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Wind Turbine Facilities' Perception: A Case Study from Canada

Peter N. Cole MD, MHSc, FRCP(C)

Email colep@circleofchange.ca

Carmen Krogh, BScPharm,

Email carmen.krogh@gmail.com

Summary:

This paper is a family case study looking at the adverse health effects of living in close proximity to wind turbines and transformers. It reviews the wind farm project, complaints of the family and their neighbours, and the results of testing by private and official agencies for low frequency noise (LFN), electromagnetic fields and electrical phenomena associated with wind turbines and transformers. It also looks at the impact of perceived self-efficacy on health. The findings and conclusions point to LFN and perceived self-efficacy as the most likely causes of the family's complaints.

Introduction:

I am a Family Physician with a practice in Orangeville, Ontario, Canada, a rural area 60 miles north of Toronto. In March 2006, a significant number of wind turbines (45) were erected in a community 30 miles north of Orangeville. The transformer station was located 7 km away from the wind turbines and is as close as 360 metres to existing farms and their residential and animal buildings. This project was part of the Ministry of the Environment (MOE) of Ontario's green energy plan and represented a strategy to phase out coal fired electricity. This paper details some of the impacts, both human and environmental, of the wind turbines and transformers and is presented in the form of a family case study.

The Wind Turbine Project:

The developer conducted an environmental impact study to assess the feasibility of wind turbines as an alternative source of power located in a rural community. Following a series of community meetings, the project was approved by the Ontario Ministry of the Environment (MOE) and a construction company was selected to build the wind turbines. The developer, Canadian Hydro Developers, contracted with local farmers to have the wind turbines and a transformer station located on their property. In return, the farmers received remuneration annually based on a lease agreement with the developer.

In 2008, after 2 years of complaints from members of the community, the Ministry determined that the transformer did not meet the applicable noise limits. As a result, 2 new step up transformers were installed in the transformer station to replace the original transformer.

In the Fall of 2008, an additional 88 wind turbines were installed so that the completed development included 133 wind turbines and a transformer station containing 2 step up transformers.

The Subject Family (The W Family):

This paper presents details of the impact of the wind turbines and their transformers on the W family and their farm. The father (TW), age 63, the mother (CW), age 61, and their daughter (KW), age 23, have lived on the property for 26 years. I have been their family physician for 12 years. For the most part they had been enjoying reasonably good health.

The transformer station is located 490 meters from the W's home.

Adverse Health Effects Experienced by the Family:

Just shortly after the wind turbines were put into operation, the family began to experience health problems. Initially, they all suffered from sleep disturbances, having difficulty falling asleep and staying asleep. The significantly severe sleep deprivation was associated with mental and physical exhaustion, severe anxiety, an inability to focus and concentrate and a generally decreased capacity to cope with the stresses of everyday living. TW suffered the most in terms of the complexity and intensity of symptoms. CW had less severe symptoms than her husband. Their daughter, KW, had fewer physical symptoms but more severe emotional issues than her parents.

The daughter became profoundly depressed with suicidal ideation and thoughts of self-harm. She responded only marginally to counselling and medical treatment and

continued to be symptomatic as long as she resided in the family home. Unfortunately, when she was married and left the family home, KW's emotional issues continued. However, the onset of her depression and anxiety clearly coincided with the beginning of the operation of the wind turbines.

The father developed debilitating headaches. He was aware of vibration throughout his whole body, especially in his chest. He also experienced severe anxiety associated with shaking and palpitations. TW started to have vertigo at night and developed tinnitus both of which disappeared when he went fishing for three days and resumed when he came home. In fact, if he was away from home for more than two days he slept better and generally felt less anxious and physically healthier. However, his symptoms would all return as soon as he came home.

The mother suffered from anxiety as well and both parents were very distressed to watch their daughter's health deteriorate so significantly.

Environmental Impacts:

The W family run a goat and cattle farm. Previously, the animals were healthy and the farm prospered. Once the wind turbines began, the goats were much less successful with respect to milk production. The cattle were much less fertile, had difficulty breeding and the herd was reduced from 23 to 8 cattle within 5 years. The veterinarian states that their farm animals have experienced undiagnosed reproductive failure and approximately 1/3 of their breeding animals are not pregnant.

Other Related Stresses:

The value of the W's property has decreased dramatically. In fact, no one is interested in buying the farm because of the proximity to the wind turbines and the problems experienced by the W family. The transformer station is located 490 meters from the house. In fact, there are 3 other families located near the transformer station. Two of the neighbours were also having similar issues, one family located 360 meters from the transformer station. Their symptoms appeared to be just as intense. The third neighbour is receiving financial compensation from the developer and there is no evidence that complaints to the Ministry have been filed.

However, fortunately, one of the neighbours with complaints now resides in another home and only comes to their farm to do chores. They do not eat their meals or sleep at the farm and their symptoms appear to have resolved. The W family do not presently have this luxury and are not able to eat or sleep in another location.

This financial stress serves to aggravate the situation even further.

Confounding Variables:

Clearly, one possible cause of these impacts relates to the proximity to the wind turbines and transformer station and the low frequency noise (LFN) produced by both. However, there is now considerable evidence of a dose-response relationship for adverse health effects due to exposure to the **electromagnetic frequencies (EMFs)** emitted by transformers as well as **electrical phenomena** associated with transformers, including dirty electricity, neutral to ground and stray voltage.

The W family had an independent assessment of the **electrical energy** patterns detectable in their house. The technician found very erratic wave patterns and when he asked to have the power supply shut off, he was told it had already been cut.

Despite these confounding variables, the overall impact of **low frequency noise (LFN)** from both the wind turbines and the transformers is still the most likely cause for the adverse health effects since the impacts are experienced equally by others who are situated close to the wind turbines but not close to a transformer.

A recently released report [*Health Hazard Investigation of a Transformer Station (2013)*] produced by Wellington-Dufferin-Guelph Public Health (the area in which the W family resides) reviewed the scientific literature re: wind turbines and transformers and adverse health effects. It also looked at 2 families, including the Ws and one of their neighbours, their specific complaints and studies/testing done locally by official and private researchers.

The findings of the report indicate that the levels of EMFs and electrical phenomena related to the transformers were as expected. They did not exceed safety standards/guidelines in the homes and the immediate vicinity and could not be implicated as the cause of the complaints. It did state that the animals are much more sensitive than humans to the neutral to ground and stray voltage and that their problems might be attributable to the electric patterns associated with the transformers.

The report concluded there is no evidence from the literature that either electric or magnetic fields or dirty electricity or stray voltage (which has been measured) present a health hazard or are a direct cause of their symptoms. However, while the report referenced sleep disruption, stress and noise annoyance, there was no discussion of the serious medical consequences of these effects which occur via the indirect pathway.

The report also concludes that “it remains plausible that some of the described symptoms may be a result of LFN”.

The report also identifies perceived “self-efficacy” (i.e. personal control over one’s circumstances) as a possible factor. Another term to describe lack of self-efficacy is “personal powerlessness”. Low self-efficacy impacts mental and physical health and can be associated with depression, anxiety and helplessness. Certainly, the individuals in this case study were frustrated by the lack of response by the MOE to their complaints and felt helpless to alter their circumstances (short of abandoning their home).

The impact of the lack of self-efficacy is supported by the World Health Organization’s document on the Social Determinants of Health (2008). It states: “Social justice is a matter of life and death. It affects the way people live, their consequent chance of illness, and their risk of premature death.” In the case of Ontario’s Green Energy Act, the wind facilities are imposed and planning rights have been removed from local municipalities.

Conclusions:

1. The W family experienced mental and physical symptoms that almost certainly were caused by their proximity to wind turbines and the transformer station.
2. The most likely cause of their adverse health effects was exposure to LFN.
3. The EMFs and electrical phenomena associated with transformers, including dirty electricity and neutral to ground and stray voltage, were not detected at high enough levels to be implicated as a cause for the reported complaints.
4. However, stray voltage conduction likely creates higher currents in animals and makes them more sensitive than humans. As a result, some of the effects on animals may be attributable to stray voltage from the transformers as well as LFN.
5. In assessing the feasibility of locating wind turbines and transformers in close proximity to residences, broader determinants of health such as perceived self-efficacy should also be taken into consideration.
6. Wind farms in rural communities would best be located a considerable distance from human and animal habitation (e.g. 2000 meters as a guideline for prudent avoidance).

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