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Attached is my response and data to the Stray Voltage Staff Discussion Paper. Thanks for the opportunity to response and express my opinion and findings.

Regards

Lorne Lantz

Response to OEB Staff Discussion Paper:

(Sec. 5.3) (Ref. page 26) Farm stray voltage in Ontario
The Hammond Filter was developed by Hammond Mfg. and Ontario Hydro to mitigate stray voltage at the farm service panel. **The filter does not absorb current** as stated in the staff discussion paper. The filter is a impedance device which sets up a counter electro magnet field when AC current tries to flow through it. This counter EMF limits the current flow in both directions to a point of saturation of 28V AC. Once the voltage is over 28V AC, current is able to flow with no further build up of counter EMF.

Now let's look at fault current on the grounding system. Any fault current with a voltage below 28V AC **will be locked on the grounding system** because the voltage is not high enough to saturate the filter and cause enough current to flow to blow a fuse or trip a cct breaker. Not all faults in a electrical system in barns are full 120V faults. This is due to the dirty moist conditions found on most farms, causing partial fault current to flow. Data logging (Dia.1) shows voltage locked on a grounding system from a hot water heater due to a Hammond Filter located between the Neutral and the farm grounding system. Data logging (Dia.2) shows the farm N-E voltage with the Hammond Filter in place. Note the ground had more voltage on it over night than that of the Sec. Neutral.

We rely on the grounding system to take any fault current back to the transformer Sec. Neutral. There is **no way** we should be allowing an impedance device in the ground return path to restrict current flow below 28V AC.

(Dia. 3)
This is the warning on the very last page of the instructions on the Hammond Filter. If the Hammond Filter is recognized as a useful mitigation device, then farmers should be made aware of the fact that it can **lock partial faults** on the grounding system and that the filter be **monitored** at all times for fault conditions.

(Sec. 5.4.4)
The effectiveness of equal potential planes draws a question on how well they work. Tests done on dry concrete show that it does not conduct electricity. Placing a wire mesh in cement does not come in contact with livestock to provide a equal potential plane. Only the dirty wet surface of the cement conducts electricity, this is why equal potential plane does not work.

(Sec. 6.4) Effects of stray voltage on farm animals.
There is no study on low level continuous current on farm animals below 2mA AC @1V AC. I believe from what I see on some farms that there is some effect on these animals over the long term (1-5 years). Most studies look for a immediate reaction by the animal in the short term.
Due to the electrical code on bonding of the grounding system by ESA, many new barns are being built with a very low resistant to earth (.7 OHMS). When you test for stray voltage, at first it appears to be below 1V AC, but when you measure the total N-E current to that farm it can be any where from .5 -3.5Amps. There should be a limit to

total current that any one farm must take. These new barns are one huge ground rod for Hydro One. These are the farms where I see problems with the farm animals.

(Sec. 7.6) 5 wire system (pg. 49)
I disagree with the 5 wire system do to the fact that it will encourage more earth currents to be picked up by the farm grounding system and taken back to the sub-station. Several farms that I have tested show earth currents of 30 – 180 mA AC with hydro connection completely removed from the farm.

(Sec. 7.7) (pg. 51) Isolation Devices
There is only one device that is called a VTNI. It is made by Dairyland Industries and tested to fail closed under severe fault current conditions. It must not be considered the same as Metal Oxide Varistor or Ronk Blocker and Hammond Filters. These devices work some what differently than a V.T.N.I. I see the Dairyland Isolator as the choice of mitigation, by stopping both AC & DC current 100% up to 45 volts. This will isolate the farm from outside sources of voltage current and use only local grounding for that farm. In some locations we may still be dealing with earth currents flowing through the farm, more so on large farm operations.

Pad mount transformers should have a minimum limit set for distance between the pad mount transformer and nearest grounding of that farm operation. The reason for this is to limit ground coupling of N-E voltage and currents to the farm ground system.

My over all view on lowering the N-E voltage to 2 mA 1V AC is that it will cause Hydro One to drive more ground rods into the earth along with increasing the size of the primary neutral lines. More ground rods will increase earth currents back to the sub-station. Increasing the neutral size will help, but not solve the problem completely. The way I see it, we should limit the use of ground rods for lightning protection only and use lightning arrestors on the secondary neutral. Use a VTNI on every transformer and let the primary neutral voltage float as needed. This would allow the farm to be isolated from the primary neutral and limit earth currents from traveling back to the sub-station via the earth.

Diagrams 4 & 5 show primary neutral voltage and farm ground voltage with a Dairyland Isolator in place.

Submitted by:

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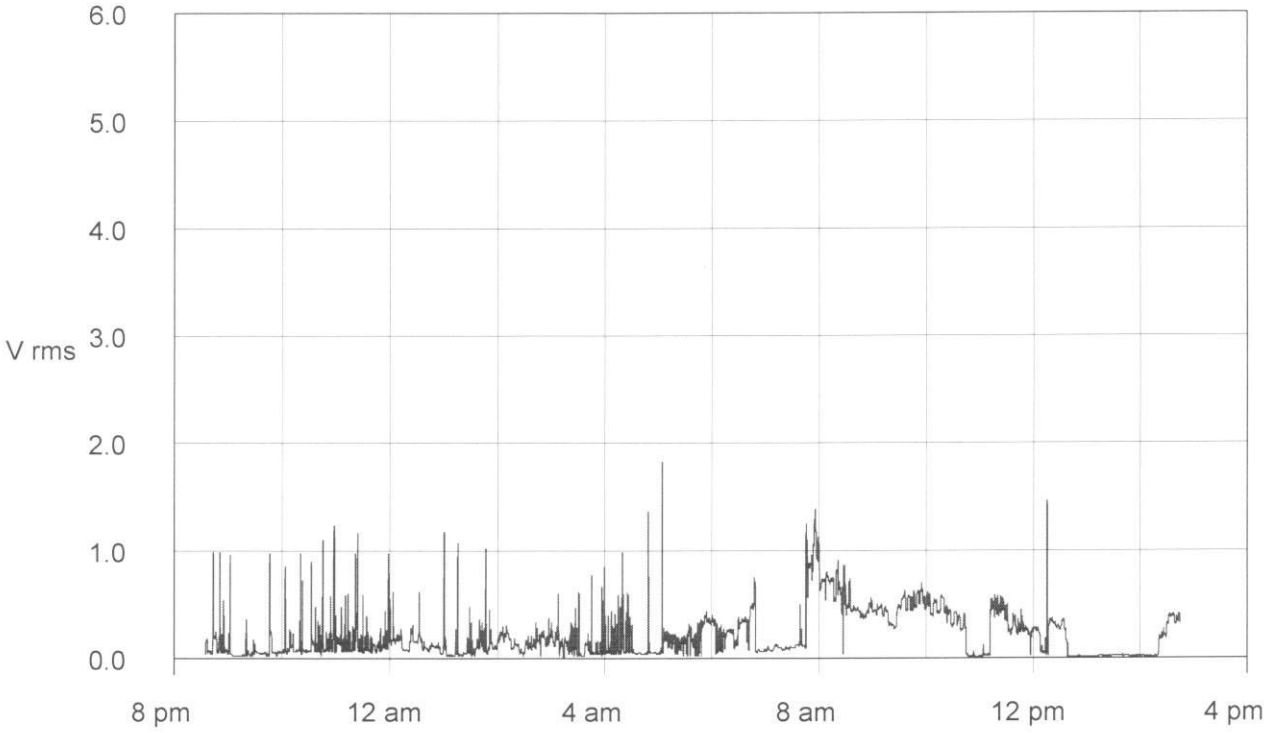
(Dia. 1)

STEPHEN MARTIN GG NIGHT



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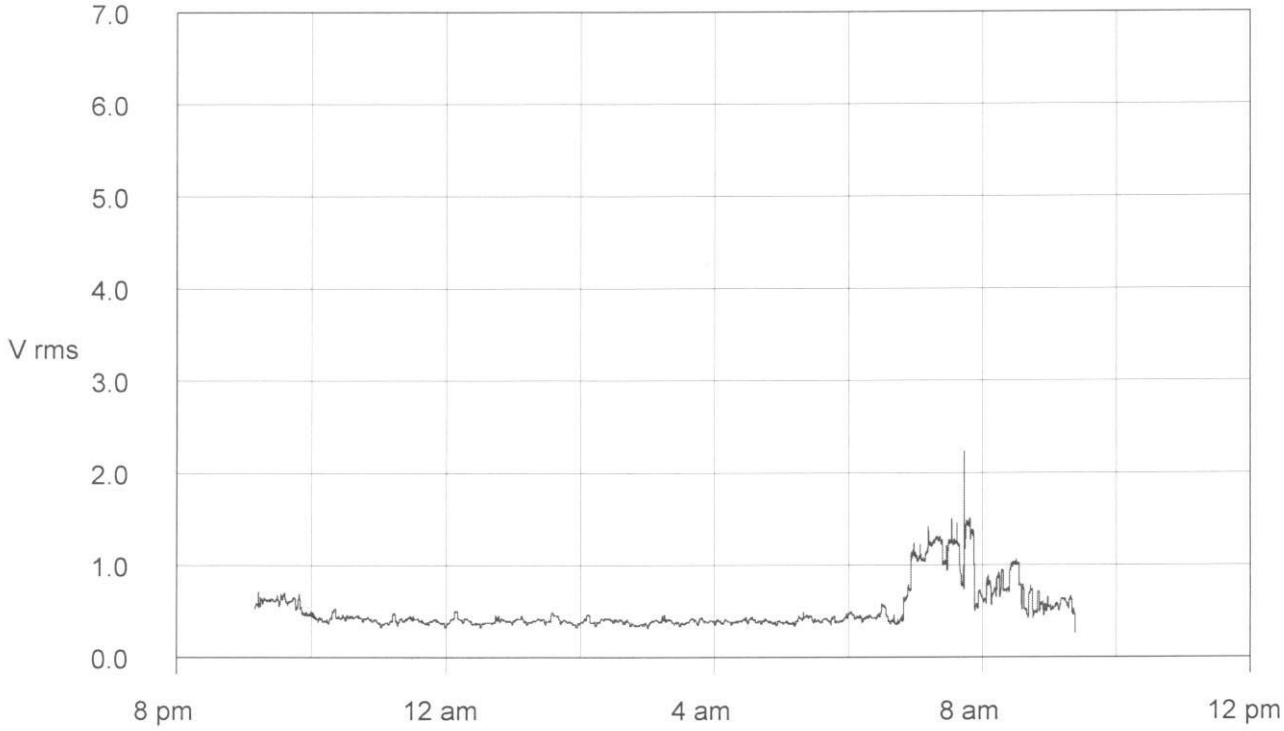
Logger No:7623
Points:4655

Max:1.83
Min:0.01
Average:0.21

DATA LOGGING SHOWS THAT A HAMMOND FILTER LOCKED VOLTAGE ON THE GROUNDING SYSTEM FROM A PARTIAL FAULT IN A HOT WATER HEATER..

(Dia. 2)

STEPHEN MARTIN NN NIGHT



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Max:2.24
Min:0.26
Average:0.51

DATA LOGGING SHOWS VOLTAGE ON THE SEC NEUTRAL
WITH A HAMMOND FILTER IN PLACE.

(Dia. 3)

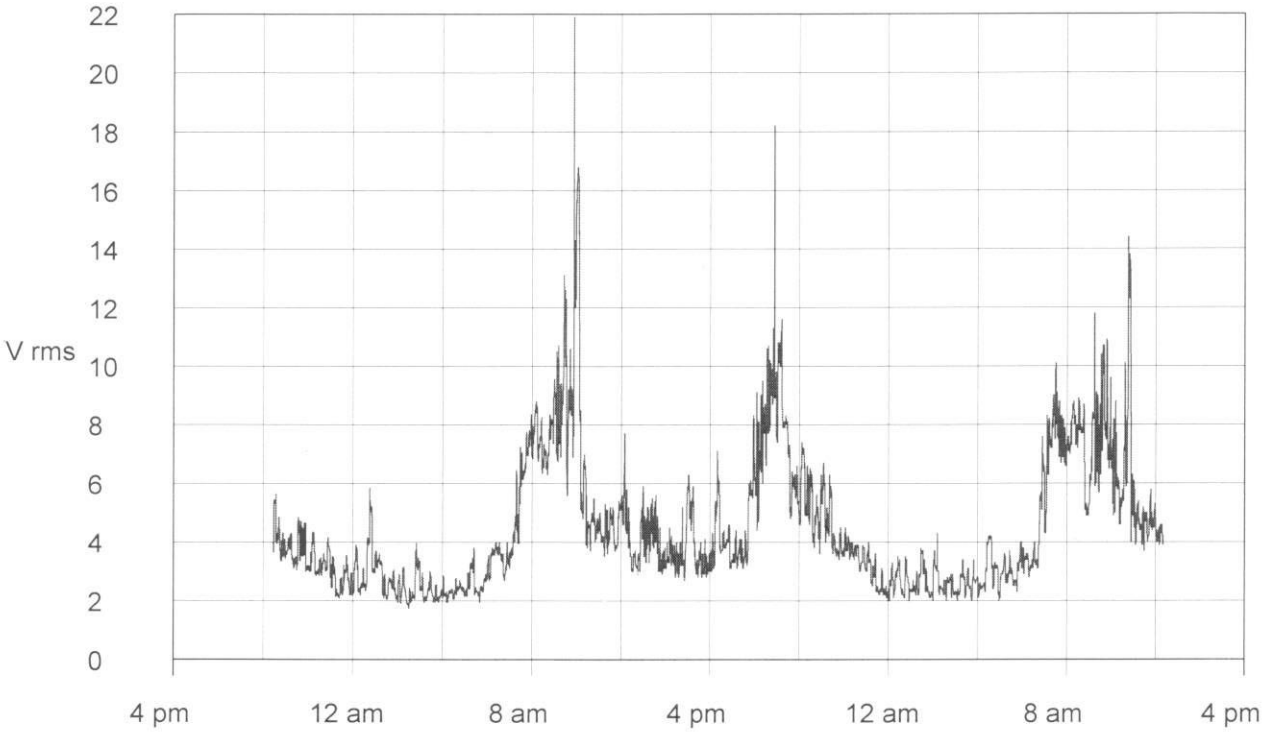
W A R N I N G

TO PERFORM SATISFACTORILY, THE TINGLE VOLTAGE FILTER REQUIRES THAT ALL EQUIPMENT AND WIRING MEET ELECTRICAL CODES, THAT THE FILTER BE INSTALLED IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS AND THAT THE INTEGRITY OF THE SYSTEM BE CONTINUOUSLY MAINTAINED. FAILURE TO COMPLY MAY RESULT IN HIGHER LEVELS OF TINGLE VOLTAGE THAN MIGHT HAVE EXISTED WITHOUT THE FILTER

A TINGLE VOLTAGE INDICATOR IS RECOMMENDED FOR EVERY INSTALLATION. IT CONTINUOUSLY MONITORS THE SYSTEM FOR VARYING LEVELS OF TINGLE VOLTAGE.

(Dia. 4)

NITHCREST RSN2



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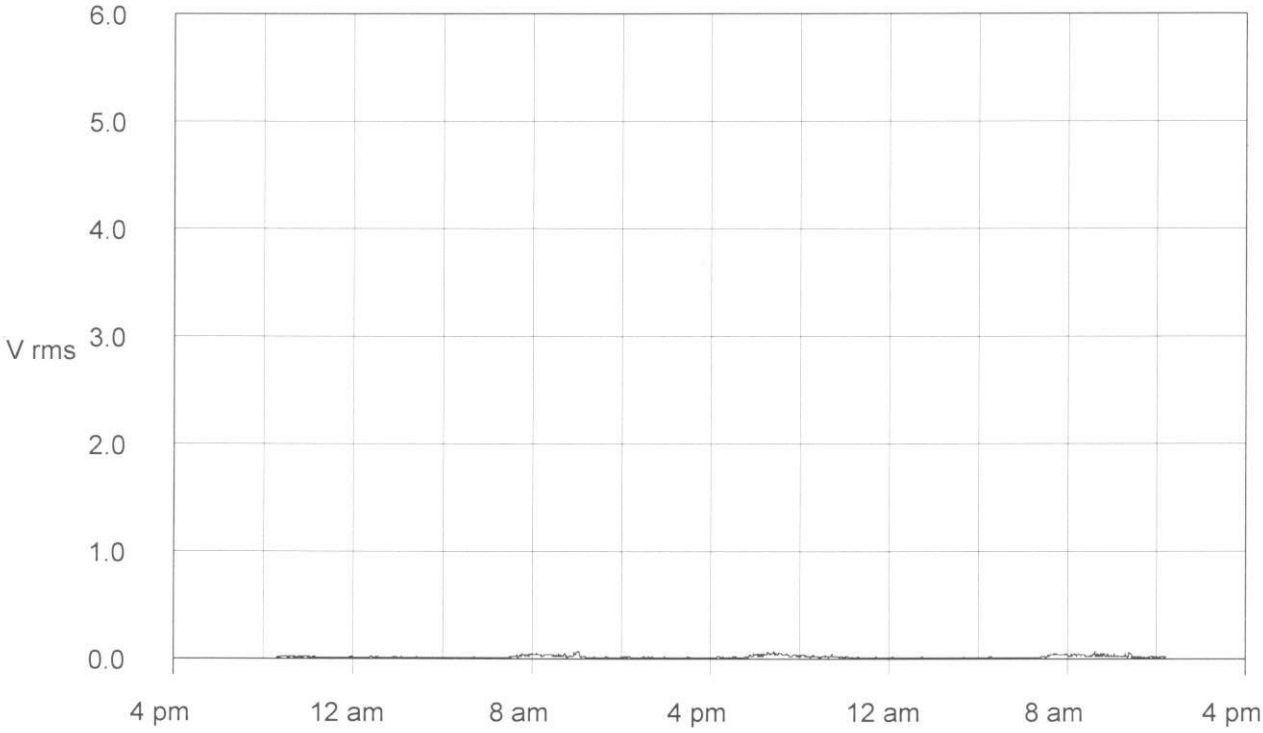
Average:4.4

DATA SHOWS VOLTAGE ON THE PRI. NEUTRAL WITH DARIYLAND ISOLATOR IN PLACE.

(Dia. 5)

NITHCREST GR2



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Max:0.08
Min:0.01
Average:0.02

DATA SHOWS GROUND VOLTAGE AFTER DARIYLAND ISOLATOR WAS INSTALLED.