FLYERS CREEK WIND TURBINE AWARENESS GROUP

25th July 2019

Independent Planning Commission
Chair of IPC Panel: Alan Coutts
Other IPC Panel Members: Alice Clark, Prof Chris Fell AM
Level 3, 201 Elizabeth Street
Sydney NSW 2001

Dear Mr Coutts, Ms Clark and Prof. Fell

OBJECTION to Recommendation for approval of Flyers Creek Wind Farm Modification 4

Our group strongly objects to the Flyers Creek Wind Farm and to the Recommendation to Approve Modification 4.

Whilst we understand that the IPC are dealing with Modification 4 we believe that this is only part of the process and the dealings of Infigen and the liberties and extensions that have been granted to Infigen Energy, formerly Babcock and Brown and Flyers Creek Wind Farm over the past 11 years allowing favourably for this project to get to this point in time, needs to be seriously reviewed. If this project had not been deemed Critical Infrastructure by Kristine Keneally on the 11th November 2009 (even when the legislation was not retrospective) and now deemed State Significant, would Flyers Creek Wind Farm still be in the planning system! Minister Brad Hazzard even labelled Flyers Creek Wind Farm, "The last of the wind farms approved under the rotten laws of the previous labour government" If Flyers Creek Wind Farm was so Critical or significant why wasn't it built some years ago!

Please refer to all prior objections/submissions to the Flyers Creek Wind Farm, its modifications and submission to the NSW Draft Wind Farm Guidelines by our group and members of our Community.

We are totally disillusioned by the farcical processes offered in the past and have chosen not to waste our time with attending the IPC meeting, but to instead lodge a written objection as over the past 9 years, all of our submissions, concerns and reports have been treated with ignorance and denials. Many people in this community are completely disillusioned and angry that not only do we have to contend with impacts from the very large Cadia mine but that we have to continue to fight for our right to live in our homes in peace. We believe from all the evidence we have collected over the last 9 years including current research, that the wind farm is likely to constitute a common law nuisance and infringe on our rights as neighbouring landowners to have reasonable enjoyment of our land .

As people across the state unite over planning issues, be it wind farms, mining and exploration and other energy projects and industry, the common consensus is "It appears that the Department of Planning have complete disregard, some even liken it to contempt for the people's wishes and independent experts work and research. It appears that these government departments are happy to facilitate industry at any cost to the people and their environment"

Our group are not opposed to renewable energy or development if it is in the best interest of our environment, but what we are opposed to is the underhandedness of developers and the disregard for the impacts of developments and the inadequate regulations by government authorities, in the case of wind farms.

We believe that the NSW Planning department, the EPA and Office of Environment and Heritage are not regulating or legislating to protect the people and are allowing industry to do as they please. In fact it even appears that industry runs the departments. We believe that the NSW Department of Planning, the EPA and Office of Environment and Heritage have had enough formal complaints to raise concerns of the impacts of wind farms and other industries on communities. One would believe under their obligations that the NSW Department of Planning, the EPA and the Office of Environment and Heritage have a "Duty of Care" to first protect the environment and the people above all else. If developments are to precede the NSW Department of Planning, the EPA and Office of Environment and Heritage have a duty to make sure that developments are adequately regulated and to make sure that the highest standards of mitigation measures possible are in place based on current knowledge and research to protect the people and the environment in which they reside and not rely on the developers' self-regulation and "not so independent advice" from so called professionals who are happy to meet developer's needs.

MODIFICATION 4

Prior to modification 4 the Flyers Creek Wind Farm was granted approval on the 14th March 2014 for a up to 132 MW wind farm project and not to exceed 41 turbines with a Condition of Consent of a period of 5 years before the Approval would lapse making the lapse date the 14th March 2019. Subsequently other modifications since the original approval have been lodged and approved along the way to deal to with the inadequacies in the original Environmental Assessment that assured Flyers Creek Wind Farms' approval did not lapse under the conditions of consent.

SHOULD THE APPROVAL OF FLYERS CREEK WIND FARM HAVE LAPSED ON THE 14TH MARCH 2019?

This question has also been asked of the Department of Planning 3 times with no response?

It appears Infigen/Flyers Creek Wind Farm Pty Ltd as an 11th hour bid to avoid their approval lapsing stuck a site hut on land off Errowanbang Road and called it a start! (*Please refer to John Gerathy's submission, a group member and other NSW group members for further comment and which we fully endorse).*

VISUALLY the wind farm will have a devastating impact on those who face into the wind farm (regardless of whether the turbines are 150 metres or 160 metres), whose views of scenic rural landscape will be polluted with mammoth industrial rotating structures that no one here ever dreamed of and that only drastic mitigation measures would reduce in some cases.

The visual pollution that will be created has already had an impact on the valuation of properties sold in recent times in the area as potential buyers expressed that they were not interested when they found out the wind farm was approved for the ridgelines in front of them. The devaluations have been documented and have been in the vicinity of $70,000 to over $100,000. Finding prospective buyers who were happy to live with the wind farm of course also took some time. Is mitigation the answer? NO! Shouldn't the developer be made to compensate for the devaluation of each and every property they impact visually upon construction of the wind farm? The noted **DEVALUATION** to date is of course before the wind farm has even been constructed and if Flyers Creek Wind Farm is constructed and considered visual pollution on the landscape, one can only imagine how much the prices will further decline once the enormity of the turbine size and scope of the project is actual.

Of course the further impacts of cumulative industrialisation along with the other impacts of noise/sound/vibration and environmental degradation will only further reduce values and in some cases homes will be completely unsaleable or fit for human habitation.

Other environmental impacts regarding dust, flora and fauna, heritage, aboriginal culture etc have been discussed in previous submissions and there is no point to continue elaborating. There are issues whether the project is modified or not. It is extremely noticeable however, that we believe developers of wind farms are enlisting the services of "not so independent consultants" the go to consultants nationally and these consultants are forging quite a concerning reputation for themselves with inaccuracies and discrepancies. This is evident and has been highlighted in the last senate inquiries, hearings, presentations and current pending legal cases.

It is hoped that any impacts if they are to arise from the construction and operation of Flyers Creek Wind Farm due to inaccurate reporting will be covered by the consultant's professional indemnity insurance.

Noise/Sound/Vibration and Cumulative Impacts and siting

Modification 4 whilst accommodating only 38 turbines takes the whole project up to a 159.6MW Wind farm 27.6 MW above the original maximum output of the development and increases the size of turbines to 160 metres and a much wider rotor diameter of 140 metres. Larger wind turbines are certainly gaining a reputation for ever increasing noise nuisance and ILFN.

We note there is no movement of turbine placement/siting only that which is allowed due to micro siting, however one has to consider, if due to the increase in turbine output, size and rotor diameter, will the siting of turbines still be compliant with international standards, relating to siting/ of turbines and structural adequacy. Inappropriate siting of turbines will ultimately have an impact on the noise and vibration output of turbines.

Extract from full report for another wind farm prepared by Steve Cooper of The Acoustic Group.

Emission of Sound and Vibration

Note: ILFN = infrasound and low-frequency noise.

1. *Wind turbine blades produce airborne pressure waves (correctly called sound but which, when unwanted, is called noise) and ground-borne surface motion (vibration).*
2. *Recent measurements have indicated that turbines generate vibrations even when shut down,[1] presumably from the wind causing the flexing of large blades and the tower structure, and that this vibration (when turbines are shut down) can be measured at significant distances.*
3. *The airborne energy manifests as sound across a range of frequencies from infrasonic (0–20 Hertz [Hz]) up through low-frequency sound (generally said to be below 200 Hz), and into the higher audible frequency range above 200 Hz. (Hertz is the variation in a particular changing level of sound pressure, as the rate of cycles [or period] per second).*
4. *Sound at 100 Hz is audible at sound levels of around 27dB (decibels) for an average person, whilst the level of sound required for average audibility rises quite quickly below frequencies of, say, 25 Hz. Sensation, being non-auditory but bodily recognition of airborne pressure waves, occurs at lower pressure levels of infrasonic frequencies than can be heard. At infrasonic frequencies the "sounds," i.e., pressure waves, exist and may be detected by the body and brain as pressure pulses or sensations, but via different mechanisms than the perception of audible noise.*
5. *Periodic pressure pulses are created by each turbine blade passing the supporting pylon. This is an inherent consequence of the design of horizontal axis wind turbines. These energy pulses increase with increasing blade length, as does the power generating capacity. People living near turbines have described the effect of these pulses on their homes as "like living inside a drum".*
6. *Larger turbines produce a greater percentage of their total sound emissions as low-frequency noise and infrasound than do smaller turbines.*

[2] Therefore replacing a number of small turbines with a lesser number of larger turbines, whilst keeping the total power output of a wind project constant, will increase the total ILFN emitted by the development. This effect will be compounded by increased wake interference, unless the turbines have also been repositioned further apart in accordance with the spacing specifications for the larger turbines. Wake interference results in turbulent air flow into adjacent turbines, with a consequent loss of efficiency, and increased ILFN generation.

7. *If estimated sound contours have been used in seeking planning permits, then replacing the permitted turbines with larger turbines will significantly increase the persistence of the wake turbulence, and thereby the sound emitted by adjacent turbines (and the proportion of ILFN emitted) will be significantly above the predicted contours. This is what occurred at the Waubra development, and will occur when a lesser number of larger turbines are used to maintain the generating capacity of the development, as occurred at Macarthur (both projects being in Western Victoria).*

Infrasound

1. *Infrasound is common in our world, but most natural infrasound is irregular and random, or is caused by a transient event (e.g. earthquakes). Some frequency bands below 20 Hz have been shown experimentally to cause a physiological stress response in humans at below audible levels.[3] Industrial machinery noises are often regular and repetitive, as is the case with wind farm noise emissions, across the audible and infrasonic frequency spectrum.*

2. *Infrasonic pulsations travel much larger distances than audible noise and easily penetrate normal building materials, and once inside can resonate building elements (i.e., increase in impact inside rooms).[4]*

3. *Infrasonic pulsations from a single 4 MW wind turbine were measured 10km from their source by NASA researcher William Willshire in 1985.[5] Recent data collected by acoustician Les Huson in Australia and in the United Kingdom at onshore and offshore wind developments has shown that attenuation (reduction in sound level with increasing distance from the source) can be much less than the 3dB per doubling of distance found by Willshire in 1985.[6]*

4. *Some acoustic pressure pulsations are relatively harmless and indeed even pleasant to the body, including waves on a beach. Organ music at frequencies just below 20 Hz generates "feelings" in people that can be either pleasant or unpleasant, and has been designed to produce emotive effects.[7] Once it is understood that different frequencies can have very different effects on humans, it is easy to understand the importance of accurate acoustic measurement.*

5. *Dr Neil Kelley and his colleagues from NASA demonstrated in the 1980's that wind turbine–generated energy pulses and noise in the infrasonic and low-frequency bands, which then penetrated and resonated inside the residents' living structures, directly caused the range of symptoms described as "annoyance" by acousticians and some researchers.[8] A more accurate general descriptor would be mild, serious or intolerable "impacts".*
6. *Residents and their treating medical practitioners know these symptoms and sensations include repetitive sleep disturbance, feelings of intense anxiety, nausea, vertigo, headaches, and other distressing symptoms including body vibration. American Paediatrician Dr Nina Pierpont gave this constellation of symptoms the name "wind turbine syndrome" in 2009.[9] Dr Geoff Leventhall, a British acoustician who was one of two peer reviewers of the NHMRC's 2010 Rapid Review, has accepted these symptoms and sensations as "annoyance" symptoms, which he attributes to a stress effect, known to him to be caused by exposure to environmental noise, one source of which is wind turbine noise.[10]*

Wake Interference and Turbulence

1. *Historically it was accepted that wind turbines should be no less than 5–8 rotor diameters apart, depending on the direction and consistency of the prevailing wind, with the higher separation being for turbines in line with the major wind direction. This was accepted industry practice and, as an example, was explicitly specified in the 2002 NSW SEDA handbook.[11] The purpose of this specification is to minimise turbulent air entering the blades of an adjacent turbine. As noted above, turbulent air is associated with increased sound levels and infrasonic pulsations.[12]*
2. *If a significant proportion of the wind blows at a right angle (90°) from the major direction used for turbine layout it follows that turbine spacing should be 7 or 8 rotor diameters in both directions. It should be noted that the 7–8 rotor diameters number is a compromise between ensuring smooth air inflow to all turbines (and hence less noise and vibration) and packing as many turbines as possible into the project area. Research conducted at Johns Hopkins University in 2012 showed that the best design for efficient energy extraction suggests wind turbines should be 15 rotor diameters apart.[13]*
3. *It is increasingly evident that some projects are not laid out in accordance with accepted specifications to reduce turbulence, which in turn significantly increases acoustic emissions including audible noise and infrasonic pressure pulses. The consequences of increased turbulent air entering upwind-bladed wind turbines resulting in increased generation of impulsive infrasonic pressure waves and low-frequency noise were known to the industry in 1989.[14] Recent projects with turbines positioned inappropriately too close together should not have been given final approval by the responsible authorities.*
4. *Yawing (side to side movement of the blades caused by minor wind direction changes) is also known to increase wake interference.*

Transmission of Energy Pulses

1. *Information on the different attenuative and penetrative properties of infrasound and audible sound are discussed above.*
2. *Topography, wind speed, wind direction, wind shear, and ambient temperature will also have an impact on noise emissions and how that sound travels.*

Noise Guidelines for Turbines

1. *Many acoustic consultants and senior acousticians have known that wind turbines produce pulsatile ILFN as the blades pass the tower. It was common knowledge in the 1980's, from research conducted by Dr Neil Kelley [15] and NASA researchers such as Harvey Hubbard,[16] that the pulsatile infrasound generated by a single downwind-bladed wind turbine and other sources of ILFN such as military aircraft and gas fired turbines penetrated buildings, amplified and resonated inside the building structures, and directly caused "annoyance" symptoms including repetitive sleep disturbance.[17]*
2. *Long-term sleep disturbance and chronic stress symptoms (accepted as "annoyance" symptoms), are well known to medical practitioners and clinical researchers to damage human health. Dr Kelley was quoted in 2013 as advising that the conclusions from his research in the 1980's were equally relevant to modern turbine designs,[18] and this seems to have been confirmed in the preliminary results of acoustic measurements commissioned by Pacific Hydro and conducted by acoustician Steven Cooper at the Cape Bridgewater (Victoria) development.[19]*
3. *The New Zealand and Australian Noise Standards for wind projects were written by the then uninformed planning authorities. They were based on the UK ETSU 97 standard, also an uninformed document.[20,21]*
4. *Despite information being available from the Kelley research in 1985 specifying recommended exposure levels of ILFN which should not be exceeded,[22] the respective Australian guidelines only specified limits for audible, filtered, sound levels expressed as dBA outside homes; so there are no recommended limits or requirements to forecast, or to measure, ILFN levels or vibration inside homes neighbouring wind projects.*
5. *Permitted sound levels across most Australian States for all industrial equipment are background noise levels plus 5dBA or 35dBA whichever is less, whereas for wind turbines they are background plus 5dBA or 40dBA whichever is more. There is no scientific evidence or reason for this difference. An increase of*

5dBA represents an approximate doubling of the sound level. Most rural environments have a background noise level of 18dBA to 25dBA, approximately averaging 22dBA at night. This represents a huge increase in audible sound. Increases of 10dBA at night are long known by acoustic consultants to raise complaints, and increases of 15–20dB are associated with widespread complaints and legal action. Averaging measured levels of sound across too-wide frequency bands also allows the hiding of sound pressure (level) peaks to which the ear responds, understating the true extent of facility noise emission levels.

6. *World Health Organisation (WHO) Night Noise Guidelines for Europe quoted the 1999 WHO Community Noise Guidelines: "If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise".[23] Cities have a higher background noise than country areas. Denmark limits indoor noise from industrial sources, including wind turbines, to a maximum of 20 dBA at night.[24]*

7. *The currently permitted outdoor noise level in New Zealand and some Australian states has been ameliorated somewhat by the addition of a deduction of 5dBA from the 40dBA limit to allow for especially quiet environments.*

8. *History has shown that these Australian guidelines were based on ETSU 97 from the UK, and were expressly designed to encourage development of the wind industry, not to protect the health of rural residents from wind turbine noise. Predictably, because the Kelley criteria limiting exposure to impulsive ILFN were ignored,[25] these guidelines have turned out to be completely unsafe.*

9. *It is therefore necessary to predict and measure sound pressure levels across the full spectrum of frequencies in order to predict and control sound energy impacts on project neighbours.*

Compliance with Permitted Noise Conditions

There are several problems associated with validating compliance.

1. *Compliance is generally carried out by an acoustician or acoustics consultancy, paid directly by the owner or operator of the project. In one case a wind turbine manufacturer has contracted the acousticians directly, making the results even more questionable.*

2. *Compliance is of utmost importance to all parties with a financial interest in the development, but it is critical to families that neighbour the projects.*

3. *There are many ways that data measurements can be rigged (faux compliance): measuring instruments placed under trees or too close to buildings; waiting for optimum weather and wind conditions; not measuring for long enough*

continuously, recording in octave bands that are too broad and other averaging techniques. Operators may also reduce operational noise by reducing power output (with blade angle changes and slowed rotation) to reduce the noise during the monitoring period. Operators may also refuse to provide wind turbine facility operating data from test periods, claiming that it is "commercial in confidence", thus making it impossible to verify actual operating conditions.

4. *It would therefore be both appropriate and necessary for all projects to have their compliance independently audited.*

5. *Sufferers will not escape disturbance to their sleep and damage to their health even if a project is properly compliant with its permit conditions and noise guidelines, as preliminary findings of the acoustic survey commissioned by Pacific Hydro, conducted by Steven Cooper, have recently demonstrated.[26]*

6. *A compliant project may still cause damage to neighbours for numerous reasons. First, the standard refers to dBA only and thereby omits reference to ILFN; and second, even with regard to audible noise, the standard refers to a maximum of 40dBA outdoors, whereas every other form of industrial or other noise in country and city is limited to 35dBA maximum. There is no technical basis for such an aberration, and it is clearly (intended or not) discriminatory. Third, in quiet rural environments, even 35dBA will be intrusive and loud if the background level is below 25dBA, which is not uncommon. The ear responds to the peaks of sound levels, not the averages. The wind turbine noise standards all refer only to averages, and exclude ILFN, and do not account for the human response, so cannot protect people from predictable serious harm to their health.*

We have noted to date the negligence and denial by Authorities and OFFENDING INDUSTRIES when it comes to noise and vibration complaints from industrial sites throughout the state and thought the only way to deal with this is take matters into our own hands.

For two and half years we have implemented full time, full spectrum noise monitoring in this community, and in the last 10 months we have additionally been monitoring the ground borne vibration, out of concerns for what already exists in our environment and what we are impacted with on a daily basis, which of course varies on occasion and intensity. We are now fully aware of what nuisances are being created in homes and what exists from sound and ground borne vibration. Of course this is a matter for further discussion with relevant parties at a later date. The noise recordings to date have also highlighted that background noise used for noise modelling of Flyers Creek Wind Farm is also inaccurate. We have serious concerns with the **CUMULATIVE IMPACTS** of underground mining and the further addition of Infrasound and low frequency sound and vibration

from wind turbines that would certainly further heavily burden many who reside within a wider area of the underground mine and wind farm. Additionally the underground mine we understand will continue to expand with additional plant and equipment, (known producers of ILFN) and additional chambers underground that will most likely cause further ground movement (seismic events) as they are developed. With increased ILFN and ground borne vibration from a wind farm of Flyers Creek magnitude and the increasing size of the mine and mining exploration what cumulative impacts will really be felt, including the ground borne vibration and seismic movements, on an already problematic tailings dam system!

Also, one would have to question the additional ground borne vibration and electrical ground current caused by the grounding of the turbines that would further impact on the gas pipeline, (critical infrastructure that has vibration and EMF sensitivities as a concern) that turbines will straddle and the current impacts from mining and seismic events in the area! These concerns to date are still being denied.

Repeatedly in the past we have asked for written guarantees, assurances in writing from the developer and government authorities, only to be told this can't be done. Developers telling us that they build to what they are allowed to build by government standards and regulations, so it is not their problem. Do developers have all appropriate insurances in place and are the turbines insurable for toxic emissions?

Dust is a major concern for many in the area from mining activities already being conducted so with additional movement and displacement of air from larger wind turbines what will the consequences be and who will be responsible?

TRANSMISSION LINES

In the past we have raised issues about the powerlines and the fact that right from the initial Environmental Assessment, Infigen could not prove how they could connect to the grid as they had problems signing up landowners they required to make the project viable, yet Flyers Creek Wind Farm was still approved. Subsequent modifications and changes assured Infigen that Flyers Creek Wind Farm would stay in the planning system regardless.

We refer to the "conditions of consent" and wonder to date have all the landowners required to host the new path of the transmission line signed contracts with Infigen?

After further discussions between our group and other community members in the area, it is also noted that whilst Cadia secured landowners to host the newer larger transmission lines, which were

believed to be solely for the mines purpose from Orange to Cadia, are the lines which we believe Infigen wish to connect Flyers Creek Wind Farm to. The people we have spoken to hosting the new power poles and lines had for the Cadia line, had no idea when negotiations were taking place that Flyers Creek Wind Farm would be connecting into these lines and that they would be a party to facilitating an additional and unwanted development, namely the Flyers Creek Wind Farm.

It is also questionable if transmission lines from Orange to Cadia are fully charged with power coming from the grid to service the mine, the impacts that will be encountered by adding the variable energy produced from the wind farm!

It is hoped that on your site visit to the proposed Flyers Creek Wind Farm area that you took particular notice of the homes nestled away in the valley and those exposed on the ridgelines and in the villages of Carcoar and Mandurama. The homes who will be most likely impacted by the unwanted development of Flyers Creek Wind Farm all within an a distance that is known to suffer impacts from just wind farms alone, let alone the cumulative impacts from large scale underground mining.

It certainly appears that no matter what we "the small people" who have paid for our lands and built our homes and lives in beautiful landscapes, with hard earned money earned by hard work and sweat, have to say is irrelevant in the scheme of things. The Government has made its decision, and has no respect for where the money comes from to fund these "trendy" initiatives. We the "small people" are ultimately funding these wind farms by initially paying for renewable certificates with our taxes and ultimately paying to consume any energy produced at a very high cost. It is not only the financial burden, but if we are the ones being impacted, we are also paying with our health, environment, lifestyles and ultimately the devaluation of our greatest asset that we and in many instances subsequent generations on the land have worked hard for all of their lives. Why?? Because it appears lazy, inept governments have opted for the private sector to develop "so called" renewable energy infrastructure with little thought to long term ramifications all because they chose to rush in to industry propaganda instead of looking to sustainable, minimal impacting developments of truly long term benefit to our world.

You can be sure that none of the decision makers will be affected in any way with any of these developments as they are protected by their own stupidity and being paid handsomely with tax payer money.

As the responsibility now falls to you the Commissioners, members of the Independent Planning Commission to make a decision we do hope you take the time to read and review everything we have provided and question what industry propaganda and what a "trendy" government initiative dictates and think about the people and the impacts on their lives, the impact on future generations

and the environment. Are there better alternatives already available that we should be using for energy! From our understanding there certainly are maybe at a higher initial cost but with far better long term outcomes for the people and environment.

It is time that there was accountability, no more denials and cover ups, no more not so independent consultants who are prepared to sacrifice their reputations for "high end" jobs from profiteering dodgy developers.

We sincerely hope that you the Commissioners now responsible for this community's future evaluate if the approval for Flyers Creek Wind Farm should have lapsed on the 14th March 2019 or refer this matter to the appropriate authority.

If you choose to make judgement only on Modification 4 we hope you do so with the expertise required to make judgement on the technical issues or that you seek independent and "not preferred" consultants' advice. We hope you weigh up the "so called merits" of larger wind turbines and see that they really do not outweigh the harm that will be done.

After 9 years of research and consulting with world leading experts in infrasound and low frequency noise research and other wind turbine issues, we ask you to carefully consider our concerns seriously in relation to noise and other impacts associated with larger wind turbines and the cumulative impacts, and refuse the approval for Modification 4 of Flyers Creek Wind Farm.

If you choose to approve the recommendation of Approval for Modification 4 for Flyers Creek Wind Farm:

Can you please identify who would be liable for the consequences of adverse impacts arising from the construction and operation of Flyers Creek windfarm even if the wind farm satisfies their permit conditions?

Will all insurance documentation related to the construction and operation of turbines be publicly available along with all compliance certificates relating to structural and siting adequacy?

If bureaucracy fails us we will elect to seek justice through the legal system.

Yours sincerely

Patina Schneider

On behalf of FCWTAG

There is a plethora of documentation and evidence supporting all our claims but we have chosen just a small selection that highlights some of the issues of dealings and what is relevant to our concerns and inherent impacts from wind turbines which only increase dramatically as the size of turbine increases. Hopefully by you gaining an understanding of what is becoming increasingly evident world-wide, it will allow you to question the recommendation for approval of Flyers Creek Wind Farm Modification 4 and any further wind farm and industrial developments that come before you. Hopefully with better regulations, legislation and mitigation in place we can make this state a better prosperous state, one where people want to live.

Documents enclosed:

1. **PREVALANCE OF WIND FARM AMPLITUDE MODULATION AT LONG-RANGE RESIDENTIAL LOCATIONS** – Kristy L. Hansen, Phuc Nguyen, Branko Zajamsek, Peter Catcheside, Colin H Hansen
2. Letter from Jonathan Upson, Infigen Energy to Jonathen Carle NSW Department of Planning - Asking for no testing of Low frequency Noise
3. Questions to NWFC – Andrew Dyer – These questions relating to noise were asked of the National Wind Farm Commissioner in January 2017 and on several occasions since and he has avoided answering them. WHY?
4. Email from Karen Jones – NSW Department of Planning – making statement re delays in the Planning system and Infigen's delaying information.
5. Hansard – Senate Select Committee on Wind Turbines- Friday, 19th June 2015 – Treatment of Wind Turbine hosts - Robert Griffin, Alwyn Roweth and Graham Oborn.
6. Dr Marianna Alves-Periera – Presentation on Infrasound and Low frequency noise- Ljubljana 2018 https://www.youtube.com/watch?v=ZXCZ3OyklrE – (USB enclosed with Objection to IPC)
7. INFRASOUND AND LOW FREQUENCY NOISE GUIDELINES: ANTIQUATED AND IRRELEVANT FOR PROTECTING POPULATION – Paper presented at 26th International Congress on Sound and Vibration Montreal Canada 7th to 11th July 2019
8. Hansard – The Senate of Proof – Matters of Public Interest –Wind Farms SPEECH -Senator Chris Back – Wednesday, 26th March 2014
9. Biological consequences of Low-Frequency Sound. Dr Bruce Rapley – Book Enclosed with Objection to IPC
10. Truth of renewables is plain for all to see. Graham Lloyd July 16th 2019 https://www.theaustralian.com.au/commentary/truth-of-renewables-is-plain-for-all-to-see/news-story/0b75ed63959a6cc16ae6aa6e891cc2fa
11. FCWTAG Objection to Modification 4 objection
12. Newcrest – Cadia Valley Operations Objection to Modification 4

Prevalence of wind farm amplitude modulation at long-range residential locations

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Abstract

The presence of amplitude modulation (AM) in wind farm noise has been shown to result in increased annoyance. Therefore, it is important to determine how often this characteristic is present at residential locations near a wind farm. This study investigates the prevalence and characteristics of wind farm AM at 9 different residences located near a South Australian wind farm that has been the subject of complaints from local residents. It is shown that an audible indoor low-frequency tone was amplitude modulated at the blade-pass frequency for 20% of the time up to a distance of 2.4 km. The audible AM occurred for a similar percentage of time between wind farm percentage power capacities of 40 and 85%, indicating that it is important that AM analysis is not restricted to high power output conditions only. Although the number of AM events is shown to reduce with distance, audible indoor AM still occurred for 16% of the time at a distance of 3.5 km. At distances of 7.6 and 8.8 km, audible AM was only detected on one occasion. At night-time, audible AM occurred indoors at residences located as far as 3.5 km from the wind farm for up to 22% of the time.

Keywords: Amplitude modulation, Wind farm noise, Low-frequency noise, Tonal noise

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1. Introduction

The rapid global expansion of wind energy has been associated with widespread complaints regarding annoyance, sleep disturbance and adverse health effects from people who have been exposed to wind turbine noise [1]. Therefore, to ensure that residents living near wind farms are not subjected to excessive noise-related disturbance, it is important to identify potentially disturbing wind farm noise components. Moreover, suitable methods for quantifying these components are required. Acceptable threshold levels also need to be defined to determine the prevalence of potential noise disturbance.

Several researchers have shown that amplitude modulation (AM) of wind farm noise contributes to annoyance [2][3][4][5]. Despite this finding, many regulations and guidelines concerning wind farm noise do not include penalties for this characteristic, possibly due to the ongoing debate as to what constitutes a reasonable penalty [6]. As discussed by Perkins, *et al.* [7], the exposure-response to wind turbine AM noise is influenced by several factors including AM depth, noise level, duration/consistency of AM, time of occurrence and noise sensitivity of the individual.

Several methods have been developed to determine the AM depth of wind farm noise based on analysis in the time-domain, frequency-domain and a combination of both [8]. Recently the AM Working Group (AMWG), on behalf of the UK Institute of Acoustics, conducted an extensive review of existing methods for AM detection and quantification [8]. Following this review and a period of consultation, the group developed a method referred to as the IOA 'reference method' [9], which incorporates concepts developed by other research groups including Fukushima *et al.* [10] and Renewable UK [2] into a hybrid (time- and frequency-domain based) method. The main advantages of this method are that it can be automated, allowing analysis over long time periods, and it is robust to background noise contamination, reducing the instances of false positives.

This study investigates the suitability of the IOA 'reference method' for detecting low-frequency AM of a tone that is generated by wind turbines. The motivation for this analysis is to investigate the prevalence of a low-frequency 'thumping' or 'rumbling' noise that has been mentioned in complaints from residents. In fact, during a study by the South Australian Environmental Protection Agency in 2013, at least 14 (out of 15) residents living at various distances up to 8 km complained of 'thumping' and/or 'rumbling'. Their responses were documented in noise diaries that were collected over several

weeks and these were provided to our research group. Since the IOA 'reference method' has been validated using broadband noise [2][11], which is representative of wind farm noise at distances less than 1 km from a wind farm, some modifications are proposed to extend its applicability to tonal AM measured at larger distances. These include changes to the analysis bandwidth, reduction in the prominence factor representing 'valid AM', assessment of the tonal audibility and reduction in the AM depth for cases when the tonal audibility is less than 0 dB at AM 'troughs'. The modified algorithm is then applied to outdoor and indoor data measured at 9 residences over a total of approximately 64 days of continuous recording to investigate the prevalence of AM and the associated AM depth. Relationships between AM and distance from the wind farm, AM and wind farm operating conditions and AM and time of day are also explored.

2. Measurement set-up

Outdoor measurements were carried out for a total of approximately 64 days at 9 different residences located between 1 and 9 km from the nearest wind turbine of a South Australian wind farm, which at the time of measurements was made up of 37 operational turbines, each with a rated power of 3 MW. The wind farm is positioned along the top of a ridge and the wind turbine hub height relative to the residences varies between 85 and 240 m. The wind turbine and residence locations are shown in Figure 1. Time series data were acquired both outdoors and indoors using National Instruments 9234 (at 10240 Hz sampling rate) and Bruel and Kajer LAN-XI Type 3050 (at 8192 Hz sampling rate) data acquisition systems, respectively. The outdoor microphone was a G.R.A.S type 40AZ with a 26CG preamplifier, which has a noise floor of 16 dB(A) and a flat frequency response down to 0.5 Hz. The outdoor microphone was mounted at a height of 1.5 m and protected using a spherical secondary windscreen with a diameter of 450 mm. Details of the construction of this windscreen are provided in Hansen *et al.* [12]. The outdoor microphone was typically positioned at least 20 m away from the residence and at least 10 m from surrounding vegetation to minimise façade reflections and wind-induced vegetation noise, respectively. A typical outdoor measurement set-up is shown in Figure 2. The indoor microphone was a B&K type 4955, which has a noise floor of 6.5 dB(A) and a flat frequency response down to 6 Hz. The indoor microphone used in the analysis was mounted on a mini tripod and positioned approximately 100 mm from

a room corner, at the intersection between two walls and the floor. Two other indoor microphones were mounted at heights of 1.5 m and positioned randomly within the room. At all residences, the indoor measurements were taken in a room that faced as closely as possible towards the wind farm and the windows were closed. A total of 8716 and 8972 10-minute samples of outdoor and indoor data, respectively, were analysed in this study. The number of 10-minute samples taken outdoors and indoors at each residence is shown in Table 1.

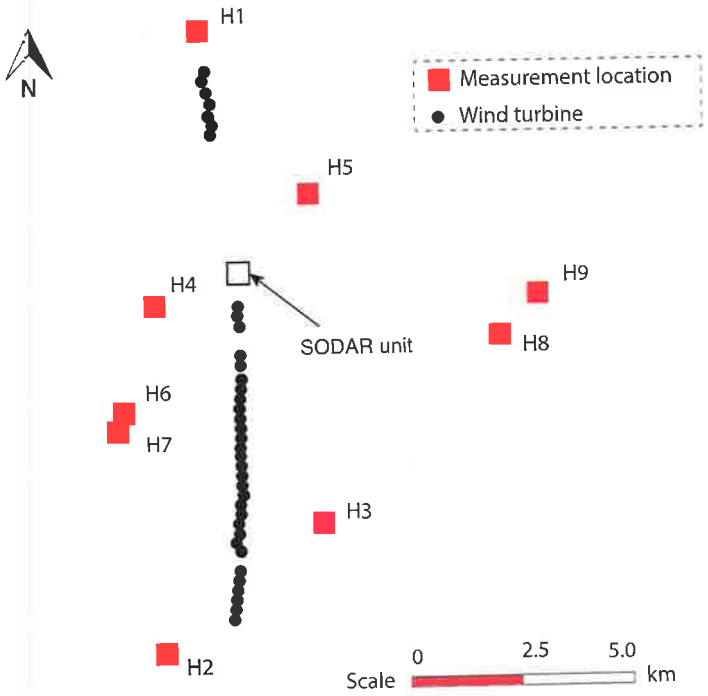

Figure 1: Scaled diagram showing position of residences relative to the wind farm.

Table 1: Number of 10-minute samples measured outdoors and indoors at each residence.

Residence	H1	H2	H3	H4	H5	H6	H7	H8	H9
Distance (km)	1.3	2.3	2.4	2.5	3.3	3.4	3.5	7.6	8.8
Outdoors	833	700	471	1548	1087	640	1659	999	848
Indoors	834	803	860	1561	1091	640	1344	989	850

Hub-height wind speed data for the nearest wind turbine to each residence were available from the wind farm operator for all residences except H5, for which the hub height data were measured using a Fulcrum 3D SODAR. The SODAR was located on the same ridge-top as the wind turbines, as shown in Figure 1. The resolution of this device is $\pm$ 0.01 m/s, according to the manufacturer. Power output data for the wind farm were obtained from the Australian Energy Market Operator website [13] in 5-minute averages. These data pertain to the entire wind farm and data for each individual wind turbine were not available.

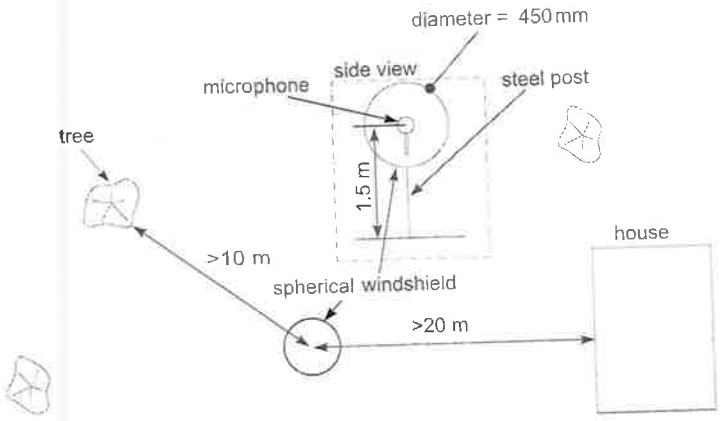

Figure 2: Schematic showing a typical outdoor measurement set-up.

3. Analysis techniques

3.1. AM detection and quantification method

Several methods have been developed for detecting and quantifying AM and they can be divided into 3 categories: time-domain [10], frequency-domain [4] and 'hybrid' methods [9], the latter of which involves analysis in both the time and frequency domains. A comprehensive review of these methods can be found in [8] and [14]. In this study, the IOA 'reference method' [9], a hybrid method, has been used for detecting and quantifying AM. However, to ensure reliable detection of the low-frequency tonal AM that is characteristic of the wind farm noise analysed in this study, several modifications were required, which are as follows:

1. The bandwidth of analysis was limited to a single 1/3-octave band containing AM with the highest associated AM depth.
2. The prominence factor described in the IOA 'reference method' was reduced to 3. This means that the spectral peak at the BPF did not need to be as high above the noise floor of the power spectrum to be considered as wind farm AM.
3. The audibility of the tone was assessed based on the sound pressure level (SPL) in the 50 Hz 1/3-octave band and masking noise in the first critical band (20 - 120 Hz).
   (a) The normal hearing threshold curve specified in ISO 389-7 [15] was used to determine if the SPL in the 50 Hz 1/3-octave band was sufficiently high to be potentially audible.
   (b) For cases identified in (a), the tonal audibility was assessed using the method outlined in the IEC 61400-11 standard [16]. Note that this standard does not explicitly state that the tone should be above the hearing threshold. However, this is an important consideration for low level tones, and thus audibility was also evaluated using ISO 389-7 [15].
4. If the AM troughs, as pictured in the bottom-right of Figure 3, were not expected to be audible based on the calculated tonal audibility, the AM depth was reduced. For instance, if the tonal audibility was 0 dB and the AM depth was 6 dB, the reduced AM depth would be 3 dB. This is referred to as the 'AM correction' hereafter.

For the specific wind farm and receiver distances analysed in this study, narrowband analysis revealed that the most significant AM occurs at approximately 46 Hz [17]. Therefore, due to the tonal nature of the AM, the analysis bandwidth was reduced to the 50 Hz 1/3-octave band. Although Bass *et al.* [9] suggest an analysis bandwidth of 50 Hz - 200 Hz, it is highlighted that this bandwidth precludes the audible tone and that even if the lower bound were extended to 40 Hz, the AM depth would be much lower. This is expected for the tonal AM analysed in this study but the approach may not be valid for broadband AM such as 'swish'. In fact, it is recommended that before deciding on the analysis bandwidth, it is important to identify the frequency range in which AM occurs. To ensure that the AM depth is not underestimated, it is important to choose a bandwidth that results in the highest AM depth. In this analysis, a narrow bandwidth of 2 Hz, centred on the tone, was also investigated but it was found that the AM depth was close

to that obtained using 1/3-octave bands. Moreover, use of 1/3-octave bands is required by the New Zealand standard for wind farm noise measurement [18] and has been used by other researchers [19][20] for AM analysis.

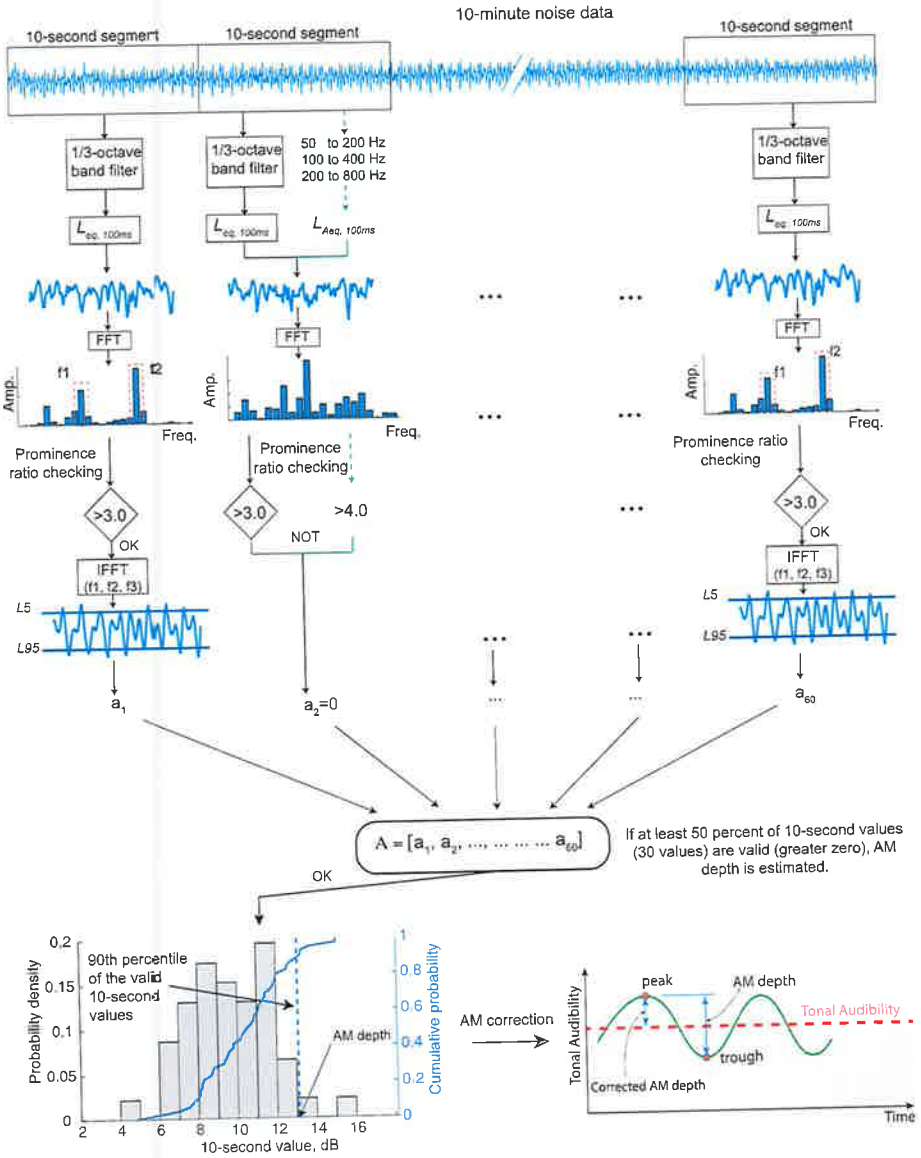

Figure 3: A summary of the steps for determining and quantifying AM based on the IOA 'reference method' that has been modified to suit analysis of AM of a low-frequency tone. The Inverse Fast Fourier Transform (IFFT) is calculated using the fundamental and first two harmonics. The values in the box shaded green with dashed grey outline are the original values used in the IOA 'reference method'. The modifications are applied for all 10-second segments.

The prominence ratio was reduced from 4 to 3 based on a systematic analysis, which is described in Section 3.2. Figure 3 shows a summary of the steps for determining and qualifying AM based on the IOA 'reference method' with the modifications discussed above.

3.2. Validation of AM detection algorithm

To show a visual representation of the accuracy of the IOA 'reference method' with prominence ratios of 3 and 4, comparison is made to a spectrogram plot in Figure 4. These data were measured at H5 over 24 hours, during which there were some periods with AM present and other periods with AM absent. The plot was constructed using a Hamming window, frequency resolution of 0.1 Hz, time resolution of 5 s and 50% overlap. As shown in Figure 4(a), use of a spectrogram plot is an effective method of identifying AM of a tone, which is visible as horizontal lines in the spectrum spaced vertically at the blade pass frequency (BPF) of 0.8 Hz. The disadvantage of this approach is that it requires significant computational resources and a human for visual data interpretation. Hence, it was used in this study as a validation tool only. The results of applying the IOA 'reference method' with modifications are shown in Figures 4(b) and (c). Here the AM depth is plotted against time, and 10-minute periods with and without AM are shown using red circles and blue plus signs, respectively. Figure 4(d) shows that the SPL of low-frequency noise is much higher during periods containing wind farm AM compared to periods when the ambient noise is dominant.

Comparison between Figures 4(a) and (b) indicates that the prominence ratio of 4 that is recommended by Bass *et al.* [9] fails to detect many occurrences of AM. On the other hand, selection of a more conservative prominence ratio of 3 results in a better correlation between the AM visible in Figure 4(a) and the 10-minute periods identified as containing AM in Figure 4(c). The rate of detection of true and false positives for various prominence ratios is discussed in more detail below.

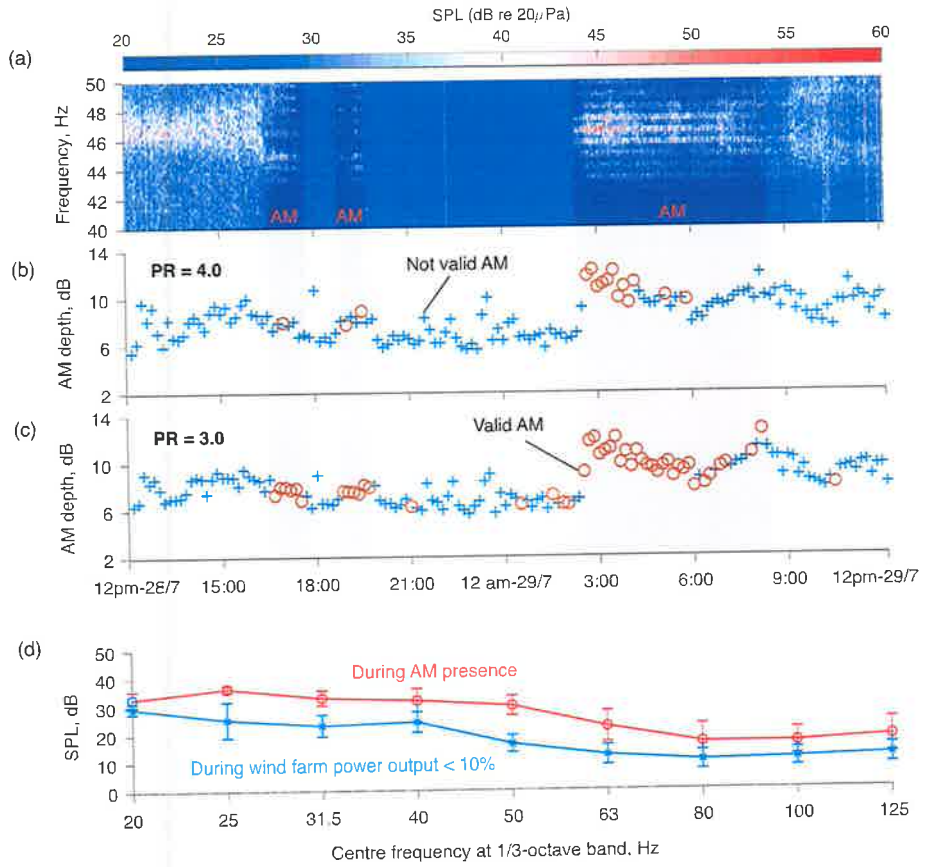

Figure 4: The effect of prominence ratio on the result of AM detection for measurements at H5. (a) Spectrogram showing the presence of AM, as determined by a human scorer, shaded in grey. The AM is characterised by horizontal bands of relatively high SPL spaced at the BPF. (b), (c) Results of AM detection corresponding to prominence ratios of 4.0 and 3.0, respectively. The red and blue markers show AM depth for 10-minute data points that are considered valid and not valid, respectively using the IOA 'reference method' [9]. (d) Mean and standard deviation of 1/3-octave spectra corresponding to data containing wind farm AM (red) as shaded in (a-c), and the period with negligible wind farm noise (blue), as indicated by the low-level signal without AM in the centre of (a-c).

To further refine the selection of the prominence ratio for the entire data set, a Receiver Operating Curve (ROC) analysis was carried out using the methodology outlined by Fawcett [21]. The aim of the ROC analysis was to systematically examine true versus false positive and negative detection rates

at each possible prominence ratio to find the optimal prominence ratio cut-off that simultaneously maximised both true positive (sensitivity) and true negative (specificity) detection. This is done by comparing the algorithm output to a 'gold standard' which in this case is the human-scored presence of AM. To construct the 'gold standard' data set, 96 10-minute periods (equivalent to 16 hours of continuous measurement) were randomly selected from each of the 9 data sets. These data were plotted in spectrograms with the same criteria used to plot Figure 4(a). One investigator (PN) manually reviewed and classified each of the resulting 864 spectrogram segments into those containing ($N = 200$) versus not containing ($N = 664$) visually discernible AM for at least 50% of the time, as consistent with the IOA 'reference method'. The IOA 'reference method' was then employed to detect AM, using prominence ratios between 2.5 and 4.5, with steps of 0.25, and the resulting ROC curve is shown in Figure 5(a). The standard IOA 'reference method' and prominence ratio cut-off of 4 showed high specificity (0.99) but poor sensitivity (0.09) for detecting 'gold standard' classified AM events compared to a prominence ratio of 3; which achieved a more reasonable balance of lower specificity (0.82) and higher sensitivity (0.62). A prominence ratio of 3 is closest to the top-left corner (0,1) of the ROC which represents an ideal classifier and so provides the best compromise between true and false positive rates [22]. The total area under the ROC curve (AUC) is 0.783 (95% confidence interval 0.751 to 0.815), which indicates that the IOA 'reference method' is a reasonably good discriminator of AM, but could potentially be improved. Figure 5(b) shows an alternative method for measuring algorithm performance using the number of true and false positives for each value of the prominence ratio investigated. For each prominence ratio, the vector containing a binary outcome for the presence/absence of AM from the 'gold standard' data set is subtracted from the corresponding vector obtained using the IOA 'reference method'. All elements in the resulting vector are summed and the entire process is labelled 'sum of subtraction' in Figure 5(b). The results show that at low prominence ratios, there is a high rate of false positives whereas at high prominence ratios, there is a high rate of false negatives (i.e. non-detection of AM). The curve asymptotes near a value of -200 as this corresponds to the number of AM events in the 'gold standard' data set and thus indicates that few AM events were detected using high prominence ratios. The point closest to the blue dashed line, which reflects maximum true positives and true negatives, corresponds to a prominence ratio of 3, which is in agreement with the ROC analysis. Hence, a prominence ratio of 3 was selected

for this study. Use of a higher cut-off, such as 3.5, could be used to reduce the false positive rate to more confidently 'rule-in' the presence of AM (i.e. higher specificity), but also increases the chances of missing AM (i.e. lower sensitivity). Similarly, use of a lower cut-off, such as 2.5, could be used to more confidently ensure that AM is not missed (i.e. higher sensitivity), but at the expense of falsely detecting AM in some cases (i.e. lower specificity). Ultimately AM classification methods need to both reliably detect the most annoying features of AM when AM is present, and reliably rule out AM when it is absent.

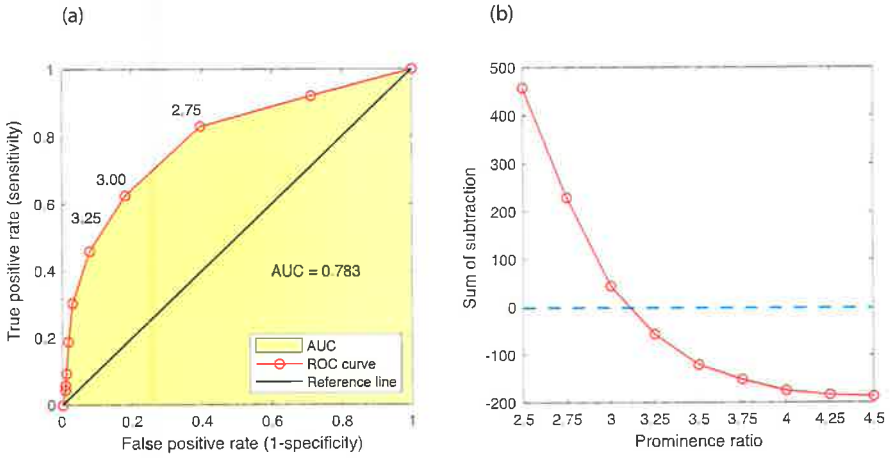

Figure 5: Selection of the most suitable prominence ratio. (a) ROC curve analysis and (b) Sum of subtraction method.

4. Results

4.1. Prevalence of AM

The results of applying the modified AM algorithm without the 'AM correction' for audibility to outdoor and indoor data measured at 9 different residences located near a wind farm are shown in Figure 6. In Figure 6(a), the number of AM events is plotted against the AM depth. It is evident that the mean AM depth for indoor noise was higher than that for outdoor noise. The reason for this is that the background noise in the 50 Hz 1/3-octave band was higher indoors, resulting in less AM events being detected, and thus a shift in the mean value. Given that the AM occurs in the 50 Hz

1/3-octave band, where the equal loudness contours are closer together than for mid-frequency noise, the fluctuation in loudness as a result of AM would be greater and hence potentially more annoying. On the other hand, to obtain a more realistic prediction of annoyance, the 'AM correction' should be applied, as outlined in Section 4.2. Figure 6(b) shows that the modulation frequency was consistently 0.8 Hz, which corresponds to the expected blade-pass frequency when the wind turbines are operating at their nominal speed of 16.1 rpm [23].

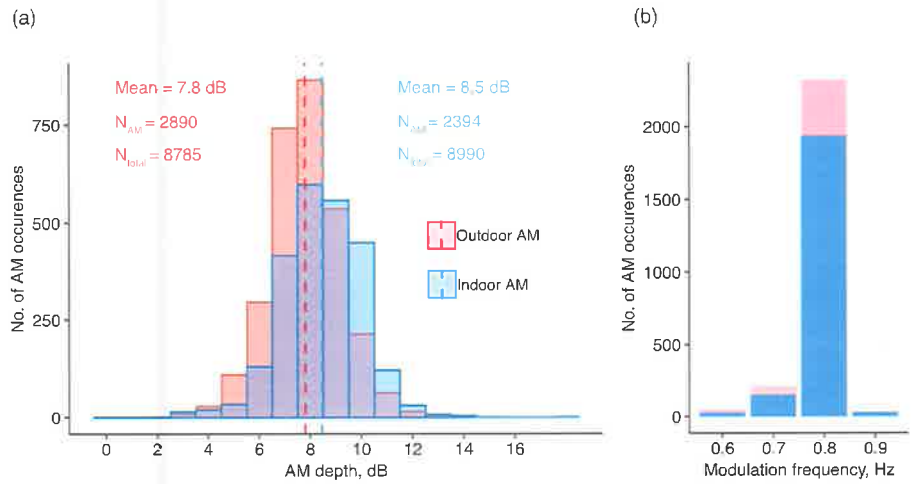

Figure 6: AM analysis of outdoor (red) and indoor (blue) noise measured at 9 different residences located near a wind farm. The overlap between outdoor/indoor AM data is shown in purple. The 'AM correction' has not been applied. (a) Histogram of AM depth. (b) Histogram of modulation frequency.

4.2. Prevalence of audible AM

To determine which data points required an 'AM correction' to more accurately reflect the perception of AM depth, the tonal audibility was assessed as described in Section 3.1. Results of this assessment are shown in Figure 7(a) and it can be seen that the tone was potentially audible both outdoors and indoors. In fact, the tone would have been audible in more cases than reflected in Figure 7(a) since the tonal audibility assessment is based on mean values and therefore the peak audibility of an AM tone is higher. The mean tonal audibility outdoors and indoors was 4 dB(A) and 2.8 dB(A), respec-

tively. As the histogram for the outdoor data is negatively-skewed, the mode was much higher at 7 dB(A). The lower tonal audibility indoors may be the result of higher indoor masking noise.

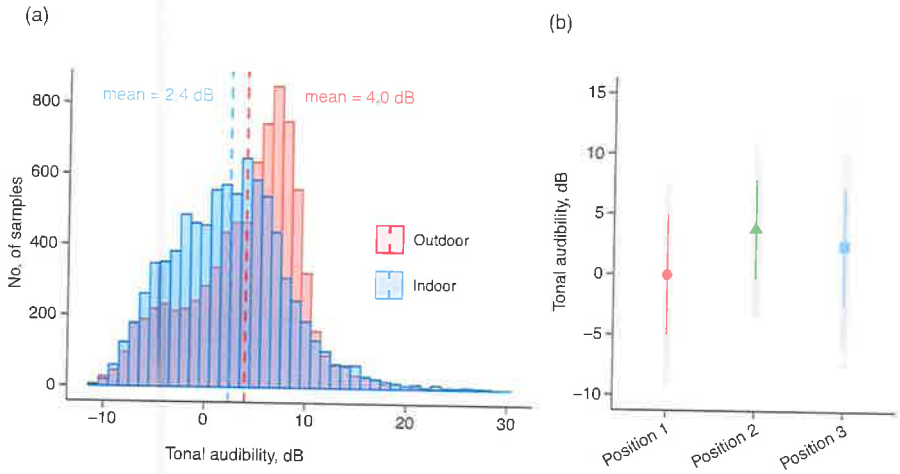

Figure 7: (a) Histogram of tonal audibility measured outdoors (red) and indoors (blue) using the corner microphone. (b) Tonal audibility measured at 2 random locations within a room (Positions 1&2) and in the corner location (Position 3).

An unexpected result was obtained when comparing the tonal audibility at various positions around the room for H5. It was found that the mean tonal audibility was highest at randomly chosen 'Position 2' in Figure 7(b), where the microphone was mounted near the centre of the room at a height of 1.5 m. At the corner 'Position 3' in Figure 7, the mean tonal audibility was slightly lower and therefore the results shown in Figure 7(a) may not reflect worst case conditions. The reason that the tonal audibility is not necessarily highest in the corner is that the corner is an anti-node for all room response modes and therefore the masking noise in the critical band containing the tone would have been higher as well. At another randomly chosen location near the centre of the room at a height of 1.5 m, the mean tonal audibility was shown to be lower than the other two positions and therefore for consistency, the corner position was used in the tonal audibility assessment. However, these results indicate that it could be advantageous to involve the resident when selecting measurement positions when a tone is involved, since the corner position may not represent the worst case in this

situation.

The results obtained after applying the 'AM correction' to the indoor data are shown in Figures 8(a) and (b). It is evident that the 'AM correction' is necessary for a large number of data points, resulting in a reduction in the mean AM depth from 8.5 dB to 7.4 dB. This indicates that the tonal audibility at 46 Hz was often less than 0 dB, as shown in Figure 7(a). The overall number of AM events is also much lower, indicating that a large proportion of detected AM events were entirely below the hearing threshold. Figure 8(b) shows that the median AM depth is the same before and after correction but that the mode is higher after correction. Also, the distribution shape changes significantly and becomes negatively-skewed, which is expected as the 'AM correction' involves a subtraction only. Similar trends were observed for the outdoor data and thus the results are not presented here.

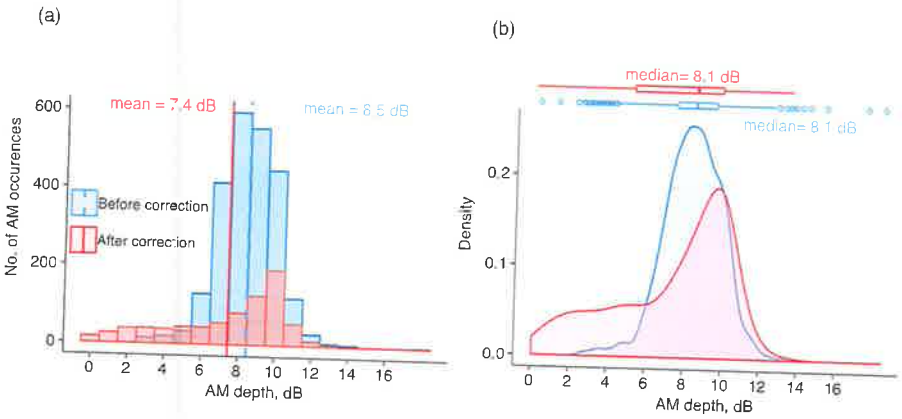

Figure 8: Indoor noise measurements taken at 9 different locations near a wind farm before and after the 'AM correction' (blue and red, respectively). (a) Histograms of AM depth. (b) Probability Density Function of AM depth.

4.3. Relationship between distance from the wind farm and AM.

Figures 9(a) and (b) show uncorrected and corrected AM depth as a function of distance from the nearest wind turbine for data measured outdoors and indoors, respectively. There is no clear relationship between the AM depth and distance for both outdoor and indoor data before the 'AM correction' is applied. This is anticipated as the difference between the peak and trough SPL remains constant. Also, our previous analyses [17] have shown that the wind turbine signal is as high as 15 dB above ambient noise levels

in the 50 Hz 1/3-octave band at a distance of 8.8 km from the nearest wind turbine, suggesting that masking in this frequency range may only occur during periods of low wind farm power output. In these cases, it is possible that the AM would not be detected as valid due to relatively high ambient levels. Differences in the AM depth measured at the various residences can be explained by differences in the positioning of the residences with respect to the wind farm. This affects the distance between the residence and the wind turbines other than the closest one. Also, the number of wind turbines that are orientated in a given direction with respect to the residence varies with both wind direction and residence position.

The AM depth is expected to reduce with distance when the 'AM correction' is applied, since tonal noise at 46 Hz is less likely to be audible at larger distances from the wind farm. However, this relationship is not evident in Figures 9(a) and (b). The reason for this is that audibility of wind farm noise is dependent on the wind turbine power output and this was not the same during the measurements taken at each residence. In fact, the reduced tonal audibility and lower AM depth after 'AM correction' at 2.5 and 3.3 km in Figure 9(a) may indicate that worst-case conditions, in terms of AM depth and audibility, were not captured at these residences. It is interesting to note that although the number of AM events is lower at 8.8 km relative to 1.3 km, the AM depth is similar outdoors both before and after the 'AM correction', as shown in 9(a). For the indoor data, there was only one instance of audible AM at 8.8 km but the associated AM depth was also similar to that measured at 1.3 km. The variation in the AM depth with distance for the indoor data after 'AM correction' shown in 9(b) can be attributed to differences in housing construction and orientation of the room relative to the wind farm. These factors affect the indoor SPL and hence audibility.

The large number of outliers, shown by the green and red open circles, in Figures 9(a) and (b) is attributed to meteorological effects such as changes in wind direction, atmospheric stability and atmospheric turbulence. However, the number of outliers is small (10%) compared to the total number of data points, from all locations, that were used for the averages. Fewer outliers are associated with the red data points as the 'AM correction' reduces the overall number of AM events, however, the actual percentage of outliers remains the same.

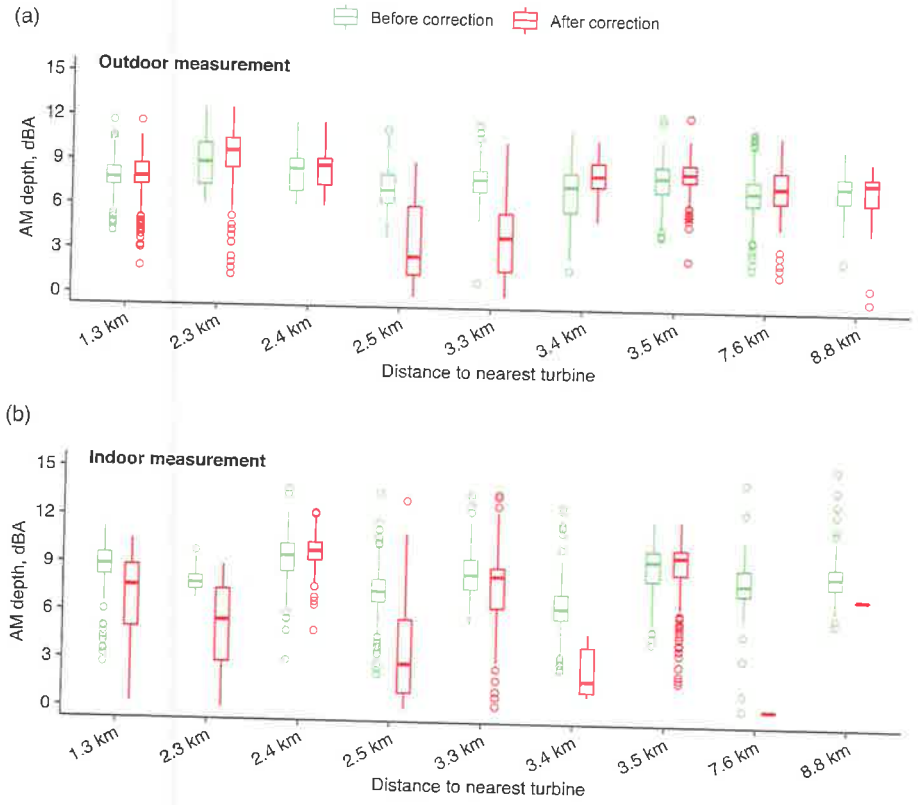

Figure 9: Relationship between AM depth and distance from the wind farm before (green) and after 'AM correction' (red). (a) Outdoor measurement, (b) Indoor measurement.

Figures 10(a) and (b) provide insight into the percentage of time that AM occurred at each residence both outdoors and indoors. These numbers should be interpreted with caution due to differences unrelated to distance such as: size of the data set, position of the residence with respect to the wind farm, worst case atmospheric conditions for wind farm AM not captured, housing construction, room orientation relative to the wind farm and room size. The latter three characteristics are only relevant when considering the results after 'AM correction'. Valid AM was detected less often indoors, which may be related to background noise, as some of the residences (but not the measurement room) were occupied during the measurement period.

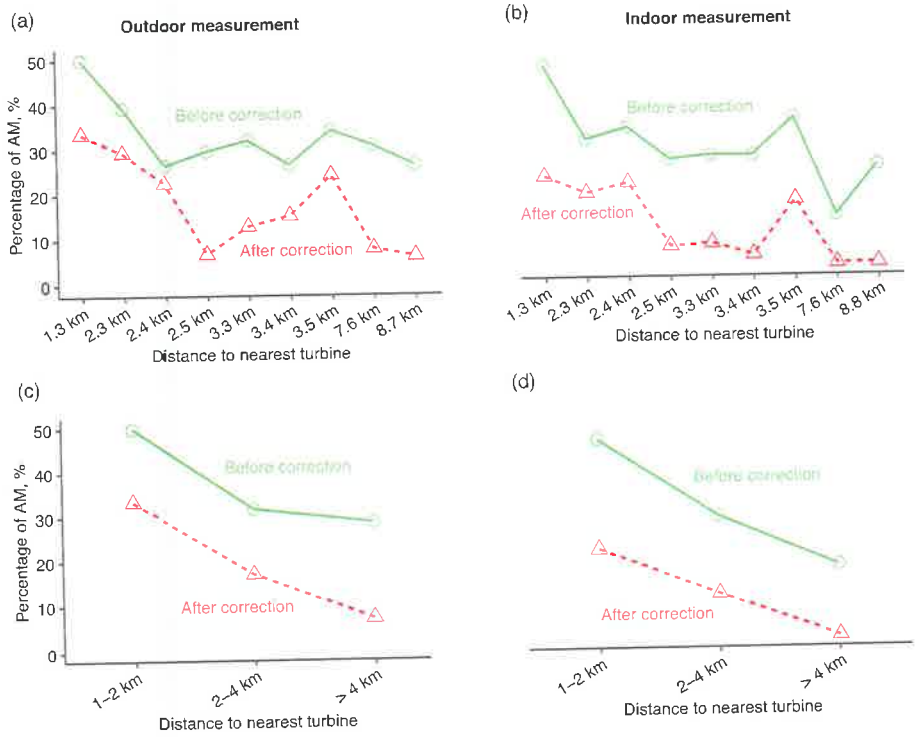

Figure 10: Outdoor and indoor noise measurements taken at 9 different locations near a wind farm. (a, b) Relationship between the percentage of time that AM was present and the distance from the wind farm. (c, d) Relationship between percentage of time that AM was present and distance from the wind farm, where the results have been combined into three distance bins of 2 km width.

Figures 10(a) and (b) indicate that tonal AM was present outdoors between 25 and 50% of the time and indoors between 14 and 46% of the time. Applying the 'AM correction' results in fewer AM events, however, the tonal AM is shown to be audible outdoors and indoors up to distances of 3.5 km for as much as 24 and 16% of the time, respectively. At distances of 7.6 and 8.8 km, it is expected that the tonal AM would generally not be audible for a person with hearing in the normal range. The tonal AM could be audible at these distances for a small proportion of the population that have sensitive hearing (i.e. 2.5% of the population have a hearing threshold that is 10 to 12 dB less than than the ISO 389-7 [15] threshold curve [14]). The results at 2.5 and 3.5 km are not considered representative for the reasons discussed

in the paragraphs above. Therefore, to further investigate the relationship between percentage of AM and distance, Figure 10(c) and (d) were plotted. To reduce the variance between measurement locations in this figure, the data have been categorised into three groups; 1-2, 2-4 and > 4 km. A clear trend of reducing AM with distance is apparent from these figures both before and after the 'AM correction'. In fact, it is shown that the occurrence of AM may be reduced by a factor of two after a distance of 2 km. A lower AM detection rate at distances greater than 2 km may be associated with a reduced signal-to-noise ratio, particularly during periods of low wind farm power output.

4.4. Wind farm operating conditions and AM

Figure 11(a) provides insight into the relationship between AM depth and hub-height wind direction for the indoor data without 'AM correction'. It can be seen that the mean AM depth is similar for crosswind and downwind conditions but slightly lower for upwind conditions. Also, the distribution shapes vary such that there are more AM events with a higher AM depth under crosswind conditions. Figure 11(b) indicates that the percentage of time that AM was present during each wind direction is similar for downwind and crosswind directions but much lower for the upwind direction. For the entire data set, crosswind, downwind and upwind conditions occurred 17%, 80% and 3% of the time, respectively. For the results shown in Figure 11, the wind direction is defined based on the line joining the nearest wind turbine to the receiver with a margin of ±45°. This is an approximation as wind turbines adjacent to the nearest wind turbine are orientated differently for a given wind direction. On the other hand, since the wind farm layout is approximately linear in the North-South direction and most of the residences are located to the East and West of the wind turbines, the direction categories are usually applicable to the adjacent wind turbines as well.

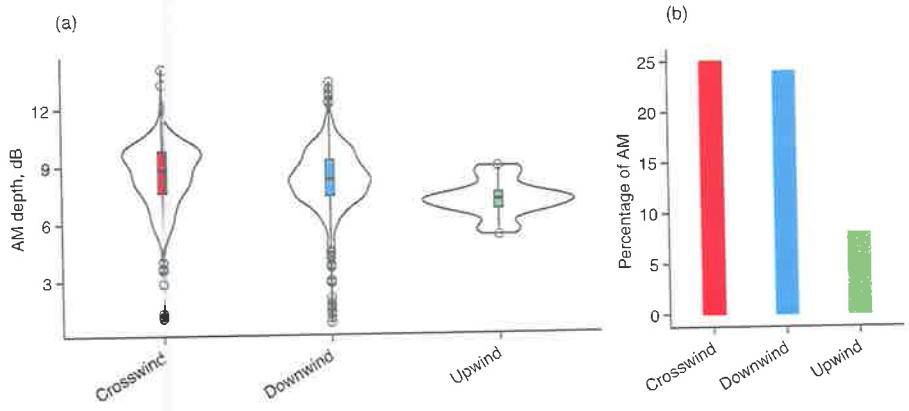

Figure 11: Indoor noise measurements taken at 9 different locations near a wind farm. (a) Bean plot of AM depth against hub-height wind direction. (b) Percentage of time that AM was present during various hub-height wind directions.

The relationship between wind farm power output, hub-height wind speed and the presence of AM indoors is presented in Figures 12(a) and (b). In these figures, the grey and green bars correspond to periods of no AM and valid AM, respectively. The line plot indicates the percentage of time that AM was present for the entire measurement period. As shown in Figure 12(a), a large number of measurements were taken when the wind farm was operating at a percentage power capacity of <5% as there were several periods during which the wind speed was less than the cut-in wind speed of 3.5 m/s [23].

Figures 12(a) and (b) indicate that the highest number of AM events is associated with a wind farm percentage power capacity and hub-height wind speed of approximately 40% and 10 m/s, respectively. After applying the 'AM correction', the peak in the percentage of time that AM was present is less distinct and it is more useful to consider a range of operating conditions. Referring to the dashed line in Figures 12(a) and (b), it can be seen that audible tonal AM was present indoors for at least 20% of the time when the hub-height wind speed at the nearest wind turbine was between 11 and 14 m/s and the percentage power capacity was between 40 and 85%.This indicates that AM is more likely to be detected when the wind turbines are operating below their maximum rated power. It is unclear if this is a source characteristic or an environmental effect, as the background noise may also be higher due to wind noise at the receiver when the wind farm is operating at higher power capacities. This could result in non-detection of AM, even

though it may be present.

In Figures 12(c) and (d), the AM depth without the correction for audibility is plotted against the percentage power capacity and wind speed at hub height, respectively. There is a poor correlation between the AM depth and percentage power capacity as well as hub-height wind speed, as indicated by the low R^2 values obtained for both linear and second order polynomial regression fits. However, according to the second order polynomial regression fit, which has a higher R^2 value, there is a general trend that the AM depth increases slightly up to a percentage power capacity and wind speed at hub height of 70% and 15 m/s, respectively, after which it decreases slightly. Limited improvement in the correlation between AM depth and percentage power capacity as well as hub-height wind speed is obtained when the data are separated into 2 km-wide distance bins. This is indicated by the large scatter in the data points for each distance bin shown in Figures 12(c) and (d). Hence, the large variation in AM depth for the various power capacities and wind speeds at hub height is most likely attributable predominantly to meteorological effects. Detection of valid AM at a power output of 0% can be explained by the 18% false positive rate using a prominence ratio of 3, as shown in Figure 5(a).

Figure 12(e) shows that tonal AM occurs much more frequently during the night-time, particularly between 10pm and 5am. In fact, compared to daytime hours from 9am to 5pm, there are twice as many AM events during the night-time. This is in agreement with the findings of Van den Berg [24] and supports the idea that AM is more likely to occur during stable conditions, which occur more often at night-time. A larger proportion of AM events that occurred during the daytime were audible compared to the night-time. A possible explanation is that inaudible AM events are less likely to be detected during the daytime when the background noise level is higher. Approximately 10% of the total measurement time at night-time contained audible AM. However, at residences located up to 3.5 km from the wind farm, audible AM occurred for as much as 22% of the measurement time at night-time.

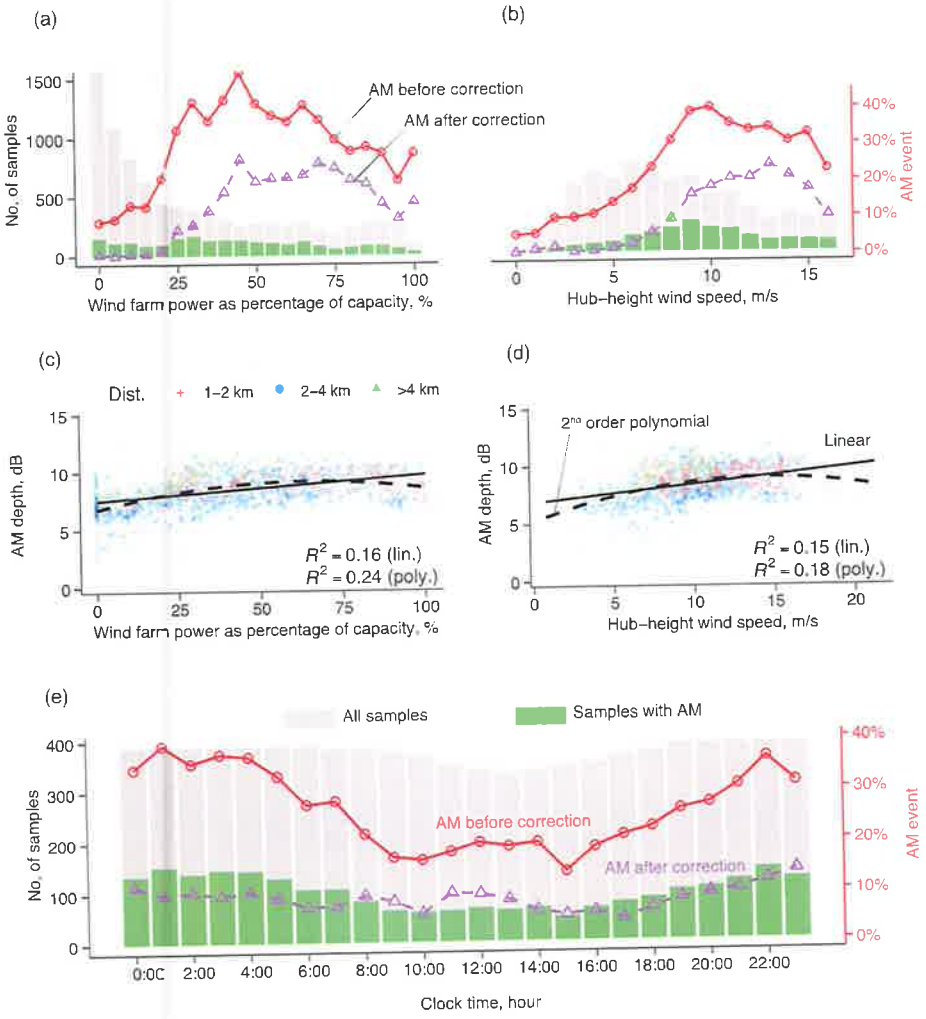

Figure 12: Indoor noise measurements taken at 9 different locations near a wind farm. (a) Number of AM events and percentage of time that AM was present before and after 'AM correction' against wind farm percentage power capacity, (b) Number of AM events and percentage of time that AM was present before and after 'AM correction' against hub-height wind speed, (c) AM depth against wind farm percentage power capacity, where the data has been separated into 2 km-wide distance bins and the regression fits applied to all data, (d) AM depth against hub-height wind speed, where the data has been separated into 2 km-wide distance bins and the regression fits applied to all data, (e) Number and percentage of time that AM was present as a function of time of day.

5. Conclusions

Low-frequency tonal AM with a modulation frequency consistent with the expected blade-pass frequency, has been measured between 1 and 9 km from a wind farm. The mean AM depth was 8.5 dB for noise measured indoors, slightly higher than the mean of 7.8 dB which was measured outdoors. On the other hand, when the tonal audibility was taken into account, the mean AM depth reduced to 7.4 dB for noise measured indoors and there was a similar reduction for the outdoor data.

Despite the relatively low noise levels, it was found that the tonal AM could be audible both outdoors and indoors up to distances of 3.5 km from the nearest turbine in the wind farm. The tonal audibility was higher outdoors than indoors, possibly due to higher indoor masking noise relative to the tonal noise. The indoor tonal audibility was dependent on the microphone location and the highest tonal audibility was not measured in the corner. This is because both the tonal level and masking noise are higher in the corner position since it is an anti-node for all room response modes. The relatively higher masking noise at the corner location can therefore give rise to a relatively lower tonal audibility.

There was no clear relationship between the AM depth and distance from the wind farm before the 'AM correction' for audibility was applied. This is expected, as AM depth is not affected by distance, and masking of the wind farm noise by ambient noise in the 50 Hz 1/3-octave band can be negligible, even at distances as far as 8.8 km from the nearest wind turbine. Due to differences in the power output that occurred during the measurement period at each residence, it was not possible to draw conclusions about the relationship between AM depth and distance from the wind farm after 'AM correction'. However, for the outdoor data, it was observed that the AM depth after correction was similar at the various distances. The percentage of time that AM was present was shown to reduce significantly with distance from the wind farm both before and after the 'AM correction'. This observation is consistent with noise attenuation during propagation, which results in a decrease in the wind farm noise level and hence, a reduction in tonal audibility and valid AM. Tonal AM was shown to be audible outdoors and indoors up to distances of 3.5 km for as much as 24 and 16% of the time, respectively. At distances of 7.6 and 8.8 km, the results indicate that the tonal AM would generally not be audible for a person with hearing in the normal range.

The percentage of occurrence and AM depth were both found to be higher during downwind and crosswind conditions. However, under crosswind conditions, the AM depth was higher for a larger number of AM events. The AM occurred most often when the wind farm percentage power capacity was approximately 40% both before and after the 'AM correction' was applied to account for the tonal audibility. Audible tonal AM was shown to be present indoors for at least 20% of the time for the entire data set when the hub-height wind speed at the nearest wind turbine was between 11 and 14 m/s and the percentage power capacity was between 40 and 85%.

Tonal AM occurred most often at night-time, during the hours between 10pm and 5am. Approximately 10% of the total measurement time at night-time contained audible AM. At residences located up to 3.5 km from the wind farm, audible AM occurred for as much as 22% of the time at night. This has important implications for possible sleep disruption from wind farm AM, particularly as ambient noise levels in rural South Australia can be as low as 15 and 5 dBA, outdoors and indoors, respectively. Further research is needed to determine the prevalence of AM on an annual basis. Further work is also needed to quantify the annoyance and sleep disturbance potential of this type of tonal AM.

6. Acknowledgements

The authors gratefully acknowledge financial support from the Australian Research Council, Projects DP120102185 and DE180100022 and fellowship FT120100510 and the National Health and Medical Research Council, Project 1113571. We also acknowledge Mahmoud Alamir's assistance in developing the AM detection code.

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22 July 2011

Jonathon Carle
Senior Policy Officer
NSW Department of Planning
23-33 Bridge Street
Sydney, NSW 2000

Dear Jonathon,

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Thank you for the brief opportunity to comment on the presentation made on Monday with regards to the updated NSW draft wind farm guidelines.

Our company has serious concerns with some of the changes being proposed and the rapid nature of the industry consultation process. In the interests of being concise, we will limit our response to our primary areas of concern.

Noise

It is necessary for me to state, as I did on Monday, that NSW currently has the strictest wind farm noise limits in the country. It is also a fact that NSW has the least experience of any state with regards to the acoustic characteristics of wind farms with the sole exception of Queensland. The State with the most wind farms, South Australia, effectively **raised their noise limit from 35dBA to 40dBA in 2009.** Therefore, it is hard to see any technical or logical rationale for NSW to contemplate more stringent noise requirements for wind farms.

Some of our specific concerns are as follows:

- Establishing a C-weighted criteria for wind farms is unprecedented in Australia, and potentially in the world. The methodology for measuring C-weighted sound is not covered at all in AS4959, so this new requirement would necessarily result in a "learn as we go" approach that will cause huge regulatory uncertainty for the wind industry.

- Larry Clark, Manager, Noise Assessment Unit DECCW, stated at the meeting on Monday that it would essentially be impossible for any wind farm to exceed the proposed 85 dB(G) noise limit while still satisfying the dB(A) criteria. Therefore, one has to ask the question why the wind industry should spend tens of thousands of dollars to measure compliance to a criteria we can't fail. In addition, specifying an infrasound limit gives credence to the falsehood that wind farms emit infrasound at levels anywhere close to the level that can be perceived by human beings, let alone cause any detrimental health effects. Again, we are not aware of any country requiring infrasound

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measurements of wind farms and there is no infrasound measuring methodology mentioned in AS4959, so NSW will be venturing where no State or country has gone before. The only certainty is that this needless requirement will be very expensive to define and comply with for no discernable benefit.

- The so-called Van den Berg effect is the result of one researcher finding one anomalous effect at one wind farm in Germany. To our knowledge, his results have not been repeated by any other researcher or at any other wind farm. His research is routinely brought up at Planning Panel Hearings in Victoria and is always dismissed as unproven and not applicable to Australian conditions. While we have no objection to discussing the so-called Vand den Berg effect in wind farm environment assessments, there should be no further requirements in this regard.

It is worth noting that these changes will not satisfy the Landscape Guardian groups. First, they are very unlikely to comprehend or understand the changes being proposed, and secondly they have publicly stated they will be unsatisfied by anything short of a complete moratorium on wind farm development and construction.

Last, adding needless, untried and extraordinarily expensive noise monitoring regimes will be sending a message to the renewable energy industry that the NSW Government is seeking to discourage continued investment in wind energy.

2 Kilometre "Gateway"

As the NSW Government knows, there is no Australian Planning Institute or Planning and Environment Court that endorses the idea of arbitrary buffer zones between developments and neighbouring residences. There is unanimous agreement that a merit based assessment is the only sensible approach. As you well know, the recent Gullen Range Wind Farm Land & Environment Court decision reiterated this, and stated that the only apparent rationale for the Shire's 2km buffer was the "streaker's defense"—it seemed like a good idea at the time. Whether it's a 2km buffer or a 2km "gateway", the concept appears to be very similar although the explanation of how the "high level of assessment" might work has been quite vague.

In your presentation, it is stated that the 2km gateway "could lead to agreements with non-associated residents". We believe that it would be more realistic to state that the 2km gateway could lead to legalised extortion by non-associated residents. In the same court case previously stated, the concept of "blight" caused by the wind farm and a requirement for compensation for neighbours was soundly rejected by the judge when he wrote:

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> *160 Creating such a right to compensation (for creating such a right it would be) would not merely strike at the basis of the conventional framework of landuse planning but would also be contrary to the relevant objective of the Act, in s 5(a)(ii), for "the promotion and co-ordination of the orderly and economic use and development of land".*

Therefore, we would have to differ with the statement on page 11 of the presentation that the Gateway proposal and a "focus on [contributions to] non-associated residents within 2km" is consistent with recent NSW L&E Court decisions. The only approach that is consistent with recent NSW L&E Court decisions is a merit based approach with no buffers and no "gateways".

Decommissioning

Infigen Energy takes responsibility for the decommissioning of the wind farm, including the wind turbines, as part of every one of our landowner agreements. In addition, it is customary, as in NSW, that decommissioning of the wind farm by the wind farm owner is required by the conditions of consent.

The proposition that a company might abandon the wind turbines without decommissioning them faces several challenges:

1. Historically, wind farms are far more likely to be re-powered (new turbines installed in place of the old turbines) than decommissioned.
2. Even if the owner of a wind farm were to go bankrupt and leave the wind turbines standing, the scrap value of the wind turbines (towers, electric cabling, etc.) far exceeds the cost of bringing in a crane to dismantle the turbines. The value of scrap metal will only rise over time making this trade off even more favourable over time.

The suggestion that a decommissioning bond be required is unnecessary, and simply represents another attempt by the Landscape Guardians to add additional and unnecessary costs to wind farms. Such costs would inevitably have to be passed onto NSW electricity customers, so we would trust the NSW Government would reject including a decommissioning bond in the draft wind farm guidelines.

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Conclusion

We understand that one could have the view that while one or more of the above concerns are valid, they can simply be made once the draft wind farm guidelines are on display and open for submissions. However, this view ignores the political reality that many issues raised above, if included in the draft guidelines put on public display, will be very difficult to remove. For example, if an infrasound measuring requirement is included in the draft guidelines, it would be very difficult politically to simply remove this requirement from the final version of the guidelines even if the Government shared our view they were unnecessary and expensive. This is similarly true for the other points raised. On the other hand, if the draft guidelines did not include an infrasound measuring requirement, the Government could, after consultation with the industry, add this to the final draft without serious political ramifications.

Therefore, we would respectfully recommend that further consultation occur with the wind energy industry over the draft wind farm guidelines such that when the draft of the wind farm guidelines is released, they are effectively a final draft.

Sincerely,

Jonathan Upson

Jonathan Upson
Senior Development Manager

Australian Industrial Wind Turbine Awareness Network

"OPEN LETTER"

23rd January 2017

National Wind Farm Commissioner
PO Box 24434
Melbourne VIC 3001

Dear Mr Dyer

RE: Adequacy and Ramifications of Your Investigations.

Under the terms of reference for the Wind Farm Commissioner you have been given the unique powers that in investigating complaints from residents who may provide the material concerning their impacts, there is no requirement for the wind farm operator to fully and properly investigate the claims. It appears the discretion as to what constitutes an investigation is up to you.

We have received complaints from many residents concerning the conduct of your investigations and what is consistently expressed as a clear bias towards the wind industry in the mediation sessions. This would appear to be different to what was intended by the majority report of the Senate Inquiry.

We have also received complaints that you undertake what appears to be a very limited and cursory examination of the complaint, and without getting to the bottom of any of the issues you simply dismiss the complaint and as such close the case without any investigation into ongoing suffering that residents have been experiencing.

Until late last year acoustic compliance with respect to permit conditions for operational wind farms was based upon the New Zealand Standard (used in Victoria) or the South Australian EPA Wind Farm Guidelines (used in New South Wales and South Australia) and guidelines issued in 2016 by the Queensland government.

Serious questions have been raised as to the adequacy of those guidelines and the basis of how the criteria have been established. It is clearly the case that residents are being disturbed as a result of operation of wind farms when apparently those wind farms are compliant with the acoustic criteria set out on the permit conditions.

Senator Madigan exposed the doctoring of acoustic compliance reports by Marshall Day Acoustics concerning the Cape Bridgewater wind farm and brought into the public awareness the nature of acoustical firms with vested interests to amend their reports to suit the client's

needs.

Similarly, matters have been raised as to the absence of compliance reports in accordance with the original permit conditions for the Waubra wind farm and that the Victorian government altered the terms of compliance when such matters were exposed in the public domain.

The Senate Inquiry into wind turbines, from which the appointment of a Wind Commissioner came about, identified serious issues in terms of the operation of wind farms and questioned the fundamental basis of the acoustic criteria that is issued on planning permits.

In 2016, in New South Wales another set of draft wind farm guidelines (wind energy framework) was placed in the public domain with hundreds of submissions in relation to those guidelines being received by the Department of Planning and placed on their website.

A previous set of draft guidelines for wind turbines in New South Wales received many submissions, but it would appear on a technical basis there were only some four submissions referring to acoustic matters and technical concerns with the draft guidelines.

The most comprehensive submission in terms of acoustic criteria contained in the first draft guidelines that prepared by Mr Cooper who as you are aware, is the author of the report into the ground-breaking research Cape Bridgewater wind farm.

As you are aware Mr Cooper has continued research into wind farm noise and was invited by the Director of Acoustic Standards of the Acoustical Society of America to become a member of the ASA's Wind Turbine Working Group. We understand that you are aware of Mr Cooper's involvement in further research work and various papers that have been presented to the ASA.

Mr Cooper provided a submission to the NSW 2016 draft wind farm guidelines issued by the Department of Planning (copy attached) where he identified the inadequacies of the guidelines with respect to a technical basis for acoustic assessment.

That submission was placed on the Department's website.

An examination of the New South Wales guidelines that have been issued reveal that with respect to the particular matters raised by Mr Cooper there is no change in the document and therefore there is no basis for the guidelines protecting the community from adverse impacts and fulfilling the objectives that are stated.

As a result of research work undertaken by Mr Cooper in 2016 a number of questions in terms of the basis of guidelines were developed and presented by Mr Cooper to the ASA meeting in December 2016.

Mr Dyer if it appears that there is no source material to substantiate what noise levels constitute sleep disturbance or protection from sleep disturbance in either the New Zealand

Standard, the South Australian EPA guidelines, the New South Wales guidelines, or the Queensland guidelines, then please explain how you can make a decision to dismiss complaints concerning wind turbines (and the effects upon people) when you have no basis to determine the validity or otherwise of the disturbances.

It would appear that with the New South Wales Department of Planning being publicly advised of the technical inadequacies of the basis of the guidelines, and that the Department chose to ignore those relevant technical issues, then the New South Wales Department of Planning would be legally liable for any nuisance or damages claims that arise from operational wind farms that purport to be compliant with the permit conditions obtained from the wind farm guidelines.

We assume Mr Dyer you are aware of the Irish High Court decision for the purpose of damages and that there is an admission of liability by the wind farm operator as causing those damages.

Mr Dyer you are aware that the former operator of Cape Bridgewater Pacific Hydro acknowledged that their wind farm was giving rise to disturbance and publicly stated that as part of Mr Cooper's study they would be looking to return the acoustic environment that residents received to the pre-wind farm situation. However, at the public meeting held at Portland that released Mr Cooper's ground-breaking study Mr Lane Crockett told the residents that Pacific Hydro were not going to change the operation of the wind farm and that basically the residents were collateral damage.

As a result of the numerous complaints that we have received concerning the conduct of the Wind Farm Commissioner in handling peoples' complaints, then it is appropriate that where such complaints have been dismissed, that you provide the basis of the dismissal and the scientific evidence that verifies that there are no grounds for complaints.

As part of the verification process that you have undertaken it therefore follows that you must have a full understanding of the basis of the acoustic criteria contained or utilised in various states on permit conditions and how that criteria ensures the community is not adversely affected.

Having made such decisions in relation to complaints, then you should be able to automatically answer the following questions:

1. Please provide the studies upon which the wind turbine/farm criteria for wind farms you have investigated have been developed.

2. Please identify the noise source(s) that have been used in the studies related to question 1.

3. Please provide the dose-response data related to wind turbines/farms upon which the acoustic criteria are based and the corresponding level that represents 10% of the population that is highly affected.

4. The most common complaint from residents relates to sleep disturbance. Please provide the studies of wind farm noise that identify the noise level (in any relevant acoustic index) that gives rise to sleep disturbance.

5. Please provide the studies of wind farm noise that identify the noise level (in any relevant acoustic index) that will not give rise to sleep disturbance.

6. Please provide the socio-acoustic studies of wind farm noise that identify the noise level that will protect the acoustic amenity of residents in proximity to wind farms. (N.B. The WHO guidelines are based primarily on road traffic noise and some rail and aircraft studies – no mention of wind turbines).

It therefore follows, having made various decisions/findings to dismiss complaints against wind farm operators, please identify the entity that is responsible for any class-action that may occur and the extent of liability that you Mr Dyer will also have as a result of your decisions/findings in response to the following question:

In light of the above please identify who would be liable for the consequences of adverse impacts arising from the operation of wind turbines/farms finalised in any Class action for the cases you have determined even though the wind farm allegedly satisfies the permit conditions?

The network looks forward to your response.

Yours sincerely

Patina Schneider

On behalf of AIWTAN

POSTAL ADDRESS: PO Box 1082 ORANGE NSW 2800 **EMAIL:** aiwtan@hotmail.com.au

Re: Flyer's Creek wind turbines
From: Karen Jones <Karen.Jones@planning.nsw.gov.au> | Date: 06/12/2013 2:37 PM | Email To:
View message details

Humphrey,

As discussed, contractual arrangements between landowners and the proponent are not relevant planning considerations for the Department's assessment. However, in recognition of the objections received from landowners fundamental to the project as assessed, and to provide certainty for all stakeholders, the Department has recommended conditions which require the proponent to demonstrate that appropriate agreements are in place.

i.e the Proponent must obtain an agreement with the relevant landowners for the construction and operation of the turbines.overhead transmission line, underground power cabling, access tracks and any other infrastructure or works associated with the project, within 12 months from the date of the determination. Should this agreement not be obtained and approved by the Director-General within 12 months, then the Project can not commence.
Furthermore, the planning process is not accountable to any contracts that the proponent may have with landowners notwithstanding that much of the delay during the assessment process for the proposal was attributable to the proponent.

Kind Regards

Karen Jones

COMMONWEALTH OF AUSTRALIA

Proof Committee Hansard

SENATE

SENATE SELECT COMMITTEE ON WIND TURBINES

(Public)

FRIDAY, 19 JUNE 2015

CANBERRA

BY AUTHORITY OF THE SENATE

[PROOF COPY]

SENATE

SENATE SELECT COMMITTEE ON WIND TURBINES

Friday, 19 June 2015

Members in attendance: Senators Back, Day, Leyonhjelm, Madigan, Urquhart.

Terms of Reference for the Inquiry:

To inquire into and report on:

The application of regulatory governance and economic impact of wind turbines, with particular reference to:

a. the effect on household power prices, particularly households which receive no benefit from rooftop solar panels, and the merits of consumer subsidies for operators;

b. how effective the Clean Energy Regulator is in performing its legislative responsibilities and whether there is a need to broaden those responsibilities;

c. the role and capacity of the National Health and Medical Research Council in providing guidance to state and territory authorities;

d. the implementation of planning processes in relation to wind farms, including the level of information available to prospective wind farm hosts;

e. the adequacy of monitoring and compliance governance of wind farms;

f. the application and integrity of national wind farm guidelines;

g. the effect that wind towers have on fauna and aerial operations around turbines, including firefighting and crop management;

h. the energy and emission input and output equations from whole-of-life operation of wind turbines; and

i. any related matter.

GRIFFIN, Mr Robert John, Private capacity

ROWETH, Mr Alwyn, Private capacity

CHAIR: We will now resume. In light of the fact that it seems that we are experiencing some technical difficulty, I suggest to the committee that Mr Griffin and Mr Roweth be called now. Welcome. Could you please confirm that the information on parliamentary privilege and the protection of witnesses has been provided to you?

Mr Griffin: It has indeed.

Mr Roweth: Yes, it has.

CHAIR: The committee has your submissions. I now invite you to make a brief opening statement and at the conclusion of your remarks I will invite members of the committee to put questions to you.

Mr Roweth: We are involved in the wind farm proposal, and in the beginning with the little information that we were given everything seemed quite okay. But as time has gone on we could see that there was a distinct lack of information to help us decide on things. I have personally come to the conclusion that I do not know why I became involved in it in the beginning. Everything has dragged on for so long that you get very disillusioned, even in the company that has proposed the wind farm in our area.

Mr Griffin: In my submission I have limited myself to a couple of issues. One deals with the way we have been treated by Infogen. We are part of the Flyers Creek Wind Farm. The contract we signed ran out almost two years ago. Infogen tried to insist on a force majeure clause for our contract, which continued on because they had not been able to get development approval for the project. The development approval was so long in coming mainly because Infogen had not been able to satisfy the department of planning's requirements. This was over two years ago. We informed them that our contract was over and that we did not accept the force majeure. With that information we were threatened to be sued for millions of dollars. I have submitted the letter which, they sent to us, and if you would like to read it I think you will find the language is completely over the top. It is as threatening as a letter could possibly be. It could only be understood as being intimidation. It was meant to make us fall into line and not stand up for our own legal rights. I do not want to speak about anything more.

I have provided that evidence and a written overview. I have also addressed the problem of blind contracts. All landholders who have wind farms have to sign blind contracts. That is, they do not know how many turbines they are getting, where the roads will be, where the lay down areas will be. It is a complete open contract. What they do is sign a contract which only says how much money they will get for the turbines that they are given. They do not know what they are signing up for. There are a lot of landholders who only get one turbine.

In the case of Mr Oborn, who is with me here today and who was also threatened, the roads go through his best paddocks, his lucerne paddocks, and the lay down areas had two hectares in the middle of his best lucerne paddock. So he is a loser out of the whole process. By having being part of the wind farm he is a net loser. This is why they want to continue not having a design for the wind farm before they start. Then it is up to anyone to negotiate as best they can, but they have already signed the contracts and their negotiating strength has gone.

It has been very interesting in the last few year as Infogen have tried to get people to sign the new contract. They still say the old contract exists but they are trying to get people to sign new contracts. They have actually had to negotiate with people because people knew where they were going to put their roads and the lay-down areas. All of these things have been a complete mystery from the time we signed their contracts. This is something that needs to be looked at. Farmers should not be put in the position where immediately they have no power. They are more or less powerless; the wind-farming tenants in fact have all of the rights. Even though the contract says they should consult with the landholders, they never do and there is no reason why they should. They just do what they like. That is the process.

While I have got the torchlight in front of me, I would like to shine it into a really dark little corner that has come about quite recently—that is, the New South Wales department of planning. Under the planning process, the department of planning gave provisional approval for the project—provisional in that they had to settle deferred commencement conditions, all of the things that they had not done to satisfy the department of planning. One of the deferred commencement conditions was that they had to have approval of all of the landholders, and they had to have that within 12 months of the PAC—I do not know if you are familiar with the Planning Assessment Commission, which is the final arbitrating body in the New South Wales planning department. The Planning Assessment Commission gave that condition, and it had to be fulfilled by March this year. Come March, New South Wales planning approved an extension of that by six months.

Now, the process whereby this took place is quite incredible, and this is what I want to draw some attention to. The officers in the department of planning who had been taking care of this matter for all of this time were

completely dismissed from the project and it was taken over by management. The management made a decision to make this a secret matter and no submissions were allowed. It still should have been in the power of the minister but the department had taken it into their own hands to make the decision on the basis that there were no objections raised. The notice asking for an extension was given at the back of their website—four steps into their website—a week before the decision was made by the department of planning. The department of planning have made no consideration of any other view besides the wind farmers' view. Six times, I think, they referred to it as an 'essential project', which is it not. It is a hollow document; it is intellectually pathetic, it is illogical and it is just a shame that the people in the department can take over like this.

The only explanation I can think of for why this radical change has taken place is that there has been very effective lobbying by the wind farm industry. It is exasperating for us. I have sent emails to the person who is making the decision and I get no reply. We have had barristers write to them and we get no reply. They now regard it as a matter that is completely up to these couple of bureaucrats in the department. We have no power and no influence and the things that need deciding for us are taken out of our hands. That is something I would like to draw attention to. Fortunately, I have been overseas for the last two months, so I have not had to think about it, but I will have to think about it now, about what we can do to approach this and review this decision—having people involved who look at all sides of the argument. The PAC did this exactly: the minister delegated the power of planning to the Planning Assessment Commission and they listened to all sides. People have two days to make all of their presentations. Infigen had another two meetings trying to get rid of this particular clause and they could not. We are having one person of the department making a secret decision like this. We are completely out of it. These are the issues I would like to bring forward to your attention in my five minutes here.

Senator LEYONHJELM: Thank you for coming, gentlemen. Your submission raises some interesting issues. Obviously you do not have wind turbines yet, so we are talking about the process leading up to getting them. The issues that you raised relate to the behaviour of one of the wind turbine companies Infigen Energy, previously Babcock & Brown, and the other one is that you have had a change of mind. When you signed the contract with Babcock & Brown as it was known at the time, what was your understanding of the benefits to you of that contract?

Mr Griffin: I probably should preface this by saying at that time I just had a heart attack and a triple bypass. I was at a particularly vulnerable time. I saw what the New South Wales government did when they approved the project. They did say it was critical infrastructure. There was such momentum on that issue that I thought I would be absolutely powerless to stop it; it was going to go ahead whether I liked it or not. In that project I could only think about positive things for the future and approaching the future without a fight on my hands. As time went on, things changed. I never thought of changing my position until the contract had expired. I must say that I never liked the idea of wind farms. I think that they are ugly, they are noisy and they destroy everything that I moved to the country for 25 years ago. I want a peaceful life.

Senator LEYONHJELM: What was the anticipated financial benefit?

Mr Griffin: The financial benefit was about $8,000 a turbine, so it would have been around $16,000 a year.

Senator LEYONHJELM: So you were going to have two turbines?

Mr Griffin: That is right.

Senator LEYONHJELM: Mr Roweth, what was your situation at the time? What did you expect the benefits would be?

Mr Roweth: I had not really thought about what the benefits would be. Part of the district and the surrounding land owners were going with it. I thought at the time that maybe it was the way things were going to go. Having not had any experience with any of the large-sized turbines, I did not think there were going to be any problems.

Senator LEYONHJELM: What financial benefit did you think there might be?

Mr Roweth: I only had one turbine, so I did not think it was going to be great. As time went on, I came to the conclusion that the benefits of one turbine were not worth the hassle of putting up with the construction.

Senator LEYONHJELM: So that leads me to the question as to what prompted you to change your mind. You obviously agreed to them at the time you signed the contract. You no longer want them on your property. Between then and now, what went through your mind to lead you to the position where you no longer want them?

Mr Roweth: The problem was mostly the information that was starting to come out in the public arena about the effects of wind farms overseas and what problems people were starting to experience. Where our house is, originally there was going to be a ring of turbines, about 180 to 200 degrees around the hills around the house.

and I was told that those situations were where problems can be the worst. As time went on I gradually came to the conclusion that I do not think I want them.

Senator LEYONHJELM: So you anticipated adverse health effects, and you mentioned the hassles?

Mr Roweth: Yes, it was just a combination—bringing a lot of unknown things out into the open—and I thought, 'I don't know what the results will be. If we can get rid of the thing I won't have to find out whether there's negatives associated with it.'

Senator LEYONHJELM: Mr Griffin, what was the reason for your change of mind?

Mr Griffin: It was just the reality. As I said, initially, I did not like the idea of wind farms but I thought we would probably have to sell the farm. I had to face a new reality at the time when I had my heart attacks. It made me look at the world in a different way. I thought that, if I could not put up with the wind farm, I would be better off probably selling the farm, because it would be all around us anyway. If you are not part of it, you are still included in it. You are just not getting any economic benefit – you have got to look at these turbines. Also it could affect the value of my property. If I were surrounded by wind farms, it would be quite hard to sell but, if I had some turbines on the farm, I could sell it. It was a very practical thing. I just had to think about what was best for my family and I think a lot of other families do exactly the same. At the time, as I say, I was very vulnerable.

Senator LEYONHJELM: When the contract was presented to you, what process did you go through in order to decide to sign it? Did you ask anyone about it? Did you go to a lawyer, friend, neighbour or relatives?

Mr Griffin: I did go to my solicitor. We did workshop it—we had a few dinner parties with friends, neighbours and so forth and workshopped to the idea. Some were solicitors; others were just neighbours. We tried to work out, as best we could, how to go about it. We were in a very particular situation.

Senator LEYONHJELM: Because you were expecting you might sell the farm because of your heart attack.

Mr Griffin: That is right, yes.

Senator LEYONHJELM: Mr Roweth, before you signed the contract, who did you talk to? Did you ask anyone about it?

Mr Roweth: We talked to our lawyer a little bit. He went through it with us. He did not really explain all the implications for us. We did a bit of research and went down to Wonthaggi in Victoria, where there were turbines—not quite as big as what we were anticipating at home. That was possibly when I started to change my opinion of it. The ones we saw were almost on the coast. We went over a kilometre away from them, but the turbines were still coming through above the noise of the ocean and the wind that was around at the time. So it started to make us think, 'If that's close to the house, how is it going to affect us, being like that?'

Senator LEYONHJELM: So you talked to your solicitor. Did you have to pay your solicitor?

Mr Roweth: No, Infigen.

Senator LEYONHJELM: Infigen paid for your lawyer. Would you have gone to a solicitor and got legal advice if that had not happened?

Mr Roweth: It is hard to say, isn't it, because legal advice was offered—up to a certain amount of money.

Senator LEYONHJELM: Do you think the legal advice you got was good legal advice?

Mr Roweth: I do not think it was adequate in hindsight—definitely not.

Mr Griffin: It is very hard for a small town solicitor to come up with a contract like this. He had never done it before. He had never seen a wind farm or a wind farm contract. What are they actually looking for? It is hard. Just offhand, it is hard. They have their own professional in-house lawyers dealing with these contracts all the time. We do not, nor do our solicitors in a small country town.

Senator LEYONHJELM: In retrospect, who do you think you would have liked to have heard from before signing that contract when it was presented to you?

Mr Roweth: Probably people who are living near wind farms—

Mr Griffin: Yes, with experience of—

Mr Roweth: to know what they have experienced with them.

Mr Griffin: We are isolated. Farmers are always isolated. We are not in contact, so it is very hard.

Senator LEYONHJELM: I now want to talk to you about Infigen's behaviour towards you. I think we have heard examples of some of the wind turbine companies being very hard-hearted, and then others are not all the same. Pacific Hydro is a good example because they incorporated a study on the adverse effects of noise. Your

experience with what was Babcock & Brown, now Infigen, can you take me through their behaviour and their attitude towards you?

Mr Roweth: In the beginning they were very cooperative. They would try to answer questions but they did not really give you any more information than they had to. As time went on, and once we had signed the contract, their attitude changed. You could ask a question and they would say, 'Oh, we don't have to—you have signed the contract.'

Senator LEYONHJELM: Did they refused to give you information?

Mr Roweth: They did not refuse, but they were not quite so friendly about things.

Senator LEYONHJELM: I see.

Mr Griffin: No one got any satisfaction with any problems they had once the design came out. For years and years it went on. It is hard for us to generalise because we have one man, Jonathan Upson, from one company, Infigen. I must say he was really shocking. He was an incredibly arrogant man. He was arrogant about everyone. All the protesters were just idiots. You could never have any discussion. They were just idiots. The department of planning were dopey. When we raised problems, we were the troublemakers. We never got anywhere with him at all, except to get threats. Even when the department of planning first said that they would have to get our written signature on a document after the date of approval we never got any consultation. We read in the local newspaper that we were going to be made to come into line. For six months we did not get one bit of consultation from them. They could not come around and try and sweet talk us. 'What's your problem?'—none of that. We just got threats straight away, right from the word go. We were told, 'They will be made to step into line.' That was the thing in the local newspaper and that was the attitude.

Senator LEYONHJELM: Tell me if I have this right. The date on the contract has expired, but because they invoked force majeure, they are arguing that the contract is still on foot.

Mr Griffin: That is right.

Senator LEYONHJELM: And you want to be relieved of the contract or you want to treat the contract as expired?

Mr Griffin: Yes.

Senator LEYONHJELM: In that light, they have written to you, threatening you with action for withdrawing from the contract or regarding it as null and void. Am I right there?

Mr Griffin: Yes, that is right.

Senator LEYONHJELM: Has as the letter come from the company or a solicitor?

Mr Griffin: It has come from both. It has come from Gilbert and Tobin, solicitors in Sydney, who act for them, plus it is come from their own—

Senator URQUHART: Thank you, gentlemen, for coming along. Mr Griffin, you mentioned something about property prices when you are talking a moment ago. Can you just give me some more detail? Have you had your property evaluated or anything like that? Can you talk a little bit more about what you meant?

Mr Griffin: At that particular time, when I went to the agents they would not handle the property because it was uncertain. It was uncertain about how many turbines I would have on the property. That was after the initial time when I had signed. So they would not even handled the property first off.

Senator URQUHART: Did the actually refuse?

Mr Griffin: More or less. They said, 'Look, there are too many unknowns here. We don't know whether there is going to be a wind farm or whether there isn't, or how many turbines you are going to have. Let's just wait until all of this is resolved and we will see what situation is.'

Senator URQUHART: At that time, were you contemplating on putting your property up for sale?

Mr Griffin: I had not before the wind farm.

Senator URQUHART: No, but at the time you went to the real estate.

Mr Griffin: Yes.

Senator URQUHART: And they would not

Mr Griffin: No, they would not list it, given that degree of uncertainty.

Senator URQUHART: They actually refused to list it?

Mr Griffin: This is a really big thing which should be known about wind farms too—there is a big cost. One thing that upsets me about it is that—

Senator URQUHART: Sorry, I just want to go back to the question. Did they actually refuse to list your property?

Mr Griffin: Yes, that is exactly what he said.

Senator URQUHART: Mr Roweth, you are nodding your head. Did you have the same issue?

Mr Roweth: Not with trying to sell. You mentioned land values. I do not know whether it was a coincidence or not, but since the start of the wind farm the value of my property has dropped $500,000. Whether it is a coincidence or whether it is because of the wind farm, I do not know.

Senator URQUHART: Have you questioned that?

Mr Roweth: No, I have not really questioned that because I have not been thinking of selling. Until you go to sell it, you cannot really—

Senator URQUHART: It does not affect you.

Mr Roweth: It does not affect you.

Senator URQUHART: Yes, I understand that. Are you able to provide the committee with that evidence—the difference in the value?

Mr Roweth: I would be able to. I can go back through the certificates.

Senator URQUHART: That would be great. Senator Leyonhjelm asked a lot of questions about getting a solicitor's advice. Mr Griffin, I think you said a country solicitor does not have that expertise. I understand that. You need to deal in a specific area of law to be able to give adequate advice. Were you confined to which solicitor you could get advice from or was it left to you to choose the solicitor you wanted?

Mr Griffin: We were allowed to choose our own solicitor.

Senator URQUHART: You went to your own solicitor, as most people do. I can understand that. You have a family solicitor and you tend to go to them for everything. Did your solicitor suggest to you that they did not have the expertise and that you might be better off getting advice from somewhere else in relation to that contract? Or were they just happy to look at the contract, be paid the money and perhaps not provide you with the proper advice?

Mr Griffin: The solicitor said exactly that—that he had no experience in this matter and had never dealt with it. But he was happy to do it, still. He is our solicitor.

Senator URQUHART: So even though he said to you, 'I do not have any expertise in this', he did not then suggest to you that you should go somewhere else and give you a name?

Mr Griffin: No.

Senator URQUHART: And was it the same for you, Mr Roweth?

Mr Roweth: It was the same for me, yes.

Senator URQUHART: Mr Roweth, I was just reading in your submission that you said:

Doctors and others are now giving their patients details of possible side effects so as to avoid being sued.

Can you just explain what you mean by that?

Mr Roweth: If you go to the doctor for general health things and they say you have to have an operation, they have got to tell you what the possibility is that that things could go wrong. The wind farm companies would prefer anything that might go wrong to be buried.

Senator URQUHART: So you are not actually talking about doctors not giving you information; it is about the wind farm proponents?

Mr Roweth: It is about the difference between the situations. If you go to a doctor, that is the situation he is in. The wind farm companies just do not want to give you any information that might be detrimental to their business.

Senator URQUHART: Do you think that the wind farm companies are the appropriate people to give health or medical advice to you?

Mr Roweth: No.

Senator URQUHART: What sort of advice are you looking for on that?

Mr Roweth: It is more to do with research into possible health effects. It is about making sure that it is researched properly and not just brushed over like you see in some of the reports from wind farm companies where they have been doing their research in a way that masks any problems.

Senator URQUHART: Were either of you able to get any sort of medical evidence such as what we heard from the NHMRC earlier? Were you able to receive any information like that? I know that it is difficult if you are not in that sphere to even know where to look, so I guess what I am asking is if you inquired as to any of that sort of stuff.

Mr Roweth: I did not really know where to start.

Senator URQUHART: It is difficult, yes, of course.

Mr Griffin: A lot of the information I have had since has been from watching television programs and seeing victims and being absolutely convinced of their authenticity. I have seen the *Four Corners* program, for example, and the people being affected were quite clearly honest people, telling their problems. I mean that has a big impact on you—

Senator URQUHART: And I do not think—

Mr Griffin: It has more impact on me than it does hearing the committee say there are no health effects. What is happening to these people? I believe them. They are absolutely convincing to me. What reason do they have to make up these stories?

Senator DAY: We have seen hundreds of them.

Mr Griffin: Yes.

Senator URQUHART: We have heard from a lot of people who have health issues. The issue is the causal link, and that is what the science and the expert advice are saying. I am not doubting at all that people are sick. It is an issue of what is the link and what is the cause. That is what the medical stuff needs to determine.

Mr Griffin: For us and our families, we make decisions. Now I would be happy to make the decision 'no' for health reasons, because I think it is too much of a threat to me and my family.

Senator URQUHART: Thanks.

Senator BACK: Just to be clear, contracts were signed in 2008 with Babcock & Brown for a five-year period. They became Infigen Energy, as I understand it. They had to commence construction within five years, by June 2013. They did not, so the contract should have been null and void. What was the basis on which they claimed force majeure? Was it bad weather?

Mr Griffin: No. They claimed it based on the fact that they could not get planning approval.

Senator BACK: Okay. Now, that would have been through the New South Wales Department of Planning and Environment.

Mr Griffin: That is right.

Senator BACK: Was that the case? Did the New South Wales Department of Planning and Environment hold them up?

Mr Roweth: I do not think it really was the way they are claiming. I think the department was asking them a lot of questions about things that they had not included in their original submission.

Mr Griffin: And we have correspondence from the department of planning saying that they did not accept any responsibility for the hold-ups or delays in planning.

Senator BACK: The New South Wales department of planning did not accept any responsibility?

Mr Griffin: That is right.

Senator BACK: They disputed the force majeure?

Mr Griffin: They disputed the force majeure—not so much the force majeure as such, because they would not come out and say it. They would not take any responsibility—

Senator BACK: They disputed that they caused any delays.

Mr Griffin: That is right—delays by Infigen in giving them the information they needed to make the decision.

Senator BACK: All right.

Mr Griffin: And, two years later, they are still waiting for the information.

Senator BACK: In that case, then, the contracts are null and void, aren't they?

Mr Griffin: That is right.

Senator BACK: It is two years ago. For whatever reason, you signed up in 2008; after the five years, you do not want to participate again. Have you sought legal advice, maybe this time from lawyers, who spend more time in this space, saying, 'Basically, if there's an issue, it's between the New South Wales department of planning and Infigen and has actually got nothing to do with you at all'?

Mr Griffin: My solicitor did get the advice of a barrister who works in the New South Wales Land and Environment Court. That advice was that there was not force majeure. We have submitted that to Infigen. That is the process we went along. We did argue a legal line. We found that what we had to do was say, 'We do not accept the force majeure but we reserve our right to end the contract,' because, if we ended the contract, their letter says, as you will see, 'by Friday of this week, legal proceedings will have begun'.

Senator BACK: That is a threat, isn't it?

Mr Griffin: Of course it is a threat.

Senator BACK: That is just a bully's threat.

Mr Griffin: Of course it is. It was meant to intimidate us, and it did, because what are we going to do? Are we going to say, 'Meet you in court'? I have had advice since to say we should have toughed it out. But it is hard to know what to do in these situations.

Senator BACK: It is very easy for someone who has no skin in the game, Mr Griffin, to make those sorts of statements.

Mr Griffin: That is right. So our tactic has been to try to state our legal position the whole time: we do not accept the contract, the contract is over and we reserve our right to end the contract at any stage—and that means tomorrow at the moment. What we have been hoping for the whole time is that New South Wales Planning do not give planning permission because there are not binding contracts over the landholders who do not want to sign the new contracts—so the deferred commencement conditions have not been met, therefore there will not be a wind farm. That would solve all our problems so we do not have to worry about solicitors.

Senator BACK: Have you sought legal advice to the extent of what action you as a group might have against the New South Wales department of planning?

Mr Griffin: No, we have not.

Senator BACK: That would appear to be a step that needs to be taken.

Mr Griffin: I must say the New South Wales department of planning has been fantastic, up until this period in time.

Senator BACK: Now they have given an extension on the planning approval—

Mr Griffin: Yes but this is different people. Management have just taken over this whole thing onto themselves, made it secret.

Senator BACK: So this is after two days of meetings with PAC, which one would assume in Australia means that both sides come before an independent arbiter, they hear the evidence, they do not need to meet anyone else, but then you tell us, I think, that independent of that they have now met on two further occasions with Infigen Energy. Have you guys been invited back for another further meeting?

Mr Griffin: No. They will not even answer anything.

Senator BACK: They being the New South Wales department of planning?

Mr Griffin: The former officer invited me to make a submission on the legality—whether they had an existing contract—which I did, and which he acknowledged, but then he told me that he could not speak to me, he could tell me nothing about the matter whatsoever. It was completely secret now and contact was over.

Senator BACK: I think the department understands why. Thank you very much for appearing gentlemen. I appreciate it.

CHAIR: Just to be crystal clear, Mr Roweth and Mr Griffin—from your testimony before the committee today, when the wind farm was proposed you signed up to it in good faith, is that correct, and you were not opposed to wind turbines?

Mr Griffin: That is right.

Mr Roweth: Not in-principle.

CHAIR: One of the issues that you have expressed to the committee today is inadequate disclosure of the position of the roads and the turbines—you have come to learn more after you have signed the contracts, is that correct?

Mr Griffin: Yes.

CHAIR: You have also told us that when you approached a real estate agent, Mr Griffin, looking to possibly put your property on the market, they would not list it because you could not inform them of how many turbines were going to be on your land, the position of them, and of any roads et cetera – this had a detrimental effect on your ability to list the property. Is that right?

Mr Griffin: That is right.

CHAIR: One of the many issues that you have raised here today before the committee is that you feel there was inadequate disclosure to you of the potential effects, positioning, et cetera, on your properties, and now you are saying if you had proper disclosure of these things you would not have signed a contract.

Mr Griffin: It is not only us, it is other landholders. Mr Osborne, at the back, for example, described this as the worst decision that they had made in their lives when they were talking to the department about it—because of the impact of where they put the roads in low down areas. It is devastating for them to lose their most productive land. All of this would not have occurred if there had been a design there.

CHAIR: Thank you, gentlemen, for your appearance before the committee today. There maybe some questions put on notice to you, so we would hope that you would be happy to answer them for the committee.

Mr Griffin: Yes. Thank you, Senators—sincerely, thank you.

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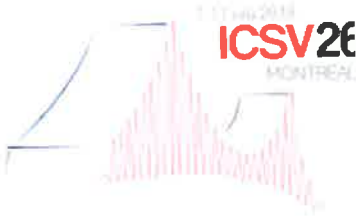

INFRASOUND AND LOW FREQUENCY NOISE GUIDELINES: ANTIQUATED AND IRRELEVANT FOR PROTECTING POPULATIONS

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Background: Over the past two decades, the increasing and unregulated production of infrasound and low frequency noise (ILFN, ≤200 Hz) has led to a considerable rise in associated noise complaints and health-related issues. The most recent of such ILFN sources are industrial wind turbines (IWT). Acoustical field-data was collected within a home located in the vicinity of IWT, to which the AUC Rule 012 and its requirements were applied. In Ontario, IWT noise complaints were gathered under the Freedom of Information legislation. **Goal:** To explore the usefulness of current noise control rules when protecting human populations against ILFN generated by IWT.

Keywords: industrial wind turbines, residential exposure, health, dBA, acoustic signatures

1. Background

The unbridled installation of industrial wind turbines (IWT) in different countries on different continents has brought a *very old problem* [1] to centre stage: the health effects induced by excessive exposure to anthropogenic (i.e., artificially generated, human-made) airborne pressure waves occurring within the lower ranges of the acoustical frequency spectrum (a.k.a. infrasound (<20 Hz) and low frequency noise (≤200 Hz), or, ILFN, given the absence of a more precise nomenclature). The goal of this report is to (yet again) emphasize the long-standing problem of anthropogenic ILFN impacting human health, this time using IWT as a source-example.

2. Industrial wind turbine 'noise' in Canada

2.1 IWT 'noise' complaints in Ontario

The government of Ontario, Canada has a process for reporting environmental pollution that offers a pollution reporting "hotline," managed by the Ministry of Environment, Conservation and Parks (MOECP), and which includes noise pollution complaints [2]. People living in proximity to IWT projects have used this service to submit Incident Reports/Complaints (IR/C) regarding environmental noise and associated adverse health effects. In order to evaluate the effectiveness of this process of reporting IWT 'noise,' government IR/C records were obtained through a request made under the province of Ontario's Freedom of Information legislation [3] by the community group coalition Wind Concerns Ontario [4].

Findings were presented during a citizen appeal of an IWT project held before the Ontario Environmental Review Tribunal [4]. Testimony included factual evidence based on the official government IR/C records submitted by residents living in proximity to operating IWT [5]. The total number of Incidents filed officially with the MOECP between 2006 and the end of 2016 was 4,574. Only 1% of the reports received a "priority" response, another 30% were deemed as "deferred," and records showed that in more than 50% of the Complaints, there was no ministry response [5]. Regarding health effects, notes by the Ministry's Provincial Officers included statements from citizens reporting "headache, sleep deprivation, annoyance, and ringing or pressure sensation in the head and ears" [5]. These health effects were reported many times, and also included children [5].

2.2 Rule 012 for Noise Control in Alberta

In the Province of Alberta, the Utilities Commission has Rule 012 [6] dedicated to *Noise Control* that encompasses "an avenue for the submission of noise complaints relating to a facility and the process for addressing noise complaints" [7]. Rule 012 imposes a limit based on a minimum basic sound level to which various adjustments are made:

Permissible Sound Level	=	Basic sound level	+	Daytime adjustment	+	Class A adjustment	+	Class B Adjustment	+	Class C adjustment

The basic sound level begins at 40 dBA L_{eq} and increases depending on the number of houses nearby and proximity of heavily travelled roads. The Daytime adjustment is an increase of 10 dBA between 7 am and 10 pm. Class A adjustments address seasonal variation and non-representative ambient monitoring. Class B adjustments are made for temporary increases in noise generation. Class C adjustments are made when the ambient wind increases to a level that masks the generated noise. On the matter of low-frequency components, Section 3.2 states: "If available, C-weighted sound pressure level (dBC) minus the A-weighted sound pressure level (dBA) is to be considered in the noise model…to identify the potential for low frequency noise impacts." The procedure then described in

Section 4.5 and Appendix 5 is required only when low frequency noise is identified subsequent to the complaint investigation. Therefore, the difference between the overall C-weighted sound level and the A-weighted sound level must be calculated for all pertinent recordings and the periodograms analysed for sharp peaks in the 20–250-hertz region. Only if both the dBC – dBA difference is greater than 20 dB *and* sharp peaks are identified, is a more comprehensive investigation of ILFN required.

3. IWT in Germany – Case Report

3.1 Background

Beginning in 2014, the Hogeveen family residing in Schleswig-Holstein, Germany, described the symptoms (to the media) that they and their children had been developing after 20 IWT were commissioned within a 2-km radius of their home [8-10]. The children—who exhibited increased aggressiveness and unexplained nosebleeds—were promptly sent to boarding school to avoid further health deterioration. The Hogeveens had to remain in the home since it is also their place of work (sports medicine and physical therapy centre), while persistently enduring dizziness, headaches, sensations of pressure on the chest and lungs, ear-aches, swollen tonsils, and ocular and oral inflammations [8-10]. But, they abandoned their upstairs bedroom and constructed a bunker-bedroom deep in the basement of the home. This has provided some respite, except when winds are easterly. Acoustical recordings were conducted simultaneously in both abandoned and bunker bedrooms, taking wind conditions into account.

3.2 Materials and methods for acoustic capture

Data were captured with a SAM Scribe FS (Full Spectrum) system (Model: Mk1, Atkinson & Rapley, Palmerston North, New Zealand) [11,12]. This two-channel recorder measures at sampling rates up to 44.1 kHz, and delivers data streams via USB to a Windows notebook computer, storing it as uncompressed wav files to hard disk. GPS information is also stored as metadata in the files, and this includes a digital signature. The manufacturer's frequency response curve shows a microphone capsule very close to linear over the 1-1000 Hz range used in this study (0.5-1000 Hz: ± 0.5 dB; 1-10 kHz: ± 2dB; 10-20 kHz: ± 4dB) (custom-made Model No.: EM246ASS'Y, Primo Co, Ltd, Tokyo, Japan) [13]. Acoustic data was processed in Matlab (The MathWorks, USA) using narrow-band filters complying with the ANSI® S1.11-2004 and IEC 61260:1995 standards. All data presented herein were captured a sampling rate of 11.025 kHz and recorded as uncompressed WAV files, including the required reference calibration tone (Type I Calibrator, 1000 Hz/94 dB). Windshields were placed on both microphones during the entire measurement periods. Microphones were attached to tripods at approximately 1.5 m above the ground. The recordings selected for analysis and presentation herein were chosen on their educational value, and are shown in Table 1.

Table 1: Samples selected for analysis and presentation herein.

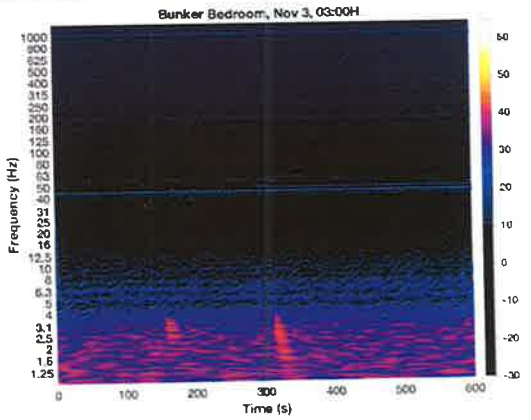
Sample	Date	Time	Wind Speed (m/s)	Wind Direction
Lo wind	03NOV17	03:00	0.9	290°
Hi wind	01NOV17	14:00	7.6	290°

3.3 Abandoned vs. Bunker bedrooms

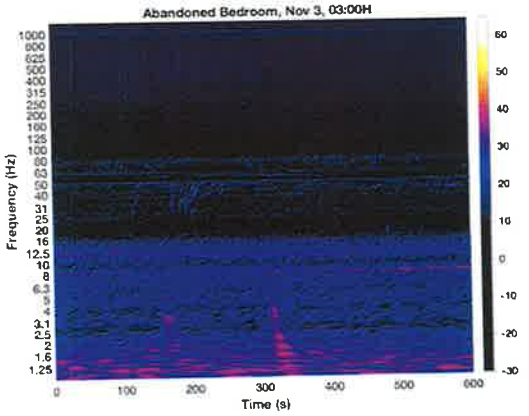
Significant and distinctive differences were found between the two environments that survived changes in wind speed and wind direction. Figure 2A-D compares the sonograms of the simultaneous recordings captured in both locations, under both wind speeds. All disclose some tonal components (horizontal lines) although these appear more prominent in the abandoned bedroom than in the bunker bedroom. The abandoned bedroom discloses larger SPL values between approximately 5-40 Hz in low wind conditions (0.9 m/s, Fig. 2B), and between 6.3-40 Hz in the high-wind conditions (7.6 m/s,

Fig. 2D). Within those frequency bands, distinct peaks at 8 and 12 Hz, as well as a peak at 80 Hz, are present in the abandoned bedroom, but absent from the bunker bedroom. Apart from some wind-gust noise—seen as vertical features broadening and moving to the right with decreasing frequency—the sonograms tend to show that the character of the sound does not change throughout the 10-minute periods and so the periodograms, shown in Figure 3, are representative of the sound over those intervals. (The continuous, 1000-Hz tone seen in the quieter recordings is due to electronic noise within the SAM Scribe Mk1, eliminated in the more recent SAM Scribe models.)

Wind speed 0.9 m/s and westerly wind (290°) on 03 Nov 2017, at 03:00H.

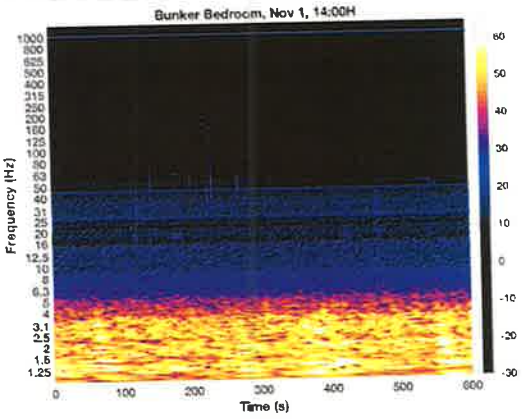


A. Bunker bedroom.

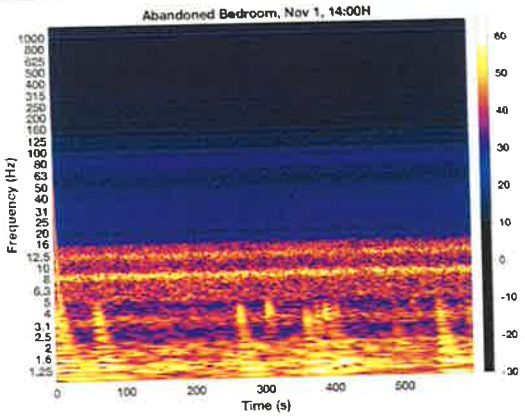


B. Abandoned bedroom.

Wind speed 7.6 m/s and westerly wind (290°) on 01 Nov 2017, at 14:00H.



C. Bunker bedroom.



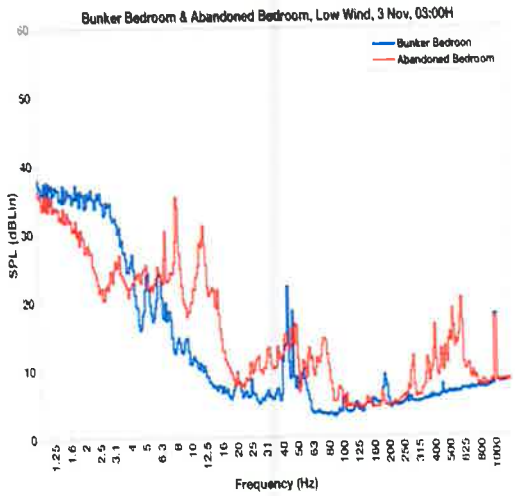
D. Abandoned bedroom.

Figure 2: Sonograms covering a 10-min interval (600 s) and analyzed between 1–1250 Hz. The color-coded bar on the right indicates SPL in dBLin.

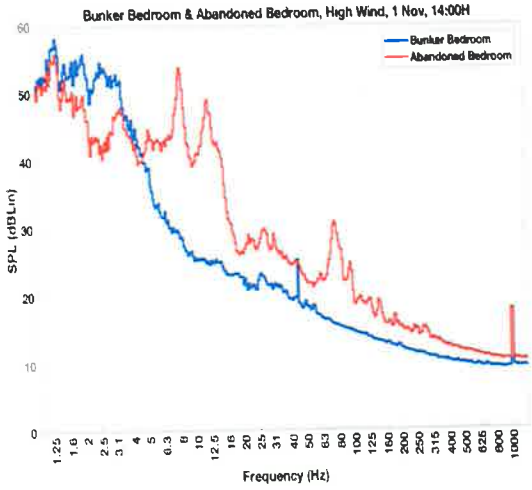
In the abandoned bedroom, the shapes and positions of the peaks at the three frequencies (8, 12 and 80 Hz, Fig. 3) are quite distinct, are clearly identifiable and independent of wind speed. Particularly visible in Fig. 3 is the similarity in the profile, occurring simultaneously in both locations, at the lower limiting frequencies of these measurements, i.e., approximately from 0.1 Hz to 2.5 Hz or to 4.5 Hz. The acoustical events responsible for these readings seem to impact both locations in the same manner, independent of wind conditions. The wavelengths corresponding to the airborne acoustical events at

these frequency values are, approximately, 76 m (4.5 Hz) to 3430 m (at 0.1 Hz). The source of these phenomena remains unclear.

At low wind speed (0.9 m/s), the bunker bedroom displays a continuous tone at approximately 50 Hz. This can be seen as a horizontal line in the sonograms (Fig. 2A and 2C), as peaks in the classical analysis (Fig. 4), and as narrow peaks in the corresponding periodogram (Fig. 3). Usually, these tones are attributed to electrical appliances that may be present in the environment, and that do not vary with wind conditions. This is much less obvious in the abandoned bedroom (Fig. 2B and 2D) since no appliances are currently present. In the abandoned bedroom, tones that are not present in the bunker bedroom can be identified at 8 Hz, 12.5 Hz and 80 Hz (Fig. 3). These tones are present at low wind speed and increase in sound pressure level with higher wind speeds, while maintaining the consistency of their shape.



A. Bunker vs. Abandoned bedrooms. Wind speed 0.9 m/s, westerly wind (290°), 03 Nov 2017, at 03:00H.



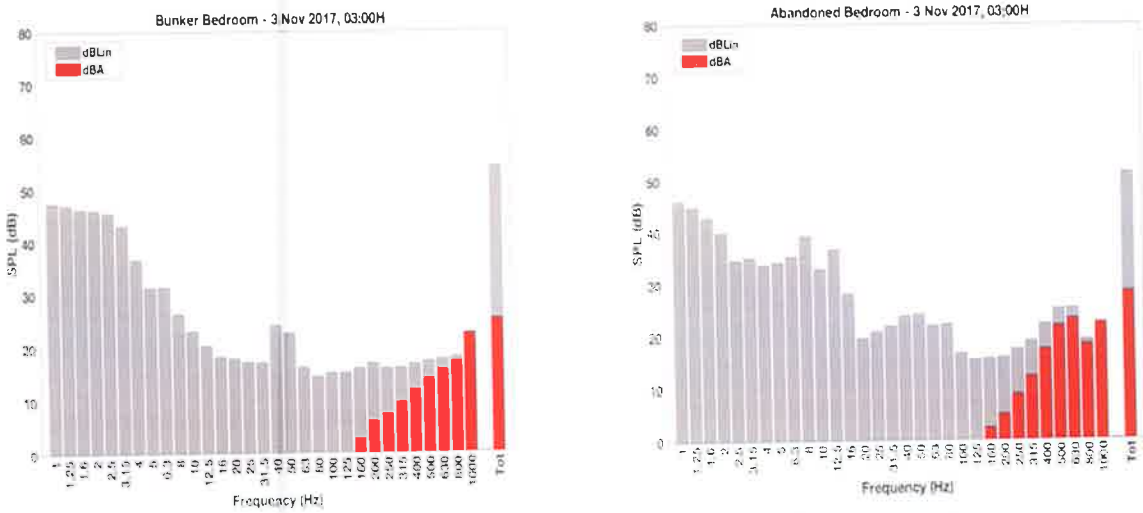
B. Bunker vs. Abandoned bedrooms. Wind speed 7.6 m/s, westerly wind (290°), 01 Nov 2017, at 14:00H

Figure 3: Periodograms covering the same 10-min intervals as in Figure 2 (analyzed between 1–1250 Hz), comparing the bunker and abandoned bedrooms at low and high wind speeds. The abandoned bedroom has consistently higher SPL levels than the bunker bedroom within the 4-40 Hz range, with very distinct shapes. At the lowest frequencies (≤2 Hz), SPL variations in both rooms have similar shapes and positions.

4. Discussion and Conclusions

Figure 4 shows ⅓-octave analyses obtained from a 10-min average, corresponding to the period shown in Figure 2A-B. In the bunker bedroom, the unweighted SPLs (Fig. 4A, grey bars) show a broad peak at about 50 Hz (or two narrower peaks on slightly either side). The highest SPLs are recorded below about 4 Hz. Unweighted SPLs in the abandoned bedroom (Fig. 4B, grey bars) show peaks at 8 and 12.5 Hz. There is relatively more energy in the abandoned bedroom above 4 Hz, but less below this. In both cases A-weighted SPLs (red bars) merely reflect that which humans would *hear* if present. As per Rule 012, this is the type of data required to establish permissible exposure levels.

Rule 012 was informally applied to the data obtained from the Hogeveen home. No recordings were made outside of the residence so the interior recordings used would a) be quieter than outside recordings and b) have a higher proportion of ILFN. The basic sound level is the lowest, 40 dBA, since it has less than 9 nearby dwellings within a 451-metre radius and is further than 500 m from a heavily travelled road. (Since outside night-time levels in the absence of IWT were impossible to measure, a 35-dBA level is assumed for the remainder of these calculations.)



A. Bunker Bedroom.

B. Abandoned bedroom.

Figure 4: These ⅓-octave frequency histograms cover the same 10-min interval as shown in Fig. 2A and B, wind speed 0.9 m/s and westerly wind (290°) on 03 Nov 2017, at 03:00H.

Two Class A adjustments are required. Assuming that a complaint is made in wintertime (the season during which these recordings were made), there is a +5 dBA adjustment. The ambient sound level with operational IWT is already 5 dBA below the basic sound level of 40 dBA, therefore, the adjustment is the maximum of +10 dBA. Since the sum of these two is +15 dBA, the maximum possible of +10 dBA is taken. For the Class B adjustment, two cases were considered: no increase occurs and one increase occurs for up to 60 days. This will give an adjustment of 0 dBA for the first case and +5 dBA for the second. The night time limit is therefore 40 dBA + 10 dBA + 0 dBA = 50 dBA for the base case, and 55 dBA is permissible for one period a year of up to 60 days. The daytime limit is the night-time value + 10 dBA = 60 dBA. The C-weighted and A-weighted overall sound levels for the 10-minute intervals captured on 01 and 03 November are shown in Table 2.

Table 2: dBC-dBA applied to the German data

	dBA Leq 10-min	**dBC Leq 10-min**	**Difference**
Bunker bedroom (01Nov)	35.7	56.2	20.5
Abandoned bedroom (01 Nov)	39.4	60.9	21.5
Bunker bedroom (03 Nov)	30.9	39.9	9.0
Abandoned bedroom [03 Nov)	33.7	42.7	9.0

Since these aspects of Rule 012 are stipulated in A-weighted sound levels, and the controversial features of IWT emissions are all in the ILFN regions, it is not surprising to find that these thresholds would very rarely be breached by IWT. The conclusion is that these aspects of Rule 012 are largely irrelevant. Moving, then, to the sections of Rule 012 dealing with ILFN, the question of whether significant components exist is determined by section 3.2 [7]. The difference in C-weighted and A-weighted sound levels must be 20 dB or more *and* there must be prominent, sharp peaks between 20 and 250 Hz. Figure 3 shows that there are prominent, sharp peaks in the bunker bedroom (blue lines) between 40 and 50 Hz. The abandoned bedroom does not show sharp peaks, therefore, they are not considered tonal, even though they are prominent. From the differences in the C-weighted and A-weighted sound levels, it can be seen that only the recording made on November 1, with high wind speeds, exceeds the 20-dB threshold. Ironically, this is because of the increased wind noise in the

ILFN regions. Section 4.5 (4) however, states that measurements should not be taken during high-wind-speed conditions for exactly this reason. Therefore, this aspect of the Rule also fails to catch the important soundscape features. Had it done, and the requirements of section 4.5 were met, the maximum penalty would be the addition of 5 dBA to the measured sound levels. If these then exceeded the limits (between 50 dBA and 60 dBA as above) then the operator would be required to implement noise attenuation measures and confirm that ILFN was no longer an issue.

When IWT are the source of ILFN, the rotating blades generate a series of pressure pulses at the 'blade pass frequency' (BPF), which is seen as a harmonic frequency series called *wind turbine signature* [14]. When synchronous IWT rotate at a constant rate, regardless of the wind speed, they will share a common harmonic series [15]. The IWT near the Hogeveen home are asynchronous, their BPF changes with wind speed. Given the sheer number of these IWT at the site, a single ('clean') IWT signature was not a reasonable expectation. Nevertheless, an analysis of the existence of harmonic series was conducted on the recordings of the abandoned bedroom, at low and high wind speeds.

Figure 5 shows the 1–100-Hz region of Fig. 3 with the harmonic series starting at 1.36 Hz added as dashed lines. The two main peaks at 8 and 12 Hz appear on this harmonic series as the 6th and 9th harmonics (H6 and H9). There is a large peak at 1.36 Hz for the higher wind speed. The 8 and 12 Hz peaks also appear on the harmonic series starting at 2.04 Hz; there is a small peak at 2.04 Hz. There is also a peak at 6.8 Hz on this series for the lower wind speed. A further harmonic series starting at 0.68 Hz includes these three peaks (1.36 Hz, 2.04 Hz and 6.8 Hz) as well as the broad peak at 3.45 Hz. There is no suggestion that peaks have moved between the two wind speeds although neither of the peaks (1.36 and 2.04 Hz) is seen at the lower wind speed. Note that the resonant frequencies of the bedroom are in the order of 60 Hz and upwards, with the peak just below 80 Hz likely being one such. The peaks discussed above are therefore less than $^{1}/_{10}$ of the cavity resonant frequencies and are not likely to be attributable to these phenomena.

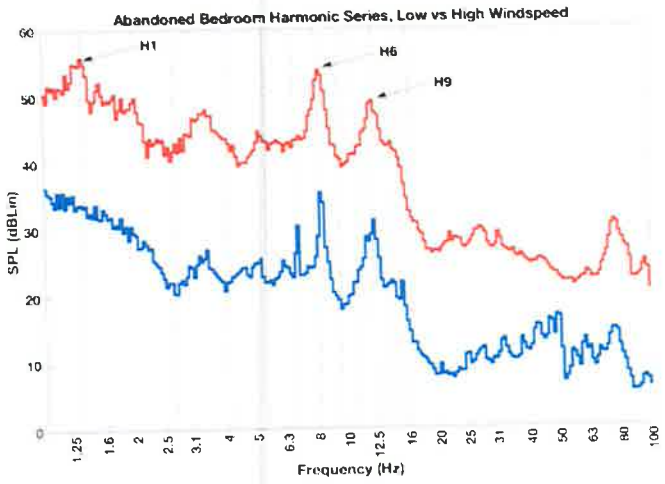


Figure 5: Comparison of data captured in the abandoned bedroom, at low (0.9 m/s-blue) and high (7.6 m/s-red) wind speeds, and same wind directions (290°). Harmonics of 1.36 Hz are shown as vertical, dashed lines.

A re-evaluation of legislation regarding population exposure to ILFN has been urgently required for decades [1]. The Canadian regulations here applied are similar to other regulations worldwide, and equally unsuitable *if* the goal is to protect human health against chronic ILFN exposures. Symptomatic complaints currently being ignored and/or misdiagnosed will predictably lead to a burden on future healthcare costs. Although the proliferation of IWT is bringing this agent of disease [16] to centre stage, the biases regarding how human health is impacted by airborne pressure waves (audible or not and whatever the source) continue to impede a proper scientific investigation [17], and consequently, proper protection of human populations and their offspring.

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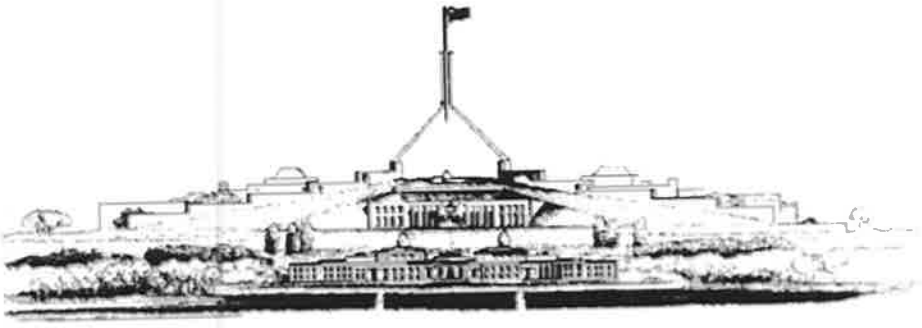
COMMONWEALTH OF AUSTRALIA

PARLIAMENTARY DEBATES



THE SENATE

PROOF

MATTERS OF PUBLIC INTEREST

Wind Farms

SPEECH

Wednesday, 26 March 2014

BY AUTHORITY OF THE SENATE

SPEECH

Date Wednesday, 26 March 2014 **Source** Senate
Page 38 **Proof** Yes
Questioner **Responder**
Speaker Back, Sen Chris **Question No.**

Senator BACK (Western Australia—Second Deputy Government Whip in the Senate) (13:26): I rise to express deep concern at the approval of an application for an industrial wind turbine development in New South Wales, the actions of the proponents and, indeed, the actions of the New South Wales Department of Planning. If the evidence that has been provided to me is accurate then it needs to be addressed urgently both by the proponent and particularly by the state department. If there is a failure to do so, I intend to proceed further.

I refer to an application which was approved on 14 March 2014 for the $200 million Flyers Creek wind farm just south of Orange, an application originally made by Babcock & Brown, subsequently renamed Infigen in April 2009. A number of potential host farmers have expressed their outrage, as evidenced in the media, about the development application to the Planning Assessment Commission on 12 February and the fact that the approval was given only one month later.

I go to the major application process for the project, which was made by Babcock & Brown under the name of an Adrian Rizza on 16 December 2008. The application form says:

Persons lodging applications are required to declare reportable political donations (including donations of or more than $1,000) made in the previous two years.

I notice that in that application, over the signature of Mr Rizza, exactly the same question was asked:

Persons lodging applications are required to declare reportable political donations … Have you attached a disclosure statement to this application?

The documents record the answer: 'No.' In this case, over the signature of Mr Rizza, no disclosure statement was made.

I then go to the figures of the donor annual return for the financial year 2006-07 submitted to the Australian Electoral Commission by a Christina Shi, a senior financial accountant with the company Babcock & Brown Australia. I notice that, in the space for donations totalling $10,300 or more for the period July 2006 to June 2007, the total sum is $43,000. The statement made by the proponent Rizza was that there was no disclosure to be made. I then go to the following year—remember, this is a two-year statement period. For the financial year 2007-08—again, this is a return from Babcock & Brown to the Australian Electoral Commission, and it is over the name Susanne Newhouse—there were donations totalling $108,800 to political parties. Of course, this causes me to ask the question: if donations of $108,800 and $43,000, totalling $151,800, were made to political parties, where is the validity in an application going back to 2008 in which the proponent stated there was no disclosure of payments to political parties?

The New South Wales Department of Planning declared, in *Disclosure of political donations and gifts : guideline*, dated October 2008:

A person is guilty of an offence under section 125 of the … act … in connection with the obligations under section 147 … if the person fails to make a disclosure of a political donation or gift in accordance with section 147 …

Furthermore:

Section 124A of the *Environmental Planning and Assessment Act 1979* (Special provision where development consent tainted by corruption) deals with a decision of a consent authority to grant or modify development consent where the decision is tainted by corrupt conduct. In these circumstances … the Minister or the Court may suspend the decision pending the institution and determination of proceedings in respect of the decision. The Minister is to give the consent authority and the applicant for the grant or modification of the development consent written notice of the suspension as soon as practicable …

If the documents I am quoting from are accurate, and I have no reason to believe they are not—they are in the public arena—then it seems to me that we are looking at potential corruption occasioning the acceptance and approval of this project. To me, that is very, very serious matter and one that needs to be addressed in the public interest as well as in the interest of those affected by it. As I said, I will be inviting the department, the commissioner, the minister and the company to advise us where the anomaly may have occurred.

This whole issue of industrial wind turbines is not settled. On 24 February this year, the NHMRC released its long-awaited systematic literature review of the health effects of wind farms—a topic which I have a very keen interest in. The NHMRC did not say there were no health issues. They stated there was consistent but poor quality evidence that proximity to wind farms is associated with annoyance and, less consistently, sleep disturbance and poorer quality of life.

I draw attention to the names of three people who were on that review panel. I have no reason to believe they are not eminent, ethical and honest people, but I ask what they were doing on the review and whether they declared an interest. One of the people is Dr Norm Broner, the only acoustician on the panel. As I understand it, he is a paid consultant for SKM, which is a large multinational company with significant commercial interest within the global wind industry. He has performed work for wind developers, which was not publicly disclosed during the review process, as far as I understand it. During the time of the wind farms and human health review, Dr Broner authored or approved a report titled *Flyers Creek Wind Farm —technical review of supporting documentation*, dated 12 July 2013, containing influential advice which, it is reasonable to argue, the New South Wales department relied upon in making its decision to approve this particular project.

Another key person on the panel providing advice to the New South Wales Planning Assessment Commission was Professor Wayne Smith, Director of the Environmental Health Branch at New South Wales Health. His advice to the New South Wales Planning Assessment Commission that there was no evidence of adverse health effects is absolutely untrue and at variance with the report of the NHMRC review.

Also on the panel was Dr Elizabeth Hanna, President of the Climate and Health Alliance. This alliance assisted a major international wind turbine product manufacturer, Vestas, to launch their global denial of any adverse effects from turbines, in Melbourne in June 2013, whilst, I understand, Dr Hanna was a member of the review panel. This was despite a Vestas engineer admitting at an Australian Wind Energy Association conference in 2004 that wind turbine noise caused annoyance symptoms and needed adequate buffers.

We have a circumstance here, regrettably, where I believe the independence and, therefore, the veracity of the report of the NHMRC is very open to question. If some authors of that review have in some way had an influence on the decision of the New South Wales department in approving this particular project, I believe it must be the subject of much further scrutiny.

I now turn to a recent statement of the Australian Medical Association. On 18 March the AMA released a position statement on wind farms and health without any listed authors, with no references and containing information that had nothing to do with health research and everything to do with supporting wind farm development applications. It reflects wind farm industry promotional spin and it is a statement that essentially implied that health symptoms are not caused by wind turbine knows, rather by anxiety.

If the Australian Veterinary Association, the body representing my profession, were to come out with such a poorly structured document as this—not authored, not defended and not referred—I would be going to the association and saying, 'Hide your heads in shame.' But it does not matter what I would do as an old vet. It is more important to learn what members of the profession have said and done throughout the world.

There has been an outcry to the AMA from across the world, and quite rightly so, including from professors from the United States and Ontario, Canada. Dr Gary Hopkins from South Australia strongly condemned this statement and demanded the AMA revoke it and amend their position to support epidemiological research. Dr Hopkins is a man with 36 years experience in South Australia as a physician. He has been a lecturer at the University of South Australia in Adelaide, lecturing to undergraduate and postgraduate students, including students in the Postgraduate Diploma in Occupational and Environmental Health. He is one person who I thought might actually know something about the topic. I quote from a letter Dr Hopkins wrote to the AMA:

I am rendered speechless by your irresponsible, ill researched, ill advised and reckless statement that those who might suffer physical effects from the presence of turbines are suffering a psychological condition (anxiety). Indeed, your very statement itself causes anxiety in those likely to be effected ("who will believe me when I tell them I feel sick"?).

He went on to make the obvious point that any medical person makes to a student, and that is: first do no harm. He concludes the letter by saying:

Was this the attitude of your forbears to those of the London plague just before they died until a connection was made to the transmission of the disease by rats?

The AMA position statement should immediately be withdrawn.

The concern now reflecting on the Australian Medical Association is what role have they played in supporting the industrial wind turbine industry in coming up

with this ridiculous statement, even after the NHMRC themselves continue to cast doubt and continue to agree with the position which we have taken for so long—and that is that there needs to be strong and independent research undertaken.

It is well known that I have been promoting for a long time to my colleagues in the coalition—and indeed with the strong support of Senators Madigan and Xenophon—the view that there needs to be independent research into the health effects of wind farms. I do not know whether or not these concerns are real, and neither does anybody else, but there is a growing body of medical opinion around the world that in fact these do have a profound effect—blind studies that have been done et cetera. What I have promoted to the parliament at different times is that the NHMRC be required to cause research to be conducted into the possible effect of wind farms on human health. Indeed if the CEO advises the Minister for Health that the NHMRC does not have the resources or expertise to conduct the research—and it may well be that they do not—then the health minister and the energy minister should jointly appoint an appropriate person or panel to undertake for the first time in the world properly and independently analysed studies.

I went on to say that any research undertaken, whether by the NHMRC or an independent panel, must include full spectrum acoustic monitoring, epidemiological and laboratory studies; seek the views of industry and the community generally; identify the range of interests and concerns of those whose views are sought—and I come back to my comments of a few moments ago with regard to the panel that did the latest so-called review; and include, but not be limited to, the research into audible noise, low-frequency noise, infrasound, electromagnetic radiation and vibration arising from or associated with wind farms, including wind turbines, transmission lines et cetera.

In the few minutes that I have available to me, I want to return to the approval that was given by the department to Infigen on 14 March 2014, and there are, quite rightly, a number of conditions pertaining to and contingent on that eventual support. I remind you the original application was made back in 2008. There was a five-year period in which the proponents had to act, and they did not. There was a circumstance in which the New South Wales department was requiring further information. The company itself, not the department, failed to fulfil the terms of the approval and that was to meet the requirements within the five-year period. We are now in the circumstance, I understand, close to some six years later, that we are at the very point of an approval being given but I say this to you: 'the project approval does not operate until the following deferred commencement conditions are complied with, and these relate to all land within the project area being identified within the document reference'. I say again: it is incumbent on the department and the proponent to come clean and tell us where the truth lies. *(Time expired)*

https://www.theaustralian.com.au/commentary/truth-of-renewables-is-plain-for-all-to-see/news-story/0b75ed63959a6cc16ae6aa6e891cc2fa

Truth of renewables is plain for all to see

GRAHAM LLOYD

- 12:00AM JULY 16, 2019
- 460 COMMENTS

As city slickers have urged governments to pursue bigger and faster renewable energy targets, the impact has largely been taking place out of sight and out of mind.

Bob Brown's alarm at the proposed Robbins Island development may be a sign that reality finally is starting to bite. On paper, emissions-free electricity from renewables is great.

In reality, it often means the transformation of once quiet and scenic rural areas into industrial zones with visual impacts and potentially hidden perils.

Complaints about wind farms in particular have been widespread and are not confined to Australia.

New onshore wind-farm developments are effectively banned over large parts of Europe.

In Australia, complaints have been persistent enough for a federal Senate inquiry to be held and for a wind-farm commissioner to be appointed.

Not everyone is happy but the wind-farm commissioner says the number of complaints is - falling.

Many, however, are forgoing bureaucracy and have elected to seek their remedy in the courts.

CLASS ACTIONS OVER NOISE COMPLAINTS AND RURAL LIFESTYLE INTERFERENCE COULD SOON BECOME A GROWTH INDUSTRY.

But as renewable energy investment has stalled elsewhere, in Australia it has gathered pace in scale and geographic spread.

The new breed of wind-farm developments are quite different to the early ventures. For Robbins Island, the wind-farm towers and blades will stretch 270m into the air. Not long ago, 100m was considered big.

As the size of turbines has increased, the developments have moved away from what once was promised to be community scale.

All of the electricity generated at Robbins Island will be transported to the mainland.

Plans are afoot for projects that will supply electricity from Australia to Asia.

Other developments envisage bottling solar and wind energy as hydrogen for export.

Dr Brown finally seems to have realised that wind farms can be industrial facilities more interested in making money than saving the world. And the impact they have is not always benign.

Dr Brown is right to fear the impact massive wind-farm projects can have on birds, particularly shore birds and raptors.

He is correct to question whether the interruption to rural landscapes can easily be justified.

A project has got big enough and close enough that a father of conservation, Dr Brown, can no longer ignore it.

If Australia is preparing to debate the merits of emissions-free nuclear energy, the reality of renewables is the foundation on which it must be built.

Flyers Creek Wind Turbine Awareness Group Inc

31st August 2018

Dear Sir/Madam

RE: Flyers Creek Wind Farm MP08_0252-Modification 4

We wish to lodge an **OBJECTION** to Flyers Creek Wind Farm MP08_0252-Modification 4.

Whilst the Department of Planning would have us just address Modification 4, the problem is far greater than Modification 4 and the department has certainly been made very well aware of the concerns from our group and community along with others who have deep concerns.

As part of our submission please refer to all our previous submissions from the original development to all subsequent modifications and submissions from the community lodged to the department of planning, including our submission to the NSW Draft Wind Farm Guidelines.

After 8 years of dealing with the NSW Department of Planning over the Flyers Creek Wind Farm it would appear to us that the Department and Ministers have certainly had a clear bias for facilitating the development of this wind farm regardless of community concerns and complaints. It is also appears very clear the complete disregard for any reports that clearly identify problems that exist with wind energy and the many impacts it creates.

The Department of Planning are very well aware of the many complaints plaguing others in this state and nationally and yet to date little if at all any action has been taken to admit to or alleviate the impacts.

The impacts reported in NSW from existing wind farm communities are not just unique to NSW and are well recorded around the world. These include but are not limited to the:

* Impact on the flora and fauna, one of the most devastating is the impact on avian and we have seen at other wind farms that the strike rate is far beyond what is estimated.

* Environmental degradation and cumulative impacts from multiple industrial sources

* Property devaluation

* Shadow flicker

* Impacts on community cohesion

* Visual pollution

* One of the worst of all is the impacts from noise and vibration on human health and well-being.

* Displacement of residents, even those that are financial beneficiaries of the wind farm

Whilst some of the impacts are not visible as such, it has made it easy to hide the truth, bury and deny complaints. The continual warnings from some experts and those impacted shows what little regard is held for communities surrounding industrial wind developments.

Based on the knowledge we have and the responses from the developer, Department of Planning and contributing professional /relevant experts reports and knowing that there is sufficient evidence that has been submitted to all parties to warrant concern one would now believe that the Department of Planning are failing to adopt the "Precautionary Principle" and breaching their "Duty of Care" to the people and their environment.

MODIFICATION 4

- In the documentation for Modification 4 Ms Richardson makes the statement in her conclusion that *"Significant consultation with relevant stakeholders, including community members and representatives, has been carried out in relation to Modification 4"*

Not sure if Ms Richardson understands the meaning of the word "Significant" but I know that most of this community could vouch for the fact that they had no consultation of this modification 4 until receiving a newsletter marked as July but post marked on the 8th August 2018, with some members of our group receiving it on Friday the 10th August 2018 and others the following week just a day or 2 before we were informed by Ms Homsey from the Department of Planning on the 14th August 2018. We would hardly call that significant consultation! A barely acceptable community consultation appears to be a tick the box exercise in what appears to be a defective department of planning process.

- The documentation provided for Modification 4 is compiled with relevant experts' reports resembling a small environment assessment , however we are given just 2 weeks to read an absorb this documentation for comment.
  Based on previous experience we could take all the time required and secure the services of qualified professionals/relevant experts to review these reports and once again we are sure the department will get Infigen to respond and accept their conclusions regardless of whether the DGR's are satisfactorily met or not. This is highly evident in previous approvals for Flyers Creek.

- Ms Richardson also states: *It is acknowledged that Modification 4 is likely to:*
  - *Result in Low to Negligible increased visual impacts; and*
  - *Generate a slight increase in predicted noise levels.*

  However, these impacts are considered to be relatively minor and able to be appropriately managed by the existing conditions of the Project Approval as proposed to be updated and the updated Statement of Commitments.

  - In previous submissions from our group and members of our community we have raised the very serious impacts we see as a major contributors that should result in refusal of this project .Visual and Noise being amongst the top issues.

  - Visually the turbines proposed will completely destroy our rural environment and Ms Richardson may well be correct in that the increased size would result in Low to Negligible increased impacts, the operative word here being "increased". If you are polluting an area visually you are polluting it. We do know the original visual report is flawed and have no hesitation in suggesting that current predications don't appear any different.

  - **Noise** – Ms Richardson states that Modification 4 *would "generate a slight increase in predicted noise levels".* Ms Richardson needs to explain how the difference between a 2.5MW GE turbine and how an increase to a 4.2MW turbine would create only a slight increase in predicted noise levels. From our understanding the increase could be seen as quite dramatic.

  - In previous submissions by our group and this community the noise and vibration issues have been clearly raised including reports from relevant experts. However there has been much controversy resulting from this including the dismissing and denial of issues raised.

  - It is still clearly evident that DGR's requirements have not been adequately addressed when it comes to impacts and the issues of low frequency noise and vibration have been dismissed.

- The cumulative impacts of noise and vibration from the existing and ever expanding Newcrest's Cadia East operation which sits on a significant fault line and in an area of increasing seismic activity has not been adequately addressed. Bearing in mind that some homes in this area are already impacted with infrasound and low frequency noise that is proven to be (even by their own emission) emitted by the Cadia Valley Operations the consequences could well and truly be diabolical for some. (1,2)

- The impacts of wind turbine noise and vibration on the Moomba Sydney Pipeline have not been assessed that we are aware of, even though APA asked for an assessment prior to approval of the original Flyers Creek Wind Farm Application. If an assessment has taken place our group and community would request a copy be made publicly available and if this already publicly available we would request we be provided with the link to this assessment.

- Ms Richardson then goes on to state :
  The approved Project will provide a substantial economic benefit to the local and regional community during construction and long term operation (25 to 30 years) of the wind farm. During the construction there will be employment opportunities for a peak of 140 people and 6 to 10 ongoing regional jobs during the operational life. There will also be a direct injection of approximately $1 million per annum to the local community throughout construction and operation through payments to landholders, permanent staff and community fund contributions.

Ms Richardson needs to explain the long term positions requiring 6 to 10 workers and guarantee that this is fact and provide a job description for each of these workers, not just figures on paper to make it look impressive. We have no doubt that during the construction it will provide short term employment for many but where will these people be drawn from?

Ms Richardson also states that there will be a direct injection of approximately $1 million per annum to the local community throughout construction and operation through payments to landholders, permanent staff and through community fund contributions. However, Ms Richardson fails to provide how the "real community" (those who live on neighbouring properties) who will be and who already are negatively impacted by this development due to property devaluation and if constructed the further lifestyle, health and well-being impacts will be provided for? Already we have seen properties sold in recent times dramatically devalued due to the approval of Flyers Creek Wind Farm. At existing wind farms and as seen in the senate inquiry in 2015 it was very evident that even wind farm hosts who are paid large sums of money have had to abandon their homes or seek respite. So how does Ms Richardson equate the local community will be economically better off?? Which community funds does Ms Richardson believe will receive contributions?

Ms Richardson then goes on to state:

The changes proposed as part of Modification 4 are required to:

- *Enable the important public benefits from the approved Project to be realised by reinstating the 132Kv transmission line required to connect the Project to the electricity grid; and*
- *Increase the total generation capacity of Project to 430GWh without increasing the number of wind turbines at site. This is a significant contribution to the NSW Government's target of reducing greenhouse gas emissions by 60% by the year 2050.*

Ms Richardson should explain why then has Flyers Creek Wind Farm been in the planning system since 2009 with landholders signed up in 2008 if it had a significant contribution to be made and how does she really class the contribution as significant?

There is been plenty of debate by relevant experts over the true benefits of wind energy to the public and the environment. (4)

What does Ms Richardson see as the public benefits of Flyers Creek Wind Farm?

If wind energy wasn't highly subsidised by way of Large Scale Renewable Energy Certificates would it even exist. Would Infigen construct Flyers Creek Wind Farm if they received no REC's?

We are led to believe that if the connection to the grid is via the specially recently constructed (mine) 330kV line there are technical issues that need addressing otherwise attempting to feed an ***intermittent*** feed from a handful of wind powered turbines will ultimately compromise the **security/integratory** of the local mine who find it vital to have reliable supply . Possibly the greater NSW electrical grid system could be compromised.

We note there is a map of the grid connection route but no formal report. Can a technical report be provided as to how they will connect Flyers Creek Wind Farm to the grid?

Of course a thorough investigation as to the consequences of connecting a known intermittent power source such as a wind farm, to the 330kV line and its connection to the grid should be conducted by qualified unbiased electrical engineer.

Especially as it appears that maybe this has not been adequately assessed based on the statement " *In addition, a small switching station on an area of land approximately 100m x 100m may be required at the northern end of the line where it connects into the existing 132kV line (Switching Station)*" One would believe it is either required or not required, not maybe!!! Maybe 2 Switching Stations are required!

CONCLUSION:

Given the technical and highly complex technology/emissions and issues/impacts arising from wind developments, it continues to be a serious matter of concern to our group and community as well as many others concerned with inappropriate development, that it appears the consent authorities do not have the specialist expertise/qualifications to assess such projects or a clear unbiased opinion, thereby raising the issue of negligence regarding 'Duty of Care' and the legislated 'Precautionary Principle'.

One of the most serious of concerns is the impacts of Infrasound / Low frequency noise/vibration which have been well documented for many years enough so that the WHO include it in their Guidelines for Community Noise. **There is research that also concludes there are some very serious ramifications to humans and dismisses the "Nocebo Effect" (4,5)**

World Health Organisation
Berglund, B., Lindvall, T., Schwela, D., Goh, K, T. (2000) Guidelines for Community Noise. World Health Organisation

"It should be noted that a large proportion of low frequency noise components in a noise may increase considerably the adverse effects on health"
"The evidence on low frequency noise is sufficiently strong to warrant immediate concern."

The recent AAT decision in the Waubra Foundation vs ACNC case also highlights the noise/vibration impacts on neighbours to industrial wind farms and concerns raised by the AAT. (Please see attached documentation)

VIPAC state : *"The Project Approval conditions relating to noise will be sufficient to achieve compliance with the relevant criteria and this will be verified by the operational noise monitoring required under Condition G9."*

With the knowledge we have and noise data collected from our area in recent times our group are not confident in the VIPAC report nor with previous noise reviews and approval statements. We request that Infigen pay for an independent review of the VIPAC report by an acoustician of our choosing.

Visually the pollution to this rural area from mammoth industrial rotating structures will be deplorable. No amount of mitigation can take the visual pollution away. It is what it is!

We find it outrageous that a government department and ministers allow a project of this magnitude to exist in a planning system for so long given the information and knowledge that has been provided to them. It could well be seen that a State Government has breached their "duty of care" to the people of the state.

Over the last 8 years our group has spent thousands of dollars in an effort to find out the facts on why people are being impacted and to also protect our environment, lifestyles, property values, wellbeing and health. The whole costly time consuming ordeal has created such undue stress and lifestyle changes already for so many while all along it appears the department and ministers of planning have facilitated every whim of the developer.

We ask you to seriously consider the following:

- Have we done an appropriate level of "Due Diligence" ?
- Are we relying on the developer/relevant experts to tell us the whole truth?
- Will this wind farm be structurally and siting compliant, especially with the significant enlargement of turbine?
- Will there be any cumulative impacts with the neighbouring industry?
- Have we adequately taken the surrounding landowners views into consideration?
- Do the professional/relevant experts who have contributed to this and all past environmental assessments, reports and approvals have professional indemnity insurance?
- Will this wind farm be insurable and will the developer insure for all liability including all toxic emissions from the wind farm that invade neighbouring homes?
- We have requested from Infigen on several occasions for them to provide us with guarantees that we will not be impacted. Of course they are not forthcoming. The best Infigen response we had was that they build to the departments' criteria, so will the NSW Department of Planning give us a guarantee that the Flyers Creek Wind Farm will not cause harm to our environment, property values, will not be a noise nuisance and will not harm our health, wellbeing and lifestyles?
- Will those in the department assessing Flyers Creek Wind Farm Modification 4 do so with a clear unbiased attitude?

- Are the Department of Planning confident that Flyers Creek Wind Farm will contribute to a cost effective, clean energy future?

It certainly appears as if planning is being imposed on us by an authority that was meant to protect the people and their environment.

If Modification 4 is approved who will ultimately be held accountable for the negative impacts it may have on the surrounding landowners. Will it be the hosts for allowing the technology that emits toxic emissions on their property, will it be the developer who hides behind the fact that they build to what the approving authorities allow, will it be the approving authority or will it be the relevant experts who make statements that they appear to try and indemnify themselves against? Or will it be all of the above?

Having ones reasonable enjoyment of their land taken away from them constitutes as a common law nuisance and an infringement of ones rights.

We ask that the Department of Planning **REJECT** Modification 4 based on their moral and legal obligations to protect this community.

Yours sincerely

Patina Schneider

On behalf of FCWTAG

(1) https://www.afr.com/business/mining/newcrest-plots-cadia-expansion-on-shaky-ground20180813-h13wid **Newcrest plots Cadia gold mine expansion on shaky ground** By Peter Ker

(2) https://www.australianmining.com.au/news/newcrest-cuts-cost-cadia-plant-expansion-80/ **Newcrest cuts cost of Cadia plant expansion by 80%** August 23, 2018News Ben Creagh

(3) AAT decision Waubra Foundation vs ACNC December 2017

(4) Compendium for Sensible Energy Policy

(5) Altered cortical and subcortical connectivity due to infrasound administered near the hearing threshold – Evidence from fMRI

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NEWCREST

31 August 2018

Department of Planning and Environment
GPO Box 39,
SYDNEY, NSW 2001

Attention: Natasha Homsey

Dear Sir / Madam

Flyers Creek Wind Farm – Modification 4 Submission

Cadia Holdings Pty Limited and Newcrest Mining Limited (together, **Cadia**) make the following submission regarding Modification 4 for the Flyers Creek Wind Farm (**Modification Application**). The proposed modification will have several impacts on the Cadia Valley Operations as approved pursuant to the current Cadia East Project Approval (06_0295) and in relation to potential further development of the mine in the future.

A summary of impacts that will be expanded on in this submission include:

- Location of the 132 kV line with respect to Cadia's approved Project;
- Induced pipeline corrosion and safety hazards;
- Switching Station location;
- Design capability of current electrical systems Cadia assets
- Energy supply reliability;
- Options for future large scale renewable energy projects on site;
- Telecommunications impacts;
- Noise impacts (including traffic noise impacts);
- Options for land for biodiversity offsets; and
- Local traffic impacts.

Having now reviewed the information provided in the Modification Application in conjunction with previously disclosed details, Cadia objects to this proposal.

Location of 132kV line

The proposed route of the Infigen proposed 132kV powerline as indicated in Appendix B, Figure 2 of the Modification Application is within a 45m wide corridor located to the east of Cadia Road. The proposed route conflicts with the existing approved mining footprint for

Cadia Holdings Pty Ltd
Trading as Cadia Valley Operations
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Cadia Valley Operations which includes the future footprint of the Cadia East subsidence zone.

Cadia also has concerns regarding the location of this powerline on company owned land which may conflict with future infrastructure requirements and the development of mineral resources.

Cadia funded the acquisition of easements and the construction of the existing and new 132kV Essential Energy powerlines and has, pursuant to its Connection Agreement with Essential Energy, an option to acquire these 132 kV powerlines.

Induced Pipeline Corrosion and Safety Hazards

The Cadia concentrate pipeline is installed on the eastern side of the Cadia Road and is the sole means of exporting the final product of the mining and processing operations to the dewatering facility at Blayney. The Flyers Creek windfarm 132kV powerline is proposed to run parallel with the Cadia copper concentrate pipeline to the east of Cadia Road. The risk of induced voltages in the pipeline from the 132kV powerline due to electric and magnetic fields have not been addressed within the Modification Application. Induced voltages can result in accelerated corrosion of the pipeline and introduce high voltage hazards to pipeline maintenance personnel.

Switching Station Location

It is difficult to accurately determine the layout and location of the switching station from the Modification Application. The proposed location appears to be somewhere within property owned by Cadia. The detail of the switching station is lacking and as such it is difficult to determine the impact of this on Cadia land and mining leases.

Design Capability of Current Cadia Electrical System Assets

The radial 132kV Essential Energy powerlines installed between Orange and Cadia are connected to a common bus within the Cadia main substation. The proposed 159 MW connection of the Flyers Creek Wind Farm will impact the power flows and metering facility within the Cadia substation. Due to the dual line configuration, between 30 to 100% of the energy output from the Flyers Creek Wind Farm may flow through the Cadia substation when the plant load is reduced during plant shutdowns or through the loss of one of the Transgrid feeder circuits. This is not a scenario that has been considered or accounted for within the protection and metering system at Cadia. Modelling and system upgrades would be required to mitigate the negative impact of this event.

The Cadia connection agreement with Essential Energy and Transgrid has specific electrical protection requirements based on a 132kV radial feed between Orange and Cadia. The protection relies on a differential current scheme to ensure that what goes in, comes out. This protection system consists of a dual redundant communication link between the Transgrid and Cadia switchyards. The communication path includes a fibre

optic network and a microwave connection with specific leases between Cadia and third-party providers. Introduction of a tee off to the wind farm would require a new protection scheme to be developed which would require additional equipment and associated power outages to install. This would introduce additional risks to power supply availability for Cadia.

Infigen should be responsible for any adjustments to additional protection systems required as a result of the Wind Farm.

The Cadia processing plant high voltage variable speed drives associated with the Cadia SAG mill and various cyclone feed pumps are highly sensitive to voltage fluctuations caused by network disturbance or significant load changes in the supply network. The Wind Farm would be a large cyclical load turning on and off depending on wind conditions. These load fluctuations may result in detrimental impacts within the Cadia site resulting in spurious tripping of the SAG mill or high voltage variable speed drives. The Modification Application doesn't include details of the modelling of the electrical system, especially the generation capacity ramp up and ramp down rates, to ensure this concern is addressed.

The installation of a large generation facility and the interconnection of this facility into the site 132kV power line will have electrical implications within the Cadia electrical distribution system. These would need to be extensively modelled to determine to what extent these affect the internal system at Cadia. Where the Wind Farm is unable to meet the nominated Cadia design parameters to insulate or mitigate the site from these issues then equipment modifications may be necessary on-site at Cadia which may have significant cost implications. The electrical implications are magnified the closer the interconnection of the wind farm to Cadia is. Ideally, the interconnection would be into a different portion of the 132kV network to maximise this electrical separation. The proponent needs to address these issues to the satisfaction of Cadia prior to the determination of the project application since these are integral to the Wind Farm project's development activities and cannot be deferred to post approval.

Energy Supply Reliability

Introduction of a 159MW generator close to the Cadia site will increase the site fault level. This would change the existing system parameters that the Cadia electrical system is designed to. If the increase in fault level created by the wind farm is substantial, it could require major equipment upgrades within the Cadia system. The Modification Application doesn't include detail on this modelling.

The introduction of the Flyers Creek wind farm circuit off the 132kV line between Cadia and Orange will however reduce the availability of the existing 132kV overhead power line. Cadia has invested significant capital to construct and install a dual redundant powerline with redundant capacity to mitigate the risk of outages, to provide capacity for future expansion and to facilitate the future construction of an onsite renewable energy generation source.

The Flyers Creek Wind Farm connection into the 132kV line serving Cadia will require an outage to enable the connection and potential outages for their ongoing maintenance. The dual 132kV circuit configuration to Cadia provides additional capacity to Cadia but also provides an opportunity to isolate each of the 132kV lines during site plant shutdowns to perform maintenance. This will be complicated with the introduction of the Flyers Creek Wind Farm connection unless it is connected into both power lines. The Modification Application lacks detail on the connection and Cadia remains concerned on how the connection can be made without impacting on Cadia through outages and supply security.

Options for Future Large Scale Renewable Energy Projects

Cadia is an energy intensive operation that has been impacted by the recent increase in energy pricing experienced within the national Electricity Market. To mitigate the business risk of the increased costs, Newcrest is actively engaging the market to explore options of a large scale renewable generation project within or near to the Cadia mining lease. The Flyers Creek Wind farm is a 160 MW generator which is the equivalent of the full rating of one of the dual circuits supplying Cadia. The Flyers Creek Wind Farm connection into the Cadia 132kv circuit will absorb the entire capacity of one of these circuits and would significantly reduce the ability for Cadia to install a large scale renewable generation project.

Telecommunications

It is noted that the potential impacts on radio communications have been identified in Appendix H of the Modification Application. Cadia is wholly reliant upon effective communications for safe surface and underground mining operations. The proponent must be required to undertake appropriate measures post construction to ensure existing communications are not degraded because of the wind farm development within the locality.

Noise

The noise assessment (Appendix F) doesn't include reference to conducting cumulative noise impact assessment based on the information from the Cadia East Environmental Assessment. This concern has been raised in previous assessments for the Flyers Creek Wind Farm in 2011. Appendix F lists several properties which have been used in the assessment, however there is no map indicating where these residences are located.

Traffic noise impacts have not been clearly referenced in the noise assessment.

Biodiversity Offsets

The Environmental Assessment for the Modification Application (**EA**) has indicated that Biodiversity Offsets will need to be calculated prior to commencement of construction. There are no details on proposed location or quantity of land required for biodiversity offsets.

Cadia have an interest in having knowledge of proposed biodiversity offset areas as this may impact on the sites long term biodiversity offset strategies that are associated with future activities at Cadia.

Traffic

The EA should reference the commitment to conducting a road dilapidation survey prior to construction and at the end of construction to appropriately determine "damage caused to roads during construction" of the project.

Cadia would like to ensure that this report reflects damage incurred as a result of Infigen's activities to eliminate the risk of this damage being associated with the Cadia operations.

SUMMARY

The Flyers Creek Wind Farm has the potential to significantly impact on the current approved and potential future operations at Cadia.

In summary our main concerns and objections include:

- Proposed powerline route encroaches on existing approved area of influence for Cadia East subsidence zone;
- Potential impacts on our existing pipeline infrastructure between the Cadia site and Blayney including safety risks for personnel conducting maintenance activities within this area if the 132kV powerline is constructed parallel with the Blayney Concentrate line;
- Potential impacts on stability of power supply for Cadia;
- Potential impacts on sensitive Cadia equipment due to faults;
- Potential for increased traffic noise impacts (above Cadia Project approval conditions) which do not appear to have been adequately assessed in the noise assessment;
- Potential impacts on Cadia communications equipment which is essential for safe operation of the mine; and
- Assumptions have been made that Cadia will agree to access Newcrest owned land for the construction of the 132kV switching station.

Should you have any further queries regarding this matter, please do not hesitate to contact Jane Chung on 0467 600 622.

NEWCREST

Yours sincerely,

Michael Dewar

for Peter Sharpe
General Manager (Acting)