Health Impacts and Exposure to Wind Turbine Noise: Research Design and Noise Exposure Assessment

EWEA, Wind Turbine Noise: From Source to Receiver, Oxford, UK
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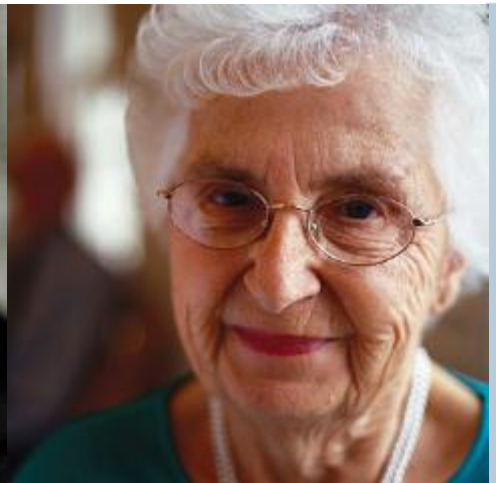


Canada

Outline

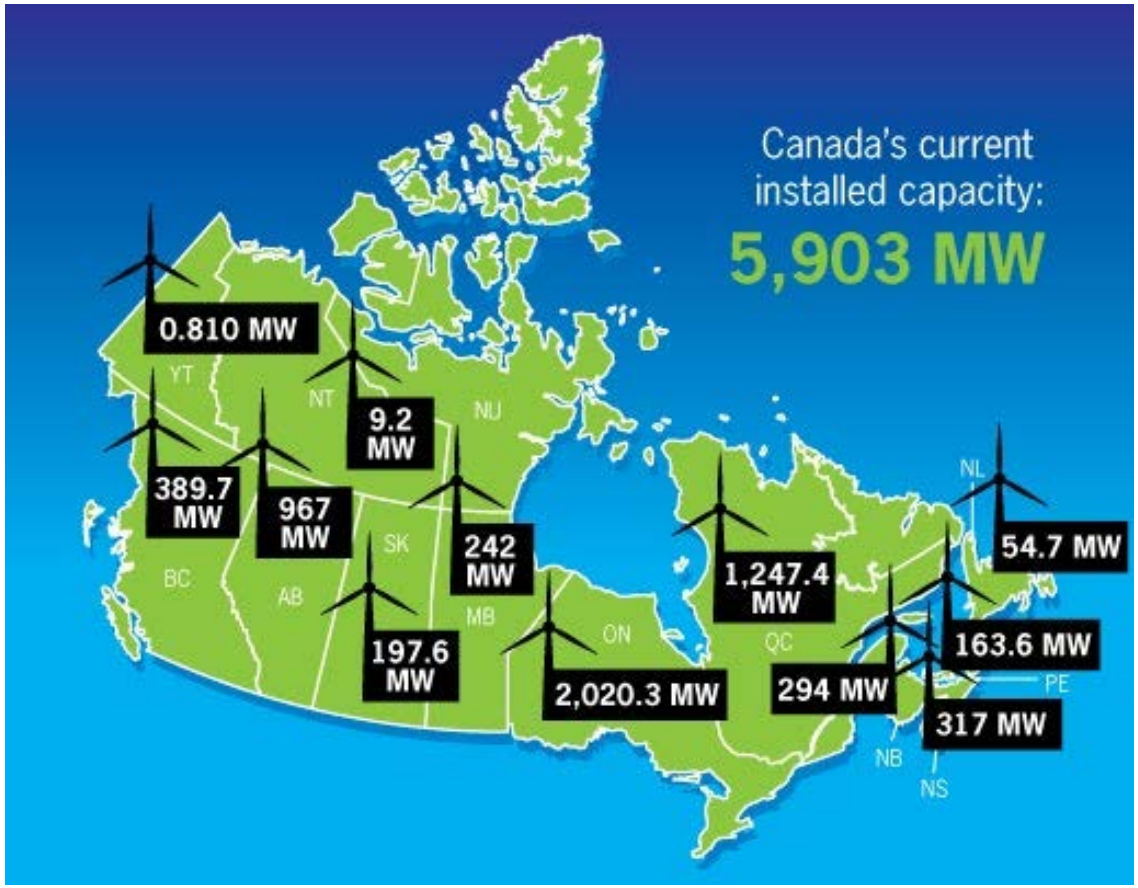
- Canadian national and provincial context
- Health Canada's role
- Wind turbine noise and health
- HC Wind Turbine Noise and Health Study
  - Research objectives
  - Study design
  - Complexities for discussion
  - Peer review/consultation of methodology
- Research team

Canadian National and Provincial Context

- The wind turbine industry is steadily expanding in Canada.
- Currently 148 wind turbine installations nationally.
- Wind capacity currently surpassing 5.9 Gigawatts (GW) - enough to power over 1.4 million homes/year.
    - By 2015 capacity is expected to reach 10 GW – a 20 fold increase over 2000 levels.
- Industry target: 20% of Canada's electricity generation by wind power by 2025.
- Provinces responsible for provincial environmental assessments, approval, siting, zoning, etc. for wind turbine developments.
- Provincial wind energy targets in place for most provinces.




…….As of December 4, 2012






Health Canada's Role

- Health Canada is responsible for protecting the health and safety of Canadians from unsafe radiation emitting devices. The *Radiation Emitting Devices Act* definition of radiation includes acoustical energy (i.e. noise), thus noise-emitting devices are considered to be radiation emitting devices.
- In carrying out this responsibility Health Canada:
  - Participates in the development of international noise standards (e.g. ISO and WHO);
  - Provides advice on the potential health effects of noise from proposed development projects including wind turbine projects;
  - Provides advice on potential health effects of certain types of environmental, occupational and recreational noise (e.g. workplace machinery noise and noisy toys).

Wind Turbine Noise and Health: The Issue

- Concerns have been raised regarding possible health risks to Canadian residents living in close proximity to wind turbine installations.
  - Indirect pathway e.g. sleep disturbance, headaches, nausea, tinnitis, annoyance
- Suggestions made that low frequency noise contributes to health impacts.
- Limited research in this area to conclude whether or not there is a relationship between exposure to wind turbine noise and harm to human health.

Health Canada's Wind Turbine Noise Study

Health Canada is working with Statistics Canada and a research team with expertise in areas including acoustics, health assessment, sleep disturbance, clinical medicine, bio-statistics and epidemiology. The study will explore the relationship between wind turbine noise and potential impacts on human health and well-being.

Primary Research Objectives

1) Investigate the prevalence of health effects/indicators among a sample of Canadians exposed to wind turbine noise using self-reported & objective measures;
2) Apply statistical modeling to derive exposure response relationships for wind turbine noise levels/distances and self-reported & objective health measures; and
3) Address an uncertainty that exists regarding low frequency noise from wind turbines as a potential contributing factor towards adverse community reaction.

Results will be considered as part of a broader evidence base and will not provide a definitive answer on their own.

Study Design:Sample identification

Locations in Canada: Initial targeted sample 2000 dwellings from 8-12 wind farms

- 30-55 dB (5 dB bins)
- Distances up to 10 km or more
- Subjects recruited through 'cold calls' with multiple follow up
- All dwellings above 40 dB will be visited
- Random selection for dwellings less than 40 dB
- One person (18-79 yrs) randomly selected from each household
- Equal demographic representation

Study Design: Questionnaire

Questionnaire administered in person (25-min)

Modules

- Demographics
- Quality of Life
- Sleep quality
- Chronic conditions
- Stress & recent life events
- Perception of outdoor noise sources
- Housing characteristics
- Physical activity
- Community engagement

Field test completed; n=24

Study Design: Objective Measures

All subjects will be tested following questionnaire administration

Measures:

- Blood pressure- automated method
- Hair sample for cortisol analysis- assayed using ELISA
- Sleep- Wrist-worn actimeter and sleep diary: 7 consecutive days (pilot study completed, n=27).

Study Design- WTN Measures/Calculations

Wind turbine noise levels at each dwelling will be calculated using the following:

Noise measurement

- Sound recordings (including LFN) inside and outside selected homes on completion of the survey
- Room dimensions (LFN calculations)
- Mobile weather station for wind speed/ground moisture
- 6 Hz and above

Noise calculations

- Using common internationally accepted sound modeling protocols (Harmonoise; CadnaA); 6 Hz and above

Pilot testing ongoing

Study Design: Addressing Knowledge Gaps

- Large sample size (~1400 subjects)
- Subjective and objective measures
- Indoor and outdoor WTN assessment (>6 Hz)
- Assessment of exposure-response relationships
- Comparing results to existing national prevalence data

- *Complemented by an independent authoritative weight-of-evidence review of all literature by the Canadian Council of Academies*.

Peer Review/ Consultation on Methodology

- Science Advisory Board (February 2012)
- Expert committee (27 individuals)
- 60 day web-based public consultation of design
  - Approximately 950 submissions including 350 attachments were received
  - Design committee currently reviewing and responding to feedback
  - Responses to be made available on the HC website
- World Health Organization Noise Committee peer review
- Presentation of design at conferences
  - Internoise 2012, New York City, August 19-22, 2012
  - International Conference on Clean Energy, Quebec City, QC, September 10-12, 2012
  - EWEA, Wind Turbine Noise: From Source to Receiver, Oxford, UK, December 10-11, 2012

- Results in 2014
  - Results will be shared with the provinces and territories.
  - Will support decision makers by strengthening the evidence base.

Research Team

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Questions?

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