on the power system (e.g. static var systems, high voltage dc converters, traction power rectifiers, etc), or due to resonance conditions on the system. IEEE 519-1992 was developed to help with the coordination that is needed to keep voltage distortion levels on the overall system within reasonable limits.

Figure 1 below is copied from the IEEE 519 and shows the harmonic voltage distortion limits.

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Table 1—Voltage distortion limits

Bus voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
1 kV < $V \leq 69$ kV	3.0	5.0
69 kV < $V \leq 161$ kV	1.5	2.5
161 kV < V	1.0	1.5[a]

[a]High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

Figure 1

Electrical distortion and contact current found during testing

In each of the properties tested, electrical pollution in the form of varying degrees of distortion was found to be riding on the 60-cycle waveform. Also, with measurement taken between the kitchen sink and floor in the homes, varying degrees of contact current were found. These were highly distorted 60 Hz sine wave that were measured when the power to each home was turned completely off. That indicates that there is nothing in the home causing his reading. Since the power to the home was turned completely off, the sole responsibility for this is the electric utility due to their use of the earth as a return path – a clear violation of electrical codes and rules. The electric utility is responsible for the 60Hz and the issue should be addressed using sound engineering practices.

A scientific report by Kavet published in *Bioelectromagnetics* states, "the absolute (as well as modest) level of contact current modeled (18µA) produces average electric fields in human tissue along its path that exceed 1 mV/m. At and above this level, the NIEHS Working Group [1998] accepts that biological effects relevant to cancer have been reported in "numerous well-programmed studies"".

Testing in a range of locations near the Niagara Regional Wind Farm shows high frequency transients riding along ground current measurable on people's properties. Again, the source of the ground currents is clearly the responsibility of the electric utility once it is their lines. Instead of keeping these electrical currents on their wires, they elect to put them onto the earth where they come in contact with people and animals.

The *National Electrical Safety Code*, Rule 92D states: "Ground connection points shall be arranged so that under normal circumstances there will be no objectionable flow of current over the grounding conductor."

The *Wiley Encyclopedia of Electrical and Electronics Engineers* states: "It is an unsafe practice to allow current to flow over the earth continuously, uncontrolled. All continuously flowing current must be contained within insulated electrical conductors."

This is not an impossible task. Electrical Power Research Institute (EPRI) published a document – *Handbook for the Assessment and Management of Magnetic Fields Caused by Distribution Lines, EPRI TR-106003, Project 3959-07, Final Report, December 1995* – which states: "A

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method that practically eliminates ground currents associated with primary distribution lines and still maintains the advantages of a four-wire multi-grounded system, is the five-wire system….

Conclusion

In conclusion, it is my opinion that the electric utility is dumping distorted, high frequency currents into the earth where it flows uncontrolled over the ground back to their sub-stations. The wind turbines are a major source of these high frequency transients that are on the electric utility's electrical grid and end up on the earth. The IEEE Standards Association's NESC Handbook, Seventh Edition, Rule 215B, "prohibits the use of the earth normally as the sole conductor for any part of a supply circuit. … (Objections to use of the earth as part of a supply circuit are made from both safety and service standpoints.)" These currents destroy the infrastructure by electrolysis. They also affect milk production in dairy cows as shown in published, scientific, peer-reviewed papers. EPRI, the electric utility's own research arm, reports levels as low as 18µA cause cancer in humans. Rule 215B in the NESC Handbook also says:

> The destructive nature of current flow through the earth endangers other facilities through electrolysis. When earth returns were used in some rural areas before the 1960's, they became notorious offenders in dairy areas because circulating currents often caused both step and touch potentials. In some cases, these have adversely affected milking operations by shocking the cattle when they were connected to the milking machines and have affected feeding (see Rule 92D – Current in Grounding Conductor). The grounding methods required by the NESC, including the use of a metallic neutral throughout each span of a multi-grounded wye system, reduced the opportunity for such occurrences.

It should be noted that the measurements are a mere snapshot in time and will change continuously as electrical loads change on the system. They will only become worse as more non-linear loads are connected to the grid. The so called "Green" loads such as solar and wind generation will only amplify these problems due to their lack of filters and use of switch-mode power supplies and inverters.

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