**To:**
Kristen Walli
Board Secretary
Ontario Energy Board
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To Ms. Walli:

Herein are my comments of the "Proposal To Amend A Code" on Stray Voltage that the Energy Board released in October 2008.

Sincerely,

Lorne Lantz

**Lantz Control Systems Inc. comments pertaining to the:**
**Notice Of Proposal To Amend A Code**
**Proposed Amendments To The Distribution System Code EB 2007-0709**

Looking at the response to the D.P., you have farmers on one hand wanting the voltage and current levels down to ACC/ACV of 2mA/1V . On the other hand you have Hydro One saying that this level is to low. If we adopt the 2mA/1V AC level, you will see an increase of earth currents because Hydro One will just simply drive more ground rods into the earth to reduce the primary neutral voltage. This is not good. I see giving Hydro One more room to work 2-3V AC, but at the same time they must reduce primary neutral current to earth, provide mitigation devices to farmers to stop any primary neutral current and voltage on to their farms. This would reduce the voltage and current on a farm to a level way below the proposed 2mA/1V AC. This would also give Hydro One more room for line drop voltage on the primary neutral to take return current back to the sub-station. More work has to be done in understanding primary neutral currents returning to sub-stations via earth. Eventually stopping the practice of using earth as a return path will benefit both animal and man kind.

Setting a limit of 2mA/1V AC P.N. voltage will help farm operations faced with stray voltage problem from the primary neutral, affecting their livestock, but it will have no effect on operations that have spent thousands of dollars to mitigate stray voltage on their farms, yet are still faced with a dreadful situation of low production, crippled animals and high death rates in their livestock.

I spoke of earth currents in my last response to the D.P. They are primary neutral currents that enter the earth at every ground rod, well casing, farm bonded grounding systems, etc. Once these primary neutral currents are in the earth they return to their respected sub-station becoming more concentrated near the sub-station. If any farm is located in the path of these earth currents, they can be affected greatly. It has been known to affect a Mennonite farm that did not even have a hydro service. Farm buildings that house livestock provide an ideal medium for these currents to travel on, wet floors coated with manure and urine. The fact that the cows walk around on these floors puts them in direct contact with these earth currents. This is a low level of electrical electrocution that causes stress, inflammation of joints, the immune system to fail and death of these animals. I have been called out to several farms to do stray voltage work. When the testing was done it showed that there should not be any stray voltage problems with the mitigation they had in place. Yet these farms had problems that resembled stray voltage conditions. One case where the hydro was completely disconnected, earth currents were flowing on the grounding system from one barn to the other. I now have measured earth currents @60Hz in the soil away from any hydro connections. A standard test was set up to record and compare information. The testing was done with two stainless steel rods placed 3 feet in the soil 250 feet apart. A coated wire connects the two rods for currents and voltage measurements. A scope was used to determine the frequency and a set of headphones used to listen to the AC hum. The direction of each test was recorded to determine the path of the earth currents.

I have done extensive testing at a farm owned by John Byman in the Listowel area. John has a Hammond Filter in place plus a Ronk Blocker on the pole. Data Logging shows an average voltage of .2V AC on his grounding system to earth. Hydro One completed there testing for stray voltage at several points in the barn and also found low readings. There should be no problems with stray voltage on this farm, yet when you hear him talk about low production, lame cows and a loss of 1-2 cows per week, this tells you that there is something wrong. Raising calves in the dairy barn and outside in hutches on a cement pad had a death rate of nearly 50%. The only bright spot in the operation of this dairy farm was that fact that he used a wooden box on rubber tires to place new born calves in. Here they received their colostrum milk for two – three days and then were taken to another farm where they can be raised with no problems at all. This farm is where the first testing for earth currents was done. The first test west of the barn showed 4.8mA, .58V AC @60Hz in an east-west direction. The second test was east of the barn. It showed 5.8mA, .792V AC @60Hz in and east-west direction. The third test showed .7mA, .057 V AC @60Hz in a south-north direction. The path of earth currents is in an east-west direction, this is determined by the larger current and voltage readings. Another test ¾ miles south of the Byman farm showed .37mA and .075V AC in a east-west direction. This farm had the highest readings of earth currents that I have tested along with having the most problems. John's son owns a hog farm north - east of Listowel, and testing here showed 2.4mA, .40V AC @60Hz tested in an east-west direction. They are also faced with a higher than normal death loss of hogs on this farm.

On a third farm we placed a wire in the ground with no connection to the farm ground system to take these earth currents around the barn. It was not a total success but we managed to draw 180mA around the dairy barn. This gave some relief to the dairy operation. We had the chance to monitor this wire when the near by sub-station was shut down for minor repairs. The currents dropped to zero and remained there until the sub-station was turned back on at which point the currents reappeared. I have done 50 tests for earth currents with a range of 5.8mA AC .79V AC to .00mA .009V AC with problems farms above .9mA, .1V AC range.

Today we are faced with soil, water, air and noise pollution all with high regulations by Environment Canada. With this kind of destruction by earth currents, we will see electrical pollution of the soil on Environment Canada's list of earth pollutants. We must convince Hydro One to stop using ground rods, farm ground systems and well casings etc. to reduce primary neutral voltage and eliminate primary neutral currents from traveling back to the sub-stations via earth.

The following is a quote from **"understanding ground currents"** by Duane A. Dahlberg, Ph.D.
"On dairy farms, current in the ground is associated with behavioral, health and production effects in cows. It is very important to carry this association to the next step, which is the determination of how these currents interact with the cow to produce the physical effects. The presence of the ground currents implies long-term, continuous exposure to low-level electrical currents. Worldwide research and investigations of both

animal and human health problems in dairy barns have demonstrated that small continuous currents (as low as a fraction of a microamp) can affect well being. Bjorn Nordenstrom, among others, has suggested models that portray the bodies of living organisms as having electric circuits with small currents actually controlling life (Nordenstrom 1983). Appropriate electric currents of small magnitudes within the circuits of the body are vital to good health. The bodies of living organisms generate these currents and naturally provide the magnitudes that afford good health.

Using Nordenstroms models, one can imagine that exposure to an electric and magnetic environment could affect the currents in the circuits of the body, either positively or negatively. The medical community has utilized this positive potential in a number of ways. Negative changes caused by these currents, however, would require the body to correct the change. Such an event could be classified as a stress on the body. It would be logical to conclude that exposure to certain electrical conditions can be equivalent to initiating a stress. If the currents in the floor of the barn set up an electric and magnetic environment that causes inappropriate currents in the body of the cow or the human, the experienced effects would likely be similar to those caused by other stresses. Unfortunately, the research community has been reluctant to investigate this source of stress on animals and humans. The traditional research model continues to assume that negative health effects are possible only in the presence of physical shock.

## CONCLUSIONS

The health of the environment is a determining factor in the health of all life within that environment. Under some circumstances, human ingenuity in the treatment of illnesses can delay and reasonably mitigate the effects of an unhealthy environment. Under other conditions or over time, however, the effects of an unhealthy environment may slowly or rapidly wear on the health of life in that environment. A world population of approximately 6 billion people, with no new frontiers, is extremely vulnerable to unhealthy changes in the environment. This world condition is a compelling reason for seriously monitoring changes in the environment and constantly assessing the effects of those changes.

An important environmental change, and one that has escalated since its inception over a century ago, is the addition of EM energies to the environment. The extensive use of the earth to carry electric current is the most dramatic and least understood of the additions. Even though the earth has been used for all these years as a sink for electrical current, little is known about the paths of these currents or the effects of the currents on either the animate or inanimate world. In fact, shock-effect models still dominate the regulatory agencies' concept of how EM energies interact with life. Even in decisions regarding research directions, these inadequate models are still applied. Research from around the world has shown the need to recognize new models that are consistent with the electrical nature of living organisms and the complexity of our environment. Stray voltage research and the ground current connection have provided valuable insights into the relationship between exposure to EM energies and effects in humans and animals.

For 50 years professionals in the dairy industry have known that electric current in the earth from a ground fault, occurring on or off a dairy farm, can seriously affect the health and production of dairy cows. Today we live with an electrical distribution system that has been designed to put electric current into the ground. The design of the electrical distribution system has created a perpetual ground fault capable in impacting all life. Perhaps it is time that we heed the warning cries of dairy operators."

I agree with having a common training course and would be willing to attend a one or two day course to share my approach in trouble shooting stray voltage and to help set up a standard testing procedure. Input to this training, must come from Hydro One, ESA, OEB, and individual stray voltage investigators, to have an unbiased approach.