

**Industry Led – Government Supported
Following Canada’s Wind Technology Roadmap
and
Health Canada’s Wind Turbine Noise and Health Study**

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November 10, 2014

On November 6 2014 Health Canada posted on their website “*Wind Turbine Noise and Health Study: Summary of Results*”.¹

We have been contacted by individuals from around the world who have expressed concern over content and the quality of this Health Canada web posting.

“*Wind Turbine Noise and Health Study: Summary of Results*” states:

“WTN annoyance was found to be statistically related to several self-reporting health effects including, but not limited to, blood pressure, migraines, tinnitus, dizziness, scores on the PSQI, and perceived stress” as well as related to “measured hair cortisol, systolic and diastolic blood pressure.”

These findings are additional evidence which support the health effects “conclusively demonstrated from exposure to wind turbine noise” identified by Health Canada and disclosed by the Honourable Rona Ambrose in a June 30, 2009 letter.

In the upcoming weeks and months, it is our intention to release a series of commentaries and disclose information on the “*Wind Turbine Noise and Health Study: Summary of Results*” and the Health Canada Wind Turbine Noise and Health Study.

In the meantime we have compiled the following relevant information to help inform those interested in Health Canada’s Wind Turbine Noise and Health Study.

Personal disclosure: We declare no potential conflicts of interest and have received no financial support with respect to the research and authorship of this commentary.

This commentary is public and may be shared.

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About Our References

This commentary provides references to support statements contained within.

References provided include:

- Peer reviewed references;
- Non peer reviewed references including grey literature;
- Statements and references authored by Health Canada and/or Health Canada representatives;
- References prepared for, or by, the Canadian Wind Energy Association and/or the American Wind Energy Association;
- References authored by consultants for members of the wind energy industry;
- Government and other documents obtained through Federal Access to Information and Privacy (ATIP) requests; and
- Other references.

Following Canada's "Industry Led – Government Supported" Road Map

Over the past decade the Government of Canada has encouraged and provided substantial support and funding to members of the wind energy industry. This support has included, but is not limited to, funds for annual wind energy industry trade shows, promotional fact sheets, production subsidies.^{2 3 4 5 6 7 8 9}, , , , , , , , ,

A 2012 Assistant Deputy Minister briefing note to the Minister of Health's Office states "Canada's vision for 2025 is that 20 per cent of electricity will be generated by wind power..."¹⁰ The briefing note cites the Wind Technology Roadmap stating it was "...was developed by Natural Resources Canada and Industry Canada in collaboration with industry stakeholders."¹¹

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FOR INFORMATION

12-100374-829

BRIEFING NOTE TO THE MINISTER'S OFFICE
Update on the Development of Federal-Provincial-Territorial Guidelines on Wind Turbine Noise

capacity is expected to reach 10 GW, a 20-fold increase over 2000 levels. Canada's vision for 2025 is that 20 per cent of electricity will be generated by wind power. Further information on this vision can be found in the Wind Technology Roadmap (http://www.ic.gc.ca/eic/site/trm-ert.nsf/eng/h_rm00521.html), which was developed by Natural Resources Canada and Industry Canada in collaboration with industry stakeholders.

Deputy Minister's Office

MECS# 12-100374-829

Branch Head: Hilary Geller, ADM, HECSB
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Natural Resources Canada defines the Wind Energy Road Map to be an "...industry-led, government supported initiative that has developed a long-term vision for the Canadian wind energy industry and identified the major technology gaps and priorities to achieve a major increase in deployment of wind energy in Canada."¹²

The Wind Technology Road Map can be found at various Natural Resources Canada web sites.

The Natural Resources Canada website also provides links to wind energy industry trade associations including the Canadian Wind Energy Association who they collaborated with to develop the Wind Energy Technology Road Map.



The “industry-led, government-supported”¹³ Wind Technology Road Map outlines a “... common vision where Canada becomes a global wind energy leader that meets more than 20% of its electricity needs through wind energy by 2025.”¹⁴

The Natural Resources Canada web site provides rationale for the Wind Technology Road Map and states “Canada needs an action plan that will identify realistic pathways to the resolution of technology, markets and socioeconomic challenges.”¹⁵

The Wind Technology Road states “Through a series of workshops, participants developed the vision, identified the barriers to achieving the vision, and articulated an action plan for overcoming those barriers.”¹⁶

Industry, Government, and Road Map Action Items

The “industry-led, government-supported”¹⁷ Wind Technology Road Map states “Members of the Steering Committee, government and our industry will be using this roadmap to direct the actions that are necessary for Canada to develop its vast wind resources.”¹⁸

To achieve the Wind Technology Road Map vision the “industry-led, government-supported”¹⁹ initiative identifies “key action items” that require collaboration between stakeholders including Government and Industry.²⁰

Major action items listed in the Wind Technology Road Map “... are anticipated to cost several hundred thousand dollars each.”²¹

One of the “key action items” detailed in the 2010 Wind Technology Road Map includes an action item for Government and Industry collaboration to develop and maintain government documents that address concerns raised about wind energy projects including that of noise, infrasound and other.²²



Action item	When	Who
Create a centralized repository of peer reviewed studies		
a) Develop and maintain an authoritative set of government documents, based on global literature reviews that address key concerns raised about wind energy projects (e.g., noise, infrasound, ice throw, structural failure, effects on wildlife).	6 months and continuing to the Long-term	Government, industry, NGOs and academia

Road Map Next Steps and Health Canada’s Membership on the Interdepartmental Wind Technology Road Map Committee

The Natural Resources web site outlines next steps for achieving the Wind Technology Road Map vision including the creation of the Interdepartmental Wind Technology Road Map Committee.


Government of Canada / Gouvernement du Canada



Natural Resources Canada

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[> Wind Energy](#)
[> Wind Energy | Canada's Wind TRM](#)
[> Next Steps](#)

Next Steps

This technology road map creates a clear vision for the future. Moving forward requires the collective effort of all stakeholders.

On behalf of industry, CanWEA is facilitating the creation of an industry implementation process with the assistance of members of the Industry Steering Committee.

On behalf of the Government of Canada, Natural Resources Canada has facilitated the creation of an Interdepartmental Working Group.

Discussions on implementation of the roadmap are underway, in both groups.

For more information on the industry implementation process, please contact [CanWEA](#).

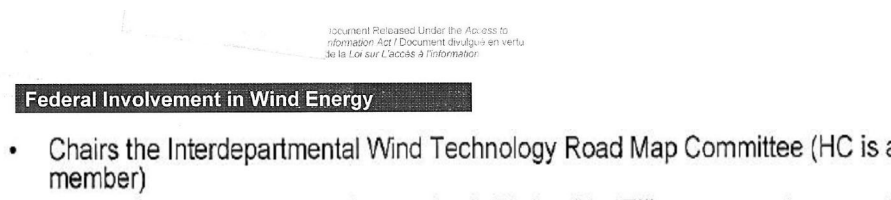
Date Modified: 2013-11-07

Natural Resources Canada Chairs the Interdepartmental Wind Technology Road Map Committee and maintains the Office of Energy Efficiency (OEE) which is “mandated to strengthen and expand Canada’s commitment to energy efficiency in order to help address the Government of Canada’s policy objectives”.²³

A February 2012 Health Canada document entitled “*Health Canada Policy and Research Approach for Wind Turbine Noise*” cites the Wind Energy Technology Road Map “National targets” of 20% of Canada’s electricity generation by wind power by 2025.²⁴



The February 2012 “*Health Canada Policy and Research Approach for Wind Turbine Noise*” also discloses that Health Canada (HC) is a member of the Interdepartmental Wind Technology Road Map Committee.²⁵



In June 2012 Health Canada announced the Wind Turbine Noise and Health Study which it stated had limitations, would be not be definitive and was designed to “inform policy”²⁶

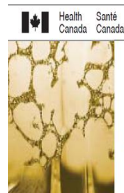
A 2013 report written by the Principal Investigator of the Wind Turbine Noise and Health Study reaffirmed the study has limitations.²⁷

The Health Canada Wind Turbine and Noise Study does not make reference to helping Canadians maintain and improve their health.

The Health Canada Wind Turbine and Noise Study team includes members who are from Natural Resources Canada or have other connections to the wind energy industry.

Health Canada: Noise Annoyance is a Health Effect

Health Canada (2005)²⁸ and other references acknowledge that annoyance is an adverse health effect.^{29 30 31 32 33 34} *Excerpt from Health Canada (2005)below:*



Health Risks of Community Noise

The most common effect of community noise is annoyance, which is considered an adverse health effect by the World Health Organization. But noise may also

The Principal Investigator of the Wind Turbine Noise and Health Study has also stated that “noise-induced annoyance is an adverse health effect”.³⁵

The World Health Organization (WHO) acknowledges noise induced annoyance to be a health effect^{36, 37} and the results of WHO research “...confirmed, on an epidemiological level, an increased health risk from chronic noise annoyance...With this background, it is urgent that noise in residential areas is reduced to an acceptable level.”³⁸

In western European countries noise induced sleep disturbance and annoyance are estimated to account for 903 000 and 587 000 disability-adjusted life years respectively.³⁹

Health Canada’s Justification to Increase the Percentage Highly Annoyed

Some individuals exposed to wind turbines report adverse effects including annoyance, sleep disturbance, stress-related health impacts and reduced quality of life.^{40 41 42 43 44 45 46 47 48 49 50 51} In some cases, Canadian families have effectively abandoned their homes, been billeted by wind energy developers or negotiated financial agreements with developers.⁵²

In 2009 the In a June 30 2009 letter Honourable Rona Ambrose, disclosed

“Health Canada provides advice on the health effect of noise and low-frequency electric and magnetic fields from proposed wind turbine projects, particularly for environmental assessments done under the Canadian Environmental Assessment Act. To date, their examination of the scientific literature on wind turbine noise is that the only health effect conclusively demonstrated from exposure to wind turbine noise is an increase of self-reported general annoyance and complaints (i.e., headaches, nausea, tinnitus, vertigo).”⁵³

Excerpt from the Hon. Rona Ambrose June 30, 2009 letter:



Honourable Rona Ambrose, P.C., M.P.
L'honorable Rona Ambrose, C.P., députée

Member of Parliament for Edmonton — Spruce Grove
Minister of Labour

Députée d'Edmonton — Spruce Grove
Ministre du Travail

JUL 30 2009

Carman Krogh Pharm

Health Canada provides advice on the health effects of noise and low-frequency electric and magnetic fields from proposed wind turbine projects, particularly for environmental assessments done under the Canadian Environmental Assessment Act. To date, their examination of the scientific literature on wind turbine noise and health is that the only health effect conclusively demonstrated from exposure to wind turbine noise is an increase in self-reported general annoyance and complaints (i.e., headaches, nausea, tinnitus, vertigo).

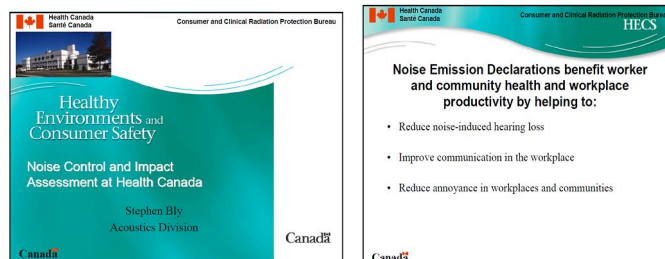
The Hon. Rona Ambrose is currently the Minister of Health.

Prevention of health effects is a fundamental principle of public health policy⁵⁴ and noise management.⁵⁵

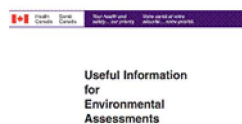
“Health Canada is the Federal department responsible for helping Canadians maintain and improve their health, while respecting individual choices and circumstances.”⁵⁶

Specifically Health Canada (HC) states it is responsible for protecting the health and safety of Canadians against unsafe radiation emitting devices including noise from wind turbines.⁵⁷

The 2004 Health Canada presentation below, acknowledges community health benefits from a reduction in annoyance.



The following 2010 Health Canada document is “Published by authority of the Minister of Health.”⁵⁸ and states:



“Health Canada considers the following noise-induced endpoints as health effects: noise-induced hearing loss, sleep disturbance, interference with speech comprehension, complaints, and change in percent highly annoyed (%HA).”⁵⁹

It would be reasonable to expect that Health Canada would help Canadians maintain and improve their health by protecting them from wind turbine noise annoyance.

However for years now Health Canada employees including the Principal Investigator of the Wind Turbine Noise and Health Study propose/recommend wind turbine noise criteria which they predict will result in adverse health effects. (i.e. result in an increase percentage highly annoyed).^{60 61 62}

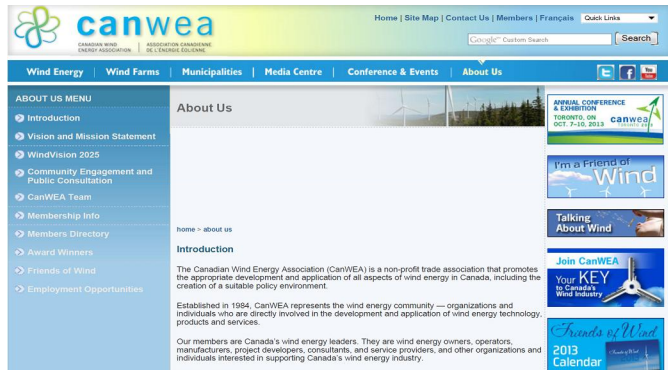
Health Canada’s “justification”⁶³ for their wind turbine noise criterion fails to employ critical accepted noise principles. Specifically the Health Canada authors propose a noise criterion which:

- is not based on a dose response relationship specific to wind turbines;
- does not adjust (+5dB) to reflect IWT are usually a newly created source of noise;
- does not apply adjustments for audible amplitude modulation;
- does not apply adjustments for audible low frequency noise;
- is not to be considered a strictly applied limit.
- is predicted to result in adverse health effects (i.e. an increase in percentage highly annoyed).

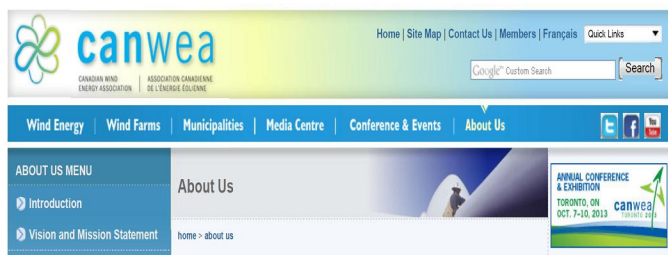
More recently a 2013 report written by the Principal Investigator of the Wind Turbine Noise and Health Study states that in regards to wind turbine noise “...more attention should be directed towards low frequency noise (16-160Hz), tones and amplitude modulation and how to better model these impacts, including how these change across the seasons.”⁶⁴

CanWEA, The Road Map, and Wind Turbine Noise Annoyance

The Canadian Wind Energy Association (CanWEA) is a wind industry trade association.



CanWEA is a lobbyist organization which seeks to advocate for their members and remove barriers to wind energy development across Canada.



Policy Development and Advocacy

Across Canada, electricity generated from wind is already providing clean, safe and reliable power to over 1 million homes. But we have only just scratched the surface of our potential.

CanWEA's policy development and advocacy work is driven by a desire to maximize the economic, industrial and environmental benefits of wind energy in Canada. CanWEA caucuses and committees examine policy issues, and develop and advocate for key proposals to remove barriers to wind energy development across the country. Our caucuses operate federally and in provinces across the country – our voice is your voice. It's our job to make sure member concerns are heard and action plans are regularly put in motion.

CanWEA is also a member of the Wind Technology Roadmap Industry Steering Committee.⁶⁵

In 2009, The American Wind Energy Association and The Canadian Wind Energy Association “...established a scientific advisory panel ...”⁶⁶ and funded a literature review, Colby et al. (2009).

Wind Turbine Sound and Health Effects An Expert Panel Review

Prepared by (in alphabetical order):

W. David Colby, M.D.
Robert Dobie, M.D.
Geoff Levenhull, Ph.D.
David M. Lipscomb, Ph.D.
Robert J. McCunney, M.D.
Michael T. Sells, Ph.D.
Bo Smørgaard, M.Sc.

Prepared for:

American Wind Energy Association
and
Canadian Wind Energy Association
December 2009

The authors of Colby et al. (2009) discuss acknowledge wind turbine symptoms and report that symptoms such as headaches, nausea, tinnitus, vertigo “... are not new and have been published previously in the context of “annoyance”...” and are the “... well-known stress effects of exposure to noise ...”⁶⁷

In 2009 the president of the Canadian Wind Energy Association stated; “... the sound of wind turbines can be annoying for some individuals and that may cause them to feel some stress etcetera.”⁶⁸

HGC Engineering is a listed member of CanWEA.⁶⁹

HGC Engineering

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In December 2011 the Ontario Ministry of Environment released a report prepared by then Canadian Wind Energy Association member,⁷⁰ HGC Engineering.



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**LOW FREQUENCY NOISE AND INFRASOUND
ASSOCIATED WITH WIND TURBINE GENERATOR SYSTEMS
A LITERATURE REVIEW**

Ontario Ministry of the Environment RFP No. OSS-078696

Ontario Ministry of the Environment
2 St. Clair Avenue West, Floor 12
Toronto, ON M4V 1L5

SUBMITTED BY:
Howe Gastmeier Chapnik Limited
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A handwritten signature in blue ink, appearing to read 'Brian Howe'.

Brian Howe, MEng, MBA, PEng
Principal

December 10, 2010

HGC (2010) states in the conclusions:

“The audible sound from wind turbines, at the levels experienced at typical receptor distances in Ontario, is nonetheless expected to result in a non-trivial percentage of persons being highly annoyed. As with sounds from many sources, research has shown that annoyance associated with sound from wind turbines can be expected to contribute to stress related health impacts in some persons.”⁷¹

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10/14/2011 The Canadian Wind Energy Association responds to October 14, 2011 statement by Wind Concerns Ontario





Authors Note: it appears this CanWEA media release is no longer available on the CanWEA website. Please contact CanWEA for a copy or contact us for a PDF version of the CanWEA media release.

[illegible]

“This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree.” ⁷⁴

Any errors or omissions are unintended

A 2014 review article published in the *Canadian Journal of Rural Medicine* states in its conclusion:

“There is sufficient evidence to support the hypothesis of Colby and colleagues that documented symptoms can result from annoyance to audible IWTs. Amplitude modulation of IWTs, audible LFN, and tonal, impulse and nighttime noise can contribute to annoyance and other effects on health. In addition, there is emerging evidence that suggests inaudible LFN or infrasound from IWTs may result in negative health effects...

Based on current knowledge, we expect that, at typical setback distances and sound pressure levels of IWTs in Ontario, a nontrivial percentage of exposed people will be adversely affected.”⁷⁶

The 2014 *Canadian Journal of Rural Medicine* review article also states:

“In 2013, research funded by the Ontario Ministry of the Environment indicated a statistically significant relation between residents’ distance from the turbine and the symptoms of disturbed sleep, vertigo and tinnitus, and recommended that future research focus on the effects of wind turbine noise on sleep disturbance and symptoms of inner ear problems.”⁷⁷

On November 6 2014 Health Canada posted on their website “*Wind Turbine Noise and Health Study: Summary of Results*”⁷⁸ stating:

- WTN annoyance was found to be statistically related to several self-reported health effects including, but not limited to, blood pressure, migraines, tinnitus, dizziness, scores on the PSQI, and perceived stress.
- WTN annoyance was found to be statistically related to measured hair cortisol, systolic and diastolic blood pressure.

*Authors note: WTN is the acronym for “wind turbine noise”.*⁷⁹

Time for Definitive Action

The World Health Organization states “The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.”⁸⁰

Health Canada has reportedly spent over 2 years and 1.8 million dollars to report findings which further support the conclusion that if placed too close to residents wind turbines can harm humans.

It is now time that Health Canada fulfill its stated responsibilities and take definitive action to protect Canadians exposed to wind turbine noise and help them maintain and improve their health.

Please look forward to our future series of commentaries and information on the “*Wind Turbine Noise and Health Study: Summary of Results*” and the Health Canada Wind Turbine Noise Study.

Respectfully submitted,

Carmen Krogh, BScPharm
Brett Horner, BA CMA
Ontario, Canada

End Notes

¹ Health Canada, Wind Turbine Noise and Health Study: Summary of Results, <http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php>, retrieved November 6 2014

² EcoEnergy for Renewable Power, Natural Resources Canada, web update June 1 2009

³ Government of Canada Announces \$9.2 Million for Alberta Wind Energy Project, (July 7, 2008) Natural Resources Canada

⁴ Minister of Natural Resources Lisa Raitt (Thursday, 10 Sept 2009)

⁵ ecoENERGY for Renewable Power Program Power Program Date Modified: 2011-02-25

<http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm>

⁶ About Renewable Energy, <http://www.nrcan.gc.ca/energy/renewable/1297>

⁷ ecoENERGY for Renewable Power Program, <http://ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm>

⁸ ecoENERGY for Renewable Power Program Power Program Date Modified: 2011-02-25

<http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm>

⁹ The Honourable Joe Oliver, Minister of Natural Resources Canada, Letter of correspondence August 10, 2012

¹⁰ Briefing Note to the Ministers Office, Update on the Development of Federal-Provincial-Territorial Guidelines on Wind Turbine Noise

¹¹ Briefing Note to the Ministers Office, Update on the Development of Federal-Provincial-Territorial Guidelines on Wind Turbine Noise

¹² Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>

¹³ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>

¹⁴ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>

¹⁵ <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7327>

¹⁶ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>

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- ¹⁷ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ¹⁸ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ¹⁹ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ²⁰ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ²¹ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ²² Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>
- ²³ Health Canada, (2012) Health Canada Policy and Research Approach for Wind Turbine Noise – A presentation to the Science Advisory Board, February 2, 2012
- ²⁴ Health Canada, (2012) Health Canada Policy and Research Approach for Wind Turbine Noise – A presentation to the Science Advisory Board, February 2, 2012
- ²⁵ Health Canada, (2012) Health Canada Policy and Research Approach for Wind Turbine Noise – A presentation to the Science Advisory Board, February 2, 2012
- ²⁶ Michaud, David S. PhD, Keith, Stephen E. PhD, Feder, Katya PhD, Bower, Tara, MSc, Health Impacts and Exposure to Wind Turbine Noise: Research Design and Noise Exposure Assessment,
- ²⁷ Health Canada Access to Information and Privacy (2014)
- ²⁸ Health Canada, Community Noise Annoyance, Its Your Health, (2005, September) Retrieved from <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/communityurbain-eng.php#he>
- ²⁹ Maschke, C., & Niemann, A. (2007). Health effects of annoyance induced by neighbour noise. Noise Control Engineering Journal, 55, 348-356
- ³⁰ Suter, A. H. (1991). Noise and its effects. Administrative Conference of the United States. Retrieved from <http://www.nonoise.org/library/suter/suter.htm>
- ³¹ General Purpose Standing Committee No. 5 Rural wind farms Ordered to be printed 16 December 2009 according to Standing Order 231, Australia
- ³² Erickson v. Director, Ministry of the Environment, Environmental Case Nos. 10-121 and 10-122, Transcript of Dr. C. Ollson, Mar, 22, 2011, p. 118
- ³³ Leventhall, H.G., (2009). Wind Turbine Syndrome - An appraisal. Testimony before the Public Service Commission of Wisconsin, PSC Ref#121877 20 October 2009, Submitted as Suncor ERT Exhibit 55, Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment
- ³⁴ Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment Transcript of Dr. G. Leventhall, Mar, 11, 2011, p. 80, p. 81
- ³⁵ Michaud, D. S., Keith, S. E., & McMurchy, D., “Noise Annoyance in Canada”, Noise Health, 7, 39-47, (2005)
- ³⁶ World Health Organization, Guidelines for Community Noise, 1999
- ³⁷ Health Canada <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/community-urbain-eng.php#he>
- ³⁸ Niemann H, Bonnefoy X, Braubach M, Hecht K, Maschke C, Rodrigues C, Robbel N. Noise-induced annoyance and morbidity results from the pan-European LARES study. Noise Health 2006;8:63-79
- ³⁹ World Health Organization. Environmental health inequalities in Europe. 2012.
- ⁴⁰ Pedersen E, Persson KW. Perception and annoyance due to wind turbine noise—a dose response relationship. Journal of the Acoustical Society of America. 2004; 116: 3460-70.
- ⁴¹ Harry A. Wind turbines, noise and health. 2007, February. Retrieved from <http://www.wind-watch.org/documents/windturbines-noise-and-health/>
- ⁴² Pedersen E, Persson Wayne K. Wind turbine noise, annoyance and self-reported health and well being in different living environments. Occupational and Environmental Medicine. 2007;64:480-86.
- ⁴³ Phipps R, Amati M, McCoard S, Fisher R. Visual and noise effects reported by residents living close to Manawatu wind farms: Preliminary survey results. 2007. Retrieved from <http://www.wind->

watch.org/documents/visual-and-noise-effects-reported-by-residents-living-close-to-manawatu-wind-farms-preliminary-survey-results/

⁴⁴ Pedersen E, Bakker R, Bouma J, van den Berg F. Response to noise from modern wind farms in the Netherlands. *Journal of the Acoustical Society of America*, 2009; 126: 634-43.

⁴⁵ Pierpont N. Wind turbine syndrome: A report on a natural experiment. Santa Fe, NM: K-Selected Books. 2009.

⁴⁶ Krogh C, Gillis L, Kouwen N, Aramini J. WindVOiCe, a self-reporting survey: Adverse health effects, industrial wind turbines, and the need for vigilance monitoring. *Bulletin of Science Technology & Society*. 2011; 31: 334-45.

⁴⁷ Shepherd D, McBride D, Welch D, Dirks KN, Hill EM. Evaluating the impact of wind turbine noise on health-related quality of life. *Noise Health*. 2011;13:333-9.

⁴⁸ Thorne B. The problems with noise numbers for wind farm noise assessment. *Bulletin of Science, Technology & Society*. 2011;31:262-90.

⁴⁹ Rand R., Ambrose S, Krogh C. Wind turbine acoustic investigation: infrasound and low-frequency noise--a case study, *Bulletin of Science Technology & Society*. 2012;32:128-41

⁵⁰ Falmouth Health Department. Letter to Massachusetts Department of Public Health. June 11, 2012

⁵¹ Nissenbaum M, Aramini J, Hanning C. Effects of industrial wind turbine noise on sleep and health. *Noise Health*. 2012;14:60:237-43.

⁵² Roy D. Jeffery, Carmen Krogh, and Brett Horner Industrial wind turbines and adverse health effects *Can J Rural Med* 2014;19(1) <http://www.cma.ca/multimedia/staticContent/HTML/N0/12/cjrm/vol-19/issue-1/pdf/pg21.pdf>

⁵³ Correspondence from the Honourable Rona Ambrose, June 30, 2009

⁵⁴ Health and Welfare Canada, Achieving Health for All: A Framework for Health Promotion, retrieved from <http://www.hc-sc.gc.ca/hcs-sss/pubs/system-regime/1986-frame-plan-promotion/index-eng.php>, Cited August 24, 2012

⁵⁵ Berglund, B., Lindvall, T., & Schwela, D. H., Guidelines for Community Noise, Geneva, Switzerland: World Health Organization, (1999)

⁵⁶ Health Canada, About Health Canada, Retrieved from <http://www.hc-sc.gc.ca/ahc-asc/index-eng.php>, Cited August 24, 2012

⁵⁷ Health Canada, (2012) Health Canada Policy and Research Approach for Wind Turbine Noise – A presentation to the Science Advisory Board, February 2, 2012

⁵⁸ Health Canada, Useful Information for Environmental Assessments, (2010), Published by authority of the Minister of Health.

⁵⁹ Health Canada, Useful Information for Environmental Assessments, (2010), Published by authority of the Minister of Health.

⁶⁰ Keith SE, Michaud DS, Bly SHP. A justification for using a 45 dBA sound level criterion for wind turbine projects. N.D.

⁶¹ Keith SE, Michaud DS, Bly SHP. A proposal for evaluating the potential health effects of wind turbine noise for projects under the Canadian Environmental Assessment Act. Second International Meeting on Wind Turbine Noise, Lyon France September 20 -21 2007

⁶² Keith SE, Michaud DS, Bly SHP. A proposal for evaluating the potential health effects of wind turbine noise for projects under the Canadian Environmental Assessment Act. *J Low Freq Noise*. 2008;27:253-65.

⁶³ Keith SE, Michaud DS, Bly SHP. A justification for using a 45 dBA sound level criterion for wind turbine projects. N.D.

⁶⁴ Health Canada Access to Information and Privacy (2014)

⁶⁵ Government of Canada, Natural Resources Canada (NRCAN) Wind Energy | Canada's Wind TRM (Technology Road Map) <http://www.nrcan.gc.ca/energy/renewable-electricity/wind/7323>

⁶⁶ Colby, W. D., Dobie, R., Leventhall, G., Lipscomb, D. M., McCunney, R. J., Seilo, M. T., & Søndergaard, B., Wind Turbine Sound and Health Effects: An Expert Panel Review, Washington, DC: American Wind Energy Association and Canadian Wind Energy Association. (2009) Retrieved from http://www.canwea.ca/pdf/talkwind/Wind_Turbine_Sound_and_Health_Effects.pdf

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- ⁶⁷ Colby, W. D., Dobie, R., Leventhall, G., Lipscomb, D. M., McCunney, R. J., Seilo, M. T., & Søndergaard, B., Wind Turbine Sound and Health Effects: An Expert Panel Review, Washington, DC: American Wind Energy Association and Canadian Wind Energy Association. (2009)
Retrieved from http://www.canwea.ca/pdf/talkwind/Wind_Turbine_Sound_and_Health_Effects.pdf
- ⁶⁸ Hornung, R., Interview on Business News Network (Video), (2010, March 4) Retrieved from <http://watch.bnn.ca/clip272347>
- ⁶⁹ CanWEA member directory http://www.canwea.ca/about/membersdirectory_e.php?viewAll=yes last accessed March 10, 2013
- ⁷⁰ CanWEA member directory http://canwea.ca/about/membersdirectory_e.php?letter=H last accessed August 22, 2010
- ⁷¹ Howe Gastmeier Chapnik Limited. (2010, December 10). Low frequency noise and infrasound associated with wind turbine generator systems: A literature review (Rfp No. Oss-078696). Mississauga, Ontario, Canada: Ministry of the Environment.
- ⁷² The Canadian Wind Energy Association, The Canadian Wind Energy Association Responds To October 14, 2011 Statement By Wind Concerns Ontario, Media Release (2011, October 14) Retrieved from http://www.canwea.ca/media/release/release_e.php?newsId=133
- ⁷³ Erickson v. Director, Ministry of the Environment, Environmental Decision Case Nos. 10-121 and 10-122. Retrieved from <http://www.ert.gov.on.ca/english/decisions/index.htm>
- ⁷⁴ Erickson v. Director, Ministry of the Environment, Environmental Decision Case Nos. 10-121 and 10-122. Retrieved from <http://www.ert.gov.on.ca/english/decisions/index.htm>
- ⁷⁵ Erickson v. Director, Ministry of the Environment, Environmental Decision Case Nos. 10-121 and 10-122. Retrieved from <http://www.ert.gov.on.ca/english/decisions/index.htm>
- ⁷⁶ Roy D. Jeffery, Carmen Krogh, and Brett Horner Industrial wind turbines and adverse health effects Can J Rural Med 2014;19(1) <http://www.cma.ca/multimedia/staticContent/HTML/N0/12/cjrm/vol-19/issue-1/pdf/pg21.pdf>
- ⁷⁷ Roy D. Jeffery, Carmen Krogh, and Brett Horner Industrial wind turbines and adverse health effects Can J Rural Med 2014;19(1) <http://www.cma.ca/multimedia/staticContent/HTML/N0/12/cjrm/vol-19/issue-1/pdf/pg21.pdf>
- ⁷⁸ Health Canada, Wind Turbine Noise and Health Study: Summary of Results, <http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php>, retrieved November 6 2014
- ⁷⁹ Health Canada, Wind Turbine Noise and Health Study: Summary of Results, <http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php>, retrieved November 6 2014
- ⁸⁰ The Constitution was adopted by the International Health Conference held in New York from 19 June to 22 July 1946, signed on 22 July 1946 by the representatives of 61 States (Off. Rec. Wld Hlth Org., 2, 100), and entered into force on 7 April 1948. Amendments adopted by the Twenty-sixth, Twenty-ninth, Thirty-ninth and Fifty-first World Health Assemblies (resolutions WHA26.37, WHA29.38, WHA39.6 and WHA51.23) came into force on 3 February 1977, 20 January 1984, 11 July 1994 and 15 September 2005 respectively and are incorporated in the present text. Accessed July 15, 2012