



COMMONWEALTH OF AUSTRALIA

# Proof Committee Hansard

## SENATE

ENVIRONMENT AND COMMUNICATIONS LEGISLATION  
COMMITTEE

**Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms)  
Bill 2012**

(Public)

WEDNESDAY, 14 NOVEMBER 2012

CANBERRA

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**SENATE**

**ENVIRONMENT AND COMMUNICATIONS LEGISLATION COMMITTEE**

**Wednesday, 14 November 2012**

**Members in attendance:** Senators Back, Birmingham, Cameron, Madigan, Xenophon.

**Terms of Reference for the Inquiry:**

To inquire into and report on:

Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012.

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**HANNING, Dr Christopher, Private capacity****SALT, Professor Alec Nicholas, Private capacity**

*Evidence was taken via teleconference—*

**Committee met at 09:00**

**CHAIR (Senator Cameron):** Welcome to the Senate Environment and Communications Legislation Committee inquiry into the Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012. The inquiry was referred by the Senate to the committee on 11 October 2012 for inquiry and report by 29 November 2012. Committee proceedings are protected by parliamentary privilege in Australia. I remind both senators and witnesses that parliamentary privilege does not go beyond the Australian parliament's jurisdiction.

It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee, and such action may be treated by the Senate as a contempt. It is also a contempt to give false or misleading evidence to a committee.

The committee prefers all evidence to be given in public but under the Senate's resolution, witnesses have the right to request to be heard in private session. It is important that witnesses given the committee notice if they intend to ask to give evidence in camera. If you are a witness today and you intend to request to give evidence in camera, please bring this to the attention of secretariat staff as soon as possible. If a witness objects to answering a question the witness should state the ground upon which the objection is taken, and the committee will determine whether it will insist on an answer, having regard to the ground on which it is claimed. If the committee determines to insist on an answer a witness may request that the answer be given in camera. Such a request may, of course, also be made at any other time.

This public hearing is being broadcast within Parliament House, and also live via the web. I ask that people in the hearing room ensure that their mobile phones, iPads and other electronic devices are switched to silent. I also ask witnesses to remain behind for a few minutes at the conclusion of their evidence in case the Hansard staff needs to clarify any terms or references.

I now welcome Dr Christopher Hanning and Professor Alex Salt via teleconference.

**Prof. Salt:** I am Professor of Otolaryngology at Washington University in St Louis and I am giving evidence about the low frequency sounds that turbines emit.

**Dr Hanning:** I am a retired consultant in sleep medicine from the University Hospitals of Leicester. I am appearing as a private individual to give evidence on the effects of wind turbine noise on sleep and health.

**CHAIR:** We are still having some small difficulty here, so I ask you to speak up as much as you possibly can, because it is a bit difficult to hear you. Dr Hanning has lodged submission No. 95 with the committee and Professor Salt has lodged submission No. 18. Do you wish to make any changes or amendments to your submissions?

**Dr Hanning:** No.

**Prof. Salt:** No.

**CHAIR:** I now invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions.

**Dr Hanning:** I think my statement clearly sets out that industrial wind turbines disturb sleep and health at distances and external noise levels that are currently permitted in most jurisdictions, including the United Kingdom and Australia. The setback distances need to be increased. I would also add that the information presented in my paper was based upon studies on relatively small wind turbines of two- to 2.5-megawatt size. This means that for larger turbines going up to 4.5- to six-megawatts it is likely that setback distances will have to be proportionately greater.

**Prof. Salt:** It has been widely assumed that you cannot hear the low-frequency sound from wind turbines and that if you cannot hear the low-frequency sound from wind turbines then it cannot affect you. Based on the work in both our lab and others we know this is incorrect. The inner ear does respond to low-frequency sounds at levels well below those that are heard. This is not just a hypothesis; it is based on years of work by some of the best-known physiologists in the field. They have shown that you hear through sensory cells of the ear called inner hair cells, which have the characteristic of being 'velocity-sensitive', which is another way of saying they are very insensitive to low frequencies. That is why you do not hear low frequencies and infrasound, because the inner hair cells of your ear do not detect it. But there is another type of sensory cell in the ear called the outer hair cell. There are three times more of them. These have been characterised as so-called 'displacement-sensitive'. This has

been known for over 50 years from the work of von Békésy. The outer hair cells do respond well to low frequencies and infrasound, and if you measure the ear's responses to an infrasound stimulus, they can be four- to five-times larger than to any sounds you normally hear. So, the ear is extremely sensitive and responds very strongly to infrasound stimuli. The big question at the moment is whether these responses stay confined just to the ear and do not have any effect on you at all, but I think this is very, very unlikely. There are multiple ways that these responses can get from the ear to the brain and have effects on you. We know they can cause a perceived amplitude modulation of sounds, which people find annoying. We know there are pathways from these cells, alerting sensors in your brainstem that could wake you up from sleep. We know that low-frequency sounds could cause inner ear fluid disturbances that could give symptoms of vertigo and nausea. There is scientific support for each of these ideas but, of course, we need more work in this area. My conclusion, based on 35 years of experience in auditory physiology, is that it is very probable that the low-frequency sound from wind farms is having effects on people at levels that cannot even be heard.

**CHAIR:** Thank you.

**Senator MADIGAN:** Good morning, Dr Hanning and Professor Salt. Dr Hanning, I believe you support the introduction of this legislation. As such, can I ask you the basic question: is the sound from wind turbines a problem?

**Dr Hanning:** Yes. There is no doubt that the sound produced by industrial wind turbines is a problem at distances of at least 1½ kilometres and probably more.

**Senator MADIGAN:** Can you explain how your research findings show the need for this legislation?

**Dr Hanning:** There are a number of reasons for my assertions. One is the epidemiological evidence based upon anecdotal reports and other collections of symptoms from people. Then there are early studies and, more recently, specific studies, and I draw your attention to the paper by Daniel Shepherd, from New Zealand, where he showed clear health effects at up to two kilometres. I also draw your attention to another recently published paper, again outlined in my submission, by Dr Nissenbaum, me and Dr Aramini, looking at the effects of wind turbine noise at two sites, Mars Hill and Vinalhaven, in Maine, in the United States—again, clearly showing substantial effects upon sleep and health at distances of up to at least 1.4 kilometres, if not further.

**Senator MADIGAN:** Thank you, Dr Hanning. Professor Salt, I will simply ask you the same questions I have put to Dr Hanning. Do you believe that sound from wind turbines is a problem?

**Prof. Salt:** I do believe that the sound from wind turbines is a problem. I also think that the current method of using A-weighted sounds to characterise wind turbine noise is as big a problem, because that is missing the low-frequency content that these machines generate. I agree that the legislation, at the moment, is not considering different measurements, but at some point it needs to be considered that measuring infrasound levels from these machines could be extremely important to understanding how they affect people.

**Senator MADIGAN:** Can you explain, Professor Salt, how your research and your research findings show the need for this legislation?

**Prof. Salt:** We know that this type of sound is going to be more annoying and disturb people at lower levels than other types of industrial sounds such as aircraft and car noise. In this respect, the legislation for wind turbine noise must be very rigorous and strict and keep these noise levels low, because the measurements that it has been based on are only looking at part of the noise. They are only looking at the sound you can hear. Because of that, these devices need to be very carefully monitored to make sure that they do not exceed these relatively low levels, and that is to ensure that the low-frequency sounds do not get to even more annoying levels.

**Senator MADIGAN:** Thank you.

**Senator XENOPHON:** Good morning, gentlemen. I want to ask you some questions in relation to the whole issue of this bill. This bill talks about a level above background noise or background sounds of 10 decibels. The bill itself does not deal with low-frequency noise. Do you consider that as something that ought to be measured separately or be considered in the context of the consideration of this bill?

**Dr Hanning:** I would not have an opinion on the low-frequency sound. It is outside my area of expertise. However, I think it is very clear that you cannot treat the noise generated by industrial wind turbines in the same way as you would consider other sources of noise—for example, traffic noise or aircraft noise. It is quite clearly different. It is more annoying and seems to produce effects at a far greater distance than those other noises. It is also perfectly clear that the noise is audible well below the background noise. So setting levels which are above the background noise pretty much guarantees that people are going to be disturbed.

**Senator XENOPHON:** Professor Salt, do you have a view? The bill at the moment is just looking at 10 dBA above background noise. Is that adequate at this stage or not?

**Prof. Salt:** Yes. I agree that 10 dB above background noise level is what you would regard as stringent criteria. But, as I said before, because of the nature of the wind turbine noise this seems to be an appropriate way to deal with it at the moment until the engineers and acousticians come up with a standard by which turbines can be measured across the lower frequency range. So at the moment it is an appropriate way to deal with the problem.

**Senator XENOPHON:** I want to put some matters to you that have been put by those who have a view that there is a wind turbine syndrome that is psychological, that it does not have a physiological basis. I know that Professor Chapman in his submission—and he will have an opportunity to give evidence later—asserts that complaints follow publicity about 'wind turbine syndrome', that an 'unbelievable number of diseases and symptoms are being attributed to wind turbines' and basically that the reviews and evidence do not point to any issue. I know that on our national broadcaster Professor Chapman made reference to there being no peer reviewed studies about wind turbine noise. Could you deal with those issues? It is put to me on a regular basis that this is just a psychological syndrome, that there are lots of wind turbines and there is no issue in respect of that other than it being a psychological phenomenon.

**Dr Hanning:** Professor Chapman is entirely incorrect. There is a considerable amount of peer reviewed evidence showing convincingly that industrial wind turbines do disturb people's sleep and people's health, and the causation—that it is the wind turbines that cause the symptoms—in my view is entirely satisfied. His assertions that it is purely psychological I think do not stand up. They are simply assertions. There is no evidence to support them whatsoever.

As regards wind turbine syndrome, this was suggested by a US physician, Dr Pierpont. She suggested that there was a specific syndrome of symptoms associated with wind turbine noise. I think she makes a convincing case. Whether there is an actual syndrome remains to be shown. This is one reason why in my work we have concentrated on the effects on sleep, as being easily measured and easily understood. I think when one looks at sleep it is perfectly clear that industrial wind turbines do disturb people's sleep at distances permitted under most regulations.

**Senator XENOPHON:** Could you refer to some of that peer reviewed evidence? That seems to be a key issue—the assertion in some quarters that there is no peer reviewed evidence in relation to wind turbine noise affecting sleep, for instance. Professor Salt, I think your paper has been referred to. Dr Hanning, you wrote a paper with Michael Nissenbaum and Jeffrey Aramini. Were they both peer reviewed?

**Dr Hanning:** Yes. The Nissenbaum paper has been published very recently in *Noise and Health*, which is a peer reviewed journal. The paper by Dr Daniel Shepherd and his colleagues was also published in this past year in *Noise and Health*, and that too was peer reviewed. There are others. They are all set out in my paper.

**Senator XENOPHON:** I just want to ask a question of both of you. In your opinion, why does it appear that the sleep of some people living close to wind farms is affected while for others it does not appear to be? Are there any steps a resident can take to reduce the impact of the noise—for instance, closing or opening windows and wearing earplugs? Are they factors that are relevant in dealing with it? I suppose, on the first question, it seems to me that some people seem to be affected whereas others do not seem to be affected, from the evidence out there—it is not a universal problem.

**Prof. Salt:** Let me take that one: the fact that some people are affected. In my view, this is something analogous to motion sickness, where some people are very affected by motion sickness and others are completely unaffected. It is just part of the way the inner ear and other senses are linked in the body. So, to me, this is not unreasonable at all.

Then, on how people can protect themselves, the biggest problem from our study is that we have shown that, if you deliver just low-frequency sound to the ear, the ear gives these large responses and that, as higher frequency sounds are mixed in, the response of the ear attenuates. It is like the ear has an iris like the eye. When you have just low-frequency sounds there, it is responding most strongly to them. The reason that is important is that people's houses shield them from the sound you can hear, but they do not shield them from the infrasound. The infrasound inside a house can be the same as or even higher than it is outside. So my view of the problem is that, in sleeping with your head on a pillow or in a quiet bedroom, you are just getting exposed to the infrasound and you are not being exposed to the other sounds which could suppress the ear's response.

We are working on what characteristics of masking noise are necessary to reduce the ear's response to infrasound. It may be that masking noises could be used. The problem with earplugs like the soft foam ones is that

they do not attenuate infrasound. The infrasound just gets through. In order to stop the infrasound getting to your ears, you need a solid plug and jelly around it so that it is an airtight seal in the air canal, and most people will not find that comfortable for sleep. So the point is that infrasound is very difficult to stop from getting to the ear. But there could be ways that this could be dealt with. The key thing is that, essentially, there has to be acceptance that infrasound is part of the problem, and then you can work to deal with it.

**Dr Hanning:** May I comment?

**CHAIR:** Yes, Dr Hanning.

**Dr Hanning:** Thank you. Again, it is well established that different people have different susceptibility to being woken by different noises. The submission I made sets out work done in the United States that shows measurements that can be made to distinguish those people who are disturbed more easily than others. That explains why not everybody seems to be susceptible to this. But a significant proportion of the population is, probably at least 15 per cent.

**Senator XENOPHON:** Are there some parts of the population affected? Could it be by age, by health conditions or by any other factors? In other words, is it better or worse the older you get, for instance, in terms of susceptibility?

**Dr Hanning:** Some people inherit, at least partially, their susceptibility to waking up, and some people are more likely than others. As we age, our sleep becomes more fragmented and we tend to wake more easily, but our hearing changes as well, and we tend to lose our high-frequency hearing, which again may make us more susceptible. I will stop there.

**Senator XENOPHON:** That is fine. I just want to finish up, from my end, on this. The second part of the bill requires that wind farm developers or proponents need to publish on the internet information about noise, wind speed and direction, weather conditions and power output. Can you comment on that part of the bill, and to what extent is the research that both of you have done made more difficult by not being able to access that sort of information?

**Dr Hanning:** Yes, I think it would be very helpful if that were done. Certainly, on the research that I have seen and what we have done, the inability to get instantaneous power outputs and noise levels from the turbines does make it more difficult.

**Prof. Salt:** I agree. I think that the monitoring of turbine noise and the ability to correlate that with people's symptoms over time is really the only way you are going to have confirmation of the effects on people for a good, solid study. I think this type of measurement is really important.

**Senator XENOPHON:** Thank you.

**Senator BACK:** Dr Hanning, just to give us an understanding, could you explain whether or not background noise masks wind turbine noise and, if it does, the mechanism for doing so?

**Dr Hanning:** The answer is yes. Background noise does partially mask wind turbine noise. If you think of an orchestra, you can pick specific noises out of an orchestra generally. You can pick out a piccolo even amongst the other noises because it is a higher frequency. You can pick out the bass drum, even though the noise generated may be less than the orchestra in total. Again, it depends on the sort of noise, but most noise is generated either by traffic or by wind in the trees or wind generated noise. There is experimental evidence to show that wind turbine noise is audible around 10 to 15 decibels below background.

**Senator BACK:** That is the evidence you quote, I think—I am citing now your submission—at point 2.5.4, the work of Hayes. Am I correct then in—

**Dr Hanning:** Hayes is a UK acoustician, and that was his sworn evidence before an inquiry. There is also other work by Bolay where he has looked at it in an experimental setting and pretty much confirmed that. In the evidence from the bigger studies like that by van den Berg and Pedersen, again, they also state that background noise does not mask wind turbine noise in the way that is expected.

**Senator BACK:** The amendment by Senators Madigan and Xenophon legislates 10 decibels above background noise level. Is that, in your view, the appropriate level that should be sought in this amendment?

**Dr Hanning:** It depends very much on what background noise levels are likely to be expected. If it is near a major road, it may be that a 10-decibel limit is too high, and the same will be true if it is a very quiet area, with background noise levels of 20 to 30 decibels. My feeling is that we should set absolute noise levels rather than setting it in relationship to background. I think Dr Thorne has recommended no more than 35 dBA or even less. However, I am not personally convinced that setting sound levels above background is appropriate.

**Senator BACK:** Can I just take you to the next point. I was most interested in your point 2.5.5. You said:

Sound with the impulsive characteristics of wind turbine noise is chosen for alarm systems because of its audibility below background noise as well as ... its ability to arouse a sleeper.

Could you explain to us what those characteristics are and give us some understanding of the background of just how that work was done to characterise them?

**Dr Hanning:** I am not sure how much I cited in there. There is quite a lot of work done on the ability of different alarm noises to awaken people, because clearly, if you have a fire alarm or something like that and you have to wake sleeping people, you want something that is going to wake them effectively and quickly. A noise that has a low-frequency element but, when the sound level is rising, rises sharply seems to be the sort of noise that best arouses people, and this is the same sound characteristic as a wind turbine.

**Senator BACK:** Would this help to explain why, anecdotally, information comes in that people wake in a panic often as a result of wind turbine noise? Would that, in your view, be a possible explanation for that characteristic?

**Dr Hanning:** It might be, yes.

**Senator BACK:** Have you had the opportunity to yourself experience these annoyance impacts that people report? Have you had the opportunity to perhaps participate in and be part of that process?

**Dr Hanning:** I live within 1.4 kilometres of four 2½-megawatt turbines. I hear them, but they do not seem to affect me. I seem to be one of these fortunate people who are not affected.

**Senator BACK:** This is no scientific experiment, but would you or people with whom you have communicated be comfortable to be able to predict whether turbines are on or off in a situation where you cannot observe them yourself, as a result of your reaction or otherwise to the sorts of sensations that are reported?

**Dr Hanning:** Could I personally do that? No, because I do not seem to be that susceptible. But I do know of plenty of people with whom I have communicated who can confidently predict whether the turbines are on or off, even if they cannot see them. Of course, it is not just whether they are on or off; it may be because the wind is in a different direction or the wind speed has dropped below their operating level.

**Senator BACK:** Thank you. Professor Salt, I wonder if I could ask you a couple of questions. I was most interested in your submission and the conclusion from your work:

... the inner ear is far more sensitive to low frequency sounds than has previously been recognized by the engineering and medical consultants to the wind turbine industry.

Could you explain to the committee the technology that you are able to use or that is able to be used to pick up airborne infrasound, whether this is new technology and your comment on its accuracy?

**Prof. Salt:** This is an engineering issue. There is very sophisticated instrumentation to pick up infrasound. It takes very specialised equipment. There are difficulties in picking up infrasound. You have to shield microphones from wind noise, so there are technical difficulties in measuring it. But this is not insurmountable, so there is no reason why it should not be measured and, for example, correlated with people's symptoms. There is no reason why that could not be done.

**Senator BACK:** We will receive evidence later this afternoon from a biomedical acoustic engineer whose area extends also into this world of infrasound. He makes the point that there are far higher internally self-generated natural infrasound levels in the body—the heart and other activities of the body. In fact, his area of expertise was in cochlear science and determination. He then makes the point that, if indeed there are higher internally self-generated natural infrasound levels, effectively those formed from external sources must necessarily be far less relevant and far less important and, therefore, calls into question the significance. I have read your work with inner and outer hair cell physiology. Can you comment on those observations. I am referring to those now of Professor Seligman, who will appear later today as a witness.

**Prof. Salt:** I disagree completely. The way sound is generated in the body and gets into the ear is completely different from the way airborne sounds get into the ear. The sounds from the body come either through bone conduction or through a hole between the cranium and the ear called cochlear aqueduct. The cochlear aqueduct opens right next to a round window membrane. Mechanically, signals that come through the cochlear aqueduct get shunted by that round window membrane so that they do not stimulate the basilar membrane of the ear. Internal sounds basically do not stimulate the hair cells of the ear, whereas when a sound is airborne it comes in through the stapes, and the stapes move. The round window is the opposite side to the basilar membrane, to the stapes, so those movements do cause big stimulation of the ear. The point is that the ear is designed to pick up airborne infrasound and is much more sensitive for that than it is for the internally body generated sounds.

**Senator BACK:** Your work basically contradicts what has been presented to us in terms of what I will call 'internally generated movement patterns'.

**Prof. Salt:** No, this is not my work. There is a whole science of literature of how low frequency sounds come in through the aqueduct and are shunted. This is well established science in our field. It is not my work. It is peer reviewed. There are many, many studies of low frequency sounds and how they enter the ear through the aqueduct.

**Senator BACK:** Is it your conclusion that these physiological mechanisms go to the actual cause, the background or the reason for wind turbine noise affecting health? Is that a reasonable summary?

**Prof. Salt:** Yes. To be honest, that is exactly how I got into this. My expertise is in how any low frequency sound affects the ear. We have years of work from working on that. I think we understand better than most exactly how the sounds get in, how the ears get stimulated, and we have more measurements than most people have of how the ear responds to these sounds. From my perspective, I can see the mechanisms by which people could be being disturbed by these sounds. So to me it makes total sense that the effects on people are novel and have not been discovered before. I think it is just an unfortunate occurrence that this is the first set of sounds that people have been exposed to which have a high low-frequency content and that to have this occur especially in their homes is to have a novel effect on them.

**Senator BACK:** In the short time left available, I wonder whether both of you would be good enough, perhaps starting with you, Dr Salt, to answer two questions. The first is: is it your opinion that the amendment which the committee is dealing with will, if passed, adequately protect the health of people living near wind turbines? To save time, I will ask my second question of each of you, and that is: do you believe further research needs to be done to establish this link between noise from industrial wind turbines and sleep disturbance, or do you believe the science is in? Could I ask each of you to respond, firstly, to the amendment and, secondly, to the research.

**Prof. Salt:** The amendment is a good solution until the problem is better studied and better understood. I think this 10 dB over background noise is an appropriate way at the moment, with the current technology and with our current knowledge of the problem. In answer to the second question: absolutely, research is the only way we will solve this problem. There is a lot about how the ear responds to low frequency sounds which has never been studied. The more we get into this, the more I realise how little has been studied. This is an unusual problem. Basically, we can only get down to this by research.

**Senator BACK:** Thank you, Dr Salt. Dr Hanning.

**Dr Hanning:** Yes, I would agree. In my view anything that increases the setback distances from the present levels is to be welcomed. Is more research necessary? Most certainly. The turbines are getting bigger and we need to be looking at that. We need to be looking as well at the mechanism. There is no doubt in my mind that people are harmed at the current distances. But we need to elucidate the mechanism and I agree entirely with what Professor Salt has said.

**CHAIR:** Professor Salt, some of the evidence given by both you and Dr Hanning has been qualified on a number of occasions with words like 'maybe'. So you are not really sure of some of the effects, are you?

**Dr Hanning:** Am I certain that wind turbines harm people at the distances allowed under current legislation? Yes, unequivocally.

**CHAIR:** That is not the question I asked you.

**Dr Hanning:** Do I have doubts about some of the mechanisms? Yes, of course I do. Science is rarely 100 per cent. Hence the call for further research.

**CHAIR:** I have a question for both of you. Is the nocebo effect a realistic option to explain some of the problems that have been raised?

**Dr Hanning:** Is it a nocebo effect? No, it is not a nocebo effect. It is a very definite physical effect caused by the wind turbine noise.

**Prof. Salt:** In my view there are good physiological mechanisms which can explain the major symptoms people are reporting.

**CHAIR:** So you are both saying there is no nocebo effect at all—is that your evidence?

**Prof. Salt:** I think there is no strong evidence to say there is a nocebo effect.

**Dr Hanning:** In all of these things, the sleep effects, there is clearly some psychological influence as well—of that, there is no doubt. But it is also very clear that there is a physical effect. But is entirely nocebo, or even an element of nocebo? No, it is not.

**CHAIR:** It could be that some of the effects reported could be a nocebo effect. Do you both agree with that?

**Dr Hanning:** No, I do not agree.

**CHAIR:** Are you saying all the years of analysis on the nocebo effect do not apply to wind turbines?

**Dr Hanning:** What I am saying is that there are psychological contributions—again, it is quite clear from the literature, particularly that done by Dr Daniel Shepherd, who is a psycho-acoustician. There is no doubt that if you can see the turbines your annoyance level is increased and if you have a financial interest in the turbines your annoyance is decreased. That evidence has not been gathered for the effect on sleep. Is there a psychological effect? Quite possibly, but that does not explain all of it. The use of the term 'nocebo' is not helpful, so my answer remains no, the nocebo effect is not—

**CHAIR:** Why is it not helpful if it is an established and well researched approach?

**Dr Hanning:** Nocebo effects have been shown for some things, but they are generally those things where there is no obvious physical cause for the symptoms complained of. Here there are very evident physical causes of the symptoms complained of, a clear causal relationship between the symptoms complained of and the wind turbine noise.

**CHAIR:** But isn't there a long literature on the nocebo effect that goes to telephones, televisions, electric blankets, microwave ovens, mobile phone towers, wi-fi, electricity meters and now wind turbines?

**Dr Hanning:** There is a literature on the nocebo effect but, for the items you mentioned, there was no obvious physical mechanism for the symptoms complained of. With wind turbines there is a clear physical mechanism for the symptoms complained of

**CHAIR:** What about wi-fi? Are you saying wi-fi has a physical—

**Dr Hanning:** What do you think is the physical mechanism between wi-fi and whatever symptoms have been claimed?

**CHAIR:** I am asking you. Are you an expert on nocebo, have you studied it?

**Dr Hanning:** I am aware of the nocebo effect. Am I an expert on it? Not to that degree. Have I done research on it? No, but I am most certainly aware of it.

**CHAIR:** We have submissions before the committee that say the health issues could be experienced seven kilometres from a wind turbine. Do you agree with that?

**Dr Hanning:** I am not familiar with that research, so I will not comment on it.

**CHAIR:** I am not saying it is research, I am saying we have got submissions that say the health effect could be up to seven kilometres? Do you agree with that?

**Dr Hanning:** As I have said in my submission, the evidence that I have gained from our own research and from that of others is that we have very clear evidence of significant effects at distances up to 1.5 kilometres.

**CHAIR:** And nothing further than that?

**Dr Hanning:** Well, that is the evidence at present. If the research is continued, it may well be that effects are demonstrated at greater distances. Otherwise, I cannot comment. The research is not there at present.

**CHAIR:** Have either of you have any contact with the Heartland Foundation?

**Dr Hanning:** No.

**Prof. Salt:** No, I have not.

**CHAIR:** Do you both accept that there is a need, and an important role, for wind power in dealing with global warming?

**Prof. Salt:** Absolutely.

**Dr Hanning:** I have no opinion on that. It is outside my expertise and my submission to this inquiry.

**CHAIR:** Do you have any views on global warming?

**CHAIR:** They are not relevant to the evidence I am giving here.

**CHAIR:** But wind turbines are absolutely essential in terms of a broader social and environmental outcome. If wind turbines are not used, we could have a more significant problem than the problem we are discussing now. Are you saying that is not—

**Senator XENOPHON:** Chair, on a point of order: the issue of global warming is not part of this bill. This bill relates to, firstly, whether there should be an appropriate noise threshold before any renewable energy certificates are granted and, secondly, whether there should be some transparency in relation to that.

**CHAIR:** I do not accept that. This is a bill that will affect the broader act, and the act is about a renewable energy target, and the renewable energy target is related to our contribution to global warming. That is the position and that is what I am indicating.

**Senator XENOPHON:** If I may, if we are going to go down that path then we should be asking questions about why the geothermal industry, which has the ability to replace baseload power stations, has been starved of funds to flourish in this country.

**CHAIR:** You can go down that path, if you want to waste your time, but I see this as relevant, so I do not accept the point of order. Dr Hanning.

**Dr Hanning:** Would you repeat your question, please.

**CHAIR:** Basically, do you see that there is a role for wind turbines in dealing with the wider social problem of global warming?

**Dr Hanning:** I think I would repeat my previous statement. My purpose of giving evidence is to speak on the effect of industrial wind turbine noise on sleep and health. That is my area of expertise; I will not comment on any other aspect.

**CHAIR:** That is very revealing. Thank you very much, Dr Hanning and Professor Salt.

**Senator XENOPHON:** Maybe I am being a bit slow. How is that revealing?

**CHAIR:** I think you are being a bit slow this morning, Senator Xenophon.

**Senator BACK:** No, I think Professor Salt—

**CHAIR:** Thank you very much. We will now move on.

*Senator Back interjecting—*

**CHAIR:** We have run out of time.

**Dr Hanning:** Thank you very much, gentlemen.

**Senator BACK:** You are not allowing him to comment? He actually wanted to answer your question.

**CHAIR:** We have run out of time.

**Senator BACK:** Yes, good. That is no worries at all.

**CHAIR:** That is true.

**HANSEN, Professor Colin Henry, Private capacity**

**NISSENBAUM, Dr Michael Alexander, Private capacity**

**PHILLIPS, Dr Carl, Private capacity**

[9:54]

*Evidence has taken via teleconference—*

**CHAIR:** Welcome. I just want to remind senators and witnesses that committee proceedings are protected by parliamentary privilege in Australia, but that parliamentary privilege does not extend beyond the Australian parliament's jurisdiction. I now welcome Professor Colin Hansen, Dr Carl Phillips and Dr Michael Nissenbaum via teleconference. Do you have any comments to make on the capacity in which you appear?

**Dr Phillips:** I am appearing as a private citizen, having been invited by Senator Madigan.

**Prof. Hansen:** I am also appearing as a private citizen, based on my experience in working in this area.

**Dr Nissenbaum:** I am a physician, appearing as a private citizen at the invitation of Senator Madigan, based on my experience with the subject matter in a recently published study of which I was a principle investigator.

**CHAIR:** I now invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions. Could I ask you to keep your statements concise, because the process here is that we would like to ask questions. We have your submissions.

**Dr Phillips:** As a brief introduction, I spent most of career as a professor of public health. I now operate a private research institute. My specialisation and my research has been how to interpret complex bodies of epidemiologic evidence, which I have won several awards for. That is the expertise that I bring to the analysis of the health effects of wind turbines. In particular, I have published one article on this topic last year, which I would like to have entered into the record if it does not exist there already. To summarise the results of that analysis, there are thousands of what we call 'adverse event' reports of individuals who are living near wind turbines who report having experienced a set of diseases. They are fairly common across these reports and include headaches, fatigue, sleep disorders, mood disorders, difficulty concentrating and nausea. It is a group of diseases that are very commonly caused by ongoing stress reactions of any sort, and thus are very plausibly related to the conscious and unconscious reactions to the noise from the turbines. Some other symptoms could be related to vestibular disturbance—that is, balance-system disturbance, including dizziness.

These AERs constitute an enormous body of scientific evidence, although this is not generally recognised by people who have a limited view of what is useful epidemiologic information. For many diseases and exposures, individual reports are not very useful, but for this particular set of diseases and exposures, where both the disease and the exposure can crossover—which is to say, change from existing to not-existing multiple times—these individual reports are in fact quite useful. Most of the reports that are out there have such crossover information, as the individuals involved quite reasonably understood that, if the diseases went away when they removed themselves from the exposure or when the wind stopped blowing, this was fairly strong evidence that they were in fact causally related to the operation of the turbines.

Once we recognise that these are effectively a collection of experiments that individuals have performed on themselves then we can recognise that they are among the strongest scientific evidence that exists in the world, as opposed to individuals anecdotes under some circumstances—say, whether someone has got cancer as a result of the local environmental exposure, which are not very useful in terms of making epidemiologic conclusions.

Therefore, my position is that this is a huge body of evidence. It is actually more useful evidence than you can get from the typical type of epidemiological studies that people are more used to seeing. It is clear evidence that a substantial number of people, a few per cent—which is a lot given the number who are exposed—will experience severe health problems of the types I have described. They are so severe that they can really ruin lives.

**Prof. Hansen:** My focus is on the definition and measurement of excessive noise. I am a mechanical engineer with a focus on acoustics. That is where I have spent my professional life, so that is why am focused on that. Currently, according to the South Australian wind farms environmental noise guidelines, in most rural environments a loud wind farm noise level is 40 dBA or five dBA above background noise, whichever is greater. The proposed amendment to the act would effectively eliminate the 40 dBA part and just focus on existing background noise, which is reasonable given that background noise levels in rural environments at night can be very low—as low as 15 to 20 dBA, which is much lower than what you experience in an urban environment.

So when considering whether or not additional wind farm noise will be intrusive and annoying to some people, the important quantity is the amount by which it exceeds existing background noise levels. Also important is the

character of the noise, which in the case of wind farm noise when you are a fair way away from the wind farm is low-frequency noise and variable noise as well. Both those characteristics add to the annoyance. So it is not just the level that is important; it is the character of the noise which should also be included in regulation.

It is also important to define how background noise is measured. When you are trying to make a statement that you cannot exceed background noise by a certain amount, you need to be able to define how you measure it. For obvious reasons, there should not be a single number representing an average over many weeks or a single number as a function of wind turbines. Background noise is much lower late at night, in the early hours of the morning and also in cases when you have significant wind shear and there is no wind at the residence where the noise is being experienced. So there really should be different values of background noise at different hours of the night with different wind conditions for the measurement. Those are the two main points I wanted to make.

**Dr Nissenbaum:** I did not send in any autobiographical information as part of my submission, although I hope you have the recent paper published by *Noise and Health*. I am a medical doctor, trained at the University of Toronto with specialty training at McGill University and postdoctoral training at the University of California, and I was a former faculty junior at Harvard Medical School. I became involved in this subject matter several years prior by way of the Maine Medical Association, which I contacted when reports of adverse health effects became clear in the state of Maine related to a wind turbine project about 90 miles away from where I live. Following a preliminary study, a more detailed study was undertaken at the two towns of Mars Hill and Vinalhaven, which I will detail shortly.

I want to state at the outset that I do not take a political position other than to advocate for health-promoting practices on issues of which I have knowledge and some expertise. That, in principle, is acceptance of human physiology in the citing of industrial wind turbines.

I have recently had a paper published with co-authors Jeff Aramini and Chris Hanning, who I believe you heard from earlier today, in the journal *Noise and Health*. It was published on 29 October and has received over 4,000 downloads in that two-week interval. We looked at a total of about 80 people separated into two halves, with one group living within about 1,500 metres of a turbine and the other 3,000 metres and beyond. We looked at recognised adverse health effects as measured by validated questionnaires, including the Epworth Sleepiness Scale and the Pittsburgh Sleep Quality Index as well as the SF-36 version 2 mental health summary. These are recognised medical instruments that have been used in hundreds of papers over the years to measure the effects of interventions in various illnesses across all medical specialties. This paper received quite a bit of attention because it is the first time that a published, peer reviewed paper, designed and carried out by medical specialists, using this sort of validated questionnaire tool has ever been published.

We found that the Epworth Sleepiness Scale, which I believe was developed in Australia and which is a measure of daytime sleepiness, showed that the closer one lived to turbines the worse the daytime sleepiness was. Similarly, the Pittsburgh Sleep Quality Index, which is a measure of sleep quality and was an aspect of the survey, showed that the closer one lived to turbines the worse one's sleep quality was. These SF-36 version 2 illustrated that the closer one lived to wind turbines the worse one's mental health was. These correlations were highly significant.

If you look at the paper you will find that the curves demonstrate a rather clear dose response. This argues against some sort of conspiracy, lying or bias on the part of the participants, because the responses would have had to have been very carefully calibrated in some sort of conspiracy in order to give these sorts of fairly uniform curves. That was clearly quite convincing and strongly points to a causative factor in the noise. Similarly, by concentrating on sleep which occurs at night, we eliminated the aspect of the visual disturbance that has been alleged to be responsible for many people's antipathy towards industrial wind turbines.

That concludes my preliminary statement. I would be happy to take some questions.

**Senator MADIGAN:** Dr Nissenbaum, why is chronically impaired sleep a health problem?

**Dr Nissenbaum:** When one has chronically impaired sleep one has to recognise that pretty much, as surely as the sun rises in the east—I think it rises in the east in Australia as well—impaired sleep will result in adverse health effects through stress mediated effects on the hormonal systems in the body. This will result in all sorts of stress related illnesses, as well as cardiovascular effects, as well as changes in cognition and mental health in a pretty significant subset of individuals. Some people are more immune than others, but we have to take people as they come, and a significant proportion of people will be affected in a negative way when there is chronic sleep disturbance. It is important to recognise that fact. Once we recognise that fact, the question becomes: do industrial wind turbines that are sited too close to people result in sleep disturbance? If we can prove that is correct, then we will know that over time very serious adverse health effects will develop.

**Senator MADIGAN:** The study seems to have a small number of people in it. Does that not affect the significance of your study?

**Dr Nissenbaum:** Statistical tools were utilised to evaluate whether the numbers are sufficient. The statistical analysis suggested that they are. Similarly, it really depends on the frequency with which the adverse effects occur. If, for example, we do a study on a drug and three out of 10 people who are given the drug die or become very sick, we do not have to subject 1,000 people to that drug in order to prove it with a larger group of people. It is very much the same principle. For certain adverse effects, the frequency of incidents was so high that findings were significant, even given the relatively small number of people.

**Senator MADIGAN:** Are you aware of any published studies that refute your study findings?

**Dr Nissenbaum:** No, there are no published studies that refute these findings at this point in time. This is what makes this so very significant. Other white papers that have been published are just that—they are white papers, they are opinions, they are selective readings of literature—but there is no controlled, peer reviewed study that refutes these findings.

**Senator MADIGAN:** Is it possible that the subjects in your study were unhappy with the site of wind turbines and therefore lied to the investigators?

**Dr Nissenbaum:** As I indicated, the curves that we obtained were fairly uniform. This would suggest that if they were lying they would have all had to get together and do some sort of conspiracy and calibrate their responses based on how far away they were from the turbines, which is just not plausible. Additionally, there was use of the validated questionnaires. Validated questionnaires themselves are designed to ferret out bias and inconsistencies. The same question is asked in a number of different ways, and inconsistencies in response are measured and the data gets kicked out. So I think it is unlikely.

**Senator MADIGAN:** Do you have any ideas as to why people react to turbine noise in the fashion identified in your study?

**Dr Nissenbaum:** There are many theories. I think you have probably heard that turbine noise has an impulsive nature—in other words, it is not a pure tone; it is amplitude and frequency modulated, it has a periodicity, or impulsivity, to it. It has a preponderance of sound energy towards the lower frequencies. We are probably designed to respond to this sort of noise with some sort of stress response. The noise seems to carry information and we do not habituate to it. Evolutionarily speaking, lower-frequency noises were associated with increased danger and this may be part of the factor. This is all conjecture. What we do know is that low frequencies are more disturbing and more pervasive. They travel longer distances and, particularly when they have a periodicity to them, our brains subconsciously seem to want to extract information from that and therefore we cannot tune it out the way we can white noise.

**Senator MADIGAN:** Thank you, Dr Nissenbaum. Dr Phillips, can you provide a brief review of the epidemiological evidence regarding health effects of industrial wind turbines?

**Dr Phillips:** In terms of what evidence exists out there, I have reviewed what exists and, as Dr Nissenbaum pointed out, there is relatively little out there in terms of systematic studies as being [inaudible]. Again, as you pointed out, this means that there is literally no evidence that argues against the results from [inaudible]. So, from these adverse [inaudible]. As I mentioned, there are thousands of those. There are several collections, including mine, that have [inaudible] attempted to [inaudible].

**Senator MADIGAN:** Do you believe that there is a large body of evidence to support your statements, Dr Phillips?

**Dr Phillips:** Yes, exactly. There may well be tens of thousands of these reports out there, and no-one has had an opportunity to collect them all together.

What is very important about them is this [inaudible] collection of complaints because, of course, [inaudible] have had some health problems. They are the very same complaints that Dr Nissenbaum found in his systematic study; they appear over and over and over again—the same as in [inaudible]. And this is a very strong [inaudible] very much like the point that he [inaudible]. In order for this to be replicated it would require an enormous amount of coordination among people who do not know each other and who did not even know that there were other complaints out there before they voiced their own. Again, when that is taken into consideration it is just an overwhelming amount of evidence.

**Senator MADIGAN:** I assume you are aware of attempts to deny the epidemiological evidence. Can you explain why there appears to be a concerted effort to deny this evidence and what some of the fundamental flaws in these arguments are?

**Dr Phillips:** Of course, there is a financial incentive for some of those involved to deny it. With others, who seem like they ought to be more neutral, it is more difficult to explain.

I think that part of the problem is that there are many people who are the moderate experts in health science who genuinely do not understand the usefulness of this evidence. They understand what a cohort study or a case control study looks like and how to make sense of that, but they do not have the understanding of science. They do not recognise that individual experiments like the individual crossover studies that people have conducted themselves are in some ways the best kind of evidence that you can ever have about a phenomenon; much better than trying to tease subtle signals out of complicated statistical data like we do for many things in the world, quite successfully.

Perhaps the failure to really understand how to look at scientific evidence and accounts for a lot of the misunderstandings.

**Senator MADIGAN:** Are you aware of statements by Professor Simon Chapman regarding the lack of evidence linking adverse health effects and wind turbines? And can you comment on these claims and explain why they are possibly flawed?

**Dr Phillips:** Yes. Professor Chapman's approach to this, as far as I can tell, has really focused on [inaudible] and ignoring the signal. Imagine listening to a noisy radio set broadcast, or something. Most of us would be trying to pick out the coherent signal [inaudible]. But he has [inaudible] made a recording of all the different bits [inaudible] and seen that there is nothing there. That was a metaphor. Literally, what he has done is go through these reports and discover [inaudible] individual in addition to [inaudible] headaches, mood disorders; the common pattern. He also mentioned that she was diagnosed with cancer since the wind turbines went in, then collected that observation and said, 'Ah, ha, ha! The wind turbines couldn't possibly be causing cancer and so therefore this information must be wrong'. But, of course, that is very much the wrong way to look at it. A scientist, of course, that the people are reporting all [inaudible] going to report any number of coincidental occurrences. But you will only see a smattering of those; one here and one there as opposed to the common reports that appear in almost every last one of these.

Furthermore I am going to have to comment, since the topic is on the table, that what he has been doing in that approach is rather unseemly. Basically, he has been publicly ridiculing people who are suffering from serious diseases. Whether he believes those are really caused by the wind turbines or not, it is really questionable behaviour to make fun of people for their perhaps mistaken belief that their cancer or whatever was caused by the turbines. Why? Again, it is that if you pay attention to signal, like the science does, instead of trying to use the noise to obscure it then you see the signal.

**Senator MADIGAN:** Thank you, Dr Phillips. Professor Hansen: low-frequency noise emissions are common in heavy industry: heavy engineering, including power generation, of all kinds, as well as in aviation, heating, ventilation, air-conditioning systems, mills and other rotating engineering processes, including wind turbines. There is a long history of research into these areas, particularly within industry, culminating in practical responses such as changing equipment design, siting work exposures through job redesign and so on. Is that correct?

**Prof. Hansen:** Yes, that is correct. There are a lot of examples where there is low-frequency noise in industry.

**Senator BACK:** Professor Hansen, in your opening comments you were talking about the need to measure background noise and that it has to be done over time. An alternative view has been put, and that is that an absolute figure rather than a figure above background should be considered—something like 35 dBA. Could you comment on your view on that position given, as you have indicated, the difficulty in getting a yardstick for background noise in rural areas?

**Prof. Hansen:** I can understand where some people are coming from when they say a 35 dBA limit obviates a need to measure background noise. The problem with that is that the 35 dBA has to be applied to any development, and there are some areas that are much quieter than other areas. Say you have a 35 dBA noise going on at night-time, when people are trying to sleep, and the other background noise is about 15. The problem with wind farm noise is that it is dominated by low-frequency noise by the time it gets to people's residences. Many residences, especially if windows are open, are sort of transparent to that noise.

The noise level at low frequencies is not much less than what it is outside, whereas the higher-frequency noise—if there is a little bit left—gets attenuated through the walls of the house and the roof. What you are left with when you are inside is a dominant low-frequency noise, and there is no higher-frequency noise to mask it. There is nothing to mix with it. It is just this low-frequency, annoying noise. It is true that probably 50 per cent of people will not be adversely affected by it and can probably sleep with it. But there is another 50 per cent, or maybe 40 per cent, who have a serious problem—and the higher the noise level is, the bigger the problem will be.

It seems to me that you want to make sure that the noise level is not too high above the background noise, because otherwise it is going to be an even bigger problem.

**Senator BACK:** Therefore, coming back to your opening statement, is it going to be possible to get reasonable yardstick figures for background noise given, as you have said, that it has to be undertaken over time et cetera, presumably when turbines are on and off and under different seasonal conditions et cetera? Is this possible?

**Prof. Hansen:** What is done now is that before a turbine development is approved people go out and leave noise monitoring devices.

**Senator BACK:** They only do that in the audible range, though, don't they?

**Prof. Hansen:** They do a dBA measurement, which really does knock out all the low-frequency components, so it does not really tell them what they want to know. But they could measure over the entire spectrum if they wanted to. They could say what the existing noise is, and then when the development is there they can go and do the measurements again at different times and in different weather conditions. You have to be very conscious of what the wind is doing at the measurement location, as well as what time of day or night it is.

**Senator BACK:** You said in your submission that you are a chief investigator on a Research Council funded research project. Can you tell us where you are with that? Are you near publishing it? Has it been published? What is the progress of that project?

**Prof. Hansen:** We do have some preliminary results of measuring inside and outside of houses, looking at the low frequencies at a wind farm near Adelaide. We are going to be presenting a paper at the Australian Acoustical Society conference in Perth next week. But this is the first year of the project. We really did not get started until the end of March. We have been taking some measurements and we have been getting all our equipment organised, so we are not really in a position to publish a journal paper at the moment, but we are getting to that point.

**Senator BACK:** Could you comment briefly on a paper you contributed to, by a Richard James. He makes the observation that wind turbines are more of an indoor problem than an outdoor problem. Could you briefly explain to the committee what your understanding is of his point in that particular comment?

**Prof. Hansen:** What he means by 'more of an indoor problem' is that it affects people more grossly when they are indoors, because that is when they are trying to sleep. Also, as I said before, the house acts like a filter; it filters out the higher-frequency noise and just lets in the low-frequency, really annoying noise. When you are outside you might not notice it so much, because you have a lot of high-frequency noise that goes with it. But when you are inside you do not have the mid-range or high-frequency noise as well, and that makes it much more of a problem.

**Senator BACK:** My last question is to you, Dr Nissenbaum. You make the observation in your discussion of your paper that the study supports the conclusion of previous studies demonstrating a relationship between proximity to industrial wind turbines and the general adverse effect of annoyance but differs in demonstrating a clear dose-response relationship in clinical indicators of health, including sleep quality et cetera. I wonder could you expand on that, particularly your observation that these strongly suggest that noise from industrial wind turbines does result in similar health impacts as other causes of excessive environmental noise. You are making the point that industrial wind turbines seem to have a different and stronger effect than other causes of environmental noise. Could you expand on that for the committee please?

**Dr Nissenbaum:** Yes. Many of these preliminary—I would not call them preliminary, but many of these studies have looked at annoyance, particularly Pedersen, Van den Berg and so on that most people are familiar with, which showed that that the noise coming off industrial wind turbines when one looked at the end result of 'annoyance' showed that wind turbine noise was more annoying at about a 10-decibel lower level compared to other sources of industrial noise in the environment, whether it was traffic or rail or air. As such, with the exception of railroad shunting yards, it was found to be more annoying than any source of industrial noise in the environment.

With regard to the term 'annoyance', this is an important thing: the authors of these studies really had a medical intention in using that word 'annoyance', and it was defined to me by Pedersen herself as 'annoyance as a state of altered and diminished wellbeing'. I do not know what the situation is in Australia, but in the US and Canada the fact that the word annoyance was used was an opportunity for those who have a different perspective to claim, 'Well, look at that, it's only annoyance'. It is utilising the North American colloquial interpretation of the word annoyance as an inconsequential bother. This was a perversion or a distortion of what the authors were intending. We went beyond annoyance in our particular study, which I think is helpful in clarifying the issue. We actually

looked at defined recognised adverse health effects as opposed to the more general and more abusable term of 'annoyance'. I do not know if that answers your question.

**Senator BACK:** Thank you.

**Senator XENOPHON:** My questions are initially to Professor Hansen. In your view have governments responded with appropriate legislation and regulations to protect workers and the public from low frequency emissions?

**Prof. Hansen:** In my opinion they have not because all of the current regulations are written in terms of A-weighted sound level and A-weighting does not properly account for low frequency components. Some regulations apply a five dB penalty if a noise is dominated by low frequency components, but in many cases this is insufficient to properly account for the true effect of low frequency noise.

**Senator XENOPHON:** Professor Hansen, can you explain to laypersons such as me the difference between A-weighted and other types of noise in the context of this bill?

**Prof. Hansen:** Okay. If you measure unweighted noise that means that is exactly the sound pressure that is being experienced by a microphone and no-one has fiddled with it. That is exactly what the microphone experiences. If you put an A-weighting on there you are knocking out the low frequency components, especially when you are starting to get down to 20 hertz you are knocking them out by 70 dB. This is a huge amount that you are just cutting off and saying, 'That's what the level is'. The reason for doing that is that people say that you cannot hear low frequencies—it is true; you cannot hear low frequencies as well as you can hear higher frequencies—so if you want to approximate how the ear hears things, you use an A-weighted sound level. But when you start getting down to really low frequencies it does not properly reflect how people experience the noise—especially if it is varying or modulated, if it is very up and down all the time.

**Senator XENOPHON:** Thank you. In your submission you suggested a number of amendments to the bill, and I think you suggested that the 10 decibel above background noise level should be amended to five decibels and to have a different basis for that. I think you referred to A-weighted levels. Could you expand on that? I think you are saying that the bill is almost too generous.

**Prof. Hansen:** The bill, as one would expect, is sort of a compromise. It is not going to stop everyone being annoyed. It will stop a lot more people being annoyed than currently, and it will stop a lot of sleep disturbance, but there are still going to be some people that are going to be disturbed. If you want to make sure that you get most people and that practically no-one is going to be disturbed, then you have to have a five dB thing.

**Senator XENOPHON:** This is sort of a double-barrelled question. Do you think that the noise limits currently allowed for industrial sound sources located in rural areas are appropriate? If not, what should they be? Further to that, when calculated noise levels are provided for an industrial development in a rural area, how accurate do you think they are in terms of predicting actual noise levels and predicting how annoying the noise will be?

**Prof. Hansen:** I will answer the second question first, on the accuracy of the predictions. You find you get single-number predictions, whereas in practice the noise varies considerably depending on the weather conditions and depending on the turbulence inflow into the turbine. If you have turbulent inflow, due to terrain or due to an upwind turbine creating turbulence for a turbine that is directly downwind of it, and if you have several of these, the actual noise generated by the turbine is much greater than the noise that is used in the calculations. The noise that is used in the calculations is something the manufacturer provides, which they have measured on a turbine on flat ground and with no turbines upstream.

**Senator XENOPHON:** That brings us to the second part of this bill, which provides that wind farms should publish on the internet information about noise, wind speed and direction, weather conditions and power output. Professor Hansen and other members of the panel, Dr Nissenbaum and Dr Phillips, does there appear to be a lack of transparency in the information that is given at the moment or is there—I think this is a phrase that the chair likes to use—'information asymmetry' when it comes to trying to work out what the actual noise levels are coming from a particular development such as this?

**Prof. Hansen:** Yes. It is extremely difficult to get data. In fact, for my ARC project I have asked the wind farm operator to provide data of what wind turbines are operating at the times we are doing the measurements, and they have refused to provide that.

**Senator XENOPHON:** Why is that?

**Prof. Hansen:** They just said they are not going to. They did not say why. They just do not want to.

**Senator XENOPHON:** The ARC is the Australian Research Council.

**Prof. Hansen:** Yes.

**Senator XENOPHON:** What is the nature of the research you are doing? What does it involve, how long will it take and what resources are being employed in respect of that Research Council grant?

**Prof. Hansen:** It is a three-year project that involves me working on an honorary basis, and I have a research assistant. We have purchased quite a bit of equipment, probably about \$100,000 worth of equipment at the moment. We are getting all that sorted out and all together, and we are going to take measurements inside and outside of people's houses. We have got lots of cooperation from people that live near wind farms. They are quite happy for us to go into their houses and do measurements there and do measurements outside of their houses. It would help us to know, especially at night, when we cannot see the turbines, how many of them are operating and which ones are operating. We can get from a website the total power generated by the wind farm, which gives us some sort of idea, but it would be nice to have more detail.

**Senator XENOPHON:** My final question, because time is against me, is: would you be able to provide to the committee, on notice, your correspondence—emails, notes of phone conversations that you may have—in terms of your attempts to obtain this information from wind turbine companies?

**Prof. Hansen:** Yes. I hope I have still got that. I usually keep all my email. There are no telephone conversations—just email.

**Senator XENOPHON:** If you could, that would be useful, thank you.

**Prof. Hansen:** Okay.

**CHAIR:** Dr Phillips, Senator Xenophon spoke about information asymmetry.

**Senator XENOPHON:** That is your phrase. I like that phrase, Chair!

**CHAIR:** There is a bit of information asymmetry about your background, Dr Phillips. I have had a quick look and you are with a group called the Populi Health Institute—is that correct?

**Dr Phillips:** Yes, that is my research and consulting firm.

**CHAIR:** And you do research and consulting promoting tobacco, do you?

**Dr Phillips:** Not promoting. I have actually spent most of my career, and a lot of my work still is on, promoting tobacco harm reduction. It is an approach which tries to reduce the number of smokers and the huge health toll that comes from smoking by encouraging people to switch to a low-risk (*inaudible*).

**CHAIR:** But you are part of what is described as the pro-smoking lobby, aren't you?

**Dr Phillips:** No, absolutely not. What I work on is very much anti-smoking. It is looking for ways to better persuade people to quit smoking, and thereby improve their health.

**CHAIR:** I am just trying to get some context for your submission. I just noticed that you were attacking some of the analysis on the amount of carcinogens in tobacco and you were saying that it was rubbish. Is that correct?

**Dr Phillips:** You might be looking at some of the work that I have done looking at smokeless tobacco, which, of course, is largely banned in your country, as I understand. There is a lot of confusion about that. The types of products that I and others who do the work that I do encourage smokers to switch to are the smokeless tobacco or the electronic cigarette products.

**CHAIR:** Are you aware of the nocebo effect?

**Dr Phillips:** It is a term that gets used to refer to a psychological negative effect from something.

**CHAIR:** Do think that there could be any element of nocebo effects in some of the reports that have been received around problems relating to wind turbines?

**Dr Phillips:** There certainly could be some of that effect. For it to explain any substantial portion of the effect that has been experienced, it would have to be far, far larger than anybody has ever found it to be for any similar exposure. A lot of these effects that we have all been talking about are mediated through psychological processes. As Dr Nissenbaum was talking about, some of the effects we hypothesise have to do with looking for a signal in this noise—thinking that a predator is sneaking up on you and your evolutionary brain, and so forth. It is extremely difficult to sort out one type of psychological effect from another, but to some extent it hardly even matters. If a lot of people are suffering because of the exposure, and we do not know anything about what type of psychological process that leads to the suffering, if we do not know how to do anything about it then it does not change the fact that it is a substantial health problem and that it is having a major impact on people's lives.

**CHAIR:** Do you see the wind turbine industry as being an important area trying to deal with global warming?

**Dr Phillips:** That is a lot beyond my area of expertise. There are serious debates that I am aware of, but that I certainly do not contribute to, about whether there is any substantial benefit for the primary goals because of the

engineering specifics of wind turbines. It does not appear that they provide as much benefit as is often claimed. As a health scientist, as somebody who is still acting as a public health advocate, my feeling is that if someone wants to claim that the benefits, in terms of (*inaudible*) and so forth, justify the health costs that are being inflicted on people, then they certainly should go ahead and make that argument. It is entirely possible that that argument could carry the day, but that argument has never—

**CHAIR:** Do you accept that there is global warming and that there is a need to deal with it?

**Dr Phillips:** Sure.

**CHAIR:** Thank you. Dr Nissenbaum, you indicated that there had been no published studies to refute the findings in, let's call it, the Nissenbaum report. Do you expect that there will be some analysis of your report?

**Dr Nissenbaum:** I am sure there will be. I am sure there will be not just analysis but attempts to disqualify or denigrate the information.

**CHAIR:** Do you also believe that there will be professional scientific analysis and critique of your report?

**Dr Nissenbaum:** I expect people will attempt to analyse it, of course.

**CHAIR:** Dr Phillips indicated that individuals had conducted experiments on themselves. Professor Hansen, how does that work?

**Prof. Hansen:** You are asking me about how people conduct experiments on themselves?

**CHAIR:** Yes.

**Prof. Hansen:** My understanding is that people who live near wind farms have certain symptoms or certain sleep problems and other symptoms, and then they go and stay somewhere else and do not have the symptoms anymore. But that is only my understanding; I am not saying that is correct.

**CHAIR:** Dr Nissenbaum, are you aware of the nocebo effect?

**Dr Nissenbaum:** I am aware of the term having been used in the American Wind Energy Association and Canadian Wind Energy Association white paper. I believe that the term was introduced in that white paper as a way to invalidate the claims that people had. Basically, they were saying that people who are complaining of adverse health effects were predisposed not to like the wind turbines and, therefore, when they saw the wind turbines or experienced them, of course they did not like them. What I will tell you—

**CHAIR:** Why would it be denigration if there is a long history of scientific analysis of the nocebo effect?

**Dr Nissenbaum:** I am not aware of any studies at all that demonstrate that this nocebo effect has been functional in people suffering from adverse health effects related to wind turbines in proximity. I am aware of zero information and no information was presented in the American Wind Energy Association white paper to that effect.

**CHAIR:** You do not challenge the validity of a nocebo effect in scientific and health literature, do you?

**Dr Nissenbaum:** It is not commonly used. In this case, in the context that we are using it, it is entirely speculative and without foundation.

**CHAIR:** You keep coming back to this narrow area. I am asking: generally, is the nocebo effect well researched, established and accepted in science and health?

**Dr Nissenbaum:** No, it is not well researched and it is not widespread. It is conceivable; it is plausible. In our context, there is no evidence that this is occurring.

**CHAIR:** Thank you very much, Dr Phillips, Professor Hansen and Dr Nissenbaum, for helping us.

**LAURIE, Dr Sarah Elisabeth, Chief Executive Officer, Waubra Foundation**

[10:44]

**CHAIR:** Welcome. The Waubra Foundation has lodged submission 197 with the committee. I now invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions.

**Dr Laurie:** Thank you for the opportunity to give evidence. The Waubra Foundation strongly supports any proposal that will help protect the health of any people currently being harmed by excessive noise, whether they are residents or workers, regardless of the source of the noise. We therefore strongly support this particular bill. It is our understanding that the bill will have no effect on wind developments where there are not excessive noise problems.

The Waubra Foundation was established initially to advocate for research into the health problems being reported by people living and working near industrial wind turbines. Sleep disturbance correlating with exposure to operating wind turbines is one of the most common problems reported. As a result of sick people approaching us for help, our work has expanded over the last 18 months to include helping residents adversely impacted by excessive noise, from sources and activities including coal seam gas compressors in Queensland and in the USA, coalmining in the upper Hunter region and gas-fired power stations, specifically at Uranquinty in New South Wales and Port Campbell in Victoria.

There is an excellent description of what can happen to people impacted by noise, in quiet rural areas, in chapter 5 of Sharon Munro's book *Richland Wasteland*, which I have with me. The chapter is called 'Clearing the country' and this is precisely what happens. Sharon also describes the use of confidentiality agreements to silence sick people. This use of confidentiality agreements to silence sick people is part of the wind industry too for both the wind turbine hosts and nonparticipating neighbours, as Senator Back revealed in his speech in the Senate on 30 October. I believe the only reason for these agreements used by noise polluters is to keep this growing public health problem from the gaze of the public and public health authorities. The mere existence of these confidentiality clauses suggests that noise polluters and the professionals assisting them are well aware of the problems.

Most doctors remain ignorant of the connections between sound frequencies in the lower part of the sound spectrum and health problems. However, acousticians have known of the connections for some years. This ignorance amongst doctors has been compounded by the omission of a crucial document from the NHMRC's Rapid Review of 2010 into the adverse health effects of wind turbines, which details what was known about the effects of low-frequency noise, regardless of the source. This is despite the lead author of that crucial document, Professor Geoffrey Leventhall, being one of the peer reviewers of the NHMRC document. I have here the document that was omitted. It is called *A review of published research on low frequency noise and its effects* dated May 2003, and it was done for the UK Department for Environment, Food and Rural Affairs, DEFRA.

The 2010 NHMRC document omitting this vital knowledge about the known adverse health impacts of low-frequency noise is still being widely used by wind developers and government departments to assert that there are no known health problems with wind turbines. Sleep disturbance is by far the most common problem reported by residents living near wind developments, which they consistently document correlates with their exposure to operating wind turbines—the experiment that Professor Phillips was referring to. They sleep well when the turbines are off or when they are away from the turbines, or when the wind is not blowing towards them. They report repetitively disturbed sleep when the turbines are operating and the wind is blowing towards them. This effect is being reported up to 10 kilometres away from three-megawatt turbines at Waterloo in South Australia and 7½ kilometres away from two-megawatt wind turbines at Cullerin in New South Wales, in two recent community noise impact surveys. These were conducted by members of the community because there has been no research by academic institutions into this problem. The size of the turbines matters. The larger the turbine, the greater the effect of the low-frequency noise and the further the distance travelled.

The connections between chronic sleep disturbance and consequent serious adverse health effects are well-known to clinical medicine. In conclusion, we strongly support all the provisions of this bill and hope that the much-needed multidisciplinary research recommended by the Senate in June 2011, after the first Senate inquiry, is conducted as soon as possible.

**Senator XENOPHON:** Dr Laurie, I know you have been referred to as the 'high priestess' of anti-wind farm agitation by, I think, Professor Chapman. I just want to clear this up on the record. I do not say it as a pejorative; I am describing what Professor Chapman said. He referred to you as an 'unregistered doctor'. Can you just give us some context about that comment? Is that the case?

**Dr Laurie:** That is the case currently. I was trained at Flinders University. I graduated in 1994, after which I underwent postgraduate training into general practice—and specifically for rural general practice. I became a country GP and worked for a number of years, and suddenly in April 2002 I was diagnosed with very early ovarian cancer. I left work immediately and took quite a substantial period of time off work. For that period of time I was registered. I went on to have a family—twins—aged 40. Various other family circumstances intervened: I became a carer for my elderly, frail parents-in-law and my husband went and worked 1,200 kilometres away. When my children were 2½ my son had just been diagnosed with a serious allergic condition, and—

**Senator XENOPHON:** I do not think you need to say any more. The fact is that you have some serious health issues and some family commitments, and basically you have not been practising medicine because of family circumstances and health circumstances.

**Dr Laurie:** I was actually on my way back into preparing to re-register when I found out about some turbines that were planned for the hills near my home, and that stimulated my interest in this particular topic. I am still very keen to get back to my work when the research is done.

**Senator XENOPHON:** It is just that, when you are referred to as an 'unregistered doctor', some people might think that there is something suspect about your qualification. I just wanted that on the record to clear that up.

**Dr Laurie:** Thank you, Senator Xenophon. It has been used frequently to assert that I am in fact deregistered, which is incorrect. I am currently unregistered but eminently registrable to go back to clinical practice, which is what I intend to do.

**Senator XENOPHON:** At the Waubra Foundation, you do work for residents affected by noise in terms of coal seam gas and gas-fired generators.

**Dr Laurie:** Yes.

**Senator XENOPHON:** In your advocacy for those residents, do you get resistance from the proponents of the coal seam gas and the gas-fired generators to release information about the source of noise or the extent of noise?

**Dr Laurie:** Work in that area has been much less in terms of volume. I respond to requests for information and help predominantly from the residents but sometimes from treating health professionals—country GPs—who are desperate to try to help these sick people. I have provided information to those people; we have not really got enough information from them to start publicising the problems. In particular, we have not got the acoustic information from those people. But we are encouraging them to employ acousticians to go and collect the full sound spectrum to clarify what we think is going on in terms of infrasound and low-frequency noise being present. I think that, once we have that, we will be able to be far more effective in helping advocate for them. The problems with regulation of noise pollution are an issue in number of industries, not just with wind turbines. There may be guidelines. But whether or not they are adequate is one issue; whether they are enforced properly is entirely another.

**Senator XENOPHON:** That is why the second part of the bill relates to the transparency of information. Is that an issue that you have struck in terms of residents making a complaint but not being able to access information to pursue the complaint?

**Dr Laurie:** Absolutely. They are not given it; or, if they are given it, it is very often in a form that they cannot use.

**Senator XENOPHON:** The Waubra Foundation sounds like a big organisation. How big is it, and who funds it? Do you volunteer your time for that, or do you get paid?

**Dr Laurie:** No, I do not get paid. I have worked voluntarily since I started working, which was about 2½ years ago. We are a small organisation. We have a board of directors which became involved in April last year. I was initially approached by the founder of the organisation, Mr Peter Mitchell, to join as its medical director. Subsequently, I became the CEO. I am the CEO of a very, very small outfit. We have a volunteer administrator who helps part-time, and there are six directors including me on the board—and that is it. We are funded entirely by donations from residents, predominantly rural residents, who are very concerned about what is going on and they want to see the research done.

**Senator XENOPHON:** You obviously run on a shoestring, but how big is your budget in general terms?

**Dr Laurie:** We currently have well under \$100,000 in the bank. Operating expenses are absolutely minimal, which is why we have shared a post office box with 300 other organisations that use the address of an accounting company called Lowell.

**Senator XENOPHON:** Okay. Thank you.

**CHAIR:** Senator Back, you have a couple of minutes.

**Senator BACK:** Dr Laurie, it has been put publicly that the Waubra Foundation represents only people in Waubra or those in the vicinity of the wind turbine operation there. Is that correct or—

**Dr Laurie:** No.

**Senator BACK:** are there also non-Waubra-based people amongst your numbers?

**Dr Laurie:** The organisation itself, as I explained to Senator Xenophon, is very small. However, the people that I was first contacted by and helped were in fact the people affected at the Waubra wind development, also people at Cape Bridgewater and a number of other locations. From the chairman, the founder, my understanding of the reason the organisation was named the Waubra Foundation is that initially the media in Victoria were calling the illnesses that people were reporting publicly at Waubra, prior to my involvement, 'the Waubra disease'. So I think the media started using the term 'the Waubra disease'. Initially, the organisation was actually registered as the Waubra Disease Foundation. That was changed.

**Senator BACK:** Just for clarity: were people affected by the wind turbines in that area contacting your organisation—

**Dr Laurie:** Yes.

**Senator BACK:** or did the foundation contact them in the first instance?

**Dr Laurie:** No. I never go out and contact people. I always wait to be contacted.

**Senator BACK:** Thank you. What is your understanding of when the effects of wind turbines in Australia were first recognised and documented?

**Dr Laurie:** Dr David Iser was the first general practitioner to raise his concerns. He certainly publicly raised them in 2004—it might have been earlier that he started talking about it. But my understanding is that it was in 2004, shortly after the start-up of the Toora wind development down in South Gippsland. Dr Iser was concerned about the health problems that his longstanding patients were reporting to him. He somehow found out that there was another rural GP, in Cornwall, who had reported similar problems there, and her name was Dr Amanda Harry. I have met with Dr Iser, and he explained that he got in touch with Dr Harry and actually used a survey that she had developed in conjunction with a physicist, who helped her understand more about the problems that were well known then about low-frequency noise. So that is how it started in Australia.

**Senator BACK:** Thank you.

**CHAIR:** Dr Laurie, we have submissions saying that there are over 200,000 wind turbines around the world. Do you agree with that figure?

**Dr Laurie:** I am not across the numbers but I know there are a lot in many parts of the world.

**CHAIR:** Yes. And there have been 17 international studies of the health effects on wind turbines; are you aware of those studies?

**Dr Laurie:** With respect, Senator Cameron, they are literature reviews. They are not what we call empirical studies. So they are not studies that have gone and collected data, such as Dr Nissenbaum, Dr Hanning and Dr Aramini's study or Dr Daniel Shepherd's study. There is a difference.

**CHAIR:** So, in Europe, Canada, the US, the UK, Australia and all over the world where wind turbines are operating, none of the health authorities in those countries are actually saying that there is a wind turbine syndrome, are they?

**Dr Laurie:** No, they are not.

**CHAIR:** We have got submissions here that say there are 150 different types of health issues associated with wind turbines. Are you aware of that?

**Dr Laurie:** I am aware of Professor Chapman's list of a certain number of conditions.

**CHAIR:** How many conditions do you say are associated with wind turbines?

**Dr Laurie:** Sleep disturbance is the number one. That is why I think this bill is so important. There are many other symptoms that people have reported. Some of them are symptoms that general practitioners would see a lot, not necessarily in conjunction with wind turbines.

**CHAIR:** Have you diagnosed any of these symptoms?

**Dr Laurie:** No; I do not diagnose conditions because I am currently unregistered and you just do not do that as an unregistered practitioner. What I have done is listened to the stories. I have then talked to the treating doctors, where I have had permission from the sick people to do that. We have shared information. I have been

focused on trying to understand what it is about the symptoms that these people are experiencing that could be related to whatever the physical force is that might be causing it. Noise was something that we were very interested in early on, but there are other issues that have been raised.

The perception of vibration through the ground is something that some residents report. Where that is reported the deterioration of their symptoms is quite marked.

**CHAIR:** There are no studies or any evidence of this, are there?

**Dr Laurie:** No, the reason the Waubra Foundation was established was to advocate for the research to be done. Professor Warwick Anderson, who is the CEO of the NHMRC, in his evidence to the Senate inquiry into rural wind farms acknowledged very clearly that anecdotal evidence and this sort of observational evidence is the start, and that an absence of peer reviewed research does not mean that there is no problem.

**CHAIR:** What the NHMRC indicates is that authorities should take a precautionary approach.

**Dr Laurie:** Yes. I wish they would.

**CHAIR:** You are saying that the precautionary approach at the moment is not sufficient?

**Dr Laurie:** Yes, I am.

**CHAIR:** But there is no evidence that you can bring forward to say why you should take a more stringent cautionary approach.

**Dr Laurie:** The evidence is around in the form of the empty houses and the sick people. This Senate called for research to be done 16 months ago. It has not yet happened.

**CHAIR:** Have you ever argued that there have been deaths from this?

**Dr Laurie:** No, I have not.

**CHAIR:** So there are sick people and there are empty houses. Have you done an analysis of the sicknesses of each individual and taken that to the authorities?

**Dr Laurie:** I have certainly made the concerns that I have very well known to health authorities.

**CHAIR:** Not concerns. You said there were sick people and empty houses. I am just wondering if you have given the evidence of these sicknesses to the appropriate authority.

**Senator XENOPHON:** What authority would that be?

**CHAIR:** The NHMRC.

**Dr Laurie:** Yes, I have made submissions to the NHMRC. We have sent letters to the NHMRC. I have presented to an NHMRC workshop.

**CHAIR:** Could you provide us with the documentation of the number of houses that are empty and the sicknesses that you are aware of.

**Dr Laurie:** I can certainly do that.

**CHAIR:** It would be good if you could do that. I think we have run out of time.

**Senator XENOPHON:** Just on a procedural matter, Dr Laurie referred to a document. I am just wondering whether that is being tabled.

**Dr Laurie:** It is called, *A Review of published research on low frequency noise and its effects*.

**CHAIR:** I am not sure that you want it tabled. It is a public document.

**Senator XENOPHON:** It is only so that the committee can note it; that is all.

**CHAIR:** It is a public document.

**Senator XENOPHON:** Thank you.

**CHAIR:** Thank you, Dr Laurie.

**HALL, Mr Chris, Senior Town Planner, Pyrenees Shire Council**

[11:03]

*Evidence was taken via teleconference—*

**CHAIR:** I welcome you to the hearing via teleconference. The Pyrenees Shire Council has lodged submission 211 with the committee. I now invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions. Do you have an opening statement?

**Mr Hall:** I will just give a brief overview of a number of wind farm facilities that we have and our position in relation to enforcement and noise compliance regulation. At the moment the Pyrenees shire has over 300 approved wind turbines across four separate projects, which are at various stages of completion or in the initial stages of getting the final computations and sign-offs internally. We have 109 turbines in the Waubra wind farm and 157 turbines in the Stockyard Hill wind farm. The only one of the projects that we have commissioned is the Waubra wind farm. That was completed and commissioned in mid-2009. We have 109 turbines within our shire boundary there. There are a further 21 in Ballarat, immediately across the shire boundary border. Shortly after the completion and commissioning of that particular project both the council and the Department of Planning and Community Development began receiving complaints from landowners living in close proximity to that particular development, mainly in relation to audible noise. There have also been complaints received in relation to subaudible noise impacts, which I am happy to answer questions on later.

That permit is regulated through a series of conditions. Noise impacts are assessed through the 1998 New Zealand noise standard, and there are various obligations on the permit holder not only to comply with the maximum dBA noise levels specified within that standard but also to provide particular documentation to the department, prepared by a suitably qualified acoustic consultant, demonstrating compliance with that noise standard.

**CHAIR:** Are you saying this is a New Zealand standard?

**Mr Hall:** Yes. It is the NZ6808: 1998 noise standard, which was the state-adopted noise standard in effect in Victoria at the time when that particular permit was issued. The planning permit is a public document, so I am happy to provide that for the record of the Senate inquiry, should you need to view it.

**CHAIR:** Isn't that the same standard that is used in Australia?

**Mr Hall:** There are varying standards used between the states, and I will touch on that briefly. My understanding is that South Australia, for instance, uses the EPA noise standard, which has a different maximum noise level. I believe 35 dBA is specified in rural areas under that particular standard, whereas the New Zealand standard specifies a minimum of 40 dBA measured within 10 metres of the dwelling. And there is a provision there for a 5 dBA penalty to bring it back to 35 dBA to be applied in areas where there are special audible characteristics present, such as tonal or modulation noise, but there is not a lot of guidance provided under that 1998 New Zealand standard in terms of how to assess those particular requirements. That is one of the issues we see: nationally there are different standards in each state. In terms of adopting a nationally consistent approach when it comes to compliance, that is one of the concerns I have. We do support it in principle. But regarding the proposed amendments to section 30E(4) of the renewable energy act—where you wish to bring in a basically nationally consistent standard that will obviously override existing permit provisions within each state and territory—I do not know whether that would stack up legally or not. I do not know what legal advice has been received on it, but I see potential issues there with those provisions overriding existing planning permits that may already be in place and been acted upon.

**CHAIR:** Mr Hall, I am going to have to ask you to try to keep your answers a bit shorter. A lot of Senators want to ask questions.

**Mr Hall:** That is fine. In terms of enforcement responsibility, it is our position that the minister is responsible for all of the projects over 30 megawatts, given that they were called in by him under our legislation. The onus on making sure that the proponents are complying with the relevant standards currently rests with the Minister for Planning and he has legal enforcement powers to be able to seek enforcement orders against operators that are not complying with the relevant standards when it comes to various wind farm projects. So that power already exists under Victorian legislation, should DPCD or the minister have reasonable proof to act on. I am now free to answer any questions about my submission.

**Senator MADIGAN:** I wish to table one document. It is a planning permit for a wind farm in the Southern Grampians shire.

**CHAIR:** Senator Madigan, we are going to have to have a look at it before we accept it for tabling. I have not seen the document.

**Senator MADIGAN:** It is just a planning permit.

**CHAIR:** It does not matter. Formally, we need to have a look at it. If you want to table it, that is fine, but we will need to have a look at it.

**Mr Hall:** I may not be able to comment on planning permit issues outside our shire boundaries.

**Senator MADIGAN:** It is not a planning permit issue. I am just seeking your assistance to decipher a planning permit document. On the top right hand page there are three headings on the planning permit. There is the permit number, the planning scheme and the responsible authority for administration and enforcement of a permit. It says next to the last heading that the responsible authority is the Southern Grampians Shire Council. If this permit had been issued in your municipality, next to that heading it would have said the Pyrenees Shire Council. Is that correct?

**Mr Hall:** It probably would have. The legal advice we have had is that the minister cannot override the enabling legislation, being the Planning and Environment Act 1987. We have had four legal opinions, plus one from a QC. A Victorian Civil and Administrative Tribunal decision was handed down last week, which basically confirmed that the minister is responsible for all planning permits over 30 megawatts that were called in. The minister's representatives, as in officers of the DPCD, are on record as having said that at various panel hearings in the early stages. It was only when Waubra started becoming an issue—with the number of complaints that were received—that the department's attitude towards being willing to take on enforcement responsibility seemed to change quite suddenly. They then wrote to us and other councils and indicated that basically they believed—without providing any legal advice, mind you—that they believed that the shires were the responsible authority for administration enforcement, overriding what they have done on the planning permit. It does not override the enabling legislation—that is legally unenforceable.

**CHAIR:** Senator Madigan, I have had a quick look at it. Senator Back agrees with me and we are happy to have the document tabled.

**Senator MADIGAN:** In your submission on behalf of the Pyrenees Shire Council you said that you have sought legal advice, and you have just confirmed that.

**Mr Hall:** In terms of the enforcement issue?

**Senator MADIGAN:** Yes.

**Mr Hall:** A number of councils have. There is—

**Senator MADIGAN:** So, in effect, the shire is not the responsible authority for administering and enforcing the permit.

**Mr Hall:** That is only for anything over 30 megawatts. In our shire there is only one wind farm we are responsible for, which is Chepstowe, which has three turbines. Given that its capacity is obviously well under 30 megawatts, we are responsible for administering and enforcing the conditions associated with that permit.

**Senator MADIGAN:** So in effect then it is the state government that is responsible.

**Mr Hall:** Correct. It is our understanding, based on the feedback that we have received from various officers of the department, that they have been liaising with the operators of the Waubra Wind Farm in relation to the noise compliance issues. We certainly have not received any confirmation that compliance has been met in accordance with the standards. So it is really an issue you are going to have to take up with the department as to their being outside the timelines, as far as our interpretation of the permit goes in terms of providing that information and confirmation that all of the nearby affected residents do comply with the noise standard. The ball is really in the minister's court in terms of what further action he may wish to take on that matter. I understand they have engaged external noise consultants to review information provided by the applicants, and from what we have been told communications have been had with new wind-farm operators to provide additional support information demonstrating compliance with that New Zealand noise standard I referenced earlier.

**Senator BACK:** Thanks very much for your submission, Mr Hall; it is very interesting. I have two quick questions. The second paragraph of your second page states:

It should be noted that some of the noise data would need to be confidential, as its publication could breach commercial in confidence issues of the proponents, otherwise all such information should be made public ...

Could you tell us briefly: of the noise data that would be supplied by a proponent, what would be commercial-in-confidence in its nature?

**Mr Hall:** We have been advised that the Department of Planning and Community Development have refused to provide information to landowners who have requested copies of noise data and reports on their properties. I would have thought individual assessments of some properties may need to be kept confidential, but I think the general report that is provided on the wind farm development as a whole should be disclosed once it has been signed off. I would personally like to see that information made available before it has been signed off, so that the public can review it, but the position that DPCD are putting is that they are not going to release any of the information they have available to them until they have completed their assessment of the—

**Senator BACK:** So, really, the information should be available to someone who is affected by the turbines, either on their property or a neighbouring property, shouldn't it?

**Mr Hall:** That is my personal opinion. It is our belief that the Department of Planning and Community Development hold a different position at this stage. I have put the question to officers and they have said, 'Look, we don't want to make it available until it's been signed off and approved by the minister; we're not sure if the minister has actually completed that step of the process yet.'

**Senator BACK:** Sure. The Chair has some questions, so I will put my questions on notice. Thank you, Mr Hall.

**Mr Hall:** Sure.

**CHAIR:** Thanks. Mr Hall, do you at council house have any evidence of health problems relating to the wind farms?

**Mr Hall:** We are not in receipt of any evidence as such from landowners—as in, none of them have come forward with a doctor's report or medical report indicating that they are suffering particular effects or health impacts that can be directly attributed to the wind farm. We are certainly in receipt of a number of complaints relating to claims of sub-audible noise impacts. There have been various symptoms reported such as headaches, nausea, dizziness, sleep disturbance—

**CHAIR:** How many have you had?

**Mr Hall:** There would probably have been 15 to 20 I reckon. I think audible noise impact complaints would be in the range of about 10 or 12.

**CHAIR:** What is the council's position on this? Do you want the wind farms to be closed down, or for there to be no more wind farms?

**Mr Hall:** Not necessarily closed down. Generally, we are supportive of renewable energy as a concept, but the noise information for these projects is just not being made available. We are not sure whether Waubra even complies. It has been over three years since this wind farm came into operation. Complaints have been received from a number of people—

**CHAIR:** You have had, what, 12 complaints?

**Mr Hall:** that seem pretty credible; they have had a lot of independent noise testing done that proves there is an issue, in the eyes of the consultant they have engaged. The department—

**CHAIR:** Sorry, Mr Hall, you are going to have to give us a chance to ask questions. Your answers are very long, I am afraid. I am not criticising you for that, but—

**Mr Hall:** Sure. I am just trying to give you an overview. Our position is that the department needs to be taking more timely action in terms of ensuring noise compliance.

**CHAIR:** So you have got a noise report, have you?

**Mr Hall:** Do we have a copy of a noise report?

**CHAIR:** I thought you said you had—

**Mr Hall:** We have not officially been provided with a noise report.

**CHAIR:** Can you forward a copy of that report?

**Mr Hall:** I said that we have not officially been provided with a copy of the final noise report.

**CHAIR:** I thought you said you had one.

**Mr Hall:** The only one we have seen is the one that was submitted pre the permit being approved by the department. I believe Marshall Day Consultants have been dealing with DPCD in relation to the final report. I believe they have submitted material to the department. They have had it audited and independently reviewed by another consultant, who raised a number of concerns, from what I understand, and they have subsequently written

back to Marshall Day requesting that further investigations be undertaken. That is the extent of where the matter is at. As I said, this has gone on well outside the permit time frames.

**CHAIR:** Mr Hall, I am really running out of time. Is this a council report that you have asked for? Did the council ask for this report?

**Mr Hall:** It is a requirement of the planning permit conditions. It is something that the department has asked the proponents to provide.

**CHAIR:** So you have had 15 complaints?

**Mr Hall:** It would be in that ballpark.

**CHAIR:** You did a 2012 Pyrenees Shire Council community satisfaction survey.

**Mr Hall:** Yes.

**CHAIR:** That closed in October. How many complaints did you get in that satisfaction survey about the approach the council has taken on the wind farms? Did you get any comments on wind farms?

**Mr Hall:** I would have to go back and have a look. To be honest, I do not pay a lot of attention to surveys. Planning does not usually figure too highly on those.

**CHAIR:** Can you take that on notice and find out whether your 2012 shire council community satisfaction survey did have complaints about the wind farm? Could you also take on notice whether the community generally is accepting of the wind farm?

**Mr Hall:** I can answer the second question for you now. I would say that the community is very divided in relation to wind farms. Prior to Waubra being built, the community was probably more in favour of them than against them generally, given that they do bring money into the community both for sports and local groups and obviously the landowners who have turbines on them.

**CHAIR:** Is this anecdotal evidence?

**Mr Hall:** Since Waubra the community's view and attitude has generally changed. A lot of people are very sceptical and scared—

**CHAIR:** Mr Hall, please take a breath, would you?

**Mr Hall:** I am trying to assist you, Senator.

**CHAIR:** You have to be a bit succinct when we have got 20 minutes and there are five or six senators. I am really sorry to do this to you, but you really have to be succinct. Could you provide us with a copy of the shire council satisfaction survey?

**Mr Hall:** Yes.

**CHAIR:** As I understand it, the position you have put to me was anecdotal and you have not done any proper analysis of the satisfaction of the community in terms of the wind farms.

**Mr Hall:** As I said, my answer to the second question was based on my view from the local council and from information coming to us. A lot of people are scared about the possible impacts.

**CHAIR:** Mr Hall, thanks very much for your evidence. We are running late for the next group who are participating via teleconference. Thanks for your evidence today.

**Mr Hall:** I will provide the information from the community satisfaction survey. Do you need anything else before we finish?

**CHAIR:** If we do, the secretariat will contact you. Thanks, Mr Hall.

**Mr Hall:** Thank you. I appreciate your time.

**COOPER, Mr Steven, Principal Engineer, The Acoustic Group**

**SHEPHERD, Dr Daniel, Private capacity**

**THORNE, Dr Robert, Private capacity**

[11:25]

*Evidence from Dr Shepherd and Dr Thorne was taken via teleconference—*

**CHAIR:** Welcome. I remind senators and witnesses that committee proceedings are protected by parliamentary privilege in Australia, but the parliamentary privilege does not extend beyond the Australian parliament's jurisdiction. I invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions. Mr Cooper, do you have an opening statement?

**Mr Cooper:** Yes.

**CHAIR:** Please keep the opening statements concise.

**Mr Cooper:** Thank you. I provided a submission which has measurements that I have undertaken at wind farms in Australia. It is not a theoretical approach, it is not an ivory-tower or a bureaucratic approach; they are actual measurements relating to wind farms. In addition to the material that has been provided, having looked at the submissions, I have four additional points which I wish to add to my submission.

The first one, which may assist in the understanding of this matter, is that the bill has to be complementary to existing guidelines and standards that are used for wind farms in Australia. My understanding from an acoustic viewpoint is that the bill required some amendments so as to agree with technical aspects, and I assume that it would be following the issue with the guidelines. The second point is that excessive noise, which relates to the first part of the bill, may be identified in various planning documents and wind farm guidelines but is not defined. The purpose of the bill gives a methodology for defining excessive noise. Therefore, in dealing with the bill, I have already provided recommendations for some additional wording. I would need to amend that. For the purpose of background, it needs to follow the procedures that appear in the standards and the guidelines, because that is a mechanism that is already accepted and it exists in practice for proposed wind farms.

The fourth point that I have is to assist the committee. I have drawn some lines on two regression curves I placed in my report at appendix E. I have copies available for members. I have placed the concept of background plus 10 on the graph. Also, in the concept of the noise that will be generated by both these proposed wind farms, one in New South Wales and one in South Australia, I have shown that the numbers presented in the bill will not alter the operation or noncompliance of what is proposed.

**Dr Shepherd:** I have a PhD in psychoacoustics, which looks at the relationship between the physical properties of sound and the consequential psychological sensations, perceptions, feelings et cetera that they give rise to. The impact of environmental factors on health defines my scope of research. I have published papers in peer reviewed journals on noise induced health impacts and the psychophysical measurement of human hearing abilities. I have also presented at numerous international conferences on this topic. Also, over the last six years I have spent a considerable amount of time in a region of New Zealand known as Manawatu, where I have resided in a dwelling located about 2½ kilometres from a major wind turbine installation. I am here today to discuss the impacts of wind turbine noise on health.

**Dr Thorne:** My evidence is simply to assist the committee, to expand on the detail within the bill and to try to give some practical guidance as to the different methods of analysis and assessment that would flow from the language within the bill. In this respect, my submission is basically a set of definitions and then, based upon my work over the last seven years just on wind farms, I have put in some guidance as to what I would expect to see in terms of measurement and assessment, which is under section 20A of the bill, referring to regulation. I believe this is necessary so that there is a fair discussion on what are the practical aspects of this bill and how to implement it.

My background is that I have been involved in acoustics since 1975. We do a lot of work on this type of noise. Wind farm noise is quite unique in its effect on people, as far as I can see. So I have added to my submission a paper that I have written on a wind farm study that was done in Victoria—and I just noticed that I had not quite specified where the wind farm study was done. I have not read any other submission to this inquiry, so I ask that that be borne in mind.

**Senator MADIGAN:** Dr Shepherd, what is the peer reviewed data saying about wind turbine noise and people's health and wellbeing?

**Dr Shepherd:** Comparatively to other noise sources, there has not been quite as much research done, and this is obviously due to the recent emergence wind turbines. What seems to be coming out from the data, which, by and large, has been collected in Europe, is that wind turbine noise really is no different to other forms of annoying community noise such as aviation noise, road traffic noise or nightclub or neighbourhood noise in that people do find it very annoying and it has a potency to disrupt sleep. In fact, the latest research is suggesting that wind turbine noise may actually be slightly more toxic than other forms of noise. The idea around that perhaps is that, because wind turbines are situated predominantly in rural areas, there are a number of physical and psychological factors which would cause that. One would be, for example, a lower ambient background noise level and fewer masking structures in rural areas and also that a lot of people actually seek to live in semirural and rural areas simply because those areas are quiet and those people may be noise sensitive. So the current research is saying that, yes, wind turbine noise does degrade health, as other forms of noise do, but it in fact may do so even more due to its unique locality.

**Senator MADIGAN:** You would be aware that a number of reviews have been written on wind turbine noise and health implications. What are your opinions of these?

**Dr Shepherd:** I have read a number of reviews in the area. Generally, my opinion of them is not high. Most of them have been done, I think, in the United States. One was done in Australia, which I have read and which stood out as being particularly poor. They are usually done by organisations which seem to have rather large conflicts of interest and they do not actually follow what we would say is sufficient scientific or research methodology in taking out these reviews. They often leave out a lot of reports and they often do not identify certain factors which are important when one is trying to critique or critically analyse the value of these reviews. I would always advise people not to look at the reviews, but rather to go to the source papers and look at the original data. I think that the last review that was published at the beginning of this year claimed to be peer reviewed but, when one actually looked into it, it was in a journal where the author paid to have it published. We call this a pay-and-display publication. My opinion is that I do not take these reviews very seriously and I would advise other people not to as well.

**CHAIR:** You say that some of the reviews are particularly poor. What reviews are those?

**Dr Shepherd:** The one that was done in Australia was the top of the heap.

**CHAIR:** What was that one? I do not know it.

**Dr Shepherd:** I think the Australian Medical Council or the Australian Medical Association sponsored it. It was called *Wind turbines and health: a rapid review of the evidence*. It was certainly very rapid. I do not think anyone could argue against that. The issue that one can instantly see is that the authors in this particular case were not even stated—you could not even look at the qualifications of the authors who undertook the review. Vast amounts of literature had been excluded for no obvious reason. Generally, there is a panel of non-experts commenting in fields that are beyond their expertise.

**Senator XENOPHON:** For the sake of fairness, on notice, could you provide details of those papers you refer to and the papers that you say are not appropriately peer reviewed or that have some other deficiencies that you refer to? On notice, could you give details of those so that the committee can make appropriate reference to them if necessary.

**Dr Shepherd:** I certainly could.

**Senator MADIGAN:** Some people suggest that the people who are complaining about wind turbine noise are simply crazy people or moaners who are just happy to have something to complain about. Some people also argue that the annoyance to wind turbine noise is simply a reflection of jealousy towards their neighbours' economic gains. Is this what the research suggests in your opinion?

**Dr Shepherd:** There are two questions there. Firstly, there has been some discussion that perhaps those who complain about noise in general have personality deficits such as neuroticism et cetera. The research is not really bearing this out. We are finding that certain individuals seem to be more sensitive to noise than others, which we call noise sensitivity. We can also compare that to noise resistance. In our everyday lives, we know individuals who are noise sensitive. When they are at work, they cannot have the radio on in the background; or, if someone is clicking a pen, they find it very difficult to fulfil their tasks, whereas other people can work through jackhammers that are being used in a building.

It is being more and more accepted now that, as you say, these people are not crazy and they are not moaners. But there does seem to be a sort of susceptibility there in terms of noise sensitivity. Some of the latest research that has been coming out of Europe in the last two years has stated pretty categorically or convincingly that there is a clear genetic component to noise sensitivity. Other research is coming out saying, 'Here are some potential

brain or biological mechanisms that will explain why certain people are different.' Certainly when we look at mental health and mental illness we see noise sensitivity prevalent across different diagnostic categories—for example, autism, schizophrenia et cetera. So no, they are not crazy or moaners. It is just that within any population there seems to be a continuum of noise sensitivity and people who are high on that continuum tend to seek out quieter areas to live in. So, to answer the question, no, they are not likely to be crazy and they are not likely to be moaners, but they may be noise sensitive.

**Senator MADIGAN:** My next question is to Dr Thorne. Your submission is quite a detailed, technical submission. Have you had any experience in writing legislative requirements for noise mitigation?

**Dr Thorne:** Yes, I have. Some years ago I was responsible for the writing of the Queensland noise policy. That was back in 1997. It was framed and developed over a period of some years with a lot of consultation with industry and with people who are susceptible to a whole range of different noises. In particular we worked with low-frequency noise and sleep disturbance in the home. The text of the policy was to allow people to have reasonable amenity and undisturbed sleep and also to allow business to develop. This was fairly intensive work and it was done over five years. I had a lot of experience with writing different briefs for ministers and for different departments to try to put together a policy that made sense.

This policy was based purely on environmental nuisance. We are most concerned with sleep disturbance and disturbance with relaxation. In those days wind farms were not around, but what was around and what was causing a lot of people problems were air conditioners. There is a lot of similarity between the low-frequency thrumming noise from air conditioners and refrigeration plants and wind turbines in the current situation.

The sound from turbines—and I would reply to Dr Shepherd on this—can be measured in three distinct types of measure. The first is sleep disturbance. This is a noise, whether it is a hum or a drone or a thump, just above the threshold of hearing. When people are trying to get to sleep it keeps them awake. People cannot get rid of this type of noise. They cannot, as we say, habituate to it. This is one of the classic issues with wind farm noise, I believe. This is seen now in five different wind farms.

**Senator MADIGAN:** I note in your submission that you have included details of potential regulations when this hearing is concerned with a bill. Why have you included details of potential regulations?

**Dr Thorne:** Section 20AB of the bill refers to regulations, hence my submission. This issue on excessive noise is quite complex. It is very easy to say it quickly, but when you start pulling apart each part of the bill and saying, 'Can we make this work? Is it fair, is it reasonable and is it practical? Does it give certainty of application?' then I felt that it was best to draft something that could be considered—no more than that—by the committee as a regulation or as a guide to regulations, or not, as the case may be. But referring to standards does not help because standards will change and standards are written for specific purposes or general purposes, whereas this is a specific bill for a specific noise source.

**Senator XENOPHON:** Mr Cooper, without going into too much of the detail of the work you have done in the past, you have been a court appointed expert on cases involving excessive noise. Is that right?

**Mr Cooper:** Correct.

**Senator XENOPHON:** In other words, you were not there for one side or the other; the court actually appointed you to give evidence?

**Mr Cooper:** Yes, I have worked both sides of the fence and in the middle, being for the court.

**CHAIR:** Some politicians could relate to that!

**Senator XENOPHON:** I understand you are currently doing work for the defence department on the Joint Strike Fighter project. Is that right?

**Mr Cooper:** Correct.

**Senator XENOPHON:** Did you have a key role in drafting the Australian standard for aircraft noise for residents?

**Mr Cooper:** Yes. The current version, which is 2000, I most probably edited a quarter of, and I wrote one of the appendices for compliance testing.

**Senator XENOPHON:** And that has also been adopted overseas in part. Is that correct?

**Mr Cooper:** Part. But the work that I did in terms of aircraft noise has changed the integrated noise model, which is the computer model used for predicting aircraft noise. I found an anomaly which neither the National Acoustics Laboratories nor Airservices Australia could sort out. My work with military aircraft found the problem and I went to America and the FAA agreed with me and modified the program.

**Senator XENOPHON:** So the work you have done has led to some changes in the way that aircraft noise is dealt with for residents in the United States as well?

**Mr Cooper:** It has dealt with the model, because the model had inaccuracies. The first part I did is about lateral attenuation. The second part is atmospheric attenuation, and that is changing the way models are being done.

**Senator XENOPHON:** Fine, I just wanted to clear that up. There are two parts to this bill. The first is the 10 decibels above background noise and the second part—which I will go to first—relates to getting information from wind turbine proponents in relation to the source of the noise, wind speeds and a whole range of other factors, and I think you are familiar with those provisions.

**Mr Cooper:** Yes, I am familiar.

**Senator XENOPHON:** Can you indicate what you have experienced when you have been asked by residents to measure noise—the difficulties you have in getting information from proponents?

**Mr Cooper:** Yes, if I can assist the committee, the graphs that I handed up this morning appear as appendix E1 in my report. It is a graph that is used prior to the development of a wind farm. It is a graph that plots the noise level for different wind speeds measured at the hub height. This becomes the assessment procedure—that is, the noise emission for the wind farm is expressed in terms of a DBA level versus the wind at the hub height. So the only way you can do a compliance check is to measure the noise at the residence and compare it with the wind at the hub height. If you cannot get the wind at the hub height, you cannot determine acoustic compliance. So you need that information. It is not available. The wind proponents or the authority will not supply the material.

**Senator XENOPHON:** To use one of Senator Cameron's classic phrases, there is some information asymmetry here with respect to that?

**Mr Cooper:** Yes. It is impossible for anybody to do a compliance check without this data.

**Senator XENOPHON:** So it is a catch-22. You cannot work out whether there is compliance or not for a particular development without this data?

**Mr Cooper:** As it is expressed in terms of a noise limit versus the speed. If there were an absolute limit full stop it would be a different kettle of fish. But because the wind farms are expressed relative to the background level and the wind speed you have to do the compliance with respect to that criteria.

**Senator XENOPHON:** Are they the shortcomings in current noise-measuring and forecasting techniques used by the operators?

**Mr Cooper:** The forecasting techniques follow the guideline, and I am assuming the bill follows the guideline, so it does not look at the direction of the wind; it provides an average. By definition those dots show that the noise will be both higher and lower than an average. So we are already doing an averaging technique for the purpose of compliance. In terms of the monitoring it is still assessed against this curve and you measure the noise. The predictions are in actual fact in the bottom graph, where the green dots are. The black line is the prediction for that wind farm, and it is under the regulatory limits and it is under the plus-10 limit. In the upper graph, which is for Flyers Creek, there is a line hidden in the blue dots, which is the regression line. The red line is the permitted limits under the South Australian guidelines, and the black line is what the bill would say. So that wind farm would actually produce lower noise than what the bill is looking to. In the second graph there is a need to reduce the noise level at the lower wind speeds and it the operation of a wind farm will be under that limit.

**Senator BACK:** What is the thick red line in the bottom graph?

**Mr Cooper:** I used black in the upper graph because there is already a red line. The red line in the bottom graph is my hand-drawn approximation of plus-10. That is, it is plus 10 on top of the blue line. So if one has a graph in front of them they can understand what the bill is saying and where the limits apply versus what is currently required, and the black line in the bottom graph is the predicted noise level for this wind farm. You will see that the noise level changes with the wind speed at the hub. That is why you need to have the wind hub information.

**Senator XENOPHON:** And you have requested this, obviously, in your work and it has been knocked back. Is that the case?

**Mr Cooper:** Correct.

**Senator XENOPHON:** What reason was given to you?

**Mr Cooper:** (1) I was not going to get it.

**Senator XENOPHON:** That is not a reason.

**Mr Cooper:** That was given as a reason. Another one was commercial-in-confidence.

**Senator XENOPHON:** How could it be commercial-in-confidence?

**Mr Cooper:** I do not know. I do not understand, because this is the criteria. A compliance test was done for New South Wales for a wind farm and they gave the material and they plotted the wind farm wind speed at the time. That appears in the report. So it may be it is commercial-in-confidence to anybody but the applicant.

**Senator XENOPHON:** Can you explain why you believe in the concept of 35 or 40 DBA levels in background level at night when the background level of less than that is unacceptable? I think one of the templates used for guidelines were the South Australian EPA guidelines, which I think were changed several years ago—the threshold changed.

**Mr Cooper:** Yes. These two graphs actually apply the earlier concept of the EPA—the upper graph, 35 and background plus five. The bottom graph is where it was changed to be 40. What both of these graphs show—

**Senator XENOPHON:** Why was it changed from 35 to 40? What is your understanding?

**Mr Cooper:** I understand it was political. There were changes in zoning in policies. There is no data that has ever been presented to justify the levels. There are no social surveys, no acoustic surveys to say these are the appropriate levels in a rural environment. There is nothing referenced in the South Australian guideline, the draft New South Wales guideline or the New Zealand standard. It is one of the things I have asked for and I have not been able to find.

**Senator XENOPHON:** In addition to the explanation I have asked you to give, can you weave into that what the difference would be if you put a wind turbine—in the context of this bill—in, say, a built-up city area compared to a rural environment? Are these guidelines skewed or inadequate in the context of a rural environment or are they more designed for a suburban environment?

**Mr Cooper:** If I can answer the question in a different way.

**Senator XENOPHON:** Sure.

**Mr Cooper:** Using the graph that I have provided you, the green dots show the background level. It shows that, as the wind at the hub height is reduced to four metres per second, the average background level is around 23 dBA. That is much lower than a noise level in a suburban area at night. The black line is the current guideline criteria. It says it can be 40; therefore, that is more than 15 dB above the background. Generally, for industrial noise sources, the criterion used throughout Australia is background plus five.

**Senator XENOPHON:** Why plus five?

**Mr Cooper:** The standards say that if a noise is above the background it is likely to be annoying and that exceedances of up to five are of marginal significance. So the concept has been that for general noise you can have noise that is audible but once you get to about five, above the background, it starts to present problems to the community or those people being affected by the noise. So if the background is higher in a city environment, then you can have a higher noise level. If you are near a large industrial estate or near a freeway that generates noise, then you are in a noisier environment and you can have a higher level of noise emission from the industrial sources.

This graph clearly shows that, as you move to quieter environments, then the criteria that apply should also drop down. Therefore, the red line in the bottom graph is showing 10 dB above the background. That is more than what is the general noise acceptability. Some people could say the appropriate criterion is background plus five. That is a reasonable argument. I am looking at the practical situation and it would seem that, from the measurements, if you are at background plus 10 you will cause some disturbance, as Professor Hansen said, but certainly nowhere near the level of disturbance as doing background plus 25, or even 30, which can be permitted at the moment.

**Senator XENOPHON:** One final question. I read Professor Chapman's paper as saying: this is a syndrome, it is a nocebo effect. You are dealing with the science and the acoustics. What do you say to the statement that this is all in people's heads or is a psychological effect?

**Mr Cooper:** I have produced a number of peer reviews that are in the public domain and I have produced a number of papers. I said when I first started to look at this matter, I went along to places and I had trouble hearing the noise and I wondered what the complaints were. But I have been doing noise investigations for 35 years and there are times when there is no valid reason for a complaint, times when there is a valid reason for complaint and clearly obvious. I kept on digging and looked at further information and testing. I uncovered these low-frequency, infrasound components. I measured them inside and outside houses. There is energy there that people cannot necessarily hear. I am just an acoustician; I am not a medical doctor. But I found things that are there. If this gives

an answer to what is giving rise to disturbance that people cannot hear or they may not be able to feel, then I have started that work. I have found that there is a unique signature associated with turbines and you can measure them near the turbines and measure them up to seven kilometres away, down at Waterloo. I have been to a house—and this is in my submission—and seven kilometres away I can see this signature and the pattern is there. You cannot hear it because it is lower than the threshold of hearing, both in frequency and in level, but it is there.

Other people can talk about the impacts because they are qualified in that area. I am just a noise guy. I have done the measurements and I have found there is something there. I am just simply the start of the food chain, so to speak, in looking at it. At present, the guidelines are in dBA and that is all that we can deal with, although all the guidelines say if you have tonality, low-frequency modulations, you adjust the noise for the character. That happens in every standard we have in Australia for noise assessment. If the noise is broadband, you take the number. If it has other characteristics, you add a penalty to it. Wind turbines are no different. It appears in all the standards and I have been able to show that modulation, infrasound and tonality occur under certain—not all—installations. In some cases I have been to houses and I could not hear a thing and I could not measure anything. That is the nature of the beast. Sometimes the wind blows in different directions. That is the variability that you get. It happens in all sorts of noise studies. Take noise from a hotel. Sometimes there is a noise problem; sometimes there is not. Usually the worse the band the louder they play! That is what happens.

**Senator BACK:** Dr Shepherd, just reading through the report that you were kind enough to provide which was published in September-October this year, in summary you said statistically significant differences were noted in some health related, quality-of-life domain scores with residents living within two kilometres of the turbine installation. Firstly, are you aware of your work yet being undertaken or repeated in other countries? Secondly, what further work do you have to do in New Zealand to validate the findings of your evaluation in this particular paper?

**Dr Shepherd:** We have resampled in the area we originally collected from. We did that in July of this year. We are currently inputting data. Hopefully what we will see, one way or another, is the longitudinal effects of being exposed to wind turbine noise. That way we will be able to also gauge whether or not habituation is occurring amongst individuals.

In respect to international research, there was a peer reviewed journal article published a month ago. I think you spoke to Chris Hanning and Dr Nissenbaum. This morning obviously their research has been published. They looked at similar measures of health related quality of life. They have used what is called the SF-36 measure. They found a dose response relationship in terms of mental health and general health. Basically, as one gets further and further away from a wind farm, the prevalence of complaints around sleep and health decrease.

**Senator BACK:** With regard to the questionnaires, was there any opportunity within those questionnaires for people to be able to indicate whether they knew the turbines were on or off at the time that they were either recorded or reporting the information upon which you relied for the quality-of-life evaluations?

**Dr Shepherd:** Our study was a masked study, so we went in with questionnaires and we basically gave the impression that we were measuring neighbourhood amenity—for example, things like rubbish collection, police presence, playgrounds and things like that. Then we asked questions about noise and health et cetera. That way people not knowing the actual intention of the study could not give purposely biased responses.

But we also had what we call an open-ended question right at the end, which was basically just a blank box where people were allowed to write in various comments. In the area that we sampled that contained the wind farm, which was an area called Makara, a number of people, probably a good 80 per cent or more—I can certainly send this information to the committee because we have it in electronic form—

**Senator BACK:** Yes, please.

**Dr Shepherd:** In these comments boxes they were saying, 'The wind turbines are keeping us awake at night when the wind blows from specific directions.' In answer to your question, yes, there was some awareness there.

**Senator BACK:** Mr Cooper and Dr Thorne, this circumstance is relating to proposed federal legislation. Obviously under our Constitution we are a federation. The area in which we are delving is covered by state legislation. Why should the Commonwealth be involving itself in this legislation which, at the end of the day, is state managed?

**Mr Cooper:** It was a point that I touched on as additional to my submission. You will not find in the current guidelines or standards used for wind farms a definition of 'excessive noise'. It exists in planning concepts. In South Australia it says that wind farms are not permitted to create excessive noise, but there is no definition. So the addition of 'excessive noise' overcomes the inadequacies of the current regulation. That is all that it is applying. It is not changing the operation of the wind farm. It is a matter of addressing the excessive noise.

**Senator BACK:** But couldn't that be incorporated into state legislation?

**Mr Cooper:** It could be incorporated into state legislation but it will take some time because the various environmental authorities have not actually investigated the noise issues from complaints from residents, there is a serious lack of credibility in terms of the origins of the data and, as I have said, there is no justification. I have put in my submission that, if one were to take into account what has occurred, if the state regulations were changed to be 25 dBA, or background plus five, then that would seem to cover the majority of the occasions; it would not cover all of them, but it would overcome that issue. At the present time that has not occurred and there is an excessive bill. That is the first part of the bill. The second part of the bill is required because none of the regulations stipulates this information, and the community needs to have that information so as to establish in the first instance that wind farms comply with their state regulations.

**Senator BACK:** Dr Thorne, what are your thoughts on state legislation?

**Dr Thorne:** My view would be that the Commonwealth give an overview and support the states. Queensland has a mechanism that would sit very well with the excessive noise definition. The thing that none of us has is a consistency across all states. That leads to my mind to the most important function of this bill: it gives a consistent approach to excessive noise throughout all of Australia, whereas each individual state could and does have completely different criteria, different standards. Back in the old days, there was a competition policy process whereby one state could not disadvantage the other states by having different criteria. In the days when I was working with it, we were dealing with environmental noise. We tried to get a consistency of approach through all the different states—this was back in the mid-nineties. This is where I would see the benefit of this particular bill in that it provides a certainty of approach to all states, it provides a certainty of approach to the industry and it gives a clear definition to all the different states' legislation. They may well want to pick it up and take some part of it for their own noise assessment protocols.

**Senator BACK:** At page 3 of your submission you refer to the publication of information on the internet. You say section 20AB, requiring publication on the internet, should be strongly supported. Could you explain to us why that is the case when much of the information may be available from other sources? Would it not simply impose another burden of administration on those who are operating these facilities? Why have you strongly supported that position?

**Dr Thorne:** This information is not available currently anywhere. This is part of the problem with compliance protocols and checking compliance with wind farms that I have been involved with. We cannot get the hub height wind speeds, as Mr Cooper has mentioned. We can get the 10-metre high wind speeds and do some maths relationships, which are a bit open to debate. The type of process that I have suggested is no different to what I recommend to my clients currently for doing their own work for their environmental authorities.

In New Zealand they had a simpler system, and Dr Shepherd has mentioned Makara, or the West Wind wind farm. They had four remote logging stations. They did not put anything on to the internet because the connections were not there and there was not a need. But I would say that the type of protocols that were put in that I have suggested even the playing field. This does two things. It gives the different states automatic information so that they can check compliance. The noise may not be excessive, of course. In the bill there is quite a high threshold for determining excessive noise. But, at the moment, there is no set protocol or ability for people to know what is happening, whereas with an environmental authority they can go to their state governments and generally pick up that information, through FOI, on what is happening at different locations.

I do not see this as being a very expensive option, and it is work that we do ourselves, so I know the costings pretty closely and the practicalities of how to actually do it. That is the background to my recommendations.

**CHAIR:** Mr Cooper, how many peer-reviewed technical papers have you written on the specific issue of wind turbines?

**Mr Cooper:** In terms of papers, two of them that have been published and, in terms of reports, another four that have been reviewed by other acousticians before they were released.

**CHAIR:** Where they published in any technical journals?

**Mr Cooper:** No. The peer reviews appear predominantly on the New South Wales Department of Planning website, and on other council websites that I have been engaged in. There are a number of papers currently in process. There is a series of papers to the acoustical society. They are expecting another one in the next week from me to follow on from the ethics paper. That paper is: 'Wind farms: what dBA doesn't tell you'.

**CHAIR:** So could you provide details of your peer-reviewed papers and any publications you have made to the committee?

**Mr Cooper:** In my report I have provided the two papers, which I have had peer-reviewed, and the technical article that appeared in the August edition of the Australian Acoustical Society's journal. It appears as an attachment. And the second paper, 'Are wind farms too close to communities?' also appears already in my submission, and I can give you a list of the other peer reviews that I have conducted that have been reviewed by other acousticians before they went out.

**CHAIR:** Thank you. Have you had discussions with the acoustic engineers working for the New South Wales government Department of Planning and/or the EPA with regard to your wind farm studies?

**Mr Cooper:** There was only one engineer in the Department of Planning. His name is Jeff Parnell. The answer is: yes and no, in that I had discussions with him prior to my undertaking the work, and at a recent meeting that was at Cullerin he refused to talk to me. As to the EPA, the EPA had said that they are not involved in it at the present time. I have had some informal discussions with two officers of the EPA who have asked me about the technical aspect of my measurements because I have used equipment that they do not have; it is more sophisticated. I had to explain to them about the frequency responsive microphones so that they could understand my data and do the corrections.

**CHAIR:** So the New South Wales department would not talk to you?

**Mr Cooper:** The one officer who is handling noise, at a meeting which was part of an audit process for Cullerin, refused to talk to me and had his back to me for the entire two hours.

**CHAIR:** Was there any other state government reaction to your studies?

**Mr Cooper:** No. There was actually a deafening silence.

**CHAIR:** It is like that on the wind farm!

**Mr Cooper:** There was an extensive submission that went in in relation to the wind farm draft guidelines issued by the department. There were only four technical submissions in acoustic terms. Mine had detailed information, and it actually had where I had tried to do compliance testing and came up with the problems of not having the information. I gave the examples and there has been no response, but there were some discussions with the aforementioned New South Wales EPA officers about my methodology and measurements.

**CHAIR:** Are you aware of a company called Sonus?

**Mr Cooper:** Yes, I am.

**CHAIR:** Are they a reputable company in sound engineering?

**Mr Cooper:** To some people, yes; to some people, no.

**CHAIR:** To you?

**Mr Cooper:** No—not on the work that I have seen they have done.

**CHAIR:** So they are not reputable?

**Mr Cooper:** I have found problems with their work and misrepresentation in terms of what they have reported about wind farms.

**CHAIR:** Are you aware that they have been working on wind farm noise issues since 2002?

**Mr Cooper:** Yes.

**CHAIR:** So they are not competent?

**Mr Cooper:** One of the persons I have spoken to is competent. I have had lengthy discussions with him.

**CHAIR:** What happened to his input? One of them is competent. Are there other incompetent people at Sonus?

**Mr Cooper:** I have not discussed with the other people. I had the opportunity when I was at a public meeting at Wellington to talk to one of the authors of the reports and we discussed some of my findings. He was most interested in my work and that I had uncovered new areas of research that had not been looked at before. He advised me that he would also like to investigate that, but there was no funding to look into the areas that I had exposed.

**CHAIR:** Who is funding your analysis?

**Mr Cooper:** Regarding my analysis—you are looking at it—I have had some funding from some communities where I have done some peer reviews. The Goyder regional council did a peer review on Stony Gap, but 95 per cent of the work that I have done with consulting fees comes to probably a quarter of a million in the last 12 months.

**CHAIR:** What about the Waubra Foundation?

**Mr Cooper:** No. The Waubra Foundation provided some funding for some measurements I conducted in Waterloo—a small amount for a proportion of the time that I was there. It assisted me to get there to do some measurements.

**CHAIR:** You have a relationship with the Waubra Foundation?

**Mr Cooper:** I have relationships with many consultants. I have spoken to two directors at the Waubra Foundation. I meet with them and discussed some of my findings because they are interested in the work that I am doing. Do I have a relationship? No, I am not part of the Waubra Foundation. I am not part of any political lobby; I am not part of any anti wind farm group.

**CHAIR:** Have you looked at the Sonus 2010 report?

**Mr Cooper:** Which one?

**CHAIR:** There was a report in 2010 from Sonus.

**Mr Cooper:** Is it the one on infrasound? There are two reports that are generally circulated: one about environmental noise and one about infra-sound. If it is the 2010 infra-sound report, yes, I have, and I have been to Cape Bridgewater to measure at their spot and found a lot more turbines than they indicated.

**CHAIR:** There was the technical paper of 2010; one done for the Clean Energy Council.

**Mr Cooper:** I think that is a general overview. I have seen that one. There was another one done for Pacific Hydro.

**CHAIR:** Are these papers incompetent?

**Mr Cooper:** The infra-sound paper is misleading.

**CHAIR:** Can you provide some evidence as to where it is misleading and where there is a lack of competency in the Sonus paper on notice? I am not asking you to do it now. You indicated that you could pick up noise from a wind turbine seven kilometres away.

**Mr Cooper:** I said I picked up infra-sound. Yes, I did pick up noise. It appears in my report. It is shown at appendix D19.

**CHAIR:** I am not sure that you are qualified to answer this, but you may have a view. Would there be any health issues surrounding that type of infra-sound from seven kilometres away?

**Mr Cooper:** If you go to appendix D9, it will show you the signature of the turbines. The red line is the outside and the blue line is the inside. It will show you that there are actually some high noise levels inside. The levels that are reported, that I indicated by Professor Salt, show they have the potential for giving rise to disturbance. I can only report on the measurements that I have taken. I have identified that the signature is apparent. Outside the residence you could certainly hear a low-frequency hum—there is no doubt about that—and the background level was about 25 dBA at that site.

**CHAIR:** There is an international standard for wind turbine noise, IEC 61400-11. You are aware of that?

**Mr Cooper:** Part 11, issue 2 is the current version.

**CHAIR:** Yes. Is that appropriate?

**Mr Cooper:** It is a method at the moment for talking about measuring the sound power level. It has a problem in that the position it does at the ground level has an issue with directivity. The standard does not measure below 30 hertz, so it does not have a procedure for assessing infrasound in terms of it, and it presents the wrong formula for the propagation of low-frequency energy, in that it uses a six dB per doubling rather than a three or four dB per doubling, as shown in—

**CHAIR:** Mr Cooper, is there any plain English language that explains what that means? My eyes are rolling; I don't know what that means! You can take it on notice if you like and give us a plain English analysis.

**Mr Cooper:** No, it is very simple. The noise for general noise in the dBA drops off at six dB per doubling of distance. Every time you double the distance, it goes down six dB. But, when you deal with low frequencies and you deal with line sources, it goes off at a lower rate. It is identified in one of Dr Chapman's reference documents. It shows that the rate of low frequency is a much lower rate than normal noise. So what happens is that the low frequency and particularly the infrasound are underestimated as you go further away from the wind farm.

**Senator BACK:** They are underestimated?

**Mr Cooper:** Underestimated.

**CHAIR:** I just have one last question. The Sonus 2010 report says that Australia has amongst the most stringent and contemporary rules in place for wind turbine noise of anywhere in the world. Is that correct?

**Mr Cooper:** In terms of dealing with the South Australian guidelines, at the time yes. If you were to introduce the New South Wales guidelines, they are actually more stringent. The reason is that the South Australian guidelines used to say 35; they have now lifted to 40. The New South Wales guidelines are talking about 35 in background plus five, but they separate it into day versus night. The South Australian guideline allows you to average all the data together, so it lifts the regression curve and gives you a higher starting point.

**CHAIR:** If the standard that you are advocating were applied, or the standard in the regulations were applied generally for infrastructure and engineering facilities across the country, how many infrastructure and engineering facilities would need to be closed down?

**Mr Cooper:** You mean if you apply the—

**CHAIR:** If you applied it generally.

**Mr Cooper:** If you applied the background plus 10 to industry?

**CHAIR:** Yes.

**Mr Cooper:** Most of that is already applied, because it is background plus five measured as an average noise level. So that becomes the standard criterion. So this is more lenient than what happens for industry across Australia.

**CHAIR:** You are saying that this would have no effect, that you could not have any effect on the rest of industry if you had this specific issue applying to wind turbines? I am just wondering why wind turbines and nothing else.

**Mr Cooper:** It might be a couple of lawyers' questions, but, if we first put it as industry in suburban areas, they are already governed in the general concept of background plus five. If you do some industries in rural areas, in the rural areas where you have industries they influence the noise, they create the background, and if there is other industry you are already artificially there. If there is no industry and you put a new one there, like a gas-fired power station, it becomes the noise source, and there have been problems. So, in the rural area, there are some cases where industry, if they applied this condition, could have penalties. In the suburban areas, with the excessive noise condition, no, if you take it as the average noise level, because the noise limits for industry are basically background plus five or, where there is lots of industry, actually less.

**CHAIR:** Thank you, Mr Cooper; thanks, Dr Shepherd and Dr Thorne.

**Proceedings suspended from 12:24 to 13:03**

**SELIGMAN, Professor Peter, Honorary Professor, Melbourne Energy Institute, University of Melbourne**

*Evidence was taken via teleconference—*

**CHAIR:** I welcome Professor Seligman. Is there anything you would like to add about the capacity in which you appear today, Professor Seligman?

**Prof. Seligman:** I am an electrical engineer appearing on behalf of the Melbourne Energy Institute of the University of Melbourne.

**CHAIR:** The committee has been provided with your submission to the 2011 community affairs committee inquiry into the social and economic impact of rural wind farms and some additional information provided by you. I now invite you to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions.

**Prof. Seligman:** Yes, I do. My first comment is that the environment is awash with infrasound, which is both from natural and man-made sources and which is often far in excess of what is produced by wind farms.

The second point is that there is a claim that it is modulation of low-frequency noise that can produce the symptoms that have been described. The Melbourne Energy Institute, in combination with the Department Psychology, are planning to do a double-blind study with this type of noise to see if we can actually induce the symptoms that have been described. That study has not started yet, but it is forthcoming.

Another point that I would like to make is that there appears to be an epidemic of what is called 'wind turbine syndrome' in Australia and in Ontario in Canada but not in most other regions where there are wind turbines, which is a peculiar distribution. Another point is that in the USA, symptoms of wind turbine syndrome were reported, peaked in 2010 and are now on the decline, indicating that possibly the symptoms are not being reported there anymore and that concern is going away. That is my opening statement.

**Senator XENOPHON:** Professor Seligman, thank you for your submission. Just in terms of your background: you are a biomedical and acoustic engineer?

**Prof. Seligman:** That is correct.

**Senator XENOPHON:** Have you undertaken any surveys or studies of wind farms with a view to recording the levels of noise, both infrasound and other forms of noise—

**Prof. Seligman:** No, I have not been involved in any of those studies.

**Senator XENOPHON:** Have you seen any of those studies at all?

**Prof. Seligman:** Yes.

**Senator XENOPHON:** For instance, we heard from Mr Steven Cooper earlier today, an acoustician of some 35 years standing—did you manage to have a chance to hear his evidence?

**Prof. Seligman:** No, I have not been—

**Senator XENOPHON:** That is fine; I just wanted to confirm whether you had a chance to hear Mr Cooper's evidence or not. Have you had a chance to critique the studies done, including the relatively recent New Zealand study, which I understand was peer reviewed—I think that was Daniel Shepherd and others—in relation to their assessment of wind turbine noise and the potential effect that could have on residents in terms of sleep disturbance?

**Prof. Seligman:** I have read a paper by a New Zealand group. I do not remember if it was Shepherd or not, but I could certainly review that paper again. There was a conference a couple of years ago in Rome in which there were something like 100 papers, and I actually did look at quite a number of those papers. But I do not remember this particular one by Shepherd.

**Senator XENOPHON:** Again, I do not want to put you on the spot; but if you could, then perhaps the committee could write to you with some of the peer reviewed literature—some of the papers that have been referred to in this inquiry?

**Prof. Seligman:** Certainly.

**Senator XENOPHON:** For if you have any particular views in respect of them. Certainly, I think that Mr Cooper referred to himself as being 'way down in the food chain', in all these in the sense that he said that he did the acoustic recordings and reports and that it is a matter for interpretation by others as to what impact they have. But it seems to be way above the accepted benchmark of 5dBA above background noise.

**Prof. Seligman:** I see. Yes, okay. I will look both at Steven Cooper's paper and at the Daniel Shepherd New Zealand material.

**Senator XENOPHON:** Sure, that will be very useful. If you could respond to that—in fairness to you, so that you can have a chance to comment on that.

With the work that you do as a biomedical and acoustic engineer: you were part of the original team that developed the Australian Cochlear implant, which is a great Australian invention. What work are you doing at the moment? Are you either consulting or giving advice?

**Prof. Seligman:** I have retired. I did work for the company Cochlear for 26 years; before that I worked for the University of Melbourne. I have now retired, but I work on a very casual basis with the Melbourne Energy Institute and I also work one day a week with the Bionics Institute, which was formerly called the Bionic Ear Institute.

**Senator XENOPHON:** Again, I congratulate you on all the work that you have done on the cochlear implant. May I take you to the two main provisions of the bill. The first relates to the issuing of a renewable energy certificate if the noise levels are 10 dBA above background levels. Is it your understanding of EPA guidelines around the country and WHO guidelines in respect of noise that five dBA above background is generally the threshold by which there is a level of annoyance and disturbance to individuals who are experiencing it at that level or above?

**Prof. Seligman:** Certainly a perceivable level above background noise can be annoying to people who already have some adverse opinion of what is happening. I could imagine that, for example, if I were to move to a nice quiet place in the country and somebody did something which made it noisy, whether it was a wind farm, a freeway or anything else, I would be annoyed by that.

**Senator XENOPHON:** Perhaps I need to reframe that question. Do you acknowledge that EPA guidelines and WHO guidelines, and acousticians such as Mr Cooper, who appeared earlier today, make reference to the level at which there is annoyance being five dBA above background noise? Is that a reasonable proposition from your point of view? Obviously, the noise you experience in the middle of the Sydney CBD is quite different to the noise you experience in a rural environment.

**Prof. Seligman:** I can only go back to my previous remark. The level of annoyance is very much a subjective thing, whether it is something that you object to or something that you do not mind. For example, a tram going by can be an annoying thing to some people but not to others.

**Senator XENOPHON:** I am sorry. I understand there are issues of subjectivity, but isn't it the case that the EPA guidelines around the country and the WHO guidelines talk about objective levels of noise above background levels of noise before it could become annoying in the same way that we have rules that say you cannot use your lawnmower at six o'clock on a Sunday morning? Do you acknowledge that there are accepted standards in various EPA guidelines?

**Prof. Seligman:** Of course I acknowledge that there are accepted standards, yes.

**Senator XENOPHON:** The second part of the bill relates to a requirement that there be published online—in other words, that there be some transparency and accountability around—various information such as information about noise, wind speed and direction, weather conditions and power output. Do you have any issue with that part of the bill insofar as it relates to the provision of information? For instance, Mr Cooper, who has been an acoustician for 35 years, told me that, when he has requested information, it has been refused to him, as have other researchers, including Professor Colin Hansen, who is part of an Australian Research Council grant that is looking at noise. Do you think it is reasonable that those basic pieces of information should be out there and readily available?

**Prof. Seligman:** Yes, I think that is reasonable.

**Senator BACK:** Thank you very much, Professor, for your paper. I did try to access the reference that you had made to pacifichydro.com.au for the infrasound report but unfortunately it had been withdrawn from the website so I was not able to access it.

**Prof. Seligman:** I see.

**Senator BACK:** I wonder if you would have a copy of it that you might be able to provide to the committee.

**Prof. Seligman:** Yes, certainly.

**Senator BACK:** In your submission you also pointed out, in figure 7 of the document, an issue relating to doubling of distance, and I was not able to check on that. In your submission, and I think it is at paragraph 5, you made an observation that infrasound at that level is not detectable 'by man or machine'. Could you explain to us what you were referring to in making that observation?

**Prof. Seligman:** Unfortunately I do not have it right in front of me.

**Senator BACK:** It was to do with 'The arguments for and against damage or annoyance at a distance'. You made the observation:

It has been argued that infrasound does not propagate and attenuate with distance in the same way that normal sound does.

You made the observation that that was not borne out by Pacific Hydro and then you went on to say:

At 5 km (4 doublings), a distance at which it is claimed infrasound is still problematic (Dr. Michael Nissenbaum), the level would be some 24 dB below background level, undetectable by man or machine.

I just did not quite understand what you were getting at.

**Prof. Seligman:** The thing is that if you want to detect a sound or anything if it is below the ambient level it is really swamped by that ambient level so it is not really detectable anymore because there is another level which is much higher and which is overwhelming it. So if it is 24 decibels, which is a long way below the ambient background noise level, then there is no instrument that is going to be able to pick it up because the instrument will just pick up the background noise.

**Senator BACK:** So just picking up the background noise itself and not the other?

**Prof. Seligman:** Yes.

**Senator BACK:** Mr Cooper, in his evidence to us earlier in the day, was saying that in some of the work he has been doing he has actually been able to detect infrasound signatures, which I think was the term he used. The chairman has just told me he thought that he used the term 'unique signatures'. Presumably with his using that term I wonder whether he was actually referring to it being unique to a wind turbine. He was able to detect those unique signatures out seven kilometres. Would that be consistent with your experience? Would that be, from your point of view, a likely scenario that he would have been able to detect and report?

**Prof. Seligman:** It sounds somewhat unlikely but there are special methods for detecting signals in noise which are used, for example, in wi-fi and in the radio field. That is where you are looking for a very specific signal in background noise which has got a wideband nature. So if you have got ambient noise which is very wideband and quite uniform across the band and you are looking for a particular signal, you can use special mathematical techniques to extract that signal out of the noise. Whether the human physiology is able to do that, to extract a particular signal like that, is a good question. That is actually partly the reason why I will be doing this study whereby we will be producing a wind turbine signal which we will be presenting to subjects. We will be doing a double-blind study in which the subjects will not be able to hear this noise nor will the testers and observers. So we will be trying to see whether any symptoms can be displayed.

**Senator BACK:** That will be very welcome work. In commenting as Senator Xenophon was, I note the paper to which he was referring was one led by Dr Daniel Shepherd and was in *Noise & Health* of September-October. A second paper was in the same publication of September-October. That was by Nissenbaum, Aramini and Hanning, in which they reviewed the reaction from people who were inside and were 1½ kilometres from industrial wind turbines in the United States and there was a second group outside that and it was coming up with adverse reports of sleep disturbance and ill health among those living closer. The secretariat might send you those. I would be very interested. Dr Nissenbaum briefly spoke to his paper, but that is only weeks old. I would be most interested to receive your observations of that paper as well.

**Prof. Seligman:** If you could send me that paper, that would be great.

**CHAIR:** Thank you for that.

**Senator XENOPHON:** This is not a criticism by any means, but you have a view that you consider that wind turbine energy is a good source of renewable energy from a policy perspective?

**Prof. Seligman:** Yes.

**Senator XENOPHON:** And it is something that you have advocated publicly, and there is nothing to be ashamed of, if that is the case—that is your view?

**Prof. Seligman:** That is my view.

**Senator XENOPHON:** It is something that you have any commercial involvement in, or as an investor?

**Prof. Seligman:** I am a shareholder of Hepburn Wind, which is a very small community wind farm. We have two turbines.

**Senator XENOPHON:** I take it that is not something you will be retiring on?

**Prof. Seligman:** Not exactly!

**Senator XENOPHON:** I thought it would be good to clear that up.

**Prof. Seligman:** I have another comment to make. In doing the study that we are doing with the Department of Psychology, I am not here to try and prove that this sound cannot produce symptoms. Our objective is to make a completely impartial measurement on the sound to see whether we can induce any symptoms. If we could induce some symptoms, I would think that would be a positive breakthrough for both the wind farm advocates and the opponents to wind farms, because if you actually knew of a mechanism that could induce these symptoms then you could basically keep that under control and work out what legitimate and reasonable guidelines would be. At the moment we do not have any mechanism that fully explains the symptoms. That would be the objective of the study: can this sound produce symptoms? If it can, we would be able to work out what the sensible guidelines would be.

**Senator XENOPHON:** I invite you to consider that comment in the context of the material that you will be referred to by the committee, in terms of a number of studies that have been done with respect to wind turbine noise and issues of health effects, including some peer reviewed papers. I would be very grateful if you could comment on those peer reviewed papers in the context of what you have just said.

**Prof. Seligman:** Yes.

**CHAIR:** We had evidence from Professor Alec Salt from the Department of Otolaryngology.

**Prof. Seligman:** From Washington University in St Louis.

**CHAIR:** You are aware of Professor Salt?

**Prof. Seligman:** Yes.

**CHAIR:** Professor Salt rebutted your arguments about the background noise and the internal noise of the body. He said that sound generated internally was generated in the cranium cochlear aqueduct and that it does not stimulate the hair cells of the ear, so we need better studies to understand what is really happening. Do you have any comment on that?

**Prof. Seligman:** That is the issue which we are addressing in the study which we plan to do.

**CHAIR:** So you have got that covered off in terms of your prospective research.

**Prof. Seligman:** It is specifically aimed at investigating that point, yes.

**CHAIR:** Two of the submissions we have are about being able to pick up the noise and the infrasound up to seven kilometres away. Are you aware of the Nissenbaum paper?

**Prof. Seligman:** Yes.

**CHAIR:** The conclusion they come to is that the wind turbines disturb sleep, cause daytime sleepiness and impair mental health in residents living within 1.4 kilometres of the two installations that were studied. The paper goes on to argue that the wind turbine noises are a further source of environment noise with the potential to harm human health. Do you have any views on that?

**Prof. Seligman:** I can only go back to some of the things I said in my opening statement. There appears to be an epidemic of this wind turbine syndrome in certain regions and it is not reported at all in others. That raises a question as to how valid these accusations are. Nevertheless, we are still open-minded and we would like to try to make as objective a study as is possible on this topic.

**CHAIR:** The position in Australia at the moment is that the advice being received is that we should basically take precautionary measures. Do you agree with that?

**Prof. Seligman:** I would agree with that if the precautionary measures were what I would consider to be fair and reasonable and I am not sure whether at the moment I could comment on that unless I knew what those measures were.

**CHAIR:** The World Health Organisation states that there is no reliable evidence that sounds below the hearing threshold produce psychological effects. Are you monitoring the WHO view on this?

**Prof. Seligman:** I am aware of that view, yes.

**CHAIR:** Do you agree with that at the moment?

**Prof. Seligman:** Yes.

**CHAIR:** Have you come across any evidence to say that there is a link to this wind turbine syndrome through wind turbines operating?

**Prof. Seligman:** As you will be aware, there is a whole plethora of papers and documents out there putting one view or the other: that these symptoms are being induced, or that these symptoms cannot be induced. It is our

objective to assess the validity of the views. If there is the theory that a particular type of noise can induce these symptoms, we are asked to try and establish whether that is repeatable.

**CHAIR:** What you are basically testing is what we have heard about this morning—the nocebo effect. Is that correct?

**Prof. Seligman:** No, we are not actually testing for the nocebo effect. We are testing for a specific type of noise which has been described by Dr Alex Salt. He is actually proposing a particular mechanism for these symptoms and we would be interested in trying to induce those systems with the kind of noises he is talking about to see whether it is something that you can repeat.

**CHAIR:** We had evidence from Dr Nissenbaum this morning and he says that there has been no published articles or assessed articles to refute the article by Nissenbaum, Hanning and Aramini. I just noticed now that that was published in September-October 2012 in a publication called *Noise and Health*. Would it have been possible to do an analysis of that given that it was only published in September-October?

**Prof. Seligman:** It is unlikely, isn't it?

**CHAIR:** So the argument that there has been no rebuttal of this does not mean to say that people will not have a look at it and deal with it.

**Prof. Seligman:** No.

**CHAIR:** Professor Seligman, we are over time. Thank you for your help and thank you for taking on board the questions that have been put to you on notice.

**DONOGHUE, Mr Kieran, General Manager, Policy, Energy Supply Association of Australia**

**PRYOR, Mr Ben, Policy Adviser, Energy Supply Association of Australia**

**WARREN, Mr Matthew, Chief Executive Officer, Energy Supply Association of Australia**

[13:34]

*Evidence was taken via teleconference—*

**CHAIR:** I now welcome representatives from the Energy Supply Association of Australia. The committee has received your submission, No. 205. Would you like to make a short opening statement, at the conclusion of which I will invite members of the committee to ask questions?

**Mr Warren:** I will keep this brief because I am conscious of the time. We appreciate the opportunity to present before the committee today. Taking our submission as read, we would make the following three points in relation to the proposed bill. The first is that issues around noise and planning controls are already managed by the states in Australia. There is legislation and there are extensive and comprehensive noise and planning controls in place. Given that, the ESAA's view is that it is difficult to see what the proposed legislation is going to do that is not already adequately dealt with by the states.

The second point to make is that the notion that you would have legislation to enshrine a specific noise standard on one technology only, and not have noise standards to protect a certain threshold for all sources of noise, we find a little confusing. It strikes us that if there is a concern in regional communities, or urban communities for that matter, that households and others are suffering detrimental effects as a result of a certain threshold of noise, it would seem logical for those noise standards to be applied to all sources and not just one technology type.

The third key point to make is that legislation which makes the development of any energy technology more difficult and more challenging invariably makes the cost of that energy and therefore power bills more expensive. So you can continue to impose more punitive standards on wind farms or other sources of generation, but the net effect will be to put upward pressure on commercial and residential power bills. That concludes our opening comments.

**CHAIR:** Thank you.

**Senator XENOPHON:** Thank you for your submission. Your members would include wind turbine proponents and companies. Is that fair?

**Mr Warren:** Yes, some of our companies are in the business of developing and installing wind farms.

**Senator XENOPHON:** Sure. There are regulations nationally and indeed there are international standards such as the WHO's, but I am talking about EPA regulations that talk about levels of noise above background noise that are permissible in industrial developments. It is acknowledged that the reason those benchmarks or standards exist is that noise can affect the amenity and, for instance, the sleep of nearby residents, whatever the source of the noise is.

**Mr Warren:** Yes, that is right.

**Senator XENOPHON:** There are two parts to the bill. I will begin with the second one first. It relates to requiring proponents of wind turbines to provide certain information and make it publicly available, and that includes a range of factors such as publishing on the intranet information about the noise, the wind speed and direction, weather conditions and power output. We heard a number of witnesses earlier today, including Professor Colin Hansen and Mr Steven Cooper, an acoustician. Professor Hansen is undertaking research via an Australian Research Council grant and we heard that when he has asked for information from wind turbine proponents of these very matters that information has been refused. Does your association have a view on that information being made publicly available?

**Mr Warren:** Some of those aspects are information that we as an industry collect and provide. The power output of different generation projects is publicly known. There is a rated power output of turbines but, of course, that will depend upon differing wind conditions. I think that information is available through the energy market operator, if you chose to delve into it.

**Senator XENOPHON:** I must take issue with that little snide remark: 'if you chose to delve into it'. Firstly, this is a matter where acousticians, researchers such as Professor Hansen, who has an Australian Research Council grant—and we know how rigorous the Australian Research Council is before it grants funds for research—say that they cannot get basic information in order to undertake their research and that includes issues such as the noise attributable to wind farms; the wind speed and direction at wind farms; the weather conditions at

wind farms; and the power output of individual turbines at wind farms. So for you to suggest that if I chose to look into it I could somehow get this information I find personally quite offensive.

**Mr Warren:** That is your decision, Senator.

**Senator XENOPHON:** It is not a decision; it is an observation.

**Mr Warren:** It is up to you, Senator. You can say whatever you like.

**Senator XENOPHON:** We have heard from witnesses today, eminent researchers, who say they cannot get information in relation to issues such as wind speed and direction, weather conditions and power output which, axiomatically, would be necessary in relation to the issue of determining compliance with EPA regulations.

**Mr Warren:** Senator, before you interrupted me, I was explaining that the rated output and energy production of wind turbines—any project—would be available from the energy market operator if you chose to ask them for it. I am explaining that the aspect of the data you are seeking is publicly available.

**Senator XENOPHON:** Perhaps you could take on notice—and I am sorry if we were talking at cross-purposes—the specific complaints of some of the witnesses at this inquiry, saying they cannot get some basic information in terms of being able to determine whether compliance takes place. It is almost a catch-22 situation. There are existing rules that relate to EPA guidelines with respect to wind turbines but, in order to determine whether there is compliance, they need this information. That is what has been put to us in summary by a number of witnesses who are attempting to research this issue.

**Mr Warren:** Sure. But in relation to noise attributable to wind farms, as I am sure you are fully aware, in order to collect that information accurately you need the cooperation of the wind farm operator because you need to switch the wind farm off in order to compare noise when it is operating with when it is not operating because ambient noise can constitute some, if not all, of the noise recorded near a wind farm.

**Senator XENOPHON:** But do you agree that, as a matter of public policy, considering that wind farms get renewable energy certificates, that there is in effect a subsidy in respect of that—I am not taking issue with that, because I understand the public policy desirability of renewable energy—isn't it reasonable that there be cooperation between the proponents and those who want to ensure that there is compliance with current EPA guidelines?

**Mr Warren:** Sure, but my understanding is that all wind farm projects are operating under certain licence conditions and are required to comply already with those standards that apply to them in each case. So I would assume by definition that that is occurring. If every time somebody wants to come and reassess the noise output of a wind farm and asks for it to be turned off, there is a degree in which that process can become onerous just because that wants to be repeated. But I would have thought that information would be available as a by-product of the approvals and licence conditions.

**Senator XENOPHON:** I think this will be my final question, because the chair has been very generous. Perhaps if it were put to you in writing what the specific concerns are—and we are waiting for some email threads from, I think, Professor Hansen in relation to this—that might clear up where the information asymmetry is occurring. That might be of more assistance to you to focus on the specific complaints that have been made about that information.

**Mr Warren:** Sure. We are absolutely happy to help anyone. There is information available and we are happy to direct them to how they can obtain that information so that they can fast track their research.

**Senator XENOPHON:** Thank you.

**Senator BACK:** In his evidence earlier today, Mr Cooper was talking about the need to receive information on wind, speed and power output at the hub of the turbines. Is this information collected, and can it be made available? The point he was making was in terms of placing an application before the relevant authorities and that that sort of information would be necessary to be able to fully complete an application by a proponent.

**Mr Warren:** I am not sure that I understand that, Senator. There are two stages. There is a wind farm that is operating and that has already received its approval, and there is a proposed wind farm where there are no turbines currently operating. Are you referring to the former or the latter?

**Senator BACK:** I would be referring to the latter. You would have to draw upon information presumably from existing turbines to be able to provide the information, wouldn't you?

**Mr Warren:** If there are many turbines in the region then wind speed is something you would need to measure on the site. It would depend on who owns the land as to how you acquire that information. I am checking with Ben whether the applicants, as part of the approval process, provide wind speed data. I would not have thought that was difficult. We can take that on notice. On the second part of the question: if there are no turbines,

it is difficult to specifically identify. There is nothing there to measure apart from wind noise prior to the application going through.

**Senator BACK:** Just a point of clarification, if I can, Mr Warren, to a question that Senator Xenophon asked you and that you responded to regarding turning off the turbines: the advice is that the turbines do not need to be turned off to gain the information that Senator Xenophon was asking about. Would you confirm that to be the case?

**Mr Warren:** I would struggle to understand how you could possibly measure discrete noise coming from a wind turbine. You need to turn them off to be able to compare the ambient noise without the turbine to the noise with the turbine. Turbines are in windy locations. Most of the time the noise you are picking up is the noise directly from the wind. Issues arise in this area, particularly at times of low wind levels where the turbines are still operating but the ambient noise is quite low. The only way to identify the discrete noise coming from a turbine is to turn it off and on and compare the two different outcomes.

**Senator BACK:** Mr Warren, at the top of page 2 in your submission, you make the observation:

... esaa considers that the Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012 places arbitrary and onerous requirements on wind farms that are not based on sound scientific advice.

I wonder whether you could reconcile that with your answers to a question last year by then Senator Fielding in the inquiry, which you were good enough to appear at as a witness. The question put to you by then Senator Fielding was: 'What factors would you use to determine the setback?' Your answer was 'measured audible sound'. What I am failing to understand is that in 2011 you regarded measured audible noise to be the desired measure. Am I wrong in my understanding of your now saying that this information on excessive noise 'places arbitrary and onerous requirements on wind farms that are not based on sound scientific advice'. What am I failing to understand?

**Mr Warren:** I do not think they are inconsistent. I think you are referring to the evidence I gave last year in my prior role as the chief executive of the Clean Energy Council, but that is more for the record.

**Senator BACK:** Yes, that is correct. I understand that to be the case.

**Mr Warren:** Our observation in the submission from the SAA is that if you have a concern about any threshold of noise affecting the amenity of households or others, that threshold should be consistent across all sources of noise, not just a specific technology. So the onerous nature and arbitrary nature refers to the proposed legislation's specific focus on one technology and one type of noise only.

**Senator BACK:** That is auditory noise, is it?

**Mr Warren:** Yes, that is what noise is, I think.

**Senator BACK:** Yes, I think you dealt with that in some answers to questions last year. In the time available, I again go back to your submission. You made mention of the NHMRC carrying out a more in-depth study of potential health issues related to wind farms. It is my understanding that what the NHMRC are doing is updating their literature review. Is that correct, or do you understand that they are actually undertaking epidemiological research?

**Mr Warren:** I think you right, Senator; I think they are updating their literature review. There is a lot of research done in this area and I think they are aggregating and updating the work that has been done to date.

**Senator BACK:** Due to time constraints, I will put my other questions on notice.

**CHAIR:** I will also ask a question on notice, as we have run out of time. In the Vestas submission they say that the amendments would be inconsistent with the Renewable Energy Act and the objects of the act, and they outlined the objects, being:

- (a) to encourage the additional generation of electricity from renewable sources; and
- (b) to reduce emissions of greenhouse gases in the electricity sector; and
- (c) to ensure that renewable energy sources are ecologically sustainable.

Could you give some thought to that, see whether you agree with that proposition and give us some details on your view on that.

**Mr Warren:** Certainly.

**CHAIR:** We have run out of time, so I thank you for your input today.

**ROSS, Dr James, Member, Doctors for the Environment Australia**

**TAIT, Dr Peter, Convenor, Ecology and Environment Special Interest Group, Public Health Association of Australia**

**WALKER, Ms Melanie Jayne, Acting Chief Executive Officer, Public Health Association of Australia**

[13:52]

**CHAIR:** I now welcome representatives from the Public Health Association of Australia and Doctors for the Environment Australia. The Public Health Association of Australia and Doctors for the Environment Australia have lodged submission 23 with the committee. Would you like to make a short opening statement? At the conclusion of that, I will invite members of the committee to ask questions.

**Ms Walker:** Firstly, we would like to acknowledge the traditional owners of the land on which we meet, the Ngunawal people here in the ACT. We would like to acknowledge the committee members and thank them very much for the opportunity to appear before the committee to elaborate on the content of our submission. For some of the committee members who might not be familiar with our organisation, the Public Health Association of Australia is a membership based organisation. We have some 1,900 members across Australia which constitute both individuals and organisations across a variety of fields with an interest in public health. Our members are doctors and nurses, researchers in the area of public health, public health practitioners, Aboriginal health workers, people working in related community sector fields and indeed consumers of health services as well, so we have a very broad membership base. We also have branches in each state and territory of Australia, and we have a range of special interest groups that basically look at portfolios of interest within public health. Public health is obviously a very broad area, so we have special interest groups. Dr Tait, who will speak very shortly, is the convenor of our environment and ecology special interest group. That is a bit of an introduction to our organisation. I would like to hand over to Dr Ross to provide a bit of an introduction to Doctors for the Environment before we summarise what the submission says.

**Dr Ross:** Doctors for the Environment Australia is a branch of the International Society of Doctors for the Environment. We are a membership based organisation consisting of doctors of all types and we work to address diseases that are caused by damage to the earth's environment. In that context we advocate and attempt to educate in those areas.

**CHAIR:** Dr Ross or Ms Walker, have either of you heard of the wind turbine syndrome?

**Dr Ross:** In terms of a syndrome I cannot say that I have heard of that in those terms. Can you elaborate, Senator?

**CHAIR:** It is just something that is out there called the wind turbine syndrome and it lists 150 different health problems that are associated with it. Have you not heard of that?

**Ms Walker:** We are certainly aware of wind turbine syndrome. The difficulty for Dr Ross is it is not a recognised illness or syndrome. At this stage the evidence is still very much out. It is important to note though that reviews of all the literature to date have failed to identify any adverse physiological effects attributed to exposure to wind turbines, with the exception of those mediated by noise in a small proportion of exposed people whose symptoms may or may not be related to perception, annoyance and other psychosocial factors related to the uptake of the new technology. While we do acknowledge the literature around the emerging evidence, we think the jury is still out on wind turbine syndrome. I might just throw to Dr Peter Tait to elaborate a little on our views in terms of the content of the submission.

**Dr Tait:** Thank you. If I may just summarise the submission which you have in front of you, the Doctors for the Environment Australia, which I will start calling DEA, and the Public Health Association of Australia, which I will start calling PHA, because that is going to be quicker, have three core problems with this bill.

Firstly, it fails to recognise the broad context of health effects from all the range of electricity generation options that we are choosing to use, and it is taking that around wind farms out of context. We think that any impacts of wind farms need to be taken in that broader context in order to be understood and judgements made about how to respond to them. We do note that there is an ongoing debate about the potential for wind turbines to create annoyance, which seems to be a response to audible noise rather than infrasound or any other sorts of noise, in a small proportion of people—the literature says about nine per cent of people who are exposed. We are, of course, concerned that for these people this is an issue that we need to be dealing with. Whether this is the right way of doing it is another question.

We are also aware, as Melanie has just pointed out, that there is a range of other factors that seem to be affecting whether a person will or will not respond adversely to the presence of wind turbines in their vicinity.

The wind turbine syndrome was coined by Dr Pierpoint in her series of case studies. It has not been accepted in the mainstream as a syndrome yet. The evidence that has come out of the previous Senate inquiry into wind turbines suggested that it is audible noise that is creating the problem, similar to audible noise that comes from trains, air-conditioners, traffic, aircraft and all the other things which cause audible noise. We think there is a problem with creating a new not particularly well-described and not particularly well-researched syndrome.

We also note that other electricity generation sources have similar problems which, in addition to noise, also include things such as visual impacts, dust, volatile organic compounds and greenhouse gas emissions and the effects they have on global warming from fossil fuel use. It is important to bear that context in mind as well, and I am glad, Senator Xenophon, that you were saying that you appreciate the role that renewables play in combating that. In summary for that part, we maintain that the focus on wind turbine noise out of the larger context is going to lead to a skewed policy approach to how we deal with the as-healthy-as-possible electricity generation in Australia.

Secondly, we are aware, and I have just heard from previous evidence that the committee is aware, that the National Health and Medical Research Council is conducting another review to get a more up-to-date handle on the literature around health impacts from wind farms. We are concerned that this bill, if it goes through, will preempt the findings of that and we would think that any action should wait until that review is complete in the middle of next year.

Thirdly, there are a couple of 'minor-ish' details around the contents of the bill which are in the submission, but the main one, and the one that seemed to be being talked about just before we came on, was this issue about the 10 decibels above existing noise levels: how the level of 10 decibels was reached; what the scientific evidence behind that decision was; how you technically measure 10 decibels above pre-existing noise; what are you comparing; and how are you defining pre-existing noises at peak noise, mean noise and lower noise. We think that setting a limit like this, it is probably too early. But I will leave it at that and leave ourselves open to questions. Thank you.

**Senator XENOPHON:** Thank you for your submissions and thank you for being here today. Hydro-electricity power stations are one of the cleanest forms of energy and Tasmania has been a leader in that. You would agree with that in terms of a form of energy? If I were put to you, based on information provided to me by Mr Steven Cooper, I think one of the nation's leading acousticians, that the current rules that relate to EPA guidelines for hydro-electricity power stations, coal-fired power stations and gas-fired power stations—so quite a mix there of energy from clean to not so clean to dirty in relative terms—are background noise plus five decibels. So that might help you, Dr Tait: we have used a level of 10 decibels, but with wind turbines it is either 35 or 40 decibels plus five—it seems to be at a different threshold. The rules seem to be different. If there is a rule that applies to hydro-electric power stations and coal-fired power stations and gas-fired power stations that is a benchmark for noise affecting residents, should not the same sort of rule apply to another form of renewable energy—namely, wind turbines?

**Dr Tait:** If we are talking about just noise, then that would be reasonable.

**Senator XENOPHON:** That would be reasonable? If we want consistency, shouldn't we begin with plus-five decibels for all energy in terms of that criterion of noise?

**Dr Tait:** Without knowing the background to how the EPA guidelines got to pick five decibels as their number—

**Senator XENOPHON:** We have heard evidence from acousticians today that they say five decibels is a threshold by which it will be of some annoyance rather than a minor annoyance—perhaps considerable annoyance—to a number of people, although the bill refers to 10 decibels taking a more conservative approach.

**Dr Tait:** Again, without knowing too much about that and not having noise and not being an acoustician, it does make it difficult to assess that. I can only go on a very broad statement that if that is what has been arrived at then that would seem a reasonable place without being able to comment on the 'how you get there'.

**Senator XENOPHON:** I get where you are all coming from about the impact of, say, a coal-fired power station on health in terms of particulates and issues of lung impact. I do not take issue with you about that. I note that the Public Health Association is on your website; it provides a forum for the exchange of ideas, knowledge and information on public health and you have done a lot of terrific work—is it Michael Moore that I have dealt with in the past?—and I applaud the work that you do. But I have had a number of constituents who have approached me saying they are concerned about this. We have heard from a number of acousticians and professors of engineering and a neuroacoustician and one of the issues they have is that in order to determine compliance with respect to wind turbine noise, they cannot get access to the information.

In your submission you said: 'In relation to assessment of wind turbine noise, several complicated issues arise: for instance, how is electricity supply to be maintained during this test period?' I understand why you said this. That is one thing. Mr Stephen Cooper has advised me that his and other research factors—in that you do not switch off the wind turbine. As long as you get that data from the turbine components you do not have to switch it off because you factor that in, and he has factored that into his research. As a general principle, the second part of the bill says that you need to provide this information publicly, about the wind speed, the noise and the power output, in order to encourage that debate and exchange of ideas. Would you have difficulty with that being made public, as a general principle?

**Ms Walker:** I do not think we have a problem, in principle, with the need to monitor noise and different outputs coming from wind turbines as a matter of principle. Just before I go further I would like to thank you for acknowledging the work of the Public Health Association, and Michael Moore is still about—he is just on holidays overseas at the moment. He is in transit back to our shores even as we speak. We do have a broader perspective of the whole wind turbine issue in terms of the balance that needs to be struck with health effects. Yes, noise is one issue but is it better to be near some wind turbines that make a little noise or is it better to be near another power-generating source that may have a whole range of other health effects? It is an issue of balance for us that has to be weighed up.

**Senator XENOPHON:** Or is it better to invest in other renewables, such as geothermal, that can actually replace baseload coal-powered stations? But that is another debate.

**Ms Walker:** Our policy is to reflect the need to explore that, yes.

**Senator XENOPHON:** Is there a dangerous proposition in what you have just put—that it is better to have a little bit of noise? If the evidence from acousticians, neuro-acousticians and neuroscientists is that this causes, in certain circumstances, sleep disturbance for a proportion of the population who live near a wind turbine and that sleep disturbance itself can affect one's health, is it not something you should take into account?

**Ms Walker:** Absolutely. It is part of the range of things that need to be considered. In our submission we make it clear that we think the latest NHMRC consolidation of evidence in the area will be really vital to how we look at and consider the different issues that need to be balanced in considering this broader issue. With regard to what you hit on before, in terms of principle, the issue of equity in how we manage noise—and we manage noise from different sources of electricity generation—is very important. It is important that we do not disregard any evidence that is coming forward on negative health impacts. But we are concerned that, in this instance, we may be jumping the gun a little in accommodating health impacts that have not entirely been proven.

**Senator XENOPHON:** I am just trying to find some common ground. The second part of the bill relates to the exchange of information in order to ensure compliance. We have heard from Mr Cooper. We have heard from Professor Colin Hansen, who is doing an ARC-funded project on wind noise. He cannot, from his evidence today, get some basic information that we are seeking to open up in this bill. Do you think, as a general principle, it is important for that information to be made available?

**Ms Walker:** As a general principle, absolutely. It is very important that there is clarity. But we also need to understand the meaning of that. I think the review of the evidence will give us some important benchmarks by which we can have a better, meaningful understanding of that. I take the point you made about turbines not needing to be switched off in order to understand the difference in noise levels, but at a conceptual level I have difficulty with that. How do you measure the impact of something if you do not have a before and after benchmark?

**Senator XENOPHON:** I refer you to Mr Cooper's evidence. If you could take this on notice: do you support the provisions in the bill, in relation to the second part of the bill, with respect to the exchange of the release of information, taking into account the evidence we heard earlier today from a number of senior researchers that they are told—point blank—they cannot get this information? I would ask you to consider that in the interest of at least having that information out there.

**CHAIR:** Senator Xenophon, we are out of time and no other senator has really had an opportunity here. Are there any questions that you want to put on notice now, Senators?

**Senator BACK:** Certainly, Chair. I will provide them to the secretariat.

**CHAIR:** Senator Madigan, have you got any questions on notice?

**Senator MADIGAN:** Yes.

**CHAIR:** Do you want to put them now?

**Senator MADIGAN:** Yes. It seems to me that the arguments used by the DEA and the PHAA to downplay and minimise the adverse health effects of wind turbines draw heavily on psychosociological ideas repeatedly promoted by Professor Simon Chapman in the form of psychogenic theory. Any health problems that arise are attributed to socially transmitted fears of new technology. Do you accept that this theory is dangerous to public health because all manner of technology can be declared benign even when more detailed knowledge of the area suggests the opposite?

**CHAIR:** Dr Tait, if you could answer that very quickly because we are out of time.

**Dr Tait:** What we know, from a lot of the social determinants in health literature, is that a lot of chronic disease is actually mediated through psychosocial mechanisms, so, from a public health point of view, we are not thinking this is a dangerous theory. I do not have time here to go into the full account of how Professor Chapman got to that position. There is some research to be done here. The noise is a problem. How people respond to the noise is a problem. Whether people are getting financial benefit from having wind turbines in the area seems to be a mediating factor. So there are lots of social things that are happening that do seem to be mediating how people are responding to the noise. Part of the problem, I think, of going around and promoting a wind turbine syndrome and going into communities and getting people scared about wind turbines is that it has muddied the water and it is distracting us from actually dealing with those small groups of people who have got a legitimate problem and do need us to be having some sort of debate about how we as a society work to help them with the issues that they are experiencing.

**CHAIR:** Thank you. Any other questions will need to go on notice.

**Ms Walker:** We are happy to take those on notice.

**CHAIR:** I thank you all for your assistance today.

**CHAPMAN, Professor Simon, Private capacity**

[14:12]

*Evidence was taken via teleconference—*

**CHAIR:** Welcome. You have lodged submission No. 185 with the committee. Do you wish to make a short opening statement?

**Prof. Chapman:** I have been very interested in wind turbines for the last few years because I noticed that there were many statements which were appearing, particularly on the internet, and making claims that they were causing all sorts of illness and I have a longstanding interest in new technology and the way in which it often inspires anxiety and fear in populations. I am Professor of Public Health at the University of Sydney. I have published work in the area of mobile telephone towers. About 10 years ago there was a great deal of alarm. That alarm has almost completely disappeared. You very rarely hear people expressing anxiety about mobile telephone towers these days. We saw the same sort of thing happen globally with things like microwave ovens, video display units on computers and television sets. Even way back in the 19th century when telephones were introduced we saw a similar thing.

I had a curiosity about what was happening here and started becoming interested in studying this area. I have rapidly formed the view that this is clearly a psychogenic phenomenon. The main reasons for saying that are that expressions of concern among residents living adjacent to wind farms only occur in relatively few places. The overwhelming majority of wind farms around the world do not have any sorts of examples of people expressing anxiety. There is something like 200,000 wind turbines around the world and most of the concern which is being expressed is in areas like Ontario, in Canada—but not in other places in Canada—several areas of the east in the United States, the United Kingdom and Ireland, and some places in Australia.

You would have seen that I have listed in one of my appendices the large number of wind farms that are established in Australia. The majority of those wind farms have had no complaints whatsoever from residents. In the whole of the state of Western Australia, for example, no complaints have been lodged. In Esperance, for example, the first wind farm went up in 1993. They have not had a single complaint. In the eastern states as well there are wind farms where there has been no history of complaint. For example, the Snowtown farm, which has something like 450 residents within five kilometres of it, has had no complaints. At Coober Pedy in South Australia the whole population of 3,500 lives within five kilometres of the wind farm. There have been no complaints about it.

So, when you start saying that there are radically different levels of complaints being expressed about wind turbines, obviously we are starting to look at variables other than the alleged toxicity of the wind farms coming into play. If it were true that wind farms make people ill, all other things being equal it would be the case that people would be made ill in the sorts of proportions alleged wherever wind turbines are located. But that is far from being the case.

The other thing that struck me about it is that there are many cases of wind turbines having been up for many years and there being no complaints for many years or many months and then suddenly complaints start appearing from a small minority of residents who live near the turbines. Those complaints are usually followed by agitation from anti wind turbine groups who use the media or hold meetings in the towns—that sort of thing. And that is consistent with the psychogenic hypothesis as well.

**Senator XENOPHON:** I want to put a few propositions to you. You accept that excessive noise levels can lead to sleep disturbance?

**Prof. Chapman:** Yes, noise level can be associated with sleep disturbance very obviously.

**Senator XENOPHON:** And sleep disturbance can have an adverse effect?

**Prof. Chapman:** Yes, I accept that.

**Senator XENOPHON:** There are WHO guidelines and also EPA guidelines in relation to the noise thresholds that the sources of noise need to comply with—do you accept that proposition?

**Prof. Chapman:** That is correct. In response to that, I do not believe there is a single resident in any urban area anywhere in the world who is not subject to those levels of noise. Anyone who lives in a city receives every day in excess of those guidelines.

**Senator XENOPHON:** But one of the issues here is that for a hydroelectric power station, a coal-fired power station or a gas fired power station—a real mix of energy sources—the EPA guidelines, as I understand it, refer to background noise plus five decibels whereas for wind turbines it can be 35 or 40 dBA plus five. Do you think that is an issue in terms of being inconsistent with what applies to, for instance, a hydroelectric power station?

**Prof. Chapman:** I do not have any view on that. That is not an area in which I have any expertise. I would defer to people with acoustic expertise for a question like that.

**Senator XENOPHON:** A number of witnesses have given evidence earlier today, including Professor Colin Hansen, who has received an Australian Research Council grant to look at wind turbine noise, and Steven Cooper, an acoustician, who has been responsible to a significant degree for the changing of airport noise guidelines to protect residents. They have said that they cannot get the raw material they need in order to determine compliance from wind turbine components—the second part of this bill talks about a level of transparency in providing this information—but, as Mr Cooper made clear, it does not require switching off the turbines at any time in order to determine that.

Given your background in public health, and the work that you have done, do you have an issue with that level of transparency in terms of the proponents of wind farms providing that information publicly?

**Prof. Chapman:** No, transparency is always a good thing—the right to information is a cardinal principle of a democracy, which good decision-making needs in order to take place.

**Senator XENOPHON:** You made reference to 17 papers. One of them—the most recent, I think—was *Wind Turbine Health Impact Study: Report of Independent Expert Panel January 2012—Prepared for: Massachusetts Department of Environmental Protection Massachusetts Department of Public Health*. Again, if you need to take this question on notice that is fine, because it is a lengthy document. You have said in your submission that, basically, these studies say—I don't want to verbal you, so please correct me if I am wrong—that there is not a problem as such. Is that a fair summary?

**Prof. Chapman:** The 17 reports are not 'papers'; they are reviews. A review is different to a paper—a 'paper' is usually a term we use for a single study about a particular exposure or something like that. But these are—

**Senator XENOPHON:** I apologise; thank you for correcting me on that. But you are referring to those reviews supporting the proposition that I think you are making that they do not support a change to the status quo in respect of wind turbines or do not support the complaints being made.

**Prof. Chapman:** Yes. The overwhelming consensus of those reviews would be that yes, there are people who say that they are disturbed, made ill, made anxious or whatever by wind turbines, but one has to look at whether it is the wind turbines themselves—

**Senator XENOPHON:** Sorry to cut you off, but the chair is about to wind me up. Can I take you to page ES-11 of that study where it says:

The Panel recommends an ongoing program of monitoring and evaluating the sound produced by wind turbines that are installed in the Commonwealth—

of Massachusetts, obviously—and page 34 of the study, where it says:

In summary, sleep is a complex biological state, important for health and well-being across a wide range of physiologic functions. To date, no study has adequately examined the influence of wind turbines on sleep.

On notice, could you please reflect on that in the context of your report?

**Prof. Chapman:** Yes, I will reflect on that—no problem at all.

**Senator XENOPHON:** Thank you, Professor.

**Senator MADIGAN:** Professor Chapman, in the first paragraph of page 1 of your submission you report that your work has been cited 'over 6600 times'.

**Prof. Chapman:** That is correct.

**Senator MADIGAN:** In your publication list of peer-reviewed articles about wind turbines and noise there is only one article you co-wrote, and it is currently under review. While I am not questioning your assertion that your body of work has been cited 6,600 times, mostly that work is not about wind turbines and noise, is it?

**Prof. Chapman:** That is correct.

**Senator MADIGAN:** While you may have opinions about wind turbines and noise, these opinions are not backed up by related professional qualifications or by you having a sizeable body of original published research in the relevant field—

**Prof. Chapman:** That would be true if you just said 'about wind turbines', but I do have publications which are about psychogenesis and about the nature of community panics.

**Senator MADIGAN:** Thank you, Chair.

**Senator BACK:** Thanks, Professor Chapman. I just want to go, if I can, to the much-quoted peer reviews of the NHMRC 'Rapid Review' which was presented to the Senate inquiry last year. You were one of the two peer reviewers of that review—is that right?

**Prof. Chapman:** That is correct, yes.

**Senator BACK:** And who was the other one?

**Prof. Chapman:** I believe it was the British acoustician Geoff Leventhall.

**Senator BACK:** Thank you. Can I also ask: did you have any involvement in the actual writing or editing of the original 'Rapid Review' itself, or was your only involvement in peer reviewing?

**Prof. Chapman:** No, they sent me a draft that someone in the NHMRC—or a team of people in the NHMRC—had written, and they asked me for my comments on it. I supplied comments on that—that is my recollection—some time ago.

**Senator BACK:** Can I just be clear: was it the draft or the rapid review that you reviewed, or did you do both?

**Prof. Chapman:** I am not clear what it was that was sent to me. I know that a document arrived. They asked for my comments on it. That is the normal process when you are reviewing something. Any suggestion that I wrote the thing is not correct.

**Senator BACK:** Just today—you may not have had an opportunity to look at them—we received papers and evidence from two groups. Both papers were produced. The first one was in the September-October 2011 issue of *Noise and Health*, where the principal was a Professor Daniel Shepherd from New Zealand. Are you familiar with that particular paper?

**Prof. Chapman:** Yes; I am familiar with that paper.

**Senator BACK:** They note statistically significant differences in health related quality-of-life domain scores for residents within two kilometres of a turbine installation as opposed to those who live outside. The second was an even more recent one—the same publication for September-October 2012—by Nissenbaum, Aramini and Hanning. Is that a paper that you have had an opportunity to review?

**Prof. Chapman:** I am familiar with that, yes.

**Senator BACK:** Any comment on it?

**Prof. Chapman:** Yes. Both of those studies suffer from the same problem. That is that there has been considerable activity, in both regions studied in those two papers, of anti-wind-turbine activity. For example, in the New Zealand paper there had been, for a large number of years, a resident group called 'something guardians'. I cannot remember the name of the area now but they were the local landscape guardians group over there. They have a website which lists all of their activities against wind turbines and so forth. So the idea that this was an environment which was unpolluted by people going around saying, 'These wind turbines are going to cause health problems—will probably make you unable to sleep well and will affect your quality of life in a detrimental way—was not mentioned in that paper at all. I think that the failure to mention that was really a very severe problem. It was also absent in the other paper—the more recent one. Where you have—

**Senator BACK:** Because of the brevity of time—

**Prof. Chapman:** people agitating you have a recipe for what we call the nocibo effect. You have probably all heard of the placebo effect, which is where you are given an inert substance—it might be drug or a nick in your leg, an operation, under anaesthetic—and told that this is likely to make you feel better. What we know from placebo effects is that a considerable proportion of people will feel better if they are told that they will feel better. It is the same with nocibo effects. If you go into an area and you say to people, 'Exposure to this particular agent is likely to make people feel ill or nauseous or it will disturb your sleep,' for a proportion of them that will happen. Those two considerations were not raised in either of those papers but every person that I have spoken to who has looked at them sees that problem straight away.

**Senator BACK:** That is where I have the benefit of being a veterinarian, Professor Chapman. My patients never worried too much about placebos or nocebos. I did—

**Prof. Chapman:** That is a very good point to raise. I had that discussion recently with a staff member of mine whose dog had a bad shoulder. She was about to get it put down and then she got it some kind of manipulation and the dog felt better. She made the comment to me that dogs are probably not subject to placebo or nocebo effects.

**Senator BACK:** I will just cut you short. I did speak to Dr Shepherd on the same line. Perhaps I will refer back to the *Hansard*, when it appears, because I did put those points to him.

My final question is about your table where you mentioned the distances from the various wind farms. You have given the figures for five kilometres. Could you take on notice to adjust those figures of populations within 1½ kilometres? I happen to know the Albany, Esperance, Bremer Bay and Merredin wind farms well. I would agree with the numbers you give for five kilometres. I would suggest to you that the number within 1½ kilometres of those wind farms would be practically none; nevertheless, I wonder if you could provide that information. Because of the shortness of time, I will now defer to others.

**Prof. Chapman:** It might be tricky. It has been rather difficult to get some of the information from some of the farms and there are several farms I have not been able to get any information from at the moment, so to go back to them and say, 'Now give it to me for the shorter distance,' may be a bit of a challenge. I thought five kilometres was a reasonable distance. It is a distance which is often mentioned by opponents of wind turbines. Sometimes they go out to 10. There is even one gentleman from the Goulburn area who goes out to 100 kilometres.

**Senator BACK:** Thank you.

**CHAIR:** Professor Chapman, if people do suffer the nocebo effect, do they actually feel ill?

**Prof. Chapman:** Yes, very much so. There is no suggestion that they are making it up or that they do not feel ill or that, in many cases, you cannot physiologically measure the problems that they are having—they do. An interesting phenomenon that they report in Korea is called fan death. This is a belief that electric fans running overnight can cause death. They have legislation introduced in Korea to have automatic timers on all fans because of the prevalence of that belief there. A great many people would be fearful of fans and would not have them in the house because of those fears.

**CHAIR:** There'd be a lot of cadavers in Australia in January!

**Prof. Chapman:** I want to emphasise that, by talking about nocebo effects or psychogenic effects, I am not saying at all that people who say that they are feeling nauseous or have any of the other 207 diseases or symptoms I have seen on the internet are making it up. They very often genuinely do have those symptoms, but it is whether or not they are actually being caused by the turbines or by the anxiety which is being spread about the turbines.

**CHAIR:** Is there any way this can be dealt with?

**Prof. Chapman:** It is very, very difficult for anyone to study this because these days, with access to the internet and listening to radio which often is networked all around Australia, it is very difficult to insulate people from information or propaganda which is spreading around saying that these things are going to harm you. That is one of the big challenges in any epidemiological study which could be done.

**CHAIR:** Thanks, Professor Chapman, you have been very helpful. We could have gone much longer but we have run out of time. Thank you for your input today.

**Prof. Chapman:** Thanks very much, Senator.

**BAGOT, Mr Michael, Project Manager, Development, REpower Australia Pty Ltd**

**McALPINE, Mr Ken, Director, Policy and Government Relations, Vestas, Asia-Pacific**

**TADICH, Mr Josef, Technical Manager, Alston Wind, Asia-Pacific**

*Evidence was taken via teleconference—*

[14:37]

**CHAIR:** I now welcome representatives from Alston, Vestas and Repower via teleconference. Would anyone like to make a brief opening statement?

**Mr McAlpine:** Thank you, Chair. Vestas wind systems is the world's largest manufacturer of wind turbines. I work for the Asia-Pacific section of the company and I am based in Melbourne. Vestas has got experience across the world in over 70 countries, installing more than 47,000 wind turbines over the past 30 years. In Australia we have been responsible for the supply of more than half the wind energy capacity to date including the 420 megawatt Macarthur Wind Farm which we are currently building for AGL and Meridian. We are looking forward to commissioning that towards the end of this year or at the start of 2013. We are also members of the Clean Energy Council, and I understand that you will be hearing from them shortly. We support the content of their submission as well.

On the bill itself—that is what I am looking to focus on today—we do not support the bill. We think it is inconsistent with the objects of the Renewable Energy (Electricity) Act. We also think that it is a bit of a concern because it seeks to overturn the rights of state governments to design and administer their own planning processes and make decisions on wind farms. It instead seeks to interfere by giving new powers to an existing Commonwealth regulator that is neither qualified for this task nor has never expressed any interest, to our knowledge, in exercising such powers in relation to wind farms.

In summary, we think that the bill adds complexity, additional costs, extra delays and, if it were implemented, would be highly likely to add more cost to building wind farms in Australia, which in turn would flow through and cause increases in power prices for Australian families and businesses.

**CHAIR:** Mr Tadich, do you wish to make an opening statement?

**Mr Tadich:** Yes, thank you—a very abridged one because I very much support what Ken just mentioned. Alstom is a global manufacturer of power equipment. We have manufactured roughly 25 per cent of the world's power manufacturing equipment. Roughly, over the last 30 years, we have manufactured 3,000 megawatts of wind turbines. We fully support Australia's goal of 20 per cent renewables by 2020 as well as the 80 per cent reduction of CO<sub>2</sub> by 2050. We are fundamentally opposed to the bill. We do not believe it is a logical test basis for wind farm noise. We fundamentally believe that it would be very difficult to implement and carry out in practice. This only adds uncertainty to what is already a very difficult noise market for the wind industry. In terms of Alstom's global experience, it has the most stringent requirements in the world already.

Already in Australia the wind industry is subject to higher noise requirements than traditional thermal generation, as well as other renewables. This bill only serves to increase the cost of renewable energy and makes it more difficult for us to meet the 20 per cent renewable energy target.

**CHAIR:** Mr Bagot, would you like to make an opening statement?

**Mr Bagot:** Thank you, Chair. REpower Australia is leading turnkey constructor, developer and operation and maintenance service provider for wind farms in Australia. We employ directly about 170 people and have installed more than 1,000 megawatts in South Australia, Victoria and New South Wales. Our installed capacity represents about a third of what has been put into the ground in Australia. In our experience in delivering wind farms since 2004, we have seen significant benefits flow from wind energy projects to local communities—that is, specifically, investment and employment opportunities. We do not support the proposed amendments to the Renewable Energy (Electricity) Act. We think that the additional restrictions proposed for wind farms in the legislation will put these regional development opportunities at risk and endanger achievement of the 20 per cent renewable energy target, as well as make power more expensive for consumers.

**Senator MADIGAN:** Thank you, gentlemen. In the Alstom submission, on pages 6 and 7, it says:

... most modern turbines have active noise control ... This is achieved by lowering the tip speed of the blades and therefore lowering the sound power level at the emission source. For Alstom, the tip speed can be reduced so that up to 10 dB(A) can be reduced if need be. This noise control can be set by time of day, wind direction and season to manage any possible noise complaint. However, this has an adverse effect on energy production and increases the cost of energy, and should only be used as a last resort.

Isn't that an argument for an excessive noise standard for your industry? Aren't you admitting that your wind turbines create excessive noise and that the technology can be controlled to reduce that noise, but the profit mode overrides using those controls unless you are compelled to?

**Mr Tadich:** In response to the question on our submission, on an objective technical level what we are saying is that turbines have evolved to such an extent where we can actually control the sound power level of the turbines at the source of the turbine. This is in no way a means of saying that any of the noise is excessive at all. We have already said in our submission that we already meet much more stringent noise requirements today globally and in Australia than any other power generation or any other renewable source. So I would not agree with any comment saying that there is excessive noise distribution.

**Senator MADIGAN:** Why was that noise control feature added to wind turbines? Were you pushed by regulation in other countries requiring that innovation? Presumably you did not do it as an act of charity.

**Mr Tadich:** Not as an act of charity. Alstom is a 100,000 person business with €50 billion of revenue a year. We are not a charity organisation. One of the reasons has been the technical innovation in the industry. In the early eighties turbines did not have variable speed control; they operated at fixed speed because of the size of the turbine. As the industry has developed, to reduce the cost of energy globally, one of the big differences introduced about 10 years ago is what we call variable speed pitch control. Variable speed pitch control in a turbine—and all modern turbines now employ this—means that the tip speed of the turbine can be varied through variation of the generator speed.

There has been significant technical development in the industry—nothing to do with noise generation but to increase the efficiency and reduce the cost of energy of the wind industry. As a side effect of that what we can do is we can manually reduce the tip speed during normal power production to reduce the sound power level, purely because sound power is generated by the tip speed of the turbine. So we can control that. It was a secondary effect of the technical innovation in the industry. It was not developed for noise purposes at the start.

**Senator MADIGAN:** Do all of the turbines from the respective companies have that noise control feature?

**Mr McAlpine:** I can confirm that Vestas has similar technology in our turbines.

**Mr Bagot:** REpower has a noise control model as well.

**Senator XENOPHON:** Is it correct that the noise criteria for approval relies on the regression curve that is done before approval?

**Mr Tadich:** That is correct. The regression curve you are talking about is the characterisation of background noise.

**Mr Bagot:** Senator, that may or may not be true, depending on the relevant state standard that you are dealing with. For instance, the South Australian EPA standards say that the noise from the wind farm should be either 35 dBA or the background noise, which is the regression curve you were referring to plus five decibels. So it may or it may not be depending on—

**Senator XENOPHON:** Thank you both. Again, if you want to add anything, because of time constraints you may want to provide some additional information. As a general principle the regression curve can be an important issue in terms of the approval of a wind farm. Correct?

**Mr Tadich:** Yes; agreed.

**Senator XENOPHON:** Is the regression curve determined on dBA versus the wind at the hub height?

**Mr Tadich:** It depends on the relevant state legislation and the noise consultants used on whether or not it is at the wind at the hub height or wind at 10 metres. Typically, one of the issues is that there is a difference in the wind speed between the receptor and the source—the source being the turbine and the receptor being the relevant dwelling under investigation by the noise consultant.

**Senator XENOPHON:** Is it fair to say that you cannot check compliance without knowing the wind speed at the hub height?

**Mr Tadich:** I do not think that is correct. It depends on the permitted level that has been handed down by the relevant authority in that jurisdiction. That may be the case, but it is my understanding that that sort of information—wind speed at hub height and direction—is provided as part of the compliance process for projects.

**Senator XENOPHON:** I will keep moving because I am under severe time constraints. So it can be the case—while it is fair to say that there is no uniform legislation across the country, the issue of checking compliance with reference to wind speed at the hub height may be a relevant factor in some states. Yes or no?

**Mr Tadich:** Correct.

**Senator XENOPHON:** I am not rushing you; I am just trying to get through this. The Vestas submission refers to 'New regulations to compel publication of detailed and irrelevant data'. It is not irrelevant to know wind speed at hub height, is it?

**Mr McAlpine:** I might take that one up since you drew it from our submission.

**Senator XENOPHON:** I was not picking on you. I think your submission is similar to others in suggesting that it is irrelevant. I am just trying to establish what your view is of that.

**Mr McAlpine:** I am happy to answer. I suppose the real question back to you is: why do you think a federal regulator that has never worked in this area at all would do a better job—

**Senator XENOPHON:** I am sorry. I am asking what is relevant in determining the issue of compliance and how you measure compliance. I think there has been a consensus amongst the three of you, from different entities, that in order to check compliance it may be relevant to check wind speed at the hub height. Is that a fair proposition?

**Mr McAlpine:** It might be a subset of it, but the fair proposition is the one that says that state experts that set the rules and enforce compliance against those rules are the ones who decide which data they need in order to determine that, not a federal regulator that has never played in this space before.

**Senator XENOPHON:** I do not want to get into a constitutional argument with you about jurisdictional issues and various Commonwealth heads of power. I am just trying to determine—

**Mr McAlpine:** But I think this is the nub of the issue here. This is what the bill seeking to impose in the current arrangements—

**Senator XENOPHON:** Can I just—

**CHAIR:** Please allow the witness to finish.

**Senator XENOPHON:** Are you going to cut me off?

**CHAIR:** You have time. You are going to get a fair go. You do not have to panic, so we can continue with the answer.

**Senator XENOPHON:** That look that you give me makes me panic.

**Mr Bagot:** If I can respond to that question, I do not think that the wording of the proposed amendment makes it clear that the proponent is asked for hub height wind speed data. I believe it reads 'wind speed and direction at the wind farm'. There are many wind speed measurement devices on an operational wind farm. We have power curve verification masts and nacelle-top anemometers. It is not quite clear that that is what is being requested, so I am not sure if the phrasing in the submission you read from is referring to that—

**Senator XENOPHON:** Sure, and I am very grateful for that feedback, because that is what this committee process is about—to test rigorously any piece of legislation that is put up. But is it fair to say, as a general proposition, that these matters, properly phrased, could be relevant in determining compliance with state regulations in relation to basic information such as the hub height and the power output, for instance, of a wind turbine? Obviously, the noise it produces could be determined on its power output at a particular time.

**Mr Bagot:** I think it is relevant, and that is why state regulators currently do ask for that information. It is a part of the normal compliance process at the moment.

**Senator XENOPHON:** Would you provide to me on notice details of what information is requested from you by state regulators. Also, you may have heard the evidence of Professor Colin Hansen, who is doing an Australian Research Council funded project on wind turbine noise, as well as that of Steven Cooper, a leading acoustician. They, as well as others, have said in evidence that they have real difficulty in getting this sort of information from wind turbine companies, so there does seem to be an information asymmetry in respect of this. And Professor Simon Chapman, in his evidence, said openness with information is very important in a democracy.

**Mr McAlpine:** That is a little hard for the three of us to take on notice because we each work for wind turbine equipment suppliers rather than the owners of wind farms. And when a state regulator is looking to determine whether or not noise requirements are being adhered to they go to the owner of the wind farm rather than the equipment supplier. So, if anything, they would be going to companies such as Infogen, AGL and Hydro Tasmania. These are the companies that own the wind farms. We are the companies that supply the equipment. Contact between our organisation and state regulators is minimal. Contact on the issue of compliance with noise restrictions happens with the owners of the generators, not so much the suppliers of the equipment.

**Senator XENOPHON:** Who verifies the information that you provide—as against claimed compliance? Do you think that, as a principle, it ought to be in the public domain?

**Mr McAlpine:** As I said in my previous answer, the requests do not come to the equipment suppliers, they go to the owners of the wind farms. So we cannot really answer that question. It is a question that would be best addressed to the owners of the wind farms. I do not think it is one we are able to provide an answer on.

**Senator BACK:** Do any of your companies currently manufacture wind turbine equipment in Australia and, if so, what components do you manufacture?

**Mr Tadich:** Alstom employs a little over 1,000 people in Australia. We have several workshops through South Australia, Tasmania, New South Wales and Victoria which we use for the overhaul and service of power generation equipment. We see renewable power as just another subset of power generation. The answer to your question is no, in terms of direct equipment manufacture. However, the operations of maintenance and overhaul are fully supported through the Australian business. We are currently investigating assembly of our turbines within Australia. However, right now the answer is no.

**Mr McAlpine:** We are currently building two wind farms in Australia. One is Macarthur, which I mentioned earlier, for AGL and Meridian, and that is in Victoria. The other wind farm under construction at the moment is the Musselroe wind farm in Tasmania, for Hydro Tasmania. In the past we have manufactured components in Australia. We did have a factory in Portland in Victoria but unfortunately we had to close that in 2007. We also had an assembly plant in Tasmania at one stage. Again, with both of those factories, we found that the market for wind turbine components in Australia at that time was simply not big enough to sustain those businesses remaining open in Australia. When we build wind farms we have a track record of using Australian manufacturers for the towers in many cases. That involves companies in Victoria, South Australia and Tasmania. In fact, the towers that are going into the Musselroe project are from Launceston and the towers that went into the Macarthur project came from Portland in Victoria and from Adelaide. Where we can we use local suppliers. But, as I indicated before, the market to date simply has not been big enough for the large scale manufacturing that you see in the US and Europe.

**Senator BACK:** Mr Bagot.

**Mr Bagot:** At the moment, we employ 170 people in Australia. We have had a lot of experience in building wind farms in different states. The economic benefits that come from these projects are quite substantial. An analysis that was done on AGL's Hallett wind farm projects in South Australia shows that about 13 per cent of the project's capital value went straight back into the region, some 30 per cent into the state and more than 60 per cent into Australia. We do not currently manufacture equipment for turbines in Australia. I am not aware of any other manufacturer of power plant of any kind that is manufacturing in Australia either.

**Senator BACK:** Mr Tadich, perhaps you might take this question on notice. On page 5 of your submission, you state:

... 35 dB(A) is characterized by a gentle whisper, and the World Health Organisation ... recommends a 45 dB(A) limit.

Could you on notice provide us with your reference source for the World Health Organization's comment recommending the 45 dBa limit.

**Mr Tadich:** Yes, I can provide that out of session.

**Senator BACK:** Thank you. Mr McAlpine, are your V90-3MW turbines and your V100-2.75 MW turbines capable of operating within Victoria's noise guidelines?

**Mr McAlpine:** I can tell you about one project that we are currently building and that has a different turbine model from the ones you mentioned, which is the V112. We are installing this turbine at Macarthur. We would not have got that contract had we not been able to comply with the Victorian noise guidelines.

**Senator BACK:** You have had a look at the legislation that we are discussing here today. Can you tell me whether or not our turbines are capable of operating within that background noise plus 10 decibel limit, as proposed by the matter we are discussing?

**Mr McAlpine:** Sure, I can answer that question. The short answer is that it is very difficult to make a call on that one, mainly because of the way in which the provision is drafted and the uncertainty and the level of discretion that is allowed to the regulator. There is not a lot of guidance in this bill at present, and this is one of our criticisms of it. It adds uncertainty. It is not clear how this bill will operate in conjunction with the state regulations and guidelines in this area.

The other thing that we are unclear about is how it will operate where a wind farm is deemed to be noncompliant and what it would take and who will judge how a wind farm would ever be compliant in the future. That is not clear at all. Perhaps there is a proposal to draft some regulations that will add some clarity, whereas at the moment our view would be that it is so vague as to be unworkable in its current form.

**Senator BACK:** Mr Bagot, could you explain to the committee the association between your organisation REpower and Windlab. What, if anything, is that affiliation?

**Mr Bagot:** Thank you for your question, Senator. Windlab and REpower Australia are working together to develop a wind farm project called Rugby Wind Farm. It is proposed to be located near the town of Boorowa, which is about an hour and a half, 100 kilometres or so, north of Canberra.

**Senator BACK:** Lastly, can I ask each of you—perhaps starting with you, Mr Bagot—a question. The committee is obviously most interested to know the answer as to whether you believe your company can guarantee that there will not be adverse health effects caused by the noise from your wind farms. Can you give us that guarantee?

**Mr Bagot:** I can guarantee that we will comply with any state or federal regulation that is relevant to our project. I am not able to provide a guarantee of that kind, given the potentially subjective nature of some of the alleged health conditions.

**Senator BACK:** Thank you. Mr McAlpine.

**Mr McAlpine:** I am sorry. Can you restate the question.

**Senator BACK:** Are you happy to give the undertaking to the committee that Vestas can guarantee there will be no adverse health effects caused by excessive noise from your products?

**Mr McAlpine:** It is difficult to answer that question for the reasons I stated earlier. The definition of excessive noise and the way in which that is interpreted is a massive issue with the bill. It is really not clear what you mean by that and if you are identifying excessive noise as a precursor to some sort of adverse health effects then that is a step further. I do not think anyone could be expected to respond properly while those provisions in the bill remain so vague and the bill is drafted so poorly, so it is difficult to answer that one simply because of the lack of rigour and detail in the bill as to what you exactly mean and how you would judge this. We are confident that the products that we sell into the markets comply with all laws and we are also confident that no-one suffers health effects as a result of our turbine technology. I said that when giving evidence to the Senate Community Affairs References Committee inquiry held last year and I say that again. We can only point you to the findings of health experts, including the National Health and Medical Research Council, both in its earlier statements and also in the one that I understand is being worked on at the moment.

**CHAIR:** Senator Madigan, you have a follow-up question, I understand.

**Senator MADIGAN:** Judging from your respective submissions, you all oppose the draft legislation and want the current arrangements without an excessive noise limit to continue. Do any of you support any sort of regulation of acoustic emissions from wind turbines?

**Mr McAlpine:** You are putting words in our mouths a little bit there. I think the companies assembled have all made it clear that we will comply with all laws relating to noise, and we do that at present. The term 'excessive noise' that you have introduced into this bill has not been clearly defined and you have not really made a case as to why this bill or the regulator that is empowered under this bill would do anything different or better than what state regulators and state experts are currently doing at the moment. We said in our submission that the jurisdictions around Australia and New Zealand have some of the most stringent noise requirements for wind farms anywhere in the world. We are happy to comply with those and we do so every day.

**Mr Tadich:** We are a strong supporter of state-based acoustic legislation, as you put it, Senator. I think it is important both for the renewables and for the broader power industry for other products that we sell such as traditional thermal fossil fuel plants, for example. The reason for this is that noise is very much a subjective experience for the listener and it is important that there is an objective test basis accepted by the vendor, being the manufacturers such as ourselves, the operator and the broader public. This is to get wider acceptance of power generation within the community. As a professional engineer I also very much support an objective test basis. We were more than happy to meet the current legislation. As all three of us put forward, the Australian and New Zealand requirements are some of the most stringent in the world and the wind industry has worked hard to meet those.

**CHAIR:** Have any of you got any information that there is a legislative approach being taken anywhere else in the world that would be similar to what is being proposed in this bill?

**Mr Tadich:** I have been a professional engineer for 15 years now. Eight of those years have been in the industry. I have spent four years working in Europe and I am currently working in the markets of Australia, India, Hong Kong, Japan, the Philippines, Korea, Singapore and New Zealand. Out of all the markets I have mentioned, we have not seen an excessive noise bill proposal with a 10 dBA limit such as what is put forward in this bill.

**Mr McAlpine:** The term 'excessive noise' is one introduced by this bill. As Mr Tadich indicated, we deal with objectively set levels of noise standards that have to be complied with in state and federal jurisdictions all around the world, and the wind farms that we build for our customers do that. Introducing the term 'excessive noise' suggests that somehow the states' rules and regulations in this area are not being enforced properly. We do not agree that that is the case at all, and we do not believe that you have made out the case that that is occurring at the moment. So we can see no need for this federal legislation to come in and amend the Renewable Energy (Electricity) Act and interfere with the states' powers in this area.

**CHAIR:** We have had evidence from Professor Chapman who indicated that there were some 200,000 wind turbines installed around the world and that the areas where noise was being raised as a problem were in Ontario, the eastern US, the UK and Ireland. Can someone just give us an overview as to what the issues are for the industry, because you are obviously monitoring it; it is your product. What is the situation around the world? Would somebody like to take that?

**Mr McAlpine:** I can take the first shot at that. I did not listen to all of Professor Chapman's evidence but I have read some of his work in this area, and I do tend to agree that a lot of the complaints around noise from wind farms tend to correspond with a pattern of activism by opponents of wind farms. It is not just local people who are nearby to a wind farm; it is often driven by people outside a local community coming in to that community, scaring people, putting out information that is not true and making them worry about their health.

Professor Chapman talks about the 'nocebo effects', and I do tend to agree. While he is more the expert in this area, the pattern we have observed is that anti-wind-farm activists do come into communities and that, after they have done their best to stir up a community and cause concern in that community, it is only then that you will see complaints about any existing wind farms.

A lot of the other press that you see in those countries and states tends to be about proposed wind farms rather than operating wind farms. I will give the local example of the Lake Bonney wind farm in south-east South Australia. For years, the various parts of the Lake Bonney wind farm have operated. I think in the case of all three parts of it, when it was going through the planning process there were no concerns about health, and, subsequently, there were no concerns expressed. It has only been recently, when the owner of that wind farm, Infigen Energy, proposed a further wind farm in the region, that one of the land owners that is hosting turbines at Lake Bonney has come out, in the last year or so, and complained that he is suffering health impacts from that wind farm, and yet he had been hosting those turbines for many years before that. It was only after the Landscape Guardians and the Waubra Foundation started running around and spreading misinformation about the wind industry that he also ventured into the public domain and made those claims about that wind farm. To our knowledge, he had not made any of those claims until the anti-wind activists came to town and stirred things up.

**CHAIR:** So are you seeing an organised opposition to wind farms in Australia?

**Mr McAlpine:** Yes, absolutely. In particular, over the past few years it has really intensified. I guess lay people in towns where they have never seen a wind farm before, when they hear that one is proposed for the region are entitled to be scared if they have someone with 'Dr' in front of her name coming into their town and telling them they are going to get sick from a wind farm. If they have activists telling them that their property values will suffer because of a wind farms coming into the town then, yes, they are entitled to be concerned about that, too. I think it is that misinformation and the fear factor, spread by anti-wind groups, that often drives a lot of the media and concern in these communities. Our customers do their best to get factual information into those communities, but it is often drowned out by the intensity of the anti-wind campaign.

I do not know how that campaign is funded; I do not know how many people are working on it. But you do see a pattern, and Senators Xenophon and Madigan would be familiar with it because they have also participated in some of the public meetings that have been attended by the Waubra Foundation—

**Senator XENOPHON:** What are you suggesting by that, Mr McAlpine?

**CHAIR:** Order! Senator Xenophon—

**Senator XENOPHON:** He is inferring something—

**CHAIR:** Senator Xenophon, you have had a good go.

**Senator XENOPHON:** Mr McAlpine is inferring an improper motive on my part, and I resent that and ask him to withdraw that.

**Mr McAlpine:** I am not sure what you are saying. I have said you have been at meetings where anti-wind groups have been present—

**Senator XENOPHON:** I think I know what you are saying, Mr McAlpine.

**Mr McAlpine:** and have been spreading misinformation about wind farms. I did not say that you had been spreading it. If you want me to clarify that, that is okay, but you have definitely been at the meetings. That is a matter of public record. You have been part of this roadshow that the Waubra Foundation and the Landscape Guardians have been rolling out.

**CHAIR:** That is either a statement of fact or it is not. There is one last question from me. We have a couple of dozen people here today. They look like ordinary Aussies to me. They are obviously concerned. They have been shaking their heads now and again at some of the evidence that you have put. Professor Chapman himself considered the point that this nocebo effect can cause real problems. What are the manufacturers of wind turbines and the operators of wind turbines doing to try and deal with this issue, to help people? Whether it is a nocebo effect or some other effect, what are you doing to help them?

**Mr Tadich:** We see clarifying objectively the information, the science and the facts behind it as a key issue for community acceptance and for the development of renewable industry in Australia. In a practical sense what that means is that, when there is a proposed wind farm which we are working with a customer on, we are often involved with community information days. We provide the objective evidence and the facts behind the wind farms as well as about the sound power levels which they emit and the way that we verify those sound power levels. We also provide this in general terms about the operation of the wind turbine. In my experience, having been a developer for four years myself, I have found that once you put the objective science on the table, rather than misinformation and rumour, often at a community level it is more accepted.

**Mr McAlpine:** I will just add to that. Similar to what Josef said, we do our best to work with our customers as they propose projects to provide factual information to communities. But we often do so against a background of misinformation spread by anti-wind groups that go from town to town and try and stop our projects being built. The regular person in the street would be taking what we say with a grain of salt because they know we want to get a project built. Unfortunately, it often seems that the anti-wind groups have a louder voice. They are more intense in their campaigning whereas we try and stick to the facts. In many cases they do not seem to feel the same obligation, and we have seen some very intense and emotional meetings in communities. We do our best to get the facts on the table but against that background it is very hard.

**CHAIR:** Thanks, Mr Tadich, Mr McAlpine and Mr Bagot. We have run out of time. Thanks for your submission. It has been very helpful.

**FRANCIS, Ms Lisa, Senior Manager, Institutional Relations and Media, Acciona**

**MARSH, Mr Russell, Director of Policy, Clean Energy Council**

**McGILP, Mr Jamie, Manager, Environment and Planning Team, Acciona**

**UPSON, Mr Jonathan, Senior Development and Government Affairs Manager, Infigen Energy**

[15:18]

*Evidence from Ms Francis, Mr McGilp and Mr Upson was taken via teleconference—*

**CHAIR:** I now welcome representatives from the Clean Energy Council, Acciona and Infigen Energy. The Clean Energy Council has lodged submission No. 165 with the committee and Infigen has lodged submission No. 209. Do any of you wish to make a short statement?

**Mr Marsh:** Yes, I am happy to.

**CHAIR:** Can I indicate that they must be short statements.

**Mr Marsh:** The Clean Energy Council as the peak body for the renewable energy and energy efficiency industry has some 550 members across the industry and we do not support the adoption of the excessive noise bill being discussed today. The bill seeks to apply an arbitrary and unscientific noise limit to wind farms, when existing guidelines are adequate for ensuring the amenity of the community, noting that Australia currently has some of the most stringent noise standards for wind farms in the world. Noise guidelines form part of an overall planning scheme, which should be determined by individual state governments to be considered and defined alongside other aspects of infrastructure planning. Seeing a national rule sitting above existing state-based planning regimes will create inconsistency and confusion for planners, industry and the community. We would also note that the body that has been asked to regulate this part of the guidelines is the Clean Energy Regulator and we do not think that it has either the expertise or the knowledge to deal with this quite technical issue. Thank you.

**Mr McGilp:** Acciona has built more than 200 wind farms in 15 countries around the world and has over 8,000 megawatts of installed capacity worldwide. We have three operational wind farms in Australia—one in Victoria, one in New South Wales and one in South Australia, which is a joint venture. Acciona Energy does not support the adoption of the excessive noise bill. The primary reason that Acciona has issues with the excessive noise bill is the inclusion of the 10 dB above background noise level imposition. The bill appears to apply excessive noise limits to wind farms without adequate consideration, research or rationale. The noise limits are inconsistent with the established noise standards that are adopted by state governments in Australia as part of their planning processes which, as we have discussed, are some of the most stringent and toughest in the world. Existing noise guidelines set a baseline of permissible noise levels of 35 or 40 dB, depending on which state and situation you are in, whereby a wind farm may emit up to five dBs above the background beyond that. The baseline of permissible noise limits is guided by an internal noise criterion of 30 decibels, set by the World Health Organization, which has been set after significant research into noise impacts and disturbance. It is my understanding that experience has shown that 40 dB outside a dwelling will result in compliance with this internal limit of 30 dB within a premise. Therefore we strongly disagree with the concept of removing a baseline permissible noise level.

The excessive noise level does not describe the methodology, and other companies have discussed that previously—that there is no clear guidance on the methodology that would be implemented. Acciona Energy is concerned that the excessive noise bill would be retrospectively applicable. Existing wind farms, accounting for billions of dollars of investment in regional Australia, have been designed and constructed to adhere to noise guidelines in effect at the time of planning permission being granted. Applying more restrictive noise standards to existing wind farms would have serious financial implications in relation to existing commercial and financial arrangements which underpin these large infrastructure projects.

The excessive noise bill would also have a serious impact on future development of wind farms and is likely to force wind farms into more remote areas, which are less financially viable. Therefore, renewable energy specific prices are likely to be forced up, to make the wind farm developments less viable. In order to make them more viable the RECs prices will have to go up in order to meet the Commonwealth's renewable energy target. The flow-on impact of that is likely to be a significant increase in electricity prices to consumers. Just to reiterate, Acciona Energy does not support the adoption of this excessive noise bill.

**Mr Upson:** Infigen Energy is the largest owner of wind farms in Australia and is an active developer of large-scale solar PV energy facilities as well. The company is headquartered in Sydney and its Australian operations generate enough pollution-free renewable energy to power more than 250,000 typical Australian homes.

I would like to make two key points. First, in Australia planning regulations, including noise limits and compliance with these noise limits, are completely within the realm of state governments. Steven Cooper's statement this morning that the Commonwealth should step in because state governments have no definition of excessive noise is absurd. State governments have precise and detailed wind farm noise limits which comprise the definition of excessive noise. In fact, as figure 1 in our submission clearly demonstrates, New South Wales has the most stringent wind farm noise limit in the world, and the other states are not far behind. Every state government requires an extensive and thorough demonstration of compliance with these strict noise limits soon after completion of the wind farm. The New South Wales government has even taken the step of undertaking its own independent audit of wind farms in its state to test the wind farms that it has already found to be compliant. There is no rationale for the Commonwealth to usurp the state governments' planning power.

Second, I have been very surprised, listening to the proceedings this morning, how little of the discussion had anything to do with the amendment actually under consideration today. In addition, what little discussion that did occur this morning did not support the primary thrust of the amendment. For example, Professor Salt quite correctly stated that the background plus 10 decibels on the A-scale limit proposed would have no impact on infrasound as infrasound is not measured on the dBA scale. It is actually measured on the decibel G scale. Dr Hanning stated he preferred a fixed decibel noise limit such as 35 decibels, which is the exact opposite to what is being proposed in the amendment. Professor Hansen stated that a background plus-five decibel limit would be more appropriate. So even the supporters of more stringent noise regulations could not even agree on how excessive noise should be defined. This argues very well for leaving such regulations to the state governments.

One last point that has not been raised about the amendment is its peculiar requirement that the regulator must deprive a wind farm of its accreditation if it contravenes any unwritten laws. This provision by itself would stop all wind energy development. How could one proceed with a project just to lose half its revenue because it supposedly contravenes some unknown and unwritten law? I would be pleased to respond to your questions.

**Senator MADIGAN:** On page 20 of the attachment to the Clean Energy Council's submission, which is the Sonus 'Wind Farm Technical Paper Environmental Noise', the following assertion is made:

Only a few field studies on noise annoyance among people living close to wind turbines have been conducted and further investigations have been recommended by these studies.

Do you all endorse that assertion?

**CHAIR:** Does anyone want to answer that?

**Mr Upson:** I will. There has only been one scientific paper published in a peer-review technical journal, and it was published in *Acoustics Australia* earlier in the year. It was written by Sonus, which, as was pointed out earlier this morning, has been doing wind farm testing for 10 years. This study was published in a peer-reviewed journal—it is the only study in Australia that had that done that has actually done measurements—and it found that the infrasound levels were orders of magnitude less. Even a couple of hundred metres from a turbine, the infrasound levels were hundreds of times less than can be perceived by human beings. I would be happy to send that study to the committee.

**CHAIR:** Thank you. Senator Madigan.

**Senator MADIGAN:** Through the Chair, and for the information of the committee, I would like to table a report called the *NASA Technical Memorandum 100528: Wind Turbine Acoustic Research—Bibliography with Selected Annotation* by Harvey H Hubbard and Kevin P Shepherd. The date of this report is 1988. This NASA report, with some 238—

**CHAIR:** Again, we have to have a look and see what the relevance of it is.

**Senator MADIGAN:** I showed it to Senator Back.

**CHAIR:** Yes, but I am still not sure of the relevance. If you could refer to it before you seek to table it, we may table it after we understand the relevance.

**Senator MADIGAN:** This NASA publication lists some 238 separate reports on wind turbine acoustic research. This includes 48 separate studies on the noise impacts on wind turbines on humans, conducted by 1988. Twenty-four years ago this one bibliography listed 48 separate studies. How can you seriously suggest that there are only a few field studies on noise annoyance in existence today and that almost no research has been done on this matter in the long period in between?

**Mr Upson:** I have not read that study, but in 1988 they would have been measuring noise of downwind turbines that were about 40 metres long—so it is obviously not terribly relevant. What we are looking at is recent acoustic studies. And there have been other peer-reviewed acoustic studies done measuring wind turbine infrasound and low-frequency noise overseas as well. There was one completed last year in America that measured noise at two wind farms, and I would be happy to send that study to the committee. It was published in the *Noise Control Engineering Journal*, which is essentially the journal of the American Acoustic Engineering Society.

**Senator MADIGAN:** I think the point I am trying to make here, as you made out, in 1988 there were smaller turbines; and you mean to suggest that bigger turbines would have fewer health effects than smaller turbines.

**Mr Upson:** That is actually true, Senator, because downwind turbines—that is, turbines with the rotor downwind of the tower—were known for producing higher levels of infrasound. Those types of turbines have not been made in probably 15 or 20 years, so it is possible for that turbine design to have higher low-frequency and infrasound levels than the large turbines of today.

As I said, in the sonar study that was published in *Acoustics Australia*, to put it in a simplistic way, what they basically found was that you could perceive infrasound at your house if you had 200 turbines within 300 metres of your house. Then you would have enough infrasound energy such that you could actually perceive it. That is how far below the perception of infrasound modern turbines are: you need 200-250 of them, 300 metres from your house, to actually perceive the infrasound level.

**CHAIR:** Is there any objection to the document being tabled? There being no objection, it is so ordered.

**Senator MADIGAN:** The SONUS report continues, on page 20, to assert:

European studies (Peterson, 2005) indicate correlation between the noise level and annoyance but stronger correlation factors such as overall sensitivity to noise, attitude towards the noise source, attitude towards the area as a pristine place or a place for economic development, influence over the proposal, daily hassles, visual intrusion and the age of the turbine site.

Do you endorse the SONUS assertion that people are not annoyed by the noise as much as they are by other factors?

**Mr Marsh:** All we would say on that I think is that it is clear there are a number of factors that go into why people feel annoyed about wind farms. I certainly cannot comment on SONUS's behalf as to that conclusion in their report; you would have to ask them exactly why they drew that conclusion.

**Senator MADIGAN:** Thank you, Chair.

**Senator XENOPHON:** Mr Upson and other members of the panel: is it your assertion that there is no peer-reviewed literature that raises concerns about wind turbine noise and the impact on health?

**Mr Upson:** I am not aware of any truly peer reviewed study in a reputable academic journal that proves a causal relationship between wind turbine noise and detrimental health impacts. It is a mixed up thing. Steven Cooper was asked whether he had written any peer reviewed studies and he started talking about a peer review that he wrote and put on a website. That is not peer review; that is him writing a study. It is a term that gets confused, either on purpose or by accident, by people all the time. There are 200,000 wind turbines operating in the world today. If there was a direct causal health relationship it would have been discovered years ago in Spain, Germany or—

**Senator XENOPHON:** Mr Upson, that is not the question. You have asserted that there are no peer review journals but you have qualified it now to say that there are no peer reviewed articles in any reputable journals or any reputable reviews. Are you are saying that studies that may have been peer reviewed are not reputable?

**Mr Upson:** First, I am saying that I am not aware of any. Obviously I cannot say—

**Senator XENOPHON:** So Nissenbaum and others in *Noise and Health*, September-October 2012—are you familiar with that study?

**Mr Upson:** I am sorry, Senator, I missed that.

**Senator XENOPHON:** Are you familiar with the study in the publication *Noise and Health*, by Nissenbaum and a number of other authors?

**Mr Upson:** I have not read that study.

**Senator XENOPHON:** I think the committee will advise you of that, because I just want to ask you to consider whether your view is the same after reading that. Also, there is the article in the *Bulletin of Science, Technology and Society* by Salt and Kaltenbach in 2011 and the New Zealand study by Daniel Shepherd et al on *Evaluating the impact of wind turbine noise and health-related quality of life*. I will not hold you up on this,

because of time constraints, but, Mr Upson, could you consider those articles, which I understand have been peer reviewed and tell us whether you still make the same assertion that there are no peer reviewed articles.

**Mr Upson:** Okay.

**Senator XENOPHON:** So, take that on notice. I will go back to the issue of compliance. Before you can get approval for a wind turbine you need to provide the noise criteria for the approval process; is that right?

**Mr McGilp:** Yes, that is correct.

**Senator XENOPHON:** Thank you, Mr McGilp. Does that rely, in general terms, on the regression curve before that approval is given? In other words, do you need to provide a regression curve in terms of the likely noise impact of such a development?

**Mr McGilp:** Yes; in some situations it can rely on the regression curve; in other situations it relies on the base-line permissible level. It also depends on which state you are in within Australia.

**Senator XENOPHON:** But it is fair to say that the regression curve is relevant in some jurisdictions—correct?

**Mr McGilp:** On occasions, yes.

**Senator XENOPHON:** And is the regression curve determined by dBA versus the wind at the hub height?

**Mr McGilp:** I am not an acoustician but I understand that you require information of wind speeds at hub height.

**Senator XENOPHON:** Again, these are not trick questions, and I am happy for you to provide further information after this hearing in relation to the questions I have put. One of the aspects of this bill—the second aspect of this bill—is to require certain information to be provided by wind turbine proponents so that compliance can be determined. One of the issues to be published is details of wind speed and the output of a particular turbine at a particular time. Would you say that they are relevant factors, that would have been relevant in terms of compliance being granted for such a development?

**Mr McGilp:** I can only speak from personal experience at our operational wind farms where we have permit conditions which require us to have independent compliance testing undertaken to determine whether compliance is achieved. All of that information, including wind speed, noise levels, weather conditions et cetera, is provided to the regulator such as DPCD in Victoria.

**Senator XENOPHON:** Sure. But do you have an issue with that information as provided to the regulator being provided publicly as well? I would ask other members of the panel that as well, including you, Mr Marsh.

**Mr Marsh:** So I am asked the question of what is the purpose of having that information?

**Senator XENOPHON:** No. I am not asking you what the purpose is. This information is already provided to regulators as part of the approval process—is that right?

**Mr Marsh:** As far as I am aware, yes.

**Mr McGilp:** We have no problems providing that information to regulators in a controlled manner, so we would continue to do that and we have always done that.

**Senator XENOPHON:** Why in a controlled manner, Mr McGilp?

**Mr McGilp:** It is a very complex topic, as you probably appreciate, of analysing acoustic information. It is not something that you or I is likely to be able to do and you need acousticians looking at it and reporting on it.

**Senator XENOPHON:** Sure but, Mr McGilp, we have heard from Professor Colin Hansen, who has received an Australian Research Council grant to look at wind turbine noise and I think you are aware of the strict criteria by which the Australian Research Council gives out grants and of the ethical guidelines as well, and Professor Hansen told this committee today that he could not get this basic information from wind turbine proponents. Mr Steven Cooper, in his evidence today, said that he could not get that information. One key part of this bill is for the release of the information that you already supply to regulators. Why can't that be public?

**Mr Marsh:** I think there are two separate issues. There is the issue about whether wind farm companies are prepared to allow their data to be made available to individuals. It is a separate question as to whether that information should be allowed into the public domain more broadly.

**Senator XENOPHON:** Well, why shouldn't it be?

**Mr Marsh:** To what end?

**Senator XENOPHON:** One of the great advocates of wind energy in this country is Professor Simon Chapman and, to his credit, today he said—and I do not want to misquote him—something along the lines that the

release of information in a democracy, so that transparency, is very important. I commend him for saying that. What is wrong with adopting that approach by Professor Chapman, one of the great advocates of wind energy, in the context of this information being made publicly available so that Mr Cooper, Professor Hansen and other researchers are able to analyse that information?

**Mr Marsh:** I think you would say there are two different questions there. To what end is this information going into the public domain?

**Senator XENOPHON:** To ensure compliance.

**Mr Marsh:** Yes, but who is ensuring that they are complying?

**Senator XENOPHON:** Let me put it to you simply, Mr Marsh. If residents are complaining about the noise from a wind turbine or are seeking to lodge an objection to a proposed wind turbine application because they are concerned about potential noise impacts, surely the information that has already been provided to regulators would be a relevant factor in determining issues of either compliance prospectively or of whether there have been any breaches of the regulations in the context of a particular development's operations.

**Mr Marsh:** Given that the regulator gets the information as part of the compliance program, I am not quite sure why the information needs to be put out more broadly.

**Senator XENOPHON:** So you are saying as long as the regulator gets it you do not need to give it to anyone else?

**Mr Marsh:** We would say this information goes to the regulator as part of the compliance program.

**Senator XENOPHON:** So if a resident is complaining about a particular development, you are saying that that resident or the acoustician representing that resident or the scientist giving advice to that resident by providing an expert report should not have access to that—because that is what has happened to Professor Hansen. He is trying to get that, not for residents as such but for an Australian Research Council grant funded project. He has been told point blank he cannot get it—and he will provide us with the email thread in relation to that, as I understand it.

**Mr Marsh:** I think they are two separate questions about whether individuals can get them and whether they can get them from the regulator's website.

**Senator XENOPHON:** So you do not think they should? Can I ask all of you this: do you think that individuals should not get this information that relates directly to issues of compliance?

**Mr Upson:** Senator, I would like to have a go at this.

**Senator XENOPHON:** Please do.

**Mr Upson:** This morning Steven Cooper stated very clearly that there is no way that you could determine whether a wind farm is compliant with its conditions without having the hub-high windspeed data. Is that true?

**Senator XENOPHON:** Mr Cooper is in the room and he has nodded his head. I think that is the case, yes.

**Mr Upson:** That is kind of interesting because—from his report entitled *Peer Review of Acoustic Assessment: Flyers Creek Wind Farm*—he actually did some noise monitoring at our Capital Wind Farm. On page 34 of the report he makes a statement that the result of testing at house G13 'found the Capital Wind Farm is generating noise above that permitted on the consent'. Obviously, we do not agree with that statement. But here he is stating in his report that he can judge that the Capital Wind Farm was over its noise limit and yet he did not have access to the data. So either his statement this morning was incorrect—

**Senator XENOPHON:** I do not know whether this will help you, but I had a short conversation with Mr Cooper only a few minutes ago and if I misquote him I am sure I will get a signal otherwise. My understanding in relation to the Capital Wind Farm is that he actually had to go through a freedom of information request, a laborious and torturous process, to get that information. He is nodding his head so that is the case.

**Mr Upson:** He did not have—

**Senator XENOPHON:** They had to fight tooth and nail to get that information.

**Mr Upson:** The point is that he has determined that the Capital Wind Farm is over its noise level without having that information.

**Senator XENOPHON:** No, no. He got the information—sorry, you may not have heard me, but my understanding is that that information was only obtained after a laborious and lengthy freedom of information process.

**Mr Upson:** I will take that on notice. But I do not believe he got the information by the time the report—

**Senator XENOPHON:** Can I quickly put some questions on notice. The Pyrenees council cannot get hold of the compliance reports. Could any of you comment on that in terms of the evidence they gave about a basic principle. Finally, can I ask any of you—and, Mr Upson, I would welcome your input as well—what do you consider is excessive noise?

**Mr McGilp:** I will answer the first one because it relates to the compliance testing report for one of our wind farms, the Waubra Wind Farm, the regulator of which is the DPCD. We have been dealing with the DPCD. If the Pyrenees shire needs to contact DPCD about this, then that would be the appropriate channel for them to go through.

**Ms Francis:** DPCD is the Victorian Department of Planning and Community Development, which has responsibility for planning laws in Victoria.

**Senator XENOPHON:** What is excessive noise? Can anyone help me here? What do you define as 'excessive noise' and where in any of the regulations around the country is excessive noise defined? I am very happy for that to be taken on notice, because I am conscious the chair has given me a fair go. I am just concerned about time constraints.

**CHAIR:** If you could take that on notice, unless you can answer it very quickly.

**Mr Upson:** Excessive noise, by definition, is a noise above what the state noise limits are. If you are over that limit, then it is excessive. It is simple enough.

By the way, I just received an email from someone else in my company stating that Mr Cooper did not receive the hub height wind data before he wrote this report. So he made a determination that our wind farm was over its noise limit without having this data.

**CHAIR:** One way or another, that will be a matter of public record. If you could perhaps provide more details on that, because it is now a matter before the committee as to why you say that, that would be helpful.

**Senator BACK:** I listened very carefully in previous Senate inquiries which I have either chaired or been involved in recently. We have addressed ourselves to aircraft noise in the vicinity of airports around Australia and this information is readily available. In fact, it is available online and I think in most instances in near to real time, not always with the overwhelming support of some of those who have an area of responsibility. But my observation has been that, when that information has been available to the wider community, it has added immeasurably to the level of confidence in the wider community in the areas that Airservices Australia and others deal with. Mr McGilp, you might be kind enough to lead off or Mr Marsh, but I am just intrigued as to why there is this level of secrecy for members of the public in general but particularly as to why somebody, who is engaged in what would be peer reviewed research, funded by the Australian taxpayer, cannot get information of the nature that they would need to actually end up with results that should be helpful to everybody. Could you explain to me where I am failing to understand that circumstance?

**Mr McGilp:** I will have a go at answering that. As part of our planning permission conditions, a requirement is to get an independent and appropriate acoustic technician to undertake the compliance testing. Therefore, I would assume that that person should be able to provide an adequate assessment of whether compliance is being achieved.

**Mr Marsh:** I am not aware of the request Colin Hansen has made of the companies and what response he got, so I am unable to comment.

**Senator BACK:** But, even with regard to the information sought by legitimate researchers funded by the Australian government, wouldn't it be in the interests of your industry to bend over backwards to assist those sorts of people to provide what you would regard as relevant and defensible information so that it can find its way into peer reviewed research and its results and outcomes?

**Mr McGilp:** I think it is a balance between bending over backwards for everyone's requirements and providing information to legitimate organisations. For legitimate organisations trying to understand it, I think it seems like an appropriate thing.

**Senator BACK:** Even in the evidence you have presented to this panel this afternoon, you have spoken about whether you do or do not have faith in international research. Here we have a circumstance in Australia where somebody is actually in a position funded to do this work. I ask you again: is it not in everybody's interests for assistance to be given at the highest level and in fact your own technical people to actually provide that data? Is that not something that would be seen as valuable?

**CHAIR:** Senator Back, I understand what has been put, that if it is a legitimate organisation seeking access to the information that would be fair enough. I do not know of any other industry in the country who would be subject to what you are putting forward.

**Senator BACK:** I have just mentioned aircraft and aircraft noise around major airports, Chairman, as a prime example.

**CHAIR:** Who are required to provide that to any individual?

**Senator BACK:** Absolutely—it is there in real time or near real time on the net for everyone to see.

**CHAIR:** I think it might be easier to measure that. I am not sure it is easy to measure that noise on a wind farm, given the technical arguments we have heard today, so that is another issue. But can I just say that I am equally of the view that there should be as much information available as possible. I think if it does not go out there will be another web campaign saying that there is a secret position being adopted by the wind industry. This is an industry that is very important for getting to our renewable energy target. It is an important industry for the future. I just do not agree with putting issues up that are unnecessary obligations or obligations that do not apply to other organisations in the country. If the argument is that legitimate organisations will get access then I think we can monitor that and see how that works out.

**Senator BACK:** Thanks, Chairman. Mr Upson, you were talking a few moments ago about excessive noise as being that defined above limits. Can you provide the committee now or on notice what you understand those limits to be above which noise would be regarded as excessive?

**Mr Upson:** It is actually quite straightforward. In New South Wales it is the greater of 35 decibels or five decibels above the background. In terms of the states, there are a few technicalities but basically in South Australia and Victoria it is the same, at 40 decibels or background plus five decibels. The definition is 'excessive noise': if you are over the planning requirement, then it is excessive

**Senator BACK:** This question picks up on the chairman's comments and the observation I made about aircraft noise. You asked why members of the public should be entitled to this information. Can I put to you the view that the funding of many of these projects does attract a high degree of taxpayer grant funding through renewable energy certificates. Would you not agree that, based on that level of financial grant support from the taxpaying community, those people should be entitled to receive this information in much the same way as it is for airports and aircraft noise?

**Mr Marsh:** It is fair to say that there is a level of support from electricity consumers that goes into renewable energy. But I would note that it is not actually money that goes straight from the government's coffers into the wind energy industry. It comes out of a charge on the electricity bills.

**Senator BACK:** But renewable energy certificates are grants, not out of the government's coffers. They are taxpayers' moneys.

**Mr Marsh:** Sure. It is not a grant. The renewable energy certificates are not grants. I would be interested to know whether that happens in any other industry that gets the kind of support that the renewable energy industry receives and whether they are then required to disclose information publicly as a result of getting that support.

**CHAIR:** I am looking at the real-time decibels from the airline industry, which look pretty good. Would there be huge technical problems in being able to supply the decibel output? I am aware that some people have argued here today that it is not the decibel output that is the issue; that it is the infrasound that is the problem. So is there any point in putting the decibels up?

**Mr Marsh:** I cannot answer that question but I am happy to take it on notice and have a discussion with our members around that issue.

**Mr McGilp:** It is very technical and difficult to separate background noise from wind farm noise. You cannot just measure the noise in the environment and assume that it is all from the wind farm. It is a very difficult thing to do.

**CHAIR:** Is it correct that your companies all operate internationally?

**Mr Marsh:** That is correct.

**CHAIR:** In Europe do you have a similar problem to this where there are arguments about the health issues?

**Mr Marsh:** I do not have a huge amount of experience in working overseas, but my understanding is that we do not have anywhere near the problem that we have here.

**Ms Francis:** I can speak from our international perspective. We tend to find that this issue seems to be contained to Anglo countries. In Canada, the US, the UK and continental Europe we do not see these issues. I

guess Acciona can speak from the experience of operating both in continental Europe as well as in English speaking Anglo countries.

**CHAIR:** Have you done any studies into why this is the case?

**Ms Francis:** I believe Simon Chapman might have spoken about that earlier today during his session. Is that right? He is read quite extensively on this and I would be happy to submit material to the committee around this.

**CHAIR:** It would be good if you could take that on notice, because it is quite important. Do the operating companies believe that, if there is even a psychological effect, there should be some way of trying to deal with it?

**Mr McGilp:** We operate at the wind farm sites for 25 years and we are part of the community there. Where there is psychological or whatever we think it needs to be addressed and find where the problem is coming from, I guess.

**CHAIR:** I suppose if this is not addressed—and I am sort of posing the question—you are going to continue to have campaigns against your corporations and you are going to continue to have problems. My question to you is: what steps do you intend to take to try to deal with some of the issues that have been raised here, other than legislative issues?

**Mr McGilp:** Our community consultation process is becoming more in depth at each of the new projects that we go to to educate the local community. That is the initial step that we are taking at this stage. It is very hard to solve the problem across the entire country but, on a project-by-project basis, we are attempting to consult with community in a greater and better fashion.

**Mr Marsh:** We are working with our members to try to ensure that we have a baseline level regarding community engagement to ensure that the developers are doing the right thing in terms of talking to the communities where wind farms are going to be located and making sure that they are doing as much as they can to address some of the issues that those local people will have around the development of wind farms.

**CHAIR:** As we have run out of time, that concludes the evidence from this group. I would like to thank you for coming along. I would also like to thank all the witnesses who have given evidence. I thank Hansard, Broadcasting and the secretariat.

**Committee adjourned at 15:59**