

Chapter 2

The need for more evidence-based health advice on the impact of wind turbines on human health

Introduction and context

2.1 There has been considerable conjecture and controversy worldwide about the health impact of wind turbines. Australia has been no exception. Here, as in many other countries, there is a clear disconnect: between the official position that wind turbines cause no harm to human health and the strong and continuing empirical, biological and anecdotal evidence of many people living in proximity to turbines suffering from similar physiological symptoms and distress.

2.2 In the course of this inquiry, as in others conducted by the Australian Parliament, the committee has received considerable anecdotal evidence that those living in close proximity to wind turbines have suffered adverse health impacts from the operation of these turbines. These complaints have not been isolated to a particular wind farm or a particular region. While evidence to the committee suggests that some wind turbines may not have had the alleged health impact that others seem to have caused, the committee has received health complaints from dozens of submitters living near wind turbines at various locations across several States.

2.3 The committee believes that these complainants deserve to be taken seriously. Those who have labelled 'wind turbine syndrome' as a communicated disease or a psychogenic condition have been too quick to judge. In so doing, they have unnecessarily inflamed the debate on the issue. This has understandably caused those who suffer adverse symptoms even greater distress.

2.4 Since the last Senate Committee reported on this matter in November 2012, there have been some important developments:

- in March 2015 the peak government health advisory body, the National Health and Medical Advisory Council (NHMRC), committed to conduct further research. In the past the NHMRC has dismissed health concerns associated with wind turbines; and
- in December 2014, acoustician Mr Steven Cooper found a correlation between infrasound emitting from turbines at Cape Bridgewater and 'sensations' felt, and diarised, by six residents of three nearby homes.

Significantly, the report identified a unique infrasound 'wind turbine signature'.¹

2.5 The possible effect of infrasound from wind turbines on human health has been a theme of this inquiry. Acousticians have provided different perspectives to the committee on the possible effect of infrasound from turbines. What is most striking is the lack of any professional consensus on this issue and the range of arguments as to what would constitute an acceptable research project to test the hypothesis. Accordingly, the committee's interim report recommended the need for independent research into both audible and sub-audible sound from turbines and for this research to inform national sound standards.²

Box 2.1: Interim report recommendations relating to human health

Recommendation 1

The committee recommends the Commonwealth Government create an *Independent Expert Scientific Committee on Industrial Sound* responsible for providing research and advice to the Minister for the Environment on the impact on human health of audible noise (including low frequency) and infrasound from wind turbines. The IESC should be established under the *Renewable Energy (Electricity) Act 2000*.

Recommendation 2

The committee recommends that the National Environment Protection Council establish a *National Environment Protection (Wind Turbine Infrasound and Low Frequency Noise) Measure* (NEPM). This NEPM must be developed through the findings of the *Independent Expert Scientific Committee on Industrial Sound*. The Commonwealth Government should insist that the ongoing accreditation of wind turbine facilities under the *Renewable Energy (Electricity) Act 2000* in a State or Territory is dependent on the NEPM becoming valid law in that State or Territory.

Structure of the chapter

2.6 This chapter begins by presenting some of the evidence to the committee on the alleged adverse health effects of wind turbines. It then considers the following:

- the Australian Medical Association's 2014 Position Statement;
- the role of the NHMRC and evidence-based health advice;
- the NHMRC's reviews of the evidence relating to wind turbines and health;
- submitters' and witnesses' views of the NHMRC;

1 The Acoustic Group, *The results of an acoustic testing program Cape Bridgewater Wind Farm*, 44.5100.R7:MSC, prepared for Energy Pacific (Vic) Pty Ltd, <http://www.pacifichydro.com.au/files/2015/01/Cape-Bridgewater-Acoustic-Report.pdf> (accessed 20 July 2015). Other submitters to this inquiry, in addition to Mr Steven Cooper, have recognised the importance of identifying the unique wind turbine signature. See for example: Professor Robert McMurtry, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 10.

2 Senate Select Committee on Wind Turbines, Interim Report, June 2015, pp vii–viii, http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Wind_Turbines/Wind_Turbines/Interim_Report (accessed 20 July 2015).

-
- criticism of the forthcoming 2015 NHMRC review;
 - the views of acousticians and the need for properly funded research; and
 - the committee's view on the need for future research and body that should conduct this research.

Wind turbines and ill-health

2.7 The committee has taken evidence from a number of people who reside in proximity to wind turbines who have complained of a range of adverse health impacts. These include tinnitus, raised blood pressure, heart palpitations, tachycardia, stress, anxiety, vertigo, dizziness, nausea, blurred vision, fatigue, cognitive dysfunction, headaches, nausea, ear pressure, exacerbated migraine disorders, motion sensitivity, inner ear damage and worst of all, sleep deprivation.

2.8 Dr Sarah Laurie told the committee:

The human cost of the failure to protect people from excessive noise pollution, especially at night, is terrible. I have personally helped to prevent a number of suicides of people who were utterly desperate because of the consequences of excessive noise pollution and who reached out for help...³

From my experience there is a subset of people who are terribly impacted very early on. Those people are the ones who tend to present with acute vestibular disorder type of symptoms—dizziness and motion sickness, which can be accompanied by extreme anxiety. Those people often just cannot last very long, and they move if they can.⁴

2.9 Ms Janet Hetherington, an adjacent landholder to the Macarthur wind farm in south-west Victoria, relayed her own experience:

At my farm, I experience severe adverse health effects such as vibration, heart palpitations, tinnitus, head pressure, headaches, sleep deprivation, anxiety, night sweats, nausea, itchy skin, cramps, and ear, nose and throat pain. Twice now I have experienced horrendous pain in my chest stabbing through to my backbone in between my shoulder blades. I contemplated calling an ambulance both times but could not move to do so because of the severity of the pain. Ten minutes later it had dissipated, leaving me with great stress and anxiety and feeling washed out. All these sensations leave me drained in the morning. I find it very hard to start work that day.⁵

2.10 Ms Anne Gardner also attributed her and her husband's ill health to the nearby Macarthur wind farm. She described the following symptoms:

My husband experienced bolts of pressure which tallied up with pressure peaks measured by Les Houston (sic) 86 per cent of the time while my husband was blind to the acoustic measurements of the time. Refer to his recap statement. I suffer day and night from headaches, nose and ear

3 Dr Sarah Laurie, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 40.

4 Dr Sarah Laurie, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 42.

5 Ms Janet Hetherington, *Proof Committee Hansard*, Portland, 30 March 2015, p. 48.

pressure, nausea, heart palpitations and chest burning from vibrations through the floor, couch, chair and in bed all night.⁶

2.11 Mr Clive Gare and his wife host 19 towers from the North Brown Hill wind farm located 17 kilometres from Jamestown in South Australia. Mr Gare told the committee:

After a short period of living with an operating wind farm, we had these products installed. I find that, because I work and reside in close proximity to the wind farm, I suffer sleep interruption, mild headaches, agitation and a general feeling of unease; however, this occurs only when the towers are turning, depending on the wind direction and wind strength. My occupation requires that I work amongst the wind towers during the day which means I suffer the full impacts of noise for days at a time without relief. The impacts are that we are not able to open our windows because of the noise at night and we are not able to entertain outside because of the noise.

In conclusion, if we did not have soundproof batts in VLam Hush windows [special window laminate designed to dampen noise], our house would not be habitable. In my opinion, towers should not be within five kilometres of residences, and I would personally not buy a house within 20 kilometres of a wind farm.⁷

2.12 The committee notes that the Gares have received payment of \$2 million over five years to host turbines and have reported serious adverse impacts. The committee notes, therefore, that their evidence is an 'admission against interest' and as such represents highly reliable evidence.

2.13 Mr John Pollard, a resident of Glenthompson near the Oaklands Hill wind farm in Victoria, told the committee:

The wind farm guidelines on health issues of this very serious problem have to be assessed. They will not acknowledge infrasound. I will relate one incident that happened in our home one night. My wife was sleeping in the chair beside me and I was watching television. This is after they had turned the turbines off. She was dead to the world and I was just watching the television. All of a sudden she woke up, completely startled and disorientated, and I was really worried about her because I thought she had had a stroke or something. Eventually she came to her senses and she said the turbines must be on. I said, 'No, they're not. It's 10.30. They turn off at nine o'clock.' I went outside and they were still running. So I thought that next day I would ring AGL. When I was about to ring, they rang me and said, 'I'm sorry, John. We forgot to turn the turbines off last night.'⁸

6 Ms Anne Gardner, *Proof Committee Hansard*, Portland, 30 March 2015, p. 47.

7 Mr Clive Gare, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 57. See also: Mr and Mrs Clive and Trina Gare, *Submission 222*.

8 Mr John Pollard, *Proof Committee Hansard*, Portland, 30 March 2015, p. 48.

2.14 Waubra resident Mr Donald Thomas identified hearing difficulties from the nearby Waubra wind farm turbines.⁹ He claimed that these difficulties disappeared when he left the area:

I went to the doctor with what I kept saying was a lot of ear pressure and earaches. I went to see a specialist, and my ears came back as being in good health and functioning pretty well, even though I have lost a lot of hearing. Basically, my left ear does not work too good...

My ears—especially when I go to my Stud Farm Road property, I have ear pressure that can develop into a headache and rapid heartbeat. If I leave that area and go back to one of my other properties, that can settle back down.¹⁰

2.15 Mr Peter Jelbart, a 25 year old who had lived with his family nearby the Macarthur wind farm in south-west Victoria, noted the difficulty of sleeping in the family home. He told the committee he had worked and slept unaffected in noisy environments outside of the family home in Victoria:

While I was working in Western Australia I used to do three weeks on, one week off and come home for a week. Over in Western Australia I was sleeping at times on the sides of busy highways and in the back of trucks with ice packs running...

At home, I noticed pretty much from day one that there is a serious problem there. Something is completely different when sleeping. I would wake up after a couple of hours of sleep—at times, not even after a couple of hours—and have disrupted sleep that I have had nowhere else. There is a proper problem...

Whether it is low-frequency noise and the infrasound combining with it, it seems worse when it is quiet. Around our house the yard is pretty well protected by trees. When it is relatively quiet around the house yard there is still a really soft drone that comes through and just gets into you. It is pretty hard to explain. There are probably a lot of people going through the same thing who will have the same trouble trying to explain it, especially to people who have not experienced it. The problem with it is, it also seems to affect different people over different periods of time.¹¹

2.16 The committee has had the opportunity to take evidence from researchers in the United States and Canada who expressed their concern with the health effects of turbines. Ms Lilli-Ann Green is the Chief Executive Officer of a healthcare consulting firm in the United States. In 2012, Ms Green and her husband conducted interviews with people living near wind turbines in 15 different countries. As she told the committee:

We have interviewed people on three continents who live more than five miles from the nearest wind turbine and are sick since wind turbine

9 Waubra is 33 kilometres north-west of Ballarat.

10 Mr Donald Thomas, *Proof Committee Hansard*, Melbourne, 9 June 2015, p. 17.

11 Mr Peter Jelbart, *Proof Committee Hansard*, Portland, 30 March 2015, pp 71–72.

construction. I contend that we need honest research to determine how far wind turbines need to be sited from people in order to do no harm. People report to us that over time their symptoms become more severe. Many report not experiencing ill effects for some time following wind turbine construction, meanwhile their spouse became ill the day the wind turbines nearby became operational. They speak of thinking they were one of the lucky ones at first, but after a number of months or years they become as ill as their spouse. Not one person who stayed near wind turbines reported to us that they got used to it or got better; they all became more ill over time...

I really believe that we just do not have enough information yet. But throughout the interviews, country by country, people described the same symptoms. Many times they used the same phrases to describe them and the same gestures—and they were not speaking English. There is a common thread here.¹²

2.17 Dr Jay Tibbetts, a medical practitioner and vice chair of the Brown County Board of Health in Wisconsin, drew the committee's attention to the board's October 2013 finding that the Shirley wind farm was a 'human health hazard'. Dr Tibbetts described how the declaration came about:

The [Board of Health] has been studying adverse health effects for the past 4 ½ years in the Shirley Wind Project. We have reviewed many peer reviewed studies, at least 50 medical complaints including ear pain, pressure, headache, tinnitus, vertigo, nausea, chest pain, chest pressure, loss of concentration, sleep deprivation and more, as well as more than 80 other complaints from citizens of Shirley Wind. There have been 2 formal studies of infrasound/low frequency noise by acousticians in 2012 and 2014. The latter study revealed symptom generating [Infrasound/Low Frequency Noise] at a distance of 4 ½ [miles].¹³

2.18 The committee also heard of detailed research by Professor Emeritus Robert McMurtry from Western University in Ontario, Canada. Professor McMurtry made a number of points to the committee:

- adverse health effects have been reported globally in the environs of wind turbines for more than 30 years with the old design of turbines and the new;
- the wind energy industry has denied adverse health effects, preferring to call it 'annoyance'. Annoyance is recognised and was treated by the World Health Organization as an adverse health effect, which is a risk factor for serious chronic disease including cardiovascular and cancer;
- the regulations surrounding noise exposure are based upon out-of-date standards ETSU-97, which fail to evaluate infrasound and low-frequency

12 Ms Lilli-Ann Green, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 3. See also: Ms Lilli-Ann Green, *Submission 467*.

13 Mr Jay Tibbetts, *Submission 64*, p. 1.

noise, preferring instead to use dBA.¹⁴ The issue of Infrasound and Low Frequency Noise (ILFN) is a problem and it has been confirmed by numerous acousticians including Dr Paul Schomer, a leading international acoustician;

- the setbacks for wind turbines are highly variable across jurisdictions with no evidence base in human health research for the setbacks;
- there is an urgent need for human health research to provide evidence based guidelines for noise exposure. Proposals for third-party research and evaluation were made by the Academy of Medicine of France in 2006 and by Professor McMurtry in Canada. Professor McMurtry has published peer-reviewed papers on the criteria for diagnosis of illness from wind turbines;¹⁵ and
- there is an urgent need to monitor the health effects of people exposed to turbines over time and that has been missing virtually in all jurisdictions.¹⁶

The need for civility in public debate

As the committee noted in its interim report (paragraph 1.13), it is disappointed that renewable energy advocates, wind farm developers and operators, public officials and academics continue to denigrate those who claim that wind turbines have caused their ill-health.

Even elected representatives seeking to inquire into these effects have been the target of derision. The committee draws attention to comments from RATCH Australia Pty Ltd at the public hearing in Cairns (see *Committee Hansard*, Mr Hallenstein, 18 May 2015, p. 14) and from Vestas Pty Ltd at the public hearing in Melbourne (see *Committee Hansard*, Mr McAlpine, 9 June 2015, p. 24). Mr McAlpine had tweeted prior to the hearing: 'Happy World Environment Day to all the delightfully nutty anti-wind activists out there.'

The committee notes that RATCH Australia provided a formal apology to the committee for comments made at the public hearing. This apology was accepted.

14 Institute of Acoustics, *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise*, June 2013, <http://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf> (accessed 13 July 2015). dBA is an 'abbreviation for the decibel level of a sound that has been A-weighted'. A-weighting is 'a filter that represents the frequency response of the human ear'.

15 Professor Robert McMurtry, *Submission 146*, pp 19–20.

16 Professor Robert McMurtry, *Proof Committee Hansard*, Sydney, 29 June 2015, pp 6–7; Professor Robert McMurtry, *Submission 146*, pp 10 and 12.

Professor Chapman and his critics

2.19 Professor Simon Chapman AO, Professor of Public Health at the University of Sydney, has been an outspoken critic of those who suffer ill-effects from wind turbines. In both his written and oral submissions, Professor Chapman cited many of his own publications in support for his view that:

...the phenomenon of people claiming to be adversely affected by exposure to wind turbines is best understood as a communicated disease that exhibits many signs of the classic psychosocial and nocebo phenomenon where negative expectations can translate into symptoms of tension and anxiety.¹⁷

2.20 Several highly qualified and very experienced professionals have challenged this argument. Dr Malcolm Swinbanks, an acoustical engineer based in the United Kingdom, reasoned:

The argument that adverse health reactions are the result of nocebo effects, ie a directly anticipated adverse reaction, completely fails to consider the many cases where communities have initially welcomed the introduction of wind turbines, believing them to represent a clean, benign form of low-cost energy generation. It is only after the wind-turbines are commissioned, that residents start to experience directly the adverse nature of the health problems that they can induce.¹⁸

2.21 The committee highlights the fact that Professor Chapman is not a qualified, registered nor experienced medical practitioner, psychiatrist, psychologist, acoustician, audiologist, physicist or engineer. Accordingly:

- he has not medically assessed a single person suffering adverse health impacts from wind turbines;
- his research work has been mainly—and perhaps solely—from an academic perspective without field studies;
- his views have been heavily criticised by several independent medical and acoustic experts in the international community; and
- many of his assertions do not withstand fact check analyses.

2.22 Professor Chapman has made several claims which are contrary to the evidence gathered by this committee. First, he argues that the majority of Australia's wind turbines have never received a single complaint.¹⁹ There are various problems with this statement:

- (i) wind turbines located significant distances from residents will not generate complaints;

17 Professor Simon Chapman, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 28.

18 Dr Malcolm Swinbanks, *Submission 189*, p. 6.

19 See: Professor Simon Chapman, *Committee Hansard*, Sydney, 29 June 2015, p. 28.

-
- (ii) many residents suffering adverse health effects were not aware of any nexus between their health and the impact of wind turbines in order to make a complaint;
 - (iii) just because residents do not lodge a formal complaint does not mean they are not suffering adverse health effects;
 - (iv) data obtained by Professor Chapman from wind farm operators of the numbers of complaints lodged cannot be relied upon; and
 - (v) the use of non-disclosure clauses and 'good neighbour agreements' legally restricts people from making adverse public statements or complaints.

2.23 Second, Professor Chapman has argued that complaints of adverse health effects from wind turbines tend to be limited to Anglophone nations.²⁰ However, the committee has received written and oral evidence from several sources directly contradicting this view.²¹ The German Medical Assembly recently submitted a motion to the executive board of the German Medical Association calling for the German government to provide the necessary funding to research adverse health effects.²² This would not have happened in the absence of community concern. Moreover, Dr Bruce Rapley has argued that in terms of the limited number—and concentrated nature—of wind farm complaints:

It is the reporting which is largely at fault. The fact is that people are affected by this, and the numbers are in the thousands. I only have to look at the emails that cross my desk from all over the world. I get bombarded from the UK, Ireland, France, Canada, the United States, Australia, Germany. There are tonnes of these things out there but, because the system

20 See: Professor Simon Chapman, *Committee Hansard*, Sydney, 29 June 2015, p. 28.

21 There are various relevant sources:

- Ms Lilli Green's slides and oral evidence, *Proof Committee Hansard*, Sydney, 29 June 2015 and *Submission 467*;
- The following Danish sources: Mr Mauri Johansson, *Submission 385*; Ms Greta Gallandy-Jakobsen, *Submission 380*; and Mr Bak Olesen, *Submission 416*;
- There is also scientific evidence from studies conducted in Scandinavia which illustrate that 'annoyance' and sleep deprivation are reported as issues in residents exposed to wind turbine noise. These are referenced in the NHMRC's literature reviews. See: https://www.nhmrc.gov.au/files_nhmrc/publications/attachments/eh54_systematic_review_of_the_human_health_effects_of_wind_farms_december_2013.pdf (accessed 5 July 2015). See also: NHMRC, *Information Paper: Evidence on Wind Farms and Human Health*, 2015 www.nhmrc.gov.au/guidelines/publications/eh57; and
- Inagaki, T., Li, Y., Nishi, Y., 'Analysis of aerodynamic sound noise generated by a large-scaled wind turbine and its physiological evaluation', *International Journal of Environmental Science and Technology*, Vol. 12, Issue 6, pp 1933–1944.

22 Correspondence from Dr Ramin Parsa-Parsi, Head of International Affairs, German Medical Association, received 15 June 2015.

does not understand the problem, nor does it have a strategy, many of those complaints go unlisted.²³

2.24 Third, Professor Chapman has queried that if turbines are said to have acute, immediate effects on some people, why were there no such reports until recent years given that wind turbines have operated in different parts of the world for over 25 years.²⁴ Several submissions to the committee have stated that adverse health effects from wind turbines do not necessarily have an acute immediate effect and can take time to manifest.

2.25 Fourth, Professor Chapman contests that people report symptoms from even micro-turbines. The committee heard evidence that once people are sensitised to low frequency infrasound, they can be affected by a range of noise sources, including large fans used in underground coal mines, coal fired power stations, gas fired power stations and even small wind turbines. As acoustician Dr Bob Thorne told the committee:

Low-frequency noise from large fans is a well-known and well-published issue, and wind turbines are simply large fans on top of a big pole; no more, no less. They have the same sort of physical characteristics; it is just that they have some fairly unique characteristics as well. But annoyance from low-frequency sound especially is very well known.²⁵

2.26 Fifth, Professor Chapman contends that there are apparently only two known examples anywhere in the world of wind turbine hosts complaining about the turbines on their land. However, there have been several Australian wind turbine hosts who have made submissions to this inquiry complaining of adverse health effects. Paragraphs 2.11–2.12 (above) noted the example of Mr Clive Gare and his wife from Jamestown.²⁶ Submitters have also directed attention to the international experience. In Texas in 2014, twenty-three hosts sued two wind farm companies despite the fact that they stood to gain more than \$50 million between them in revenue.²⁷ The committee also makes the point that contractual non-disclosure clauses and 'good neighbour' agreements have significantly limited hosts from speaking out. This was a prominent theme of many submissions.

2.27 Sixth, Professor Chapman claims that there has been no case series or even single case studies of so-called wind turbine syndrome published in any reputable medical journal. But Professor Chapman does not define 'reputable medical journal' nor does he explain why the category of journals is limited to medical (as distinct, for

23 Dr Bruce Rapley, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 9.

24 See: Professor Simon Chapman, *Committee Hansard*, Sydney, 29 June 2015, p. 28.

25 Dr Robert Thorne, *Proof Committee Hansard*, Cairns, 18 May 2015, p. 44. See also the evidence of Mr Norman Allan, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 63.

26 See also the evidence of Mr David Mortimer, *Submission 24*; Mr William Quinn, *Submission 118*, p. 3; Mr Luke and Leonie Martin, *Submission 356*, p. 2; Mr Colin Schaefer, *Submission 165*, p. 1;

27 See: Ms Jenny Holcombe, *Submission 336*, p. 2.

example, from scientific or acoustic). The committee cannot therefore challenge this assertion. However, the committee does note that a decision to publish—or not to publish—an article in a journal is ultimately a business decision of the publisher: it does not necessarily reflect the quality of the article being submitted, nor an acknowledgment of the existence or otherwise of prevailing circumstances. The committee also notes that there exist considerable published and publicly available reports into adverse health effects from wind turbines.²⁸

2.28 The committee also notes that a peer reviewed case series crossover study involving 38 people was published in the form of a book by American paediatrician Dr Nina Pierpont, PhD, MD. Dr Pierpont's *Report for Clinicians* and the raw case data was submitted by her to a previous Australian Senate inquiry (2011) to which Dr Pierpont also provided oral testimony. Further, at a workshop conducted by the NHMRC in June 2011, acoustical consultant Dr Geoffrey Leventhall stated that the symptoms of 'wind turbine syndrome' (as identified by Dr Pierpont), and what he and other acousticians refer to as 'noise annoyance', were the same. Dr Leventhall has also acknowledged Dr Pierpont's peer reviewed work in identifying susceptibility or risk factors for developing wind turbine syndrome / 'noise annoyance'.²⁹ Whilst Dr Leventhall is critical of some aspects of Dr Pierpont's research, he does state:

Pierpont has made one genuine contribution to the science of environmental noise, by showing that a proportion of those affected have underlying medical conditions, which act to increase their susceptibility.³⁰

2.29 Seventh, Professor Chapman claims that no medical practitioner has come forward with a submission to any committee in Australia about having diagnosed disease caused by a wind farm. Again, Professor Chapman fails to define 'disease'. Nonetheless, both this committee, and inquiries undertaken by two Senate Standing

28 Google Scholar lists 23 300 results

29 Leventhall, G, "Wind Turbine Syndrome, An appraisal", 26 August 2009, pp. 10-11, Exhibit 18 in the Application of Wisconsin Electric Power Company for a Certificate of Public Convenience and Necessity to Construct a Wind Electric Generation Facility and Associated Electric Facilities, to be Located in the Towns of Randolph and Scott, Columbia County, Wisconsin, before the Public Service Commission Wisconsin, Docket Number 6630-CE-302, <http://psc.wi.gov/apps35/ERF_view/viewdoc.aspx?docid=122161>, (accessed 30 July 2015).

Evidence given by Dr Leventhall under cross-examination by Mr Gillespie, *Katie Brenda Erickson and Chatham-Kent wind Action Inc. and Director, Ministry of the Environment and Suncor Energy Services Inc. (Kent Breeze Wind Farms)*, Environmental Review Tribunal, Case Nos.: 10-121/122, transcript of proceedings, 11 March 2011, Vol 10, p. 79 et. seq.

30 Leventhall, G, "Wind Turbine Syndrome, An appraisal", 26 August 2009, pp. 10–11.

Committees, have received oral and written evidence from medical practitioners contrary to Professor Chapman's claim.³¹

2.30 Eighth, Professor Chapman claims that there is not a single example of an accredited acoustics, medical or environmental association which has given any credence to direct harmful effects of wind turbines. The committee notes that the semantic distinction between 'direct' and 'indirect' effects is not helpful. Dr Leventhall and the NHMRC describe stress, anxiety and sleep deprivation as 'indirect' effects, but these ailments nonetheless affect residents' health.

2.31 Finally, Professor Chapman queries why there has never been a complainant that has succeeded in a common-law suit for negligence against a wind farm operator. This statement is simply incorrect. The committee is aware of court judgements against wind farm operators³², operators making out of court settlements or withdrawing from proceedings³³, injunctions or shutdown orders being granted against operators³⁴, and properties adjacent to wind turbines being purchased by operators to avoid future conflict. The committee also reiterates its earlier point that contractual non-disclosure clauses have discouraged legal action by victims.

2.32 The committee also takes issue with evidence provided by Dr Leventhall. Dr Leventhall's presentation to the committee was notable for its selectivity and lack

31 Senate Environment and Communications Legislation Committee, Inquiry Into the Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012, November 2012, http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Completed%20inquiries/2010-13/renewableenergy2012/index (accessed 20 July 2015).

Senate Community Affairs References Committee Inquiry Into the Social and Economic Impact of Rural Wind Farms, June 2011, http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Community_Affairs/Completed_inquiries/2010-13/impacruralwindfarms/index (accessed 20 July 2015).

32 Judgement against Vestas in the amount of Dkr 500,000 (A\$93,439), High Court of Western Denmark, 2014.

33 Davis v Tinsley, Watts, Fenland Windfarms Ltd, EDF Energy PLC & Fenland Green Power Co-operative Ltd, before Mr Justice Hickinbottom in the High Court (Queens Bench Division), confidentially settled. Joint press release http://filesdown.esecure.co.uk/FenlandGreen/Fens_Co-op_-_Press_Release_301111.pdf_01122011-1009-38.pdf (accessed 13 July 2015).

Vannortwick, K. et. al., v Consumers Energy Company, 51st Circuit Court for the County of Mason, MI, before Judge Richard Cooper, settled out of court 2014.

34 Town of Falmouth vs Town of Falmouth Zoning Board of Appeals & others, Commonwealth of Massachusetts, Barnstable, ss Superior Court, November 21, 2013 before Justice Muse. Judgement of the Supreme Court of Justice (Portugal), 30 May 2013, 2209/08. 0TBTV.D.L1.S1, <http://www.dgsi.pt/jstj.nsf/954f0ce6ad9dd8b980256b5f003fa814/4559d6d733d1589780257b7b004d464b> (accessed 13 July 2015).

Sowers v Forest Hills Subdivision & Ors, Supreme Court of Nevada, 14 February 2013, No. 58609.

of objectivity.³⁵ His understanding of Dr Neil Kelley's ground breaking research in 1985 and 1987 is incorrect. However, when asked about further studies that might be necessary, Dr Leventhall did acknowledge the adverse effects of sound waves on people, stating:

I think that the most important aspect of wind turbine noise—which I said in the paper I published nearly 10 years ago—is the amplitude modulation. Work is now developing on that, and I believe that that is where the main answer should be given, in amplitude modulation, because this is what upsets people.³⁶

A problem with infrasound from industrial and environmental noise pollution

2.33 The committee emphasises that it has, during the course of its inquiry, gathered evidence indicating that sources other than wind turbines, such as coal mine ventilator fans and gas driven electricity turbines, also emit large amounts of infrasound. The committee received correspondence from regulators to witnesses acknowledging the presence of sound emissions from industrial facilities. These emissions are not monitored or regulated. As Dr Sarah Laurie told the committee:

The systemic regulatory failure with respect to the way industrial and environmental noise pollution is regulated in Australia is not confined to wind turbine noise. As you would have seen from the submissions of the Wollar Progress Association; and residents living near the coalmines in the Upper Hunter region and residents of Lithgow impacted by coal fired power stations and extractor fan noise and vibration. Their stories, both with respect to the range and severity of symptoms and the way they are treated by the noise polluters and the government regulatory authorities, are all too familiar to the growing numbers of rural residents living near industrial wind power generators.

Once sensitised, residents affected by infrasound and low-frequency noise from coal fired power stations find they also react to wind turbines in the same way. The body and the brain do not care about the source of the sound and vibration. The reactions are involuntary and hardwired, and part of our physiological fight/flight response.

At the heart of this systemic regulatory failure of environmental noise pollution is the failure of the planning and noise pollution regulations, because they all fail to varying degrees to predict, measure and regulate the excessive noise and vibration in the lower frequencies—in the infrasound and low-frequency noise regions, specifically between 0.1 and 200 hertz. These regulations also permit levels of audible noise which are guaranteed to cause adverse impacts because they are so much higher than the very quiet background noise environments in rural areas. These rules are not fit for purpose, and guarantee that some residents will be seriously harmed.

35 See: Dr Geoffrey Leventhall, *Proof Committee Hansard*, Canberra, 23 June 2015, pp 9–14.

36 Dr Geoffrey Leventhall, *Proof Committee Hansard*, Canberra, 23 June 2015, p. 14.

There has been pretence that there is no evidence of harm at the levels of infrasound and low-frequency noise being emitted. This is untrue. There is an extensive body of research conducted by NASA and the US Department of Energy 30 years ago, which: established direct causation of sleep disturbance and a range of physiological effects euphemistically called 'annoyance'; acknowledged that people became sensitised or conditioned to the noise with ongoing exposure; and recommended exposure thresholds in order to ensure residents were protected from harm directly caused by this pulsing infrasound and low-frequency noise.³⁷

2.34 Dr Laurie also noted the following research that has identified adverse health effects on humans from low frequency sound:

- the 2004 report of Dr David Iser, a General Practitioner and Medical Officer of Health in South Gippsland. Dr Iser was the first General Practitioner in Australia to report adverse health effects from wind turbines;³⁸
- research conducted by Professor Alec Salt of Washington University in St Louis. Professor Salt is the leading expert in inner ear fluid physiology, detailing the effects of low frequency sound on the ear and how wind turbines can be hazardous to human health;³⁹ and
- the Inagaki study in Japan which found physiological effects from aerodynamic sound from wind turbines.⁴⁰

The views of the Australian Medical Association

2.35 The committee is disappointed that the Australian Medical Association (AMA) has not engaged with this inquiry. It has not accepted the committee's invitations to make a submission or to give evidence at a public hearing. Rather, the AMA has responded to comments made to the inquiry through a twitter post. It has been left to wind farm companies to confirm the AMA's current position.⁴¹

2.36 This is regrettable given the influence that the Association's views have on the Australian medical community. It is hardly surprising if general practitioners turn a blind eye to, or downplay, the complaints of those who claim to be suffering the

37 Dr Sarah Laurie, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 39.

38 Iser, Dr DJ (Medical Officer of Health, South Gippsland), 2004, Local Wind Farm Survey, Waubra Foundation, Banyule <http://waubrafoundation.org.au/wp-content/uploads/2013/02/Dr-Iser-Submission-to-NHMRC.pdf> (accessed 8 July 2015).

39 Professor Alec Salt, Cochlear Fluids Research Laboratory, Department of Otolaryngology Washington University School of Medicine, August 2013, Washington University <http://oto2.wustl.edu/cochlea/resp.htm> (accessed 9 July 2015).

40 Inagaki, T., Li, Y., Nishi, Y., 'Analysis of aerodynamic sound noise generated by a large-scaled wind turbine and its physiological evaluation', *International Journal of Environmental Science and Technology*, Vol. 12, Issue 6, pp 1933–1944.

41 Pacific Hydro, *Additional Information no. 10*, received 24 April 2015, published on the committee's website.

effects of wind turbines when the peak body's assessment of the authenticity of these impacts is so dismissive.

2.37 The AMA continues to hold to its position statement, released in March 2014. The statement reads:

The available Australian and international evidence does not support the view that the infrasound or low frequency sound generated by wind farms, as they are currently regulated in Australia, causes adverse health effects on populations residing in their vicinity. The infrasound and low frequency sound generated by modern wind farms in Australia is well below the level where known health effects occur, and there is no accepted physiological mechanism where sub-audible infrasound could cause health effects.

Individuals residing in the vicinity of wind farms who do experience adverse health or well-being, may do so as a consequence of their heightened anxiety or negative perceptions regarding wind farm developments in their area. Individuals who experience heightened anxiety or diminished health and well-being in the context of local wind farms should seek medical advice.

The reporting of 'health scares' and misinformation regarding wind farm developments may contribute to heightened anxiety and community division, and over-rigorous regulation of these developments by state governments.

The regulation of wind farm developments should be guided entirely by the evidence regarding their impacts and benefits. Such regulation should ensure that structured and extensive local community consultation and engagement is undertaken at the outset of planning, in order to minimise misinformation, anxiety and community division.

Electricity generation by wind turbines does not involve production of greenhouse gases, other pollutant emissions or waste, all of which can have significant direct and indirect health effects.⁴²

2.38 Rightly, the AMA's statement received pointed criticism from submitters and witnesses in the course of this inquiry. Mr Geoff McPherson, for example, argued that it is not appropriate for the AMA to focus on wind renewable power systems with no consideration of any prospect of collateral damage that the medical community would normally call side effects for any other health issue.⁴³ He identified the peculiarity of the statement relative to AMA position statements on other health issues and to those made by overseas medical associations on the issue of wind turbines:

A cursory assessment of other AMA Position Statements generally suggests that the normal formula for any other Position Statement is to indicate what the relevant medical problems are, then to explain the issues and then perhaps offer suggestions for mitigation or guidelines to approach the

42 Australian Medical Association, *Wind farms and human health—2014*, <https://ama.com.au/position-statement/wind-farms-and-health-2014> (accessed 10 July 2015).

43 Mr Geoff McPherson, *Additional Information no. 16*, received 1 May 2015, p. 2.

problem. This was clearly not the case for the AMA Position Statement on wind farms. Why is this one so different?

One would also have to question the AMA as to how many of their Position Statements have been established on literature provided by an assessment document such as the uncited Draft NHMRC Review, by definition not Final, Review. Why are there no references to substantiate the Position Statement on Wind Farms and Health given that a thinly veiled political manifesto about climate change is not stand-alone science. The AMA Position Statement on Breastfeeding for instance has almost as many references as the Position Statement on Wind Farms and Health has text. Why absolutely nothing for wind farms and health?

...

The American AMA took a stand on the advantages of developing renewable energy extraction systems over existing oil and gas systems, not from an environmental stance, but because the mortality of workers in renewable energy construction was at least an order of magnitude lower than with oil and gas construction. In their final, not Draft it should be stressed, position statement the American AMA took an appropriate health and welfare first approach to renewable energy, not the other way around as the AMA has done. This health first approach by the American medical community should have been instructive for the AMA if they were concerned about the specific health of individual Australians.⁴⁴

2.39 Ms Gardner expressed her frustration that the AMA's 2014 position statement continues to be the basis on which her health complaints are dismissed by authorities. She provided the following excerpt from AGL Energy's Community Engagement Manager which she indicated is now a standard reply to her complaints:

The Australian Medical Association has concluded that 'the infrasound and low-frequency sound generated by modern wind farms in Australia is well below the level where known health effects occur.' The Victorian department of health have also released a report on wind turbines and infrasound which can be found here.... The South Australian Environmental Protection Agency has also released a report on wind turbines and infrasound which can be found here.... We encourage you to seek medical attention for any health-related matters.⁴⁵

2.40 Other witnesses have also noted AGL's use of the AMA's Statement to dismiss complainants.⁴⁶ The AMA's statement is indeed a point of reference for wind farm companies, some of whom have directed the committee to examine it. Acciona

44 Mr Geoff McPherson, *Additional Information no. 16*, received 1 May 2015, p. 1.

45 Mr Andrew and Mrs Ann Gardner, *Submission 208a*, p. [132].

46 Mr Ron and Mrs Chris Jelbart, *Submission 152*, p. 4.

even reproduced the Statement in its submission.⁴⁷ Infigen gave the committee a link to the Statement.⁴⁸

2.41 The committee is more interested in the lack of rigour behind this statement. Far from it being a considered and cautious assessment of primary evidence, it is simply slavish repetition of the findings of the NHMRC's reviews. This is both irresponsible and harmful:

The NHMRC review 'conclusions' have been used by the Australian Medical Association to justify them making a Public Statement that there is no health concerns relating to Industrial Wind Energy Installations...

The NHMRC and the AMA have in taking advice from the industry and in some instances that of non-medical academics have placed more people in danger of suffering adverse health effects.⁴⁹

The AMA Policy Statement came hot on the heels of the Draft NHMRC Review. The AMA Position Statement seems to side with aspects of the Draft NHMRC Review that effectively and arrogantly indicates that the rest of the world's medical and acoustic capability was basically at 'background' status in their eyes and there was insufficient medical, acoustic and psychoacoustic data in the world to suggest that noise from turbines did not generate some kind of side effect relevant to Australian conditions.⁵⁰

The role of the NHMRC and evidence-based health advice

2.42 The main source of official advice on the health impact of wind turbines is the NHMRC. The current legislative basis of the Council is the *National Health and Medical Research Council Act 1992* (the NHMRC Act). The NHMRC is responsible to the Commonwealth Minister for Health and explained its role as follows:

NHMRC does not undertake field based scientific research. That job is done by Australia's best researchers, many of whom are funded by NHMRC, whose proposals are selected through independent expert review and which contribute to building a body of scientific evidence. NHMRC's other function is to translate the outcomes of both domestic and international research into an easily digestible form. These can take the form of a guideline, a statement or an information paper and can be used by clinicians, policymakers or the Australian public to achieve improvements in health.

NHMRC has a mandate to promote and support evidence based health care. When developing advice, NHMRC aims to accumulate a body of evidence that is based on high-quality research with consistent outcomes. This

47 Acciona Energy Australia Global Pty Ltd, *Submission 294*, p. [4].

48 Infigen, *Submission 425*, p. 9.

49 Ms Jackie Rovensky, *Submission 89*, p. 4,

50 Mr Geoff McPherson, *Additional documents no. 16*, received 18 May 2015, pp 2–3.

enables health authorities to make a judgement with confidence about whether an exposure is likely to cause health effects.⁵¹

2.43 The advice of the NHMRC on wind farms and human health is influential. It is the basis not only for the advice given by medical practitioners to their patients (through the AMA), but also for State Government's in their decision-making. That said, some State Governments have publicly acknowledged the shortcomings of the NHMRC's advice. The committee highlights the following comment from Mr Greg Chemello of the Queensland Department of Infrastructure, Local Government and Planning:

There is a real dearth of scientific evidence that validates health research. I understand that there are concerns, and very valid concerns, from community groups, but, on the basis of where we are at this point in time, the department formed the view that we cannot say no to any wind farms.⁵²

2.44 The terms of reference for this inquiry direct the committee to consider the role and capacity of the NHMRC in providing guidance to state and territory authorities on matters relating to the regulatory governance of wind turbines. There are two main issues:

- the first relates to the robustness of the advice that the NHMRC provides and the process through which the evidence is gathered; and
- the second issue is how state and territory authorities interpret and use this advice.

2.45 In its submission to this inquiry, the NHMRC notes that its advice 'may assist the relevant states and territories to make policy and regulatory decisions about the development and operations of wind farms'. It adds that while the NHMRC is responsible for developing evidence-based health advice, it is the responsibility of state and territory authorities to determine how NHMRC advice is applied in their jurisdictions.⁵³

The NHMRC's reviews

2.46 The NHMRC's past reviews of the evidence relating to wind turbines and human health have been a key focus of this inquiry. There have been two past reviews—the findings of which were released in 2010 and 2014.

The 2010 Rapid Review

2.47 The NHMRC commenced its contribution to advising on health and wind farm issues in 2009. On the request of Chief Health Officers at the 179th session of

51 Ms Samantha Robertson, Executive Director, Evidence, Advice and Governance Branch, National Health and Medical Research Council, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 13.

52 Mr Greg Chemello, Deputy Director General, Queensland Department of Infrastructure, Planning and Local Government, *Proof Committee Hansard*, 18 May 2015, p. 24.

53 NHMRC, *Submission 102*, p. 7.

Council, the Office of the NHMRC conducted a 'Rapid Review' of the published scientific literature on the issue of wind turbines and potential impacts on human health.⁵⁴ The Rapid Review covered the available evidence on the potential health impacts of infrasound, noise, electromagnetic energy, shadow flicker and blade glint produced by wind turbines.⁵⁵

2.48 In June 2010, the NHMRC released a *Public Statement on Wind Turbines and Health* in which the conclusion was that 'there is currently no consistent evidence that wind farms cause adverse health effects in humans'.⁵⁶ The committee notes that this document, available on the NHMRC's website, has been 'rescinded' after the integrity of the document was repeatedly questioned over the course of four years.⁵⁷

2.49 In June 2011, the report of the Senate Community Affairs References Committee recommended that the NHMRC's review of research should continue, with regular publication. The NHMRC reaffirmed its commitment to do so. The NHMRC hosted a scientific forum providing stakeholders with:

...an opportunity to present the latest international scientific evidence and canvass issues of public concern. One of the key objectives of the forum was to facilitate discussion and collaboration between the relevant state and territory health, planning and environment authorities and other key stakeholders, including environmental health experts and researchers, acoustic engineers, public interest groups involved in wind farms in Australia and international experts from countries with substantial experience in wind turbines.⁵⁸

2.50 The NHMRC noted in its submission that following the forum, the Chief Executive Officer of the Council accepted the recommendations of Council that the literature be reviewed in a systematic manner, especially focusing on the possible health impacts of audible noise and infrasound. Depending on the result of the review, the Council would consider a targeted call for research in the area.⁵⁹

54 NHMRC, *Submission 102*, p. 6.

55 *Wind Turbines and Health—A Rapid Review of the Evidence*, July 2010, https://www.nhmrc.gov.au/files/nhmrc/publications/attachments/eh53_evidence_review_wind_turbines_health_0.pdf (accessed 10 April 2015).

56 National Health and Medical Research Council, *NHMRC Statement: Evidence on Wind Farms and Human Health*, https://www.nhmrc.gov.au/files/nhmrc/publications/attachments/eh57_nhmrc_statement_wind_farms_human_health_0.pdf (accessed 10 July 2015).

57 National Health and Medical Research Council, *2010 NHMRC Public Statement: Wind Turbines and Health*, <https://www.nhmrc.gov.au/guidelines-publications/eh53> (accessed 10 July 2015).

58 NHMRC, *Submission 102*, p. 6.

59 NHMRC, *Submission 102*, p. 6.

The NHMRC's 'independent systematic review'

2.51 In 2011, the NHMRC commissioned an 'independent systematic review' (the review) of the human health effects of wind turbines. The review aimed to widen the scope of the initial 2010 review. It was undertaken by independent reviewers from Adelaide Health Technology Assessment under the guidance of a Reference Group. The Reference Group operated from 1 February 2012 to 31 January 2015 with a brief to:

- guide the development of a systematic review to determine if new evidence exists in the scientific literature on possible health effects of wind farms;
- consider the outcomes of the review and use these findings to:
 - inform updating NHMRC's Public Statement: Wind Turbines and Human Health; and
 - identify critical gaps in the current evidence base; and
- provide the NHMRC's Prevention and Community Health Care Committee with a report on Wind Farms and Human Health.

2.52 The NHMRC explained to the committee how it selected the relevant evidence for the systematic review. The review was based on only 17 publications:

In examining the possible effects of exposure to wind farm emissions on human health around 95 per cent of the original papers—approximately 4,500 of those—were excluded because none of the excluded papers examined human health effects of exposure to wind farm emissions. The remaining publications, approximately five per cent, were considered in more detail against selection criteria. This was to ensure that papers which detailed research activity that directly examined and compared the frequency of health effects in people with different levels of exposure to wind farm emissions were identified. It is the outcomes of this comparative analysis that provide the essential information for the reference group in answering the question as to whether wind turbines affect human health.

In the direct analysis of the five per cent of papers that were considered in greater detail, half of those were excluded as they did not document a study of original research. They were mostly review articles, opinion pieces, narrative reviews or discussion papers. Some other papers were excluded because they did not examine population and setting, exposure and outcomes, or use an appropriate research design to provide a comparative analysis. Only four papers were excluded on the basis that they were not published in English. As a result of this detailed search for literature, *17 publications detailing 13 studies were considered by the reference group in drafting the information paper.* An additional background literature review was also conducted to establish whether the type and level of emissions coming from wind farms might affect the healthy functioning of the human body—the mechanistic evidence—and also if health effects have been observed from noise emissions from other non-wind farm sources—the parallel evidence. Evidence was identified by the independent reviewers

through key word searches and research databases, as well as considering publications that were submitted during consultation.⁶⁰

2.53 The NHMRC told the committee that its assessment of the best evidence aligns with international best practice—namely:

...independent review of the evidence review methodology, independent review of our draft advice by relevant experts to ensure that the reference group in this case has interpreted the evidence appropriately, and public consultation which gives interested parties the opportunity to input into the process.⁶¹

2.54 The NHMRC explained that having identified the relevant evidence, 'independent evidence reviewers' were assisted by the Reference Group to develop the research questions and finalise the reports. The Reference Group that then 'considered the scientific evidence, expert review and all public consultations, synthesising this information into a format and context relevant to the Australian community'⁶²

2.55 The outcomes of the systematic review were finalised in late 2013 and considered by the Reference Group. The outcomes informed the development of a draft Information Paper on the evidence on wind farms and human health. The independent review also identified gaps in the current evidence base to inform the Reference Group's recommendations for research.⁶³

2.56 In November 2012, a further Senate inquiry into wind turbine noise placed great store in the NHMRC's forthcoming systematic review. The Senate Environment Legislation Committee recommended that 'there should be no regulatory changes prior to the release of the NHMRC's assessment in 2013, as this would be premature'.⁶⁴

2.57 The findings of the independent review were released in February 2014 as a draft Information Paper titled *Evidence on Wind Farms and Health*. A final version of

60 Ms Samantha Robertson, Executive Director, Evidence, Advice and Governance Branch, National Health and Medical Research Council, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 14. Emphasis added

61 Ms Samantha Robertson, Executive Director, Evidence, Advice and Governance Branch, National Health and Medical Research Council, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 13.

62 Ms Samantha Robertson, Executive Director, Evidence, Advice and Governance Branch, National Health and Medical Research Council, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 14.

63 National Health and Medical Research Council, *NHMRC Statement and Information Paper: Evidence on Wind Farms and Human Health*, <https://www.nhmrc.gov.au/guidelines-publications/eh57> (accessed 1 July 2015).

64 Senate Environment and Communications Legislation Committee, *Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012*, http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Completed%20inquiries/2010-13/renewableenergy2012/report/~media/wopapub/senate/committee/ec_ctte/completed_inquiries/2010-13/renewable_energy_2012/report/report.ashx (accessed 10 April 2015).

the document was formally released in February 2015. Prior to publication, the NHMRC sought input from state and territory planning and environment departments through chief health officers.

2.58 The Information Paper is intended to replace the 2010 *NHMRC Public Statement: Wind Turbines and Health* and supporting evidence *Wind Turbines and Health: A rapid review of the evidence*.⁶⁵ The Statement concluded:

There is no direct evidence that exposure to wind farm noise affects physical or mental health. While exposure to environmental noise is associated with health effects, these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia. The parallel evidence assessed suggests that there are unlikely to be any significant effects on physical or mental health at distances greater than 1,500 m from wind farms.⁶⁶

It added:

There is consistent but poor quality direct evidence that wind farm noise is associated with annoyance. While the parallel evidence suggests that prolonged noise-related annoyance may result in stress, which may be a risk factor for cardiovascular disease, annoyance was not consistently defined in the studies and a range of other factors are possible explanations for the association observed.

There is less consistent, poor quality direct evidence of an association between sleep disturbance and wind farm noise. However, sleep disturbance was not objectively measured in the studies and a range of other factors are possible explanations for the association observed. While chronic sleep disturbance is known to affect health, the parallel evidence suggests that wind farm noise is unlikely to disturb sleep at distances of more than 1,500 m from wind farms.

There is no direct evidence that considered the possible effects on health of infrasound or low frequency noise from wind farms. Exposure to infrasound and low-frequency noise in a laboratory setting has few, if any, effects on body functions. However, *this exposure did not replicate all of the characteristics of wind farm noise* as it has generally been at much higher levels and of short duration.⁶⁷

Although individuals may perceive aspects of wind farm noise at greater distances, it is unlikely that it will be disturbing at distances of more than 1,500 m. Noise from wind farms, including its content of low-frequency

65 National Health and Medical Research Council, *NHMRC Statement and Information Paper: Evidence on Wind Farms and Human Health*, <https://www.nhmrc.gov.au/guidelines-publications/eh57> (accessed 10 July 2015).

66 National Health and Medical Research Council, *NHMRC Statement: Evidence on Wind Farms and Human Health*, February 2015, https://www.nhmrc.gov.au/files_nhmrc/publications/attachments/eh57_nhmrc_statement_wind_farms_human_health_0.pdf (accessed 10 July 2015).

67 Emphasis added

noise and infrasound, is similar to noise from many other natural and human-made sources.⁶⁸

The 2015 NHMRC Statement and the Targeted Call for Research

2.59 In the February 2015 Statement, the NHMRC recognised that the body of direct evidence on wind farms and human health is 'small and of poor quality'. It added that given reported experiences of health effects and the 'limited reliable evidence', 'further high quality research is warranted'.⁶⁹ Importantly, senior public health figures have also recognised that the quality of research of the NHMRC's systemic review was 'suboptimal'. As the South Australian Chief Medical Officer told the committee:

...a lack of evidence does not mean that there is no effect; it just means that we have no evidence of an effect. The quality of the research that has been done so far has been suboptimal, and the NHMRC felt that it was important to put out a call for research to try to improve the quality of that evidence to determine if there was any evidence to suggest there are health effects of wind farms.⁷⁰

2.60 In the February 2015 Statement, the NHMRC announced that there will be a Targeted Call for Research to stimulate applications for research that addresses the gaps in the evidence base. The process will 'encourage Australia's best researchers to undertake independent, high quality research investigating possible health effects and their causes, particularly within 1500 m from a wind farm'.⁷¹ The NHMRC told the committee that the targeted call for research (TCR) closed on 6 May 2015 with four applications:

These are currently being assessed by an independent expert review panel and I hope the committee understands we cannot comment further in detail on this process due to the competitive nature of our funding processes. There are obvious limitations in existing direct evidence on wind farms and human health outcomes, and, in funding the TCR, NHMRC intends to stimulate the research required to build a robust body of evidence to establish whether there are adverse health effects from exposure to wind turbine emissions.⁷²

The committee notes that the research findings may be reported too late to apply the precautionary principle.

68 National Health and Medical Research Council, *NHMRC Statement: Evidence on Wind Farms and Human Health*, February 2015.

69 National Health and Medical Research Council, *NHMRC Statement: Evidence on Wind Farms and Human Health*, February 2015.

70 Professor Paddy Phillips, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 44.

71 Professor Paddy Phillips, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 44.

72 Ms Samantha Robertson, Executive Director, Evidence, Advice and Governance Branch, National Health and Medical Research Council, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 15.

2.61 The NHMRC expects that the annual expenditure for this Targeted Call for Research on Wind Farms and Human Health is 'up to \$0.5 million per annum', and will be 'dependent on submitted research proposals being assessed as high-quality by rigorous, independent peer review'. The grants will be available for up to five years, depending on the proposal, meaning the maximum allocation for funding is \$2.5 million.⁷³

2.62 In February 2015, *The Australian* reported the comments of the CEO of the NHMRC, Professor Warwick Anderson: 'it is important to say no consistent evidence does not necessarily mean no effect on human health'. This point is important because it would seem that the NMHRC's assessment of the lack of consistent evidence coexists with significant empirical, biological and anecdotal evidence that many people living nearby wind turbines suffer similar symptoms and identify the wind turbines as the cause for their symptoms. As the Chairman of the NHMRC's wind farm committee, Professor Bruce Armstrong, commented: 'it is difficult to "prove a negative"—that wind turbines do not harm health—and the decision to conduct further research should not be seen as a cause for alarm'. Professor Armstrong also said 'to not investigate would be negligent from a public health point of view'.⁷⁴

Submitters' views of the NHMRC

2.63 The committee received several submissions from people and organisations critical of the role of the NHMRC and its findings. These criticisms focus on the selective nature of the NHMRC's research, its failure to properly investigate the complaints of many people who allege harm from turbines, and its failure to apply the precautionary principle in giving its advice.

2.64 Dr Sarah Laurie was particularly scathing in her assessment of the membership and methodology of the NHMRC:

The National Health and Medical Research Council has gravely failed the Australian public and the governments it advises by failing to ensure that serious conflicts of interest were not prevented with their choice of experts for their literature reviews. These have had a material impact on the quality of the advice from the NHMRC and have led to dangerously optimistic predictions about the safe distance of impact from wind turbine noise, for example. This has been achieved by cherry-picking data, ensuring the goalposts for the inclusion of studies were extremely narrow, and even resorting to misclassification of studies. The only possible reason for it was to ensure these studies were never included because they would damage the commercial interests of the wind industry. Incompetence is another, perhaps less likely, explanation.⁷⁵

73 Graham Lloyd, 'Health research body to fund wind-farm studies', *The Australian*, 13 February 2015. See also: Mrs Angela Kearns, *Submission 40*.

74 Mrs Angela Kearns, *Submission 40*, p. 1.

75 Dr Sarah Laurie, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 40.

2.65 Mr Peter Mitchell also criticised the composition of the NHMRC's Reference Group and in particular, the lack of acoustical expertise:

There was one acoustician and three epidemiologists. This is an acoustical problem and, until we understand the acoustics, forget the medical intricacies. We have to understand the acoustics. No-one else on the panel had any idea of acoustics. They could not tell when they were being misled or information was being withheld. I was an observer, and it was very hard for me to prompt. So that was one thing.

The epidemiologists were focused on narrowing, it seemed to me, the 4,000 papers that were found by the library that did the literature survey into as few as possible. So the hurdles that those studies had to jump were huge. I just think that had I been wiser and looked at the construction of that panel I would have refused to have been an observer. But once you understood the construction of that panel it was there to make sure that the NHMRC gracefully slipped out of their rapid review done three years earlier and did not create any waves for themselves. It is a disgrace.⁷⁶

2.66 Ms Jackie Rovensky argued in her submission that the NHMRC's role to date has been marked by bias, in terms of both the content of its reviews and the timing of their release. She put the following argument:

Research into reported adverse effects of these turbines on humans has been undertaken for some years covering different scientific fields, but the NHMRC does not recognise this work and has sat back, listening and appearing to take notice of non-medical academics and the [Industrial Wind Turbine] IWT and have let this influence whether research should be undertaken and funded or not, leaning towards not.

Even after a Senate inquiry in 2011 recommended research the NHMRC stayed silent and a forum conducted by them they did not recommend funding research.

They have conducted two reviews of literature, which cannot be considered research. In both cases they were selective over which research was relevant. The first review was a Rapid Review and their conclusions and process was condemned and held up to ridicule because of its lack of thoroughness and biased process.

The second review resulted in many reports, papers both published and not published, peer reviewed and not peer reviewed being dismissed as not meeting their criteria for inclusion.

...The NHMRC's latest literature review could have been a turning point, but it did not wait to include the results of acoustical testing being undertaken by Mr Steven Cooper, even after they were made aware of initial findings months before, when he reported the finding of infra-sound inside resident's homes. These residents who were selected by Pacific Hydro to take part in the study had complained of adverse effects since the turbines began operating. The NHMRC had already delayed publishing

76 Mr Peter Mitchell, *Committee Hansard*, Melbourne, 9 June 2015, p. 16.

their results, but on the eve of the release of Mr Cooper's research by Pacific-Hydro, they released their report. Could they have waited perhaps a month longer allowing time for them to fully evaluate this work which found a link between infra-sound inside homes and complaints from affected residents and the operation of the IWT's? They should have done, as his findings are at the root of residents' complaints and therefore the work is significant, the question is: Why didn't they? Was influence brought to bear and/or was bias a contributing factor?

2.67 Some submitters argued that responsibility for future research should be taken out of the NHMRC's hands. A New Zealand psychoacoustician, Dr Daniel Shepherd, was one to recommend that an organisation other than the NHMRC manage further inquiries into wind turbine noise and its relationship to health. As he wrote:

As an outsider looking in, I have been surprised as to how politicised the conduct of the NHMRC has been, to a point where health and medicine have been side-lined. The "Rapid Review" undertaken by the NHMRC in 2010 was just that, all speed and no accuracy. Their 2014 Information Paper was more comprehensive, albeit containing fundamental misunderstandings of the concepts that constitute their core business: direct health effects, indirect health effects, and adverse health effects. For example, the WHO (Salomon et al., 2003) explicitly categorises cognition and sleep as direct indicators of health. Agents modifying these two processes must therefore be considered direct health effects. Noise can impact both cognition and sleep, and noise must therefore be considered a direct health effect. The NHMRC appear, however, to not accept this logic.⁷⁷

2.68 Ms Rovensky was highly critical of what she saw as the NHMRC's neglect of the precautionary principle on the issue of wind turbines. She put the following arguments:

The NHMRC has made no effort to ensure the health of Australians; they have neglected their duty to ensure they are fully informed and aware of the dangers of this industry or ensure decision are made without influence of those with an 'axe to grind'. The NHMRC has for political and possibly individual personal reasons stood back from strongly advising a Precautionary approach be taken with respect to where these IWT's are installed, until full independent research can be undertaken to assess whether they are safe to be install in proximity to humans.

They have also failed in their duty to arrange research funding in a timely manner once complaints from residents were being reported soon after IWT installations were commissioned. They may have been under pressure from a Government which wholeheartedly supported the IWT industry and ignored all attempts to get them to consider this industries safety record in rural locations close to human habitation, but this should not have silenced the NHMRC with respect to their duty to the people of Australia. They have given meagre advice to the public, none to the health profession and ineffective and uneducated advice to Government.

77 Dr Daniel Shepherd, *Submission 75*, p. 1.

The role of the NHMRC is significant with respect to medical research funding, and for them to suggest that because there is little research to show a cause and effect while acknowledging people are suffering begs the question, why did they not seek earlier to fund medical research?

Is it because they lean on a very contradictory aspect of their role? They say they rely on robust scientific research to assess the acceptance of Research Applications for grants, but then say there is insufficient robust scientific research for them to consider offering grants to fund this research. Could the NHMRC explain how robust scientific research can be funded so researchers can apply for funding to do the work? With people reporting adverse health effects since 1979, and in Australia from the beginning of installation of industrial sized wind energy turbines were installed then should the NHMRC have funded research earlier to ensure no others suffered the same effects?⁷⁸

2.69 Similarly, Mr George Papadopolous, a Canberra pharmacist, complained that the NHMRC had not listened to the 'ordinary rural dwellers' and had dismissed their 'very distressing symptoms'.⁷⁹ He contrasted the NHMRC's approach on the issue of wind turbines to its review into water quality. He wrote:

Did the NHMRC decide to discount the value of individual complaints? The NHMRC does not appear to do so in relation to other matters, such as water quality:

Consumers are the ultimate assessors of water quality. Consumers may not be able to detect trace concentrations of individual contaminants, but their ability to recognise change should not be discounted. In some cases, consumer complaints may provide valuable information on potential problems not detected by testing water quality or monitoring treatment processes. Water quality testing has limitations and there are many possibilities for contamination of water in reticulation systems after treatment. All consumer complaints should be investigated to ensure that otherwise undetected problems that might compromise drinking water safety have not occurred. Meeting reasonable consumer expectations and maintaining confidence in the water supply is vitally important (NHMRC 2011).

If the value of the individual's perception is so valuable in relation to water quality, why is the individual's perception not so valuable in relation to noise, the loss of amenity, sleep deprivation, rattling home structures and sensations? The NHMRC does not call on wind developers to take action on noise complaints. Rather it suggests that people consult with their medical practitioners if they feel their health is affected. With reference to water quality, why didn't the NHMRC perform a rapid review of the evidence and decide that water quality complaints were associated with

78 Ms Jacqueline Rovensky, *Submission 89*, p. 3.

79 Mrs Angela Kearns, *Submission 40*, p. 1.

scare campaigns of technophobes, the anti-fluoridation lobby and/or irrational fears about aluminium or chlorine?

Given that most authorities do not permit wind turbines to be installed within two kilometres of homes, the "1.5km" research recommendations of the NHMRC for research are a little out of line with the current regulatory requirements of authorities on this issue, and are in sync with those presented by authors supportive of the wind industry.⁸⁰

2.70 Emeritus Professor Colin Hansen of the University of Adelaide argued that the NHMRC Information Paper is flawed. He gave the following reasons:

- papers by many well-known scientists published in internationally recognised journals were rejected. The included papers were labelled as 'poor in quality';
- the Paper assumes that wind farm noise is like any other noise of the same A-weighted decibel level. Professor Hansen argues that this is not the case and that based on his measurement, 'wind farm noise is very different to other environmental noise such as traffic noise at the same A-weighted noise level'. He noted that wind farm noise has low-frequency 'which is not quantified very well by the A-weighting metric';
- the Paper wrongly assumes that the A-weighting measure can be directly related to the effect that noise has on people. Whereas the A-weighted noise level is typically a level averaged over a period of time, wind farm noise 'varies considerably over short periods of time and the peak levels can be much greater than levels averaged over 10 to 15 minutes'; and
- background noise levels in rural areas in Australia are well below background noise levels in urban areas and wind farm noise has 'entirely different characteristics to traffic noise, which makes it more intrusive and annoying'.⁸¹

2.71 Dr Christopher Hanning was also critical of the research methodology and the lack of insight in the NHMRC's research findings. He made the following observations in his submission:

The NHMRC statement on wind turbine noise and human health fails in its duty to "build a healthy Australia" and to protect the public health by; reversing the burden of proof, applying an inappropriately high burden of proof and failing to properly apply the precautionary principle. They have, instead, applied the "reactionary principle" (Kriebel 2007), which is clearly not in the public interest. Had they correctly applied the precautionary principle, then, even using their present analysis, they would have called for an immediate moratorium on the construction of new wind turbines within at least 1.5km of residences and immediate reductions in noise emissions from existing wind turbines sited within 1.5km of residences. Had they applied a reasonable burden of proof, they would have called for a construction moratorium and noise emission reductions for turbines sited

80 Mr George Papadopolous, *Submission 28*, p. 2.

81 Emeritus Professor Colin Hansen, *Submission 50*, p. 2.

within 10km of residences. In addition, they would have mandated research by independent experts with relevant expertise in acoustics, sleep medicine and other relevant clinical disciplines, funded by the wind industry, as an urgent matter for the protection of public health.⁸²

2.72 Similarly, the Upper Hunter Landscape Guardians argued that the limits on the criteria used and the literature reviewed, the NHMRC 'has created a bias in favour of the wind industry'. The organisation did welcome the NHMRC's proposal to undertake further research and urged high participant rates than in the studies to date.

2.73 Mr Papadopolous also contrasted the context and the approach of the NHMRC in its 2010 review of wind turbines relative to its 2015 review.

What changed from 2010 to 2015? A large number of papers have been since written on the issue of low frequency noise, wind turbines and associated human impacts, with no shortage of complaints against the wind industry in the media. Likewise authorities, such as those of New South Wales and Victoria published new stricter wind farm guidelines, effectively banning wind turbine installations within 2km of homes (in spite of the 2010 Rapid Review recommendations).

In 2010, the majority of opinions, published literature etc, was in favour of the wind industry. In 2015, we find ourselves in a vastly different environment. The 2011 Senate Inquiry and subsequent Inquiries, updated government wind farm guidelines in NSW, SA and Victoria (all challenging past assumptions over wind turbines), no shortage of public complaints and media reports against wind turbines, and published papers discussing the role of low frequency noise, qualitative aspects of wind turbine noise, suggestions of non-audible mechanisms of harm etc.

The methodology of the 2010 and 2015 statements is very different. Had the NHMRC chosen the 2010 methodology for its 2015 statement, more likely than not, it would have been forced to produce a statement critical of the wind industry. It leaves one wondering whether the NHMRC has taken a stance that minimises the potential damage to the prospects for the wind industry, and one which allows the wind industry to proliferate meanwhile, whilst research is being recommended at close proximity to wind turbines – a distance effectively considered problematic by many state government planning departments.⁸³

2.74 Interestingly, some local councils argued the need for greater leadership from the NHMRC in terms of suggested buffer distances. The Pyrenees Shire Council stated in its submission:

There is a need for the NHMRC to provide leadership and direction at a national level to state planning authorities through undertaking or peer reviewing targeted medical studies based on Australian conditions and the possible health effects from wind farms on human health. This should

82 Dr Christopher Hanning, *Submission 55*, p. 3.

83 Mr George Papadopolous, *Submission 28*, p. 2.

include recommendations to state planning authorities on minimum buffer distances.⁸⁴

Criticism of the 2015 NHMRC Review

2.75 The committee draws attention to strong criticism of the proposed NHMRC review from submitters. Two in particular—Dr Michael Crawford and the Parkesbourne/Mummel Landscape Guardians (PMLG)—are forensic in their critique of past NHMRC reviews and cynical of the prospect that the 2015 review will be better conducted. Dr Crawford criticised the systematic review on the following grounds:

Its headline statements are inconsistent with the reasoned argument in the body of the review and are slanted to exonerate wind farms in a way not supported by the actual analysis in the review.

It presents its conclusions using vague words such as "generally" (but not "always") or "unlikely" (but not "never") without offering even indicative quantification of those terms, knowing they will be misinterpreted and misrepresented by wind farm proponents.

Despite surely being aware that wind turbines have been getting much more powerful and continue to do so, and their noise emissions consequently continue to increase, there is no reference to turbine power related to distance of effect or even the need to be conscious of it, as though the NHMRC thinks all wind turbines are the same.

It has adopted a methodology inappropriate for the task, given what it understands and actually acknowledges about both extant research and the peculiar propagation characteristics of wind turbine noise.

It is inconsistent in its rigour, applying restrictive conditions on the consideration of evidence that might support a conclusion of harm from wind farms, while not requiring the same rigour when it proposes arbitrarily restricted distances at which sleep deprivation and consequent harm to health may be caused by wind farm noise.

It states "the body of direct evidence was found to be small and of poor quality" (after applying its inappropriate methodology). In that case, within that framework, the unavoidable conclusion should be "there is little evidence whether wind farms do or do not have an adverse health effect" and in fact a paragraph buried in the main report says as much. However, instead of honestly reporting that assessment in its headline statements, it uses words that convey the impression there is little adverse effect when its own analysis has demonstrated no basis for doing so.

While recognising that there can be harm to mental as well as physical health, it manages to convey the impression that if the former occurs it is due to some defect on the part of the victim and thus unrelated to the wind farm that has actually been the stressor source.

84 Pyrenees Shire Council, *Submission 47*, p. [4].

While recognising the existence of potential harmful mechanisms (audible sound, ILFN, blade glint and flicker, electromagnetic radiation) it proceeds as though their impact on people is disconnected. Even the United States Department of Justice (US DOJ) evaluating the legality of Central Intelligence Agency (CIA) interrogation techniques understood that when you apply multiple stressors they can have compounding effects and that sleep deprivation in particular has multiple interactions with other stressors, including through increasing pain sensitivity. One has to wonder why, if this compounding effect was obvious to the US DOJ in 2005, it appears to have escaped the NHMRC in 2015.⁸⁵

2.76 PMLG argued that the 2015 NHMRC review needed to consider the following issues:

Will the commissioned research do any of the following?

- Consider the adequacy or inadequacy of the noise guidelines for wind turbines in use (or proposed) in Australia.
- Consider the research for the US Department of Energy, conducted in the 1980s and 1990s by NASA and by SERI.
- Consider the research of Professor Alec Salt and his colleagues on wind turbine infrasound and the potential for adverse health effects.
- Incorporate the methodology of Stephen Cooper (sic), as used in Mr Cooper's recent study of the Cape Bridgewater Wind Farm.
- Ensure that wind farm operators are compelled to turn turbines on and off, as necessary for the conduct of the research.
- Measure wind turbine infrasound out to 10 kilometres from turbines, in connection with the study of adverse health effects within that distance.

The PMLG concluded:

Unless the research does all of the above, its value will be correspondingly reduced, and yet more time and resources will have been wasted. Yet again, wind farm neighbours will have been let down.⁸⁶

2.77 Some submitters drew the committee's attention to the NHMRC's apparent backflip on the issue of wind turbines and human health. Dr Gary Hopkins questioned the NHMRC's motives for the latest call for targeted research:

It is also interesting to note the change in the NHMRC. The NHMRC are generally very conservative. In 2010, after their rapid review, they issued a statement saying there was no association. After their more formal review in 2014, they said there was poor evidence. Then in 2015 they start to ask for targeted research. They are changing their thoughts, and the question is:

85 Dr Michael Crawford, *Submission 316d*, pp 3–4. *Defects in 2015 NHMRC Review into Wind Farms and Human Health*, 23 March 2015.

86 Parkesbourne/Mummel Landscape Guardians, *Submission 119*, p. 88.

why? Why did AGL see the need to visit GPs? Why are the NHMRC changing their attitude?⁸⁷

2.78 Ms Rovensky put the following view:

With the NHMRC, I personally cannot see any difference in their recent review from the one they did previously. They have still wiped out a lot of information they should have included. But, in their call for research, they have said that the broader social circumstances should be researched. We all know what they mean by that. Anything to do with that should come later, once the research has been done to establish whether there are—and I believe there are—effects from industrial wind turbines on people's health. Why waste money on doing something that is irrelevant or could be irrelevant?⁸⁸

Acousticians' views and the need for properly funded research

2.79 The Association of Australian Acoustical Consultants (AAAC) is a body of acoustical consultants composed of 33 member companies. Its self-description is as 'a not for profit peak body representing professionals who are involved in delivering acoustic solutions to a wide range of clients and the community'.⁸⁹ In evidence to the committee, the AAAC set out its position in relation to wind farm infrasound:

Infrasound...is generated by both natural sources...and mechanical sources ...Investigations have found that infrasound levels around wind farms are no higher than levels measured at other locations where people live, work and sleep. Those investigations conclude that infrasound levels adjacent to wind farms are below the threshold of perception and below currently accepted limits set for infrasound. The AAAC encourages members to continue to contribute to new research and review research in the technical literature.

Generally our members are not experts in health and therefore primarily rely on the view of government bodies, such as the NHMRC, and conduct our assessments in accordance with state guidelines.⁹⁰

2.80 The committee does note that some of the AAAC's members have been extensively engaged by the wind farm industry. In response to a question on notice, the AAAC noted that one of its members had performed consultancy work at no fewer than 61 wind farms, another member had been engaged at 51 wind farms and another

87 Dr Gary Hopkins, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 62.

88 Ms Jacqueline Rovensky, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 64.

89 The Association of Australian Acoustical Consultants, <http://www.aaac.org.au/au/aaac/default.aspx> (accessed 3 July 2015).

90 Mr Chris Turnbull, Director, Sonus; and Chair, Wind Farm Subcommittee of the ACCC, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 1.

at 50 sites. The wind industry is clearly a lucrative area of employment for some of the AAAC's members.⁹¹

2.81 The committee has had the opportunity during this inquiry to take evidence from a range of Australian and international acousticians. As mentioned earlier, there is a considerable diversity of professional views as to the nature of sound from turbines and the potential for this sound to impact on human health. There was, however, a general consensus that more research is needed to test causal relationships between turbine sounds and ill-health.

2.82 Acoustician Dr Bruce Rapley explained the type of field research that is now needed:

Observational studies are urgently needed to study the low-frequency and infrasound emissions. It is of those people affected inside their homes—that is the priority. I have to stress this: laboratory studies cannot replicate the situation experienced by those people in close proximity to large wind turbines, and they cannot provide the study data we need. What we have to do, now that we are in a crisis situation in terms of public health and regulation, is do the first studies on sensitised individuals. We should not be looking at large cross-sectional population studies of non-exposed people, laboratory studies. No longer are a few A-weighted sound levels and wind speeds of any use in correlating environmental conditions to subjects' experiences. We need to look at sensitised individuals first, because that is where the most rich data can be obtained. Research that relates to full-spectrum and also narrow-band analysis with an objective physiological measure in the people that you are investigating, who are suffering the worst impacts in their homes and workplaces, is the only strategy that can produce the results that we urgently need. We cannot afford as a country to waste time on other issues. We must address those who are severely impacted in their homes, use the full-spectrum narrow-band analysis, and that needs to be combined not just with diaries of their experience but with real physiological measures. I have the technology to be able to do that; the technology has been invented. We can do this, but it has never ever been done. The technology is now available. Time is of the essence.⁹²

2.83 University of Sydney neuroscientist, Associate Professor Simon Carlile made two observations relating to the need for future research:

First, it is critical that the research be aimed at examining possible physiological mechanisms on the influences of infrasonic energy on the human nervous system. Research that examines this only on a population level misses a very important fact of human biology—that is, there are significant individual differences in every aspect of human function that we have studied scientifically to date.

91 See: AAAC, *Response to question on notice 1*, dated 1 June 2015. Available on the committee's website.

92 Dr Bruce Rapley, *Proof Committee Hansard*, Canberra, 19 June 2015, p. 8.

For example, we know the susceptibility of people to motion sickness such as sea sickness varies significantly across the population. If there are, say, 1,000 people on a ferry on Sydney Harbour, only one of those might be seasick. Viewed as a population, you might conclude then that the evidence that a Sydney Harbour ferry produces sea sickness is highly insignificant. But on an individual basis, it would be trivial to demonstrate that one person on that ferry had a very different physiological reaction than everyone else on the ferry...

In his recent scientific review published in the magazine of the Acoustical Society of America, Professor Alec Salt identifies several potential biological mechanisms by which infrasonic energy could stimulate the nervous system. Professor Salt has been studying the neurobiology of the inner ear for nearly four decades and has published countless scientific papers on the subject. I will summarise his review simply by saying that there is a clear *prima facie* case that infrasonic energy can influence the neural receptors in both the auditory system and the vestibular system—the system responsible for our sense of balance. I am happy to talk through the biology if there is interest in the committee, but the key message is that infrasonic energy does affect sensory cells of the nervous system and that this would provide the basis for any possible influence of infrasonic energy on the functions of the nervous system.⁹³

2.84 Psychoacoustician Dr Robert Thorne told the committee that the NHMRC's work has to date been inadequate and there is a need for properly funded research into the nature and cause of adverse health effects. He took aim at the methodology of the NHMRC's studies:

When they investigated and read 4,000 documents and, I think, in the end they came up with 13 that met their criteria, something is wrong. Earlier—I think it was in 2011–13—Professor Anderson of the NHMRC came and made the very valid point that anecdotal information—that is, residents' submissions and their viewpoints—was valuable in identifying issues, not necessarily cause and effect, but identifying the start point. But, whenever we look at any research, we go for observations, then trying to get an idea of what is happening, then work the hypotheses and then studies. It was obvious—and I have got quite a lot of research myself in the past—that there are very few adverse health effects studies undertaken, primarily because there has been no funding for adverse health effects studies. You cannot get a study if you do not pay for it, and you cannot get an impartial university-based study unless you pay a lot for it. That is my view.⁹⁴

2.85 Dr Thorne told the committee that the type of research that is needed—with 1000 participants—would cost \$1.2 million. He criticised the \$500 000 allocated to the NHMRC study noting that this sum 'would barely scratch the surface'.⁹⁵

93 Associate Professor Simon Carlisle, *Proof Committee Hansard*, 29 June 2015, Sydney, p. 69.

94 Dr Robert Thorne, *Proof Committee Hansard*, Cairns, 18 May 2015, p. 42.

95 Dr Robert Thorne, *Proof Committee Hansard*, Cairns, 18 May 2015, p. 47.

2.86 Dr Renzo Tonin, principal of AAAC member firm Renzo Tonin & Associates, noted a forthcoming NHMRC research project that will measure the effects of infrasound on a group of 100 participants in both their normal environments and in a laboratory environment. He added:

In other words, we are going to have control groups and we are going to have exposed groups, and they will not know which they are. They will be exposed to infrasound in their home and also in the laboratory. We will measure using electroencephalographs and all your fancy medical equipment to find out exactly what is going on.⁹⁶

2.87 Dr Tonin strongly supported this study and its methodology. He suggested that Senators lend their support to fund the NHMRC project.⁹⁷ Other members of the AAAC also supported the research. Mr Chris Turnbull told the committee:

I understand that that is what the NHMRC is looking to do. I agree that 'multidisciplinary' is important, because effectively we know what the noise from wind turbines is. We know what the infrasound is. That has been measured a number of times. We agree that the impact of that infrasound should be played back to others, a larger group in different situations, so that is understood, and then the potential health effects of that should be studied as well. That is, as you suggest, a multidisciplinary group, so I think we would support that.⁹⁸

2.88 However, other submitters argued that the NHMRC is not the right body to conduct future research. Mr Peter Mitchell, for example, told the committee that the Council's lack of technical capacity 'is absolutely shattering'.⁹⁹ Dr Thorne observed:

We know quite a few of our colleagues and any one of them would die to do a proper research study. Research is, by and large, researchers: they just love going for whatever the topic happens to be. So the umbrella organisation that it sits under is not so important as the actual quality of the people you get; and their expertise and their ability to talk with each other. You have to have people on that committee who have different points of view, but held in check by a strong chairperson who moderates and brings the best of the study. That, in my view, that did not happen with the NHMRC.¹⁰⁰

96 Dr Renzo Tonin, representative of the Wind Farm Subcommittee of the ACCC, *Proof Committee Hansard*, Adelaide, 10 June 2015, pp 5–6.

97 Dr Renzo Tonin, representative of the Wind Farm Subcommittee of the ACCC, *Proof Committee Hansard*, Adelaide 10 June 2015, p. 11.

98 Mr Chris Turnbull, Director, Sonus, and Chair, Wind Farm Subcommittee of the ACCC, *Proof Committee Hansard*, Adelaide, 10 June 2015, p. 20.

99 Mr Peter Mitchell, *Proof Committee Hansard*, Melbourne, 9 June 2015, pp 16–17.

100 Dr Robert Thorne, *Proof Committee Hansard*, Cairns, 18 May 2015, p. 46.

Laboratory or field testing

2.89 The committee has heard that replicating infrasound from a turbine in a laboratory setting may not be possible. In criticising the methodology for the 2015 NHMRC review, Dr Michael Crawford wrote in his submission:

The problem starts with the requirement to include wind farm emissions, rather than say comparable emissions in a laboratory setting. Consider noise emissions. For multiple reasons actually discussed in the NHMRC review, predictions of average noise levels and characteristics at individual dwellings are poor. In addition, because wind turbines operate intermittently and essentially randomly, and noise propagation varies with factors such as wind direction and other atmospheric conditions, available proxies for noise emissions are even poorer as an estimate of the noise impact at the time other data is collected for a study. The available proxies are either distance or computer models, both of which are seriously deficient. This is a problem recognised in the Information Paper in the section dealing with further research.

The only way to get good quality noise emission data for research is through actual full spectrum noise monitoring where each participant is located. However, for reasonably large sample sizes that has been prohibitively expensive for most researchers due to the capital and labour intensity of noise monitoring, in home and outside it.¹⁰¹

Synchronicity, hot spots and the middle ear

2.90 The committee has sought evidence during this inquiry on matters of possible acoustical concern in terms of the impact of wind turbines on human health. Notably, the committee heard from Dr Andrew Bell, a Visiting Fellow at the John Curtin School of Medical Research at the Australian National University. His research and theories in relation to how turbine operations may affect the human ear are of genuine interest to the committee.

2.91 Dr Bell's research draws attention to what he calls a 'possible synchronisation phenomenon that happens between each of the wind turbines'. When this occurs, he claims the sound pressure levels 'will be higher than usually expected and they will fluctuate' and 'there will be large low-pressure variations which could affect the ear'.¹⁰²

2.92 Dr Bell published a technical note last year in which he explains:

...wind turbine infrasound can be narrow band, have multiple sources, and occur intermittently as the sources drift in (and out of) phase...[T]he proposal here is that the intermittency of the in-phase and out-of-phase conditions might underlie wind turbine annoyance. Whenever the blades become synchronised (perhaps for many tens of seconds) the intensity of

101 Dr Michael Crawford, *Submission 316d*, p. 7. *Defects in 2015 NHMRC Review into Wind Farms and Human Health*, 23 March 2015

102 Dr Andrew Bell, *Proof Committee Hansard*, Canberra, 19 May 2015, p. 17.

the fundamental and some of its harmonics could, at nodes, be at least 6 dB larger, but the levels will revert to baseline when the sources fall out of synchrony.

A lingering puzzle is why some people complain of effects from wind farms which persist for hours, not effects which come and go. Such long-lasting symptoms such as headaches and pressure in the ears might be the outcome of pressure effects within the middle ear, a possibility only more research can decide.

...the evaluations made here provide indications that intermittent coherence could be the physical basis for the annoyance of wind farm noise. One key factor is the precise frequency setting of the wind turbine control circuit, and the other is the universal tendency for coupled oscillators to synchronise.¹⁰³

2.93 The committee also received evidence from Emeritus Professor Colin Hansen of the University of Adelaide relating to the intermittency of in-phase and out-of-phase conditions. He noted that when synchronised, turbines can create 'hot spots' which are intermittent, depending on the direction of the wind. They fade where there is very low frequency, in-phase noise.¹⁰⁴ Professor Hansen told the committee that these hot spots are able to be recorded and replayed.

2.94 The committee asked Dr Bell for his comment on the NHMRC's February 2015 discussion paper. He responded by criticising the monitoring equipment that has been used to measure sound and emphasised the importance of understanding the human ear:

I think it [the NHMRC paper] was too simplistic. It failed to recognise that the human ear is the final arbiter of whether something annoys a person or not, and that the human ear is more sensitive than any of the monitoring equipment that is presently used. Given that there is the choice between saying the person did not or did hear it, I would say you need to believe that a person was troubled by that sound. That was the thing that immediately struck me. I was not planning to get into wind turbine work. I was applying for a grant to the NHMRC, and I saw on their website that they had this preliminary review and wanted public statements. When I read what was there, it did seem to be excessively simplistic and favouring the standard monitoring over the position of residents living nearby.¹⁰⁵

...

My perception is that, if you look at the history of the field, there has been a whole revolution in our understanding of frequency range, of decibels, about what effects there are on the ear. Only in 1979 did we realise that the

103 Dr Andrew Bell, 'Constructive interference of tonal infrasound from synchronised wind farm turbines: Evidence and implications', *Acoustics Australia*, Vol. 42, No. 3, December 2014, p. 217.

104 Professor Andrew Hansen, *Proof Committee Hansard*, 10 June 2015

105 Dr Andrew Bell, *Proof Committee Hansard*, 19 May 2015, p. 20.

cochlea is actually an active detector: it emits sound. If you put a microphone in the ear, you can detect faint pure tones coming out of most people's ears. This is very similar to a tinnitus phenomenon. It does actually trouble some people. But normally the cochlea is an active detector and we still do not understand what that mechanism is...

I am saying, on top of a basic pressure level measurement, there is a whole sophisticated, dynamic system involved which we do not understand. So I think we need to be open to the idea that our monitoring system is not as sophisticated as the human ear, and we need to do measurements to try and match even more closely between the ear and what the measurements are telling us.¹⁰⁶

2.95 Dr Bell has formulated a theory of how middle ear muscles function to regulate sound input to the cochlea. He explained that these muscles:

...act as "gain control" devices to control the amount of sound input to the impressively sensitive cochlea, like a sound engineer controls the setting of sliders to optimise sound recording in a studio. The cochlea can sense 20 micropascals of pressure (0 dB), but still needs to be able to sense sounds a million million times louder (120 dB). According to my understanding of how middle ear muscles work, the muscles automatically control the sensitivity of the cochlea by acting on its fluid contents so as to increase or decrease the hydraulic pressure. Such a control circuit could well be affected by large infrasonic pressure pulses (5 pascals from a wind turbine, which is 250,000 times greater than the 20 micropascals which can be heard in the audible band), and this could produce disturbing sensations.¹⁰⁷

The vestibular mechanism

2.96 Apart from the muscles in the middle ear, ill-effects from turbines may be explained by the way that turbines affect the inner ear and in particular, the vestibular mechanism. This mechanism is the sensory system that provides a sense of balance and spatial orientation. Professor McMurtry told the committee:

...annoyance in the context of wind turbines translates to 'stress, psychological distress, difficulty initiating sleep and sleep disruption'—I believe those words, although from memory, are a direct quote—so it is a very serious business. The most common problems without question we find are sleep disturbance and stress. Those two are always there. Vestibular disturbance we are also finding. There is no question though when the vestibular gets perturbed, it can make you uneasy, make you feel unwell or nauseated, for example. It may be the mechanism. I am in no way discounting it and it is considered in my diagnostic criteria.¹⁰⁸

106 Dr Andrew Bell, *Proof Committee Hansard*, Canberra, 19 May 2015, p. 22. See also: Dr Andrew Bell, *Answer to question on notice no. 5*, p. 2, (received 14 June 2015)

107 Dr Andrew Bell, *Answer to question on notice, no. 13*, p. 6, (received 14 June 2015)

108 Dr Robert McMurtry, *Proof Committee Hansard*, Sydney, 29 June 2015, p. 8.

2.97 The committee also received evidence relating to the vestibular mechanism from Dr Swinbanks. He wrote in his submission:

The conventional method of assessing whether low-frequency and infrasound is perceptible has usually involved visually comparing power spectral levels or 3rd octave levels with the threshold of hearing. This approximate process, however, is unlikely to be accurate in the low-frequency wind-turbine context, because it assesses only the mean level of sound, and fails to take account either the character of the sound or the relationship between adjacent frequency bands...

[R]esearchers have now proposed two further processes which may account for increased sensitivity to very low frequency infrasound. Conventional hearing perception is considered to take place via response of the inner hair cells of the cochlea (the sensing structure of the inner ear), but it has been shown that the cochlea outer hair cells respond with greater sensitivity at very low frequency, and induce additional neurological signals. Hitherto, these outer hair cells have been considered to perform only the task of controlling the overall sensitivity of the hearing process, but it is possible that they can also contribute directly to very low frequency perception.

A further mechanism has been proposed, whereby sound pressures acting through the lymphatic fluid directly on the otolith components of the vestibular (balance) organs have been calculated to exert comparable forces to those induced by motion and acceleration. Any non-uniformity in the compliance of the structures supporting these otolith sensors may then result in a response which simulates that of physical motion. Indeed, it has been argued that the correlation between persons who suffer from motion sickness, and those who report adverse effects from wind turbines is sufficient to be more than a result of mere chance.¹⁰⁹

The committee's view on further research and the body to conduct it

2.98 The committee is concerned that for many key stakeholders, including public health associations and wind farm companies, the 2010 and 2014 NHMRC papers are the definitive findings on the issue of wind turbines and public health. This inquiry has gathered evidence from various sources that call into question the extent to which these reviews can be relied upon. The committee draws attention to:

- the NHMRC's commitment to conduct research in 2015, for some an admission of the inadequacy of its literature reviews; and
- the view of AAAC acousticians that there is a need for well-funded multi-disciplinary research, using control and exposed groups.

2.99 The committee believes there is an urgent need to put in place a central point of expert scientific advice on the risks of wind turbines to human health. As noted at the start of this chapter, the principal recommendation of the committee's interim report was to establish an independent scientific body to conduct multi-disciplinary, primary research into the possible impact of audible noise and infrasound from wind

109 Dr Malcolm Swinbanks, *Submission 189*, pp 20–21.

farms on human health. The committee confirms the federal government's commitment to establish an *Independent Expert Scientific Committee on Industrial Sound* (IESC) by 1 September 2015.

2.100 Chapter 6 of this report presents several further recommendations that will give substance to the operation of the IESC on Industrial Sound. It is crucial that the IESC's research and advice is sought by, and communicated to, federal and state health Ministers and policy-makers, as well as State Environmental Protection Authorities. It is also very important that wind farm development proposals and wind farm operations are subject to the IESC's scrutiny.

2.101 The committee considers that the level of funding provided by the NHMRC for long overdue research is manifestly inadequate to properly study this complex and poorly understood issue. While the NHMRC should still have a role in commissioning research into the impact of wind turbines on human health, the IESC must take the lead in these research efforts. Chapter 6 explains these proposed roles in more detail.