COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

SENATE

COMMUNITY AFFAIRS REFERENCES COMMITTEE

Social and economic impact of rural wind farms

(Public)

TUESDAY, 17 MAY 2011

CANBERRA

BY AUTHORITY OF THE SENATE

INTERNET

Hansard transcripts of public hearings are made available on the internet when authorised by the committee.

The internet address is:

http://www.aph.gov.au/hansard

To search the parliamentary database, go to:

http://parlinfo.aph.gov.au

SENATE

COMMUNITY AFFAIRS REFERENCES COMMITTEE

Tuesday, 17 May 2011

Senators in attendance: Senators Adams, Boyce, Fielding, Moore and Siewert.

Terms of reference for the inquiry:

To inquire into and report on:

The social and economic impacts of rural wind farms, and in particular:

(a) Any adverse health effects for people living in close proximity to wind farms;

(b) Concerns over the excessive noise and vibrations emitted by wind farms, which are in close proximity to people's homes;

(c) The impact of rural wind farms on property values, employment opportunities and farm income;

(d) The interface between Commonwealth, state and local planning laws as they pertain to wind farms; and

(e) Any other relevant matters.

WITNESSES

SWIFT, Mr David Gordon, Executive General Manager Corporate Development, Australian Energy Market Operator

Committee met at 9:54

CHAIR (Senator Siewert): The committee will now continue its inquiry into the social and economic impacts of rural wind farms. This matter was referred to the committee by the Senate on 27 October in 2010 for inquiry and report by 30 April. The reporting date was then extended to 1 June. The committee has received many submissions and has previously held public hearings in Canberra, Ballarat, Melbourne and Perth. I remind witnesses that in giving evidence to the committee they are protected by parliamentary privilege. 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 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 resolutions, witnesses have the right to request to be heard in private session. It is important that witnesses give the committee notice if they intend to ask to give evidence in camera. If a witness objects to answering a question, the witness shall 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 which 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. I also ask that all in the hearing room will please put their mobiles either on silent or turn them off.

Finally, I would now like to welcome Mr Swift. I understand that you have been given information on parliamentary privilege and the protection of witnesses and evidence.

Mr Swift: Yes, thank you.

CHAIR: I would like to invite you to make an opening statement and then we will ask you some questions.

Mr Swift: Thank you, chair and senators. Of relevance to the current review, AEMO operates gas and electricity markets across eastern and southern Australia. We have responsibilities for electricity and gas planning across various time frames. We are responsible for the security of the power system and the approval of generator connections. We hold an advisory role to the South Australian government and the South Australian energy regulator, ESCOSA. AEMO was formed in June 2009 from a merger of a number of energy market bodies, including the National Electricity Market Management Company, NEMMCO; the Victorian Energy Networks Corporation, VENCorp; and the South Australian Electricity Supply Industry Planning Council. We have a wide range of experience in planning and operating the national power system, including operating with wind, both in our own right and through the work of our predecessor organisations.

I should say, first, that while we call ourselves national, and we talk about things like the 'national grid' and the 'National Electricity Market', committee members should note that actually does not include Western Australia, it does not include Northern Territory and it does not include some remote generation. There are some notable uses of wind generation in remote systems and there is significant wind generation in Western Australia in the south-west interconnected system. We have no responsibility for those, so I do not intend to discuss any of those this morning.

It is also important to note that AEMO does not have any responsibilities with respect to planning approvals, and in all our work we seek to be technology neutral, so we are not here to either advocate for or against any particular type or form of generation.

Wind generation in the National Electricity Market was of negligible scale until the Renewable Energy Electricity Act 2000 and the accompanying Renewable Energy Electricity Regulations 2001 established the mandatory renewable energy target. Modern large-scale generation is one of the lowest cost sources of renewable energy so, from the time these requirements were imposed on the electricity industry, wind generation has been growing very fast. By June 2011, on our latest figures, we expect that there will be 1,916 megawatts of wind generation in the NEM and the largest source of that is in South Australia where there is 1,150 megawatts of wind.

CHAIR: Sorry, was that 1,150?

Mr Swift: That is correct. That is what we expect will be fully operating and commissioned as of June. AEMO published the first national transmission network development plan in December 2010. That plan considered the development of the power system and the national grid over the next 20 years on a range of scenarios, and on most scenarios, the analysis forecasts that we will have between 7,000 and 8,000 megawatts of

wind in the NEM by 2020. The concentration of wind generation in the broader National Electricity Market is relatively modest and can currently be managed with no difficulty. Tasmania is a special case, where there is a significant level of wind generation in a technically isolated system, as it is only connected to the rest of the NEM by a DC link; and the state of South Australia currently has the highest installed capacity of wind generation in the NEM, both in absolute and in relative terms. Future growth is also expected to be strong and, on those same forecasts I mentioned earlier, we predict 2,400 megawatts of wind in South Australia by the end of the decade. I will therefore go through a bit more in terms of South Australia, as it highlights what we are successfully managing now and what we could expect to experience more broadly in the future.

Taking from the forthcoming *South Australian Supply and Demand Outlook*, which we will publish in the middle of the year, in South Australia we expect there will be 3,699 megawatts of conventional generation and there will be 1,150 megawatts of wind generation. Of that, over 760 megawatts is under our new semi-scheduled control scheme. The capacity of wind generation in South Australia continues to grow and it is now among the highest in the world relative to customer sales. In our most recent analysis we consider that the assured contribution of the wind farms to peak summer demand in South Australia is only about five per cent of their name plate capacity. While small, that contribution is at least positive. The contribution in terms of energy output is far more significant. The electricity supply mix still shows South Australia's electricity mostly comes from gas, at 44 per cent on the latest figures, followed by coal at 30 per cent and then wind at just over 20 per cent.

In terms of the integration of wind generation into the national electricity market, it is fair to say that a single wind turbine has a very variable generation output, fluctuating in the short, medium and longer terms. It is affected by the time of day, by the season as well as by the patterns of weather at the time. While the variability of a single turbine is very high, the aggregated output over a number of turbines in a wind farm and then over a number of wind farms in a region does provide some diversity and smooths the output somewhat. Nevertheless, wind generation in South Australia as a whole remains quite variable. We will publish a lot more information about that—it is a bit hard to capture that in just a few sentences, and we do each year in the analysis we publish with the *South Australian Supply and Demand Outlook*.

The variability is, however, currently well managed by the design of the national market and the operating arrangements that we have. The National Electricity Market despatches plants through a five-minute spot market. All larger generators bid into this market and the market systems determine the lowest cost of supply commensurate with the maintenance of security of supply. This provides a very flexible and responsive system which encourages the best use of all generating plant to meet customer demand. When South Australia has high wind generation and low customer demand, prices will be very low—sometimes even negative—helping to resolve the excess generation through market signals. On the other hand, if wind generation suddenly drops, spot prices rise and bring on other generation. To support the spot market and manage reliability, AEMO publishes forward looking information on supply and demand. This includes wind forecast from the Australian Wind Energy Forecasting System. AWEFS was funded by the Commonwealth Department of Resources, Energy and Tourism and commenced operation in November 2008. The forecasting capability of AWEFS and its integration into market systems is, in our view, world leading. Allied with the introduction of wind forecasting was the creation of a new category for generation in the market referred to as semi-scheduled, to allow wind generators to participate in what we call the security constrained optimised dispatch of the NEM. This can require from time to time wind generation to be turned down if that is necessary to maintain the security of the system. This has also aided integration of wind into the system.

In summary, wind is volatile in its output but the combination of market signals forecasting and central dispatch have shown it to be manageable in the NEM. This is evidenced by the fact that we have never had a security or reliability incident as a result of wind variability in the market, and that is despite the fact that South Australia now at just over 20 per cent is equal to Denmark, for example. In terms of the economics of wind generation, typical wind generation investment in the NEM is reliant on two complementary sources of revenue. One is the revenue from the energy spot market, or what you sometimes hear people refer to as the black energy price, plus the revenue that can be earned by the creation of renewable energy certificates, or RECs as they are known, but recognises that energy is produced from a renewable source and is able to be used by retailers to meet their renewable energy requirements. That is now referred to as the large scale renewable energy target.

The first component recognises the value of the generation a wind farm will produce taking into account the time at which it is produced because of this spot market pricing. While wind generation is not controllable, and it may not be operating at times of high demand, this lack of firm output is recognised in the market price paid for the output. At present the high level of wind generation in South Australia—and because that generation does not

often generate at times of peak demand and high prices—it is quite evident that that gets less than the average generation price in South Australia as a result.

The second component, the value of a REC, is the same as that for any other large-scale renewable generation and will flow up or down as required to meet the target set by parliament. This should mean that the renewable energy target is met at the lowest possible cost to consumers. I suggest it is a better way to look at the economics of wind farms to consider those two components and the way they add together than sometimes the discussions we see about base load and makeup generation and the like.

Variable generation output can also have an impact on ancillary services in the market. Ancillary service costs in the NEM are low and generators, including wind generators, pay for the costs of regulating ancillary service through a causer-pays factor. In any event, AEMO has not had to increase the level of such services to date to deal with the growth in wind generation in the system. Wind generation is the lowest-cost source of renewable generation that can currently be widely deployed in Australia. Its cost in the best sites is currently a fraction of its renewable energy competitors, including solar generation. Reducing access to the best wind generation resources close to the national grid could be expected to increase the cost of meeting our renewable energy targets. Thank you.

CHAIR: Thank you.

Senator FIELDING: Mr Swift, the Australian Energy Market Operator is involved with the Australian Wind Energy Forecasting system—is that correct?

Mr Swift: That is correct.

Senator FIELDING: Can you give us a bit of background to that and how that works?

Mr Swift: Yes. In recognising that wind was a growing source of energy supply to market, the federal government, through the department, funded that. The system is based on the European ANEMOS system and it involves almost all the wind generators in the market and in real time forecasts what generation we expect. It is doing a very good job out for several days ahead and is assisting in managing the actual reliability of the system.

Senator FIELDING: So that is a system that forecasts for the next couple of days or is it used also for profiling of areas where it may be best to place wind turbines?

Mr Swift: No, it is not used for working out where to place a wind turbine; that is a responsibility of companies that wish to participate in the market. But it does provide forecasts out to two years—they are of course very averaged—and it provides a very good forecast out for at least 48 hours. We are particularly interested in the forecasts half a day to a day ahead, as that assists with the scheduling of most plant, and we are getting quite good reliability on that. I would be happy to take a question on notice if you would like to know what those reliability figures actually are.

Senator FIELDING: No, I was more interested in the longer term. I know the short-term reasons to test their reliability and also for energy prices and whatnot—people may want to use that for various reasons. I am interested more on the issue of whether it is used by yourselves or anyone else to predict where the best places to put the next wind turbines or wind farms?

Mr Swift: No, it is not as such, but of course a lot of that same meteorological data is used in other sources by other parties for that sort of work. There is several private sector and CSIRO expertise in that area in terms of assisting to locate wind resources.

Senator FIELDING: Yeah, it is something that has come up a few times about where the next lot of wind turbines may be placed based on the best places for the wind, and a lot of people want to keep that relatively quiet until the locals know—but that is an important issue.

Mr Swift: I guess I would just point out there that it is not only the wind resource that is important in locating a generator; it is also the cost of connecting to the grid at a particular point. And, as I said, because they get paid their energy price the same as any other generator, there is an advantage in being in different states at different times, depending on which state would offer the better price.

Senator FIELDING: Yes, I think that certainly is one that has come up before about how close it is to, and how easy it is to connect to, the grid, as one location driver. One of the issues that has come up, and one of the key things that we are looking at here, is adverse health effects from living close by to a wind turbine. I am very interested to know that everyone sort of says location is based on where the wind is, location is based on how close or how easy it is to connect to the grid, but very rarely is there a requirement about how close it is to existing homes or where people live. Is that something that you have looked at as well?

Mr Swift: No, that latter matter is an issue for planning regulations; that is not an issue we get involved in at all.

Senator FIELDING: Okay. With the forecast that you have been using to create the Australian Wind Energy Forecasting system, is any reason why that could not be used to forecast the level of noise from a wind turbine individually and then also wind turbines collectively in an area? In other words, if you have a very good system—you have said it has a very high reliability—then you could know what sort of wind noise patterns could be forecasted from such systems, couldn't you?

Mr Swift: That is not an issue that I have looked into, to be honest, and I am not sure the extent to which it is associated with wind speed, because obviously at higher wind speeds the background noise is much higher and there would be dependencies in terms of the local topography and so on. It is certainly not something that I have looked at in the past, in terms of trying to predict any noise.

Senator FIELDING: I did not check your background, and whether you are an engineer or not, but my background is, and I can well imagine you could put the topography on a computer simulation and also look at the wind forecasts it has, the size of the blades, the type of the blades, and you could probably forecast the amount of noise coming from one turbine and then multiple turbines based on that basis, given that you said their reliability of the forecasts is pretty strong.

Mr Swift: Yes, I am an engineer but I am cautious to tell the committee that we could do something like that since I have never looked at it—I am not aware of any precedent in trying to do that sort of work. The work on noise generally, of course, is undertaken by specialists looking at topography, looking at the particular design of a turbine, particularly things like tip speeds and so on. I am not aware of any work trying to calculate a real-time forecast at all.

Senator FIELDING: Are you aware of any adverse health effects for people living in close proximity to wind farms or is it just not your area of expertise?

Mr Swift: It is not an area of expertise. Obviously we know there can be quite polarising debates in the community about wind farms, but we do not get involved in those aspects.

Senator FIELDING: All right. A lot of my questions do go to the adverse health effects on people living in close proximity to wind farms, so I will probably leave it at that given that you are not really an expert that could give us any insights in that area, so much appreciated, thank you.

Mr Swift: Thank you.

Senator ADAMS: I am from Western Australia, so my questions probably do not impinge on your area, but I would like to ask about a turbine of 194 metres—as you have said it depends on how hard the wind is blowing—would that turbine create more noise than one of 100 metres?

Mr Swift: Well that is quite a difficult question because, as I said it, will depend on the topography, it will depend on the actual model design and the way in which they manage that—a normal modern wind turbine has tools and techniques to manage the actual tip speed and the noise that they produce. That certainly sounds like a very large turbine, though.

Senator ADAMS: This is the latest wind farm that is going up in Western Australia, it is out in the country and it is contained on one property, but just looking at the height of it, I mean, 194 metres is very high.

Mr Swift: Yes.

Senator ADAMS: Now as far as the transmission lines coming into the grid for your area, are you involved with the planning. People have to apply to you to see if they can actually sell their electricity to go into the grid.

Mr Swift: Yes.

Senator ADAMS: So the wind blows in certain areas and yet the grid may not be close by, so my question really is, if you were to approve it and say yes, we can take the power, are you involved in financing that transmission line back, or not?

Mr Swift: Yes, well I should again put in front of my comments that we work in the National Electricity Market, which does not include Western Australia.

Senator ADAMS: No, I realise that.

Mr Swift: And the arrangements are slightly different in that respect in Western Australia. But in the eastern states and South Australia people who wish to investigate a wind farm have to talk to their local transmission network service provider. There is a different company in each state. They negotiate access through that process. That is then checked with us to ensure that the proposal meets minimum technical standards and will deliver a

secure outcome. In the National Electricity Market the participant seeking to connect pays the cost of all the connection assets, but then there is a later planning process to determine whether what we call the shared network, the bigger network, needs augmentation. If it does, that is justified on the basis that it is of a net benefit to everyone in the market and therefore that is then funded through the shared transmission charges. So there is a bit of a combination there. What we call the shallow connection cost is paid for by the proponent of the wind farm, and any deeper augmentation later is undertaken through a planning process and is shared across the market.

Senator ADAMS: And if substations have got to be upgraded and all that sort of thing who pays for that?

Mr Swift: Well if it was the connecting substation or near the connection, the proponent would pay for that. If it was somewhere else, deeper in the system, that would have been justified and paid for by everybody. Obviously there is a significant asset required right at your front door to connect to the system, and you clearly pay for that, but then in the national market it is not necessarily just one wind farm but if you get a number of wind farms in an area obviously you need to then transport that to customers, so you will find over time that could justify some broader augmentation of the network. And that is going on all the time, with at the moment, for example, new gas in south-west Queensland, and new wind in central South Australia—both of those issues are prompting a lot of work on potential upgrades to the shared system.

Senator ADAMS: Right, and as far as new applications for wind farms, you would have to be involved with those as to whether the capacity is going to create problems for you or not with the intermittent way that the wind power comes on board.

Mr Swift: That is right. We do planning in different time frames. The national plan that I mentioned before goes out for 20 years and looks at a number of scenarios. On the other hand, we publish annual reports on looking out two years and 10 years, so we are regularly looking at what the potential impacts on the power system and the grid are with what is coming up. We do individual studies on each connection and connecting generator and we have a real-time system that actually works out right now whether there are any issues coming up in the next five minutes. So that process is ongoing and obviously part of the usual process that is used to make sure that the grid is always secure and as reliable as possible. They do do the same things in Western Australia, I should hasten to add there.

Senator ADAMS: I am very tempted to ask you questions, but I am keeping off it because as you said you are not involved with Western Australia.

Mr Swift: Yes, the market design is different in Western Australia—they have a unique market design and a different market operator—I am not trying to stay away from it for any reason other than obviously it is not fair for me to comment. They are certainly competently run. I am well aware of the people there and what they are doing and we share information.

Senator ADAMS: Western Australia has got a boom going on—it may be in the minerals area but we can assure you that the wind farm boom is alive and well and every day one hears about more proposals for wind farms to go—and it is starting to cause a problem for the agency that is coping with the power when it all comes on stream.

Mr Swift: Yes.

Senator ADAMS: I did read—I have not got the article—recently that China has joined with one of the large wind farm developers, and they are looking at funding 4,000 new wind turbines throughout Australia. Do you know anything about that particular issue?

Mr Swift: I am not familiar with that particular release, but certainly one of the features of the industry over recent times has been that the manufacturing of these things is now starting to move towards India and China, away from the traditional European manufacturing bases, so that is starting to have a bit of an impact. There are some Chinese manufacturers active in Australia marketing their product. I am not aware of any wind farms at the moment on the system that are of Chinese source, but certainly that is quite likely in the future.

Senator ADAMS: This was a proposed one, it is not actually there.

CHAIR: You touched on this a little bit earlier. One of the claims or issues that have been put to us is that wind generation is very expensive, and that traditional fossil fuels are more competitive than the price of wind. You made a comment earlier, I think, where you said that wind energy is one of the lowest cost. Did I hear you correctly, and can you just talk about that?

Mr Swift: One of the lowest cost renewable energy sources.

CHAIR: Okay.

Mr Swift: At the moment it is significantly more expensive than gas or coal generation in the market, although that is questionable in the future depending on what happens to gas prices and coal prices. But I guess the point I was making in terms of economics was that the way the system works is that they get paid the same as any other generator for what they generate, plus they get their renewable energy certificate. The last time I looked, just recently, renewable energy certificates were trading at about $39 per megawatt hour. So that could be seen as the additional cost—the cost of the REC, the renewable energy certificate.

CHAIR: But the cost for you in the market is the same—you pay the same regardless?

Mr Swift: That is right.

CHAIR: So the proponents wear the risk?

Mr Swift: Exactly.

CHAIR: Thank you very much.

Mr Swift: Thank you.

WILLIAMS, Dr Warwick Hamilton, Senior Research Engineer, National Acoustic Laboratories

[10:25]

CHAIR: I welcome Dr Williams from the National Acoustic Laboratories. Good morning. I know you know about parliamentary privilege and the protection of witnesses and evidence.

Dr Williams: Yes.

CHAIR: Do you have any comments to make on the capacity in which you appear?

Dr Williams: I am a senior research engineer at National Acoustic Laboratories in Sydney. National Acoustic Laboratories is a federal government organisation.

CHAIR: Thank you very much. I would like to invite you to make an opening statement and then we will ask you some questions.

Dr Williams: I have to admit, I do not have a formal submission that I want to make. My presence here is in the context that I was requested to come along, and my area of expertise is the effect of noise on people—primarily to do with hearing, but it also extends to the noise and vibration as it is to general health. In that capacity I work in research in that area. I also work with Standards, both Australian and international, and look at the effects of noise and vibration on the health of people. So my knowledge of wind farms is through what I read in the general literature, through what I have read in scientific literature and through the limited input, I must admit, I have had into the Australian standard for measuring noise performance of wind farms/wind turbines.

CHAIR: I should put on the record that a number of the senators here have been up to the labs to have a look, when we held our hearing inquiry. One of the reasons we asked you to come was that we had a lot of evidence and people presenting on issues around noise and infrasound, so we wanted to get an expert along to talk to us about issues like that. So that is why we asked you to come along, and we very much appreciate it; thank you. I will throw to Senator Fielding first.

Senator FIELDING: Dr Williams, I thought I would start out by asking you to go through the issues of infrasound, low-frequency sound—how it is measured—dBA, dBG and the issues around the general concerns about infrasound and its effects on humans. I understand it affects some people differently than others. I would be interested to know from an expert in this area. I have been reading some of the background. If you could just try to explain that, it would be great.

Dr Williams: Okay, I will do my best. I would hesitate to say I am a real expert in it. But on the effect of sound on people, normally we look at audible frequency ranges, which are considered to be 20 hertz up to about, realistically, 12 to 16 kilohertz. Infrasound is that sound that is lower than you would expect normal hearers to hear, and when I use the word 'normal' I am using it in the sense of the average person across the population. You have a very poor ability to hear below, commonly, 20 hertz. Below that sort of level it is called infrasound. The wavelength is very long. The human system is designed not to hear those sorts of sounds. We do not particularly need to hear them for communication for speech or to know what is going on around us. We tend to feel them more. So the problem is not so much the impact of infrasound on the hearing system; it is a function of what it does on the whole of body, and that means it starts shaking up internal organs. I believe that Symphony Australia for a while had as one of the mottos, and they still might have it, 'You hear the music and feel the music'. I think they also meant that you do not just feel it is emotionally. If you have ever been to a dance club or a large, loud concert, you would feel the doof, which is the beat that people go along to hear. It shakes up internal organs et cetera. That can naturally have good and bad effects. A little bit might be good but too much might be bad, and it will affect different people in different ways. I am talking about the general case not specific case studies. I am talking about the population statistically.

Senator FIELDING: As you go, could you also talk about those who do not necessarily react to it and those who do. Does that make sense? This is the issue: claims are being made that it affects some and not others.

Dr Williams: Yes, this is the problem. There was a very good report completed in the UK only last year called the *Health effects of exposure to ultrasound and infrasound.* We all know ultrasound. It has very high frequencies and it is used to diagnose and examine the human body, particularly during pregnancy et cetera. It is a non-invasive way of looking at the body. A classic statement they made in their findings at the end of this report—and it is part of the problem, I fear, that you are facing when people bring up the question—and they said: 'No epidemiological study appears to have been published into the effects of infrasound on any aspect of health or wellbeing.'

We tend to be dealing with anecdotal reports by people and individual reports, and case studies. When people bring up these things, it is very hard to know whether you are dealing with a noise vibration effect or some other effect that tends to be there. One thing comes to mind. When I had not been working in acoustics for that long, a few years back, you might remember the Bond airships that cruised over Sydney and there was a big outcry because people did not like them. Their complaint was about the noise that they made. We did quite a big study with the department of aviation to measure the actual noise output. They were powered by the equivalent of a VW Beetle engine that was pushing them along, and they did not put out much noise at all. The problem really seemed to be that the noise was a focus for what they saw. They just did not like this thing cruising around over their houses looking into their backyards on the weekends, seeing what they were or were not doing. I think the noise was like a focal point that people could get to.

In some cases, the aspect of the noise problem is a focal point that is focusing other people's fears, apprehensions and perceptions as to maybe what wind farms are. It may not be the noise, because everything I have been able to look at basically says that, in the normal expectation of levels that you will receive, the infrasound will not have a significant physical effect on people's bodies. Certainly it will have an effect in very high levels and typically you get those sorts of levels in engine run-up test areas for jet aircraft et cetera, where there is a lot of sound energy being dissipated. A lot of it is at low frequencies, so the body shakes and vibrates. Under normal conditions, as this UK report says, there does not seem to be any indication of infrasonic sound of this sort being harmful to people.

CHAIR: When you talk about high levels, you have used the example of the aircraft run-up—what level is that in terms of measurement?

Dr Williams: In terms of decibels you are probably looking at well over 100 decibels and that is at specific very low frequencies. The threshold of hearing at those levels in fact may be in the order of 80 decibel sound pressure level so it does not have a high audible component. The hearing system just does not hear it that well, but you are feeling it. Compare that to a higher frequency sound, say, a 1,000 hertz, which might be the beep on a reverser of a truck or something like that. You are much more sensitive to it at 1,000 hertz, and the sound pressure level for that will be around zero dB. When we are measuring the effects of sound on people, if it is within normal ranges we give it what is called a A-weighting to simulate the typical response of a human ear, and that heavily discounts the low frequencies and the very high frequencies. So when I am talking about high levels of infrasound, I am probably talking in levels up over 100 dB, which are quite hard to produce. You need a big energy source to produce that sort of noise.

CHAIR: Before it starts having an impact—

Dr Williams: Yes. You have got to produce it somewhere and then the further you are away from it, the less its effect because it has a decreasing effect with respect to distance.

Senator FIELDING: The issue here really is that there are certainly people living near wind turbines who are being affected and the question is: what is a good setback distance from wind turbines? Let me just cover something else with regard to wind turbine syndrome—and I do not know whether you are familiar with the term at all—

Dr Williams: I have heard of the term but I would not want to try to define it.

Senator FIELDING: Have you had a look at any of the Dr Pierpont's material?

Dr Williams: I have read commentaries on it, but I do not think that I have read any of the original work.

Senator FIELDING: That is not going to help much at all. With regards to setbacks from wind turbines, is it something that you have looked at before or do you have a view on it?

Dr Williams: Yes, it is sound propagation in the atmosphere. Theoretically it is possible to predict and look at what is going on but it is subject to wide fluctuations. Again, you can really do it on a sort of statistical basis. The problem is that if you have got wind blowing on a wind turbine, in general it is going to assist propagation of the sound anywhere downstream. Because they are low frequencies and long wavelengths, one of the phenomena that can happen with infrasonics is that while you may not be able to hear the sound, they can often set up resonances in things like buildings and homes et cetera. It happens sometimes in coalmining areas where you have large coal trains running over culverts. They can set off a low-frequency sound travelling through the atmosphere that can arrive at someone's house and if the rooms and so on are of the right dimension it can cause them to resonate, to vibrate in sympathy with that sound that is being propagated and that amplifies the problem.

Senator FIELDING: So it would be very difficult then to determine a setback, wouldn't it? It could be somebody who is 500 metres away or someone who is two kilometres away; it just depends on the topography and the arrangement of the wind turbines themselves?

Dr Williams: It is the topography, the groundcover, the atmospherics at the time, whether you have got a lot of wind or no wind, whether you have the temperature profile as you go up into the atmosphere—it is a very complex area. You can do it by trying to actually model it in real time, which is quite difficult, but the best way to do it for the industry would be to do it on a statistical basis and say, 'What do you get in the worst case?'

Quite a few years back National Acoustic Laboratories did some work with the defence department around their firing ranges and test ranges, which used to be a long way from 'civilised areas' or built-up areas, areas that tended to be flat and open. Subsequently more people have moved in there particularly in areas like the Hunter Valley and around Sydney et cetera.

We did a lot of propagation work to see whether in fact advice can be given on when you should and when you should not make a lot of loud bangs and noise et cetera. There are general conditions that you can look at and say, 'Okay, these conditions are not good.' The trouble is that a lot of the conditions that would be good for propagating sound would not be good for the people living downstream, yet those conditions would be very good for running wind turbines.

Senator FIELDING: The issue is that this is my house or your house or home and I am sure that we would not want to live with that happening. This is the concern that we have got. Obviously something is happening, and how many households are affected is a hard thing to determine, as is how it impacts different people. Some people may be more sensitive than others to these types of things and, secondly, the actual noise level affects different people at different levels. In other words, you could say that there is a safe level but it may impact someone's health because they are more sensitive or more receptive or they just cannot stand that type of noise. They have bought into an area and they have been living there for maybe 10 years or 20 years and all of a sudden a wind turbine goes up, or turbines, and it affects their lives. There is the problem of how far they should be set back to remove any of that possibility. Albeit a small number of people may be affected, but what setback should there be? This is what I am trying to work out and I think that some of the committee members may have trouble with that too. What is safe? No-one would like to live near something that is affecting them. Even though someone may say that it is very safe, if it is affecting them and it is not their fault—it was actually placed there—they would not like it.

Dr Williams: I have to agree. Some people are more sensitive and we all vary in our sensitivity compared to others. For a lot of exposures we do not actually declare a safe value or a safe exposure. What we do is declare an exposure that we are willing to accept a certain amount of annoyance from, or injury, if it is with noise exposure. So to actually set a distance is very hard. I would hesitate to try to do it here, except that it would have to be the order of kilometres.

Senator FIELDING: I understand that. The issue that we are facing is that there are competitive or market pressures that say given the renewable energy targets we need more wind turbines, we need them in windy places, we need them close to connection to the grid, ones that are cheap or at lower cost. There are those drivers, and then there is the other issue about people.

A lot of people do not want to live close by these things and so you have got these competing aspects which are a real issue. It is very hard to try to work out what is reasonable through this process. The bigger setback may potentially mean that there are fewer places where you can place wind turbines, or it could be that more compensation has to be paid to people that live close by. These are the issues that we are trying to struggle with and get to the bottom of and it is proving very difficult. No-one is 100 per cent certain. People are saying that it may not be the noise, but it could be, and this is the issue that we are grappling with and this is the reason I was asking those questions. I agree that it would be good for us to try to set a setback. Do you have any comments about that at all? I have a further question but I thought that generally this is the issue we are grappling with.

Dr Williams: All I can do is agree with you rather than say, 'This is what you do.' If somebody perceives it as a problem, then it is a problem, and if we treat everybody well, we say we must affect it somehow. We have got to do something about it. But I am afraid I could not give you an answer to that with the current state of knowledge that I have. I think that even with the current state of knowledge that actually exists, maybe we have to look at different measurement parameters. Maybe we are trying to force the wrong sort of measurement into what we are doing. We are using a parameter that will work pretty well in maybe a built-up area where you have got lots of traffic noise, but where you are out in a rural area where it is a lot quieter, maybe we need a different parameter to see how well that parameter actually aligns with people's perception of annoyance and irritation.

CHAIR: Senator Fielding, we are going to have to move on.

Senator FIELDING: All right, thank you.

Senator BOYCE: Can I just ask you about what those parameters might look like?

Dr Williams: I am basically an engineer-scientist so I used to always come at this aspect from saying, 'We can measure this, and we sort of fit people to do that.' But what you have got to really do is say, 'Here is a series of measures we have, let us ask people how they feel about it,' and you basically plot a graph of your measure against the effect. You have probably seen that in some of the submissions here. They look at annoyance versus the noise level, say, the average background noise level and the noise from the turbine. Maybe it is something like that but a bit different. Maybe you have got to measure it in a different way and the measure has to relate to what the people hear. We used to have a big problem with aircraft noise because of the way we said the noise around airports was measured and noted. People could not understand it when they went to buy a house, and they said, 'It's so noisy.' But they said, 'Oh, that's all right,' but the measure didn't relate to what their perceptions were. Maybe we have got to get a measure that relates to what their perceptions are, what they will actually hear or feel from the noise, but make sure that that scientific objective measure is well related to a subject measure.

Senator BOYCE: Does that exist now for houses—the example you gave, for example?

Dr Williams: The airport people in Australia did a really good job for noise around airports I am sure that a similar sort of thing could be done—and it might have been done throughout the rest of the world—for wind farm noise. There are a lot of wind farms out there—there are huge ones—so I am sure it is not a unique problem to us.

Senator BOYCE: Thank you.

Senator ADAMS: Just to continue on the measurement: we had evidence, or we have tried to get evidence as to how the measurements are actually done for the setback. We were given evidence that they would not do it within a house because of background noise—radio or something like that—and over the particular time, but they were doing it sort of 30 metres out from a house and it was actually buried. It was just weird. So there was no way that we have really been able to gain any evidence as to how these measurements are done. You were talking about a room, and that that can change the whole sound as it comes down wherever it comes with the soundwave but from your experience, what would you consider to be an accurate measurement? How would you do it physically?

Dr Williams: The problem is if you want to know how it is affecting someone in a house or in a room, then you have got this problem that you are not actually measuring what is originally coming in without the effect of the room. You have got to somehow discount not just the background noise but the effects. If it is causing a room to vibrate or whatever you have got to discount that effect, so what the parameters tend to do is go somewhere where they just measure what is actually coming out—at that distance and under those conditions, what is the measure there? Some of the standards use a plate on the ground and they set a certain microphone of a certain type on the ground and measure the emission coming from the wind turbine. When you go to start measuring where people are, you have got to sort of superimpose that measurement on the environment that they are in. That is going to take a bit of thought to work something out. It is like understanding all the other effects that are going on around you and trying to concentrate on one particular part of it when there are all these other things influencing you at the same time.

Senator ADAMS: That is probably why we have not had a really good answer.

Dr Williams: It is probably a good reason. I would basically say I do not know, to be quite honest with you. You would have to sit down, knock a whole lot of ideas around and come up with something. It is like you do with brainstorming: you put a whole lot of ideas on the table, knock out the ones that are not any good and then try the ones that you think are okay to see if they work.

Senator ADAMS: So, as far as the guidelines with setback, in some areas it is 500 metres but other areas are different. Victoria now has gone to two kilometres. In Denmark they have really come unstuck there. Trying to find more land to put their wind turbines on has become an impossibility because of setback. They just cannot get far enough from populated areas, so they now have to go out to sea, which is double the costs and double the maintenance costs. Admittedly the wind blows pretty well on the coast, but they have really come under fire trying to put up any more turbines on the land. Sweden are looking at their setback being based on the height of the shadow or where the shadow goes to times two.

Dr Williams: But what time of day would they have that?

Senator ADAMS: I have no idea. That was all they said to me: 'We don't go 500 metres. That's too far. This is what we're doing.' I was just asking a question of the witness before. The proposed turbines in Western Australia are a new farm that is going up with 67 turbines 194 metres high.

Dr Williams: Yes, you are getting much better propagation there because your source is way off the ground, so you are overcoming the local topography. That is nearly 200 metres. It is over 600 feet. That is very high.

Senator ADAMS: It is huge. When you look at what they have given as examples, the Statue of Liberty in New York is only 93 metres, and the Swan Bells in Perth, which looks quite large on the Esplanade, is only 82½ metres. So you are going double that. To carry on with a question: would the noise of a tower of 194 metres be louder than one of 100?

Dr Williams: All things the same—blade length, turbine size—I would have thought the noise output would be the same. It would be the ability to propagate further that becomes your problem. You are standing up much higher. It is like being able to see further when you get higher; you can propagate the sound much further. Low frequencies propagate much better than high frequencies. So you will get rid of the high-frequency noise, because that will be absorbed quite rapidly in the atmosphere, but the low-frequency noises will go further. If you put them higher up, they will go further still.

Senator MOORE: What does propagate mean in that phrase?

Dr Williams: Transmission.

Senator MOORE: Just transmission. I thought it might have a special technical meaning.

Dr Williams: No.

Senator MOORE: So it is just spread wider.

Dr Williams: Yes, it will just go further. You are getting up above any shadow effects; if there is a little hill, you are sticking it way up above it.

Senator MOORE: I would hate to make it more complex!

Dr Williams: No, we will keep it simple.

Senator ADAMS: I am still trying to work out where the setback goes, because it seems to be so confusing.

Dr Williams: I cannot give you an answer; I am sorry. I do not know. It is something that people will change over time as we learn more about them and people get used to it. Some things initially we did not like and then people have accepted, so maybe it will change. Maybe it is people's perceptions as much as anything.

Senator MOORE: In terms of the work that you do, what does it take to get National Acoustic Laboratories to do an investigation into this the same as you did for aircraft noise? What are the steps in the process?

Dr Williams: I guess it is like any project: money—funding and resources. We do projects. We get money directly from the Commonwealth. We also apply for other funding through CRC and other funding sources that come about—even some commercial research. You sit down and think up what an idea is, where you are going, where you want to get to, where you want to start off, how you can get there and what a feasible way of doing it is.

Senator MOORE: Who funded the one you did on aircraft noise in New South Wales?

Dr Williams: It was a Commonwealth project. It was done partly because funding for Commonwealth departments was different at that stage in the late eighties and early nineties. It was jointly funded between the Defence department our department and the department of transport with the aviation people.

Senator BOYCE: You were asked to do that investigation.

Dr Williams: Yes.

Senator BOYCE: It was not something that you generated internally.

Dr Williams: No, there are a lot of things we would like to do internally, but the available resources do not let you do all the things you would like to do.

Senator MOORE: It is an entirely unfair question but I will ask it anyway: what kind of resources would be needed for a project in this area?

Dr Williams: You would need a few people to sit down and work on it. Like any project you would have someone coordinating the whole thing and then people out doing the work and organising it and then you would have cooperation from and preferably do it with industry so it is a win-win situation. Whenever I have run projects you always try to do them with all the bodies that are involved so that everybody wins out of it. You need everybody to have an input to it so that when you come out with a solution at the end it is something that everybody has agreed with. It may not be the best solution. It is like a standard, an Australian standard or international standard is not always the best way to do something but it is something that everybody has agreed with and you go through the process and look and say this is what the problem was—

Senator MOORE: Dr Williams, the one thing that we can agree is that everybody will not.!

Dr Williams: Yes.

Senator MOORE: So if such a project was being put in place, it would have to generate engagement whether or not it will end up with satisfaction. I think that is uncertain. There does seem to be from what we have heard a great difference of opinion in this area and not a lot of established data. That creates uncertainty on all sides and then creates arguments. It would seem that some kind of independent assessment would be a good idea and I am trying to get my head around who would do that, how would you recommend it and what would it cost? Simple questions I know!

Dr Williams: You would have to allow a few years to do it. It would not be done instantly because you have to look at what has been done and then see why that has not been satisfactory, why it does not meet the current situation and then you can look at where you are going to go. It is in the order of hundreds of thousands of dollars realistically with people's time and effort and energy. You have to have a few years because you have to make sure that you have the things that you want to measure out there to measure and they are not cheap.

CHAIR: I have one last question. There are two issues with sound. There is the audible sound and then there is the infrasound. That seems to me to be the most difficult. You started earlier to talk about the population trends and the fact that you do not hear infrasound because it is low frequency. How would you do a study around infrasound when you are saying that different people have different responses but you do not hear it, you feel it in your body? As I understand it from what people are saying—I acknowledge that I may be misquoting Dr Pierpont—the inference is that people do not know that they are experiencing the impact of infrasound, it just is having an impact.

Dr Williams: It is not quite, 'just is'. There can be an impact. It is the same as carcinogens, we did not know they were toxic. You can still go out and actually measure the infrasound. You do it in a different way. You do not measure it like you do audible sound.

CHAIR: I understand that but, as I understand it and from the evidence presented to date from the sonic enquiry—and I know that people will go berko in a minute and say that that was done by industry, but the fact is that that is the only study we have—infrasound from wind turbines is less than it is from the beach, buildings et cetera. That is the evidence we have had. The leap then is: it is still there and it is still having an impact. How do we know? I am not talking about the sound now because I see the noise as a separate issue. How do we know infrasound is having an impact when the evidence we have had to date is that it is very low and is not having an impact? We are being told, essentially, to believe that it is having an impact. I understand with carcinogens that people do not know they are having an impact, but you can measure the impact because you can measure the cancer. How do we know and how do we work on infrasound having an impact on people if what the measurements are saying is that it is really low?

Dr Williams: We have to do the measurements and correlate the measurements with the incidents. We have to do an epidemiological study to see what people have and what they are experiencing and see what the correlation is between those factors. You will never end up with a perfect one-to-one correlation because you will not say, 'People are not affected by the infrasound near the beach.' Some people do not live near the beach because they might not want that constant noise.

CHAIR: But that is noise, not the infrasound. When people say that they do not want to hear that noise, it is the noise they do not want to hear and not necessarily the infrasound. People talk about the noise next to the beach.

Dr Williams: But it is very hard to generate clean infrasound without any other noise around it because of the way sound is. It is like plucking a string on a guitar: you do not get just one pure tone out of it, which is what makes the instrument interesting. You get a lot of mixtures and overtones coming out of it. So you do not always get just the pure, low-frequency noise that is there but you cannot hear. You will always get other noise there with it. What you have to do is look at it and say, 'Here's what these people near wind farms are being exposed to, so we will do a double-blind study,' or something like that. We need to do a double-blind study in which people know or do not know what is going on, and then you see what the effects are, what they say about it and how it works.

CHAIR: We have had evidence that there are a lot of psychological impacts, which are still impacts. But if it were a double-blind study that would cut out the potential psychological impacts, wouldn't it?

Dr Williams: It should do. It is like doing a placebo test. It is a normal medical type of test in which you have a drug and a placebo and you do a double-blind study to see what the results are.

CHAIR: No work has ever been done on that in terms of infrasound. Wind farms are not, potentially, the only things that cause infrasound.

Dr Williams: I know that nothing that I have seen has done that.

CHAIR: As there are no further questions, Dr Williams, thank you very much; your time is very much appreciated.

Committee adjourned at 11:02