

## Communities, neighbours and wind energy facilities

### SUMMARY

Wind energy's nature as a safe and healthy fuel type has been challenged by assertions of negative health impacts. While these claims have not withstood scientific scrutiny, they have posed challenges at the community level where stakeholders look to government and health authorities for facts.

### Human well-being and wind turbines

As a pollution-free form of power generation, wind energy is a vital energy source for a less carbon-intense economy and an effective means of achieving clean air targets. With life cycle emissions significantly lower than conventional power generation sources, wind energy can support individual and community well-being by mitigating the adverse health impacts associated with emissions from fossil-fuel generation.

Wind energy has a well-established record as a safe source of power – there are over 300,000 wind turbines currently in operation globally.<sup>1</sup> There have, however, been claims of adverse health impacts from wind turbines. While these

claims have not withstood scientific or regulatory scrutiny, they have posed challenges at the community and municipal level. Stakeholders often look to government (federal, provincial and local) and health authorities for facts and protection. When these sources are absent, hard to find, or underdeveloped, individuals may turn to sources of information whose reliability, origins and scientific-rigour may be uncertain.

In addition, some stakeholders have raised concerns about specific operational impacts from wind projects: noise, shadow flicker, vibrations, blinking lights and impacts on views. These concerns – often characterized collectively as “annoyance” – are linked to negative attitudes towards wind development, of which visual impacts (i.e. the sight of wind turbines) has been noted as a key contributor to those attitudes.<sup>2</sup>

### Wind and human health: scientific findings

In addition to a comprehensive study released by Health Canada in 2014 there is substantial scientific literature demonstrating the safety of wind energy facilities. Indeed, there are approximately 100 peer-reviewed scientific articles on the issue of wind turbines and health, as well as a number of reviews of such works by government and medical agencies (e.g., Oregon Health Authority, Massachusetts Department of Health, National Health and Medical Research Council in Australia, Canadian Council of Academies).



When sited correctly (i.e., compliant with regulations) audible sound, low frequency sound and vibrations from wind turbines are not a direct, physiological source of self-reported human impacts. For example, Health Canada’s 2014 study, involving over 1,200 households near wind energy facilities in Ontario and Prince Edward Island, found no link between wind turbine noise and self-reported illnesses:

*“Self-reports of having been diagnosed with a number of health conditions were not found to be associated with exposure to WTN [wind turbine noise] levels. These conditions included, but were not limited to chronic pain, high blood pressure,*

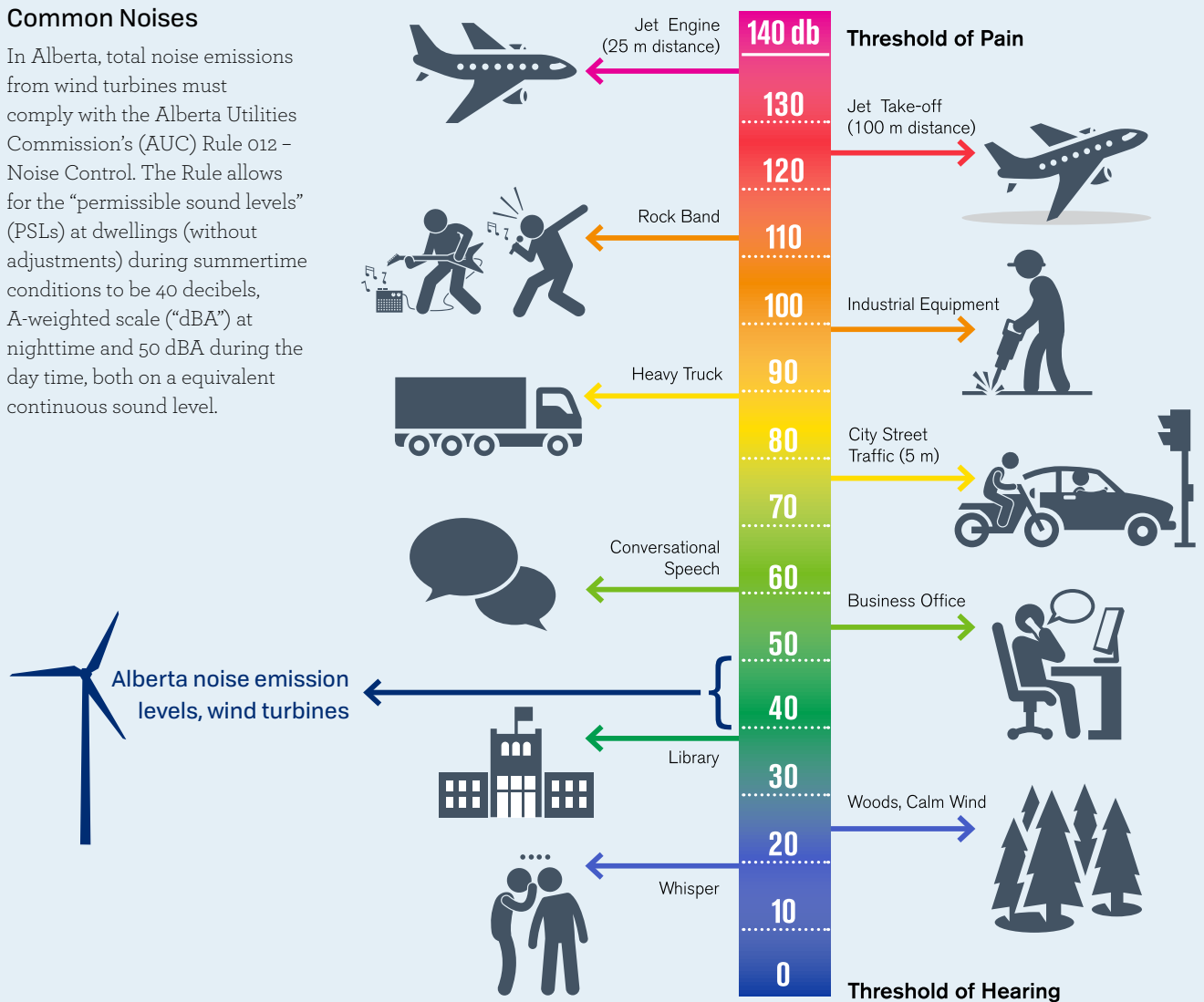
*diabetes, heart disease, dizziness, migraines, ringing, buzzing or whistling sounds in the ear (i.e., tinnitus).”<sup>3</sup>*

In 2012, the Massachusetts Department of Environmental Protection’s 2012 assessment of the scientific literature to-date noted:

*“...[t]here is no evidence for a set of health effects from exposure to wind turbines that could be characterized as a ‘Wind Turbine Syndrome’...we conclude the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems.”*

### Common Noises

In Alberta, total noise emissions from wind turbines must comply with the Alberta Utilities Commission’s (AUC) Rule 012 – Noise Control. The Rule allows for the “permissible sound levels” (PSLs) at dwellings (without adjustments) during summertime conditions to be 40 decibels, A-weighted scale (“dBA”) at nighttime and 50 dBA during the day time, both on a equivalent continuous sound level.





## Annoyance

Health Canada did find an association between increasing levels of noise from turbines and individuals reporting themselves as very or extremely annoyed. However, when other variables related to annoyance were investigated (i.e., shadow flicker, blinking lights, vibrations and visual impacts<sup>4</sup>) these variables were stronger drivers of annoyance than noise from turbines.

Dr. Loren Knopper and Dr. Chris Ollson found annoyance to be a common element in both the scientific research and the popular literature on wind turbines and human illness. While not dismissing the potential of annoyance in any context to contribute to negative health outcomes (as manifested through “stress”), they noted personal, subjective factors (such as attitude) to be more likely to determine individual annoyance levels. Visual cues (i.e., the sight of wind turbines) and individual attitudes toward wind turbines, or any unwanted development, may be the source of annoyance and associated health concerns:

*“Given that annoyance appears to be more strongly related to visual cues and attitude than noise itself, self-reported health effects of people living near wind turbines are more likely attributed to physical manifestation from an annoyed state than from infrasound.”<sup>5</sup>*

Australian researcher Simon Chapman (et al.) has explored the development of attitudes toward wind turbines in relation to health effects, and has proposed a “nocebo effect hypothesis”:

*“The hypothesis requires that those complaining have been exposed to negative, potentially frightening information about the impact of proposed wind farms on nearby residents, and that this information conditions both expectations about future health impacts or the etiology of current health problems where wind farms are already operational.”<sup>6</sup>*

## Sources of potential annoyance

The following are common operational effects that are attributed to annoyance.

### Visual impacts

Residents living around proposed wind projects may express concerns that local landscapes and ‘view sheds’ will be impacted by wind turbines, particularly due to their size (80 to 100 metres to hub height). In certain jurisdictions, impacts to important view sheds are considered during the regulatory approval processes.

### Shadow flicker

Shadow flicker can occur when turning wind turbine blades create alternating changes in light at times when the unit is between the sun and a stationary location. Shadow flicker decreases or is non-existent when sunshine is diminished e.g. cloudy days, foggy days, angle of the sun (winter/summer). The flickering effect of light and shadow is most obvious when it is experienced in homes and on properties. The probability of shadow flicker can be predicted based on the time of year and the sun’s angle, and operational steps can be taken to reduce impacts on neighbours.

### Night sky impacts

Due to their height, federal air traffic navigation regulations require modern wind energy facilities to use aircraft warning lights.<sup>7</sup> The most common of these navigational lighting systems use multiple red warning lights that blink on and off at regular intervals. Some residents in rural locations view these lights as disrupting the dark night sky. These light requirements are similar to those found on cell phone/communication towers.

## Mitigation: regulations and opportunities for stakeholder input

The Alberta Utilities Commission (AUC) manages the regulatory process for large scale wind energy facilities in Alberta in terms of stakeholder input, among other matters. This process is outlined in AUC Rule 007<sup>8</sup>, which sets out specific opportunities for both individual and municipal involvement in the regulatory process. The process includes:

- Direct consultation by the developer with those living nearest to proposed facilities (within 800 metres);
- Requirements of the developer to report on which issues arose during consultation and how the developer plans to address these;
- Requirements of the developer to report on consultation with the municipality;

- Opportunities for individuals and municipalities to make public filings to the AUC; and,
- The potential of a hearing process for those who have been unable to resolve their concerns.

The stakeholder engagement process, as set out in Rule 007, can result in changes and adaptations of the design and layout of a proposed facility, as well as revised operational parameters, for example to manage shadow flicker concerns.

### Challenges for municipal governments and health authorities

Canadian municipalities possess broad powers to enact bylaws and regulations for the protection of public health and safety.<sup>9</sup> This authority, as well as the role in zoning and permitting, means that municipalities may be asked to consider claims about the potential health and safety impacts of development projects. While health and environmental impacts from energy developments are provincially regulated, wind farms also require local permits for development, such as construction permits, road use agreements, and rights-of-way for power lines. Concerned citizens may ask municipalities to regulate larger setbacks between wind turbines and residences than are required by provincial regulations, or to deny permits altogether. In Alberta, for example, municipalities have the right to establish unique set-backs for wind projects through a bylaw.<sup>10</sup> Ontario municipalities had this authority removed in 2009.

These situations can place municipal decision-makers in a difficult position: being asked to evaluate potential health impact claims when making decisions on local permits, and having to respond to concerned residents. In other Canadian jurisdictions, municipalities have turned to health authorities (such as the Medical Officer of Health, or departments of Health) and asked them to provide clear science-based information and conclusions. In addition, municipalities and other authorities have sometimes been asked to supplement existing research with local studies on potential human impacts.

### Stakeholder judgements and risk communication principles

Communication about potential human health impacts takes place within a broader context of project communications and engagement. Stakeholders judge the quality of development proposals based in part on the degree to which they feel they have been respected, had their voices heard and seen their concerns addressed. Stakeholder neutrality or support is more likely when developers and decision-makers are committed to openness, honesty, transparency and inclusiveness.

Risk communications theory suggests that adverse judgements are associated with engagement processes that are characterized by a real or perceived lack of due process, and/or a lack of respect for people who perceive they will be affected by a project.<sup>11</sup> Stakeholder judgements are known to be affected by:

- Faith in the engagement process;
- Perceived fairness of the distribution of risks and benefits (impacts are borne by one group of stakeholders, but the benefits accrue to another group of stakeholders);
- Whether the exposure to impacts is perceived to be voluntary or involuntary;
- Trust in the proponent and regulator;
- Unclear benefits, or a lack of alternatives; and
- High impact potential consequences (even if low probability).



## Questions for consideration

The following questions are proposed for further discussion:

### Resources regarding questions on health

- What resources exist for stakeholders including Alberta residents, media and decision makers to obtain reliable information on the question of health effects and wind turbines?
- What is the role that science-based assurance (i.e., studies, reports) can play in guiding discussion? Can scientific material provide the kind of simple, clear communication that people are seeking?
- What are the best resources for learning what the science says about these issues?

### Municipalities and health authorities

- What materials or resources would be helpful to municipalities in responding to questions on health effects from wind turbines?
- How are Alberta municipalities currently responding to residents who have questions about health risks?
- What role should Alberta-based health authorities or researchers have when responding to health risk questions from municipalities or residents?

- How can health authorities, stakeholder organizations, developers, regulators and advocates for wind development be effective when communicating about human health issues?
- In light of the level of scientific work done on this matter, is there reason to continue conducting studies? If so, in which subject areas?
- How should municipalities or other public authorities respond if there are requests for additional health studies?

### Operational and design solutions for mitigation

- What operational practices are in place to limit shadow flicker disturbance for facility neighbours?
- Are there adequate regulatory requirements for addressing local concerns about view shed impacts?
- Outside of regulatory requirements, what options exist for developers to address residents' concerns, particularly about annoyance factors (i.e., shadow flicker, lighting, visual impacts, etc.)
- What operational practices are in place to limit impacts to night skies from aircraft navigation lights?
- How are developers and stakeholders working together to reduce or mitigate annoyance?

<sup>1</sup> <http://www.gwec.net/global-figures/wind-in-numbers/>

<sup>2</sup> Knopper, Ollson, "Health effects from wind turbines: A review of the literature" *Journal of Environmental Health*, 2011

<sup>3</sup> Wind Turbine Noise and Health Study: Summary of Results, p 3 (<http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php>)

<sup>4</sup> Ibid.

<sup>5</sup> Knopper, Ollson, *Journal of Environmental Health*, 2011

<sup>6</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4264329/>

<sup>7</sup> In Canada, this federal regulation is managed by Transport Canada and NAV Canada. In the United States, the requirement is managed by the Federal Aviation Agency.

<sup>8</sup> <http://www.auc.ab.ca/news-room/brochures/Documents/PublicInvolvement.pdf>

<sup>9</sup> For additional information, see Municipal Powers, Land Use Planning, and the Environment: Understanding the Public's Role. James S. Mallet. Environmental Law Centre. 2005 <http://elc.ab.ca/media/7600/MunicipalPowersLandUsePlanning.pdf>

<sup>10</sup> Provincial regulations as set by the Alberta Utilities Commission use sound levels to determine appropriate setback minimums of wind turbines from residences. These are established in AUC Rule 012, which, in summary, allows for the "permissible sound levels" (PSLs) at dwellings (without adjustments) during summertime conditions to be: nighttime basic sound levels of 40 dBA, and a daytime basic sound level adjustment of 10 dBA above the nighttime basic sound level. More at: <http://www.auc.ab.ca/acts-regulations-and-auc-rules/rules/Documents/Rule012.pdf>

<sup>11</sup> "Deconstructing NIMBY: Challenging Conventional Wisdom", Thorne Butte, Association of Power Producers of Ontario, Epcor and the Ontario Power Authority (2008). The study reviewed three decades of literature, examining more than 100 papers on the psychology of social friction, risk communications, and best practices in consultation.

APRIL 2017

## FOR MORE INFORMATION:

This paper is one in a series prepared for **Wind Energy in Alberta: Sustainable Communities, Sustainable Environment** initiative, a project to gain input from stakeholders on responsible growth of this renewable resource in the province. This series includes the following papers: Benefits to local economies; Communities, neighbours and wind energy facilities; Environmental benefits and mitigation of wildlife impacts and Local government capacity and wind energy.



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