The Health Effects of Magnetic Fields Generated by Wind Turbines

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SUMMARY

This report presents an analysis of the expected magnetic field for 1,650 kW proposed wind turbines at the Windrush sites. This study is based on:

1. References given below;
2. Over 50 years of the consulting experience in the area of magnetic fields. Consultants are Professor Reza Iravani, Dr Milan Graovac and Dr Shashi Dewan;
3. Test results at the CNE windmill site at Toronto;

The test results at CNE wind turbine show that the magnetic field at 10 feet from wind turbine and associated transformer is less than the magnetic field from household hair dryer. No measurable magnetic field is expected at distance of 25 feet from Windrush wind turbine installation. It is our strong belief that the magnetic fields produced by the generation and export of electricity from the Windrush wind turbine does not pose a threat to public health. **(**Measured MF=0.4mG in front of door , Typical value around wind turbine=0.04mG, Acceptable =833mG**)**

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Magnetic Fields

Magnetic fields (MF) occur where any electric conductor exists with an electrical current flowing through it.

All alternating currents generate magnetic fields. Power lines are highly visible source of magnetic field, but any electrical device is capable of producing them. Canadians are exposed to these fields, to varying extents, throughout their lives.

Examples of such conditions include high-voltage transmission lines, feeder lines, substation transformers, house wiring and electrical appliances. Transmission lines are not fundamentally different from other electrical conductors. MF can occur indoors and outdoors.

Magnetic field strength is proportional to the current through the conductor. The field exists around the lead and the appliance but only when it is operating. This field emanates from the wires delivering electricity to our homes and all devices that use electricity in the home.

Buried power lines generate lower magnetic fields than overhead power lines because of their design. In general, the easiest way to reduce exposure to magnetic field is to increase the distance from the source.

The scientific evidence does not establish that exposure to 60 Hz magnetic field around the home, the office or near power lines is a hazard to human health. The scientific research done so far shows that any risk is negligible.

Implication at Windrush site

There are four potential sources of magnetic field associated with proposed Windrush installation. These are:

- The grid interconnection power line;
- The wind turbine generators;
- Any electrical transformers; and
- The underground collector network cabling.

It is anticipated that the interconnection with the existing grid will be made above ground and is no different from any other power line used within the network. The MF levels are comparable to typical household appliance, i.e. negligible.

The electrical generator windings are close together and surrounded by conductive metal so that the magnetic fields around the windmill tower from the generator is effectively zero.

Windrush turbines will sit on solid steel enclosed towers in which all electrical equipment will be located, except for the windmill transformer. Access to the tower is only through a solid steel door that will be locked when not in use. The magnetic field from the windmill transformer is negligible 10 feet from the transformer and tower.

The collector network, which connects the wind turbine generators, will operate at typical distribution voltage of 600 V and is buried below ground level. Because of the closeness

of the phase conductors within the cables magnetic fields are balanced out to effectively zero.

Test results at CNE windmill Toronto site

Magnetic field measurement was performed at the foot of the CNE windmill tower in Toronto. The results show that anywhere on the wooden platform surrounding the tower the measured magnetic field is less than 0.5 mGauss. Magnetic field of 0.40 mGauss was recorded in front of the steel windmill tower door, as shown in Figure 1.

Figure 1

The typical magnetic field anywhere around the tower was around 0. 4 mGauss, as illustrated in Figure 2. For comparison, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommended 60 Hz magnetic field exposure limits for general public of 833 mGauss [1].

Figure 2

Conclusion

At Windrush Energy installation, electrical cabling between wind turbines will be buried in the ground, effectively eliminating any MF. Grid connection is made at 27 kV similar to the voltages used by the utilities in existing distribution networks for households in Ontario.

The magnetic fields produced by the generation and export of electricity from the Windrush wind turbine does not pose a threat to public health. The test results at CNE wind turbine show that the magnetic field at 10 feet from wind turbine and associated transformer is less than the magnetic field from household hair dryer. No measurable magnetic field is expected at distance of 25 feet from Windrush wind turbine installation.

References

[1] International Commission on Non-Ionizing Radiation Protection, "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)," Health Physics, Vol. 74, No. 74, April 1998.
[2] "The Electromagnetic Compatibility and Electromagnetic Field Implications for Wind Farming in Australia," Australian Wind Energy association, May 2004.
[3] "Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz)," National Radiological Protection Board, UK, Documents of NRPB, Vol. 15, No. 2, 2004.
[4] "Wind Farming, Electromagnetic Radiation and Interference," Australian Wind Energy association.
[5] "Site Permit Application for a Large Wind Energy Conversion System," G. McNeilus Wind Farm, prepared by HDR Engineering, Inc., Minneapolis, Minnesota, 2004.