**REPORT OF PROCEEDINGS BEFORE**

# GENERAL PURPOSE STANDING COMMITTEE No. 5

## INQUIRY INTO RURAL WIND FARMS

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**At Sydney on Friday 11 September 2009**

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**The Committee met at 9.30 a.m.**

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**PRESENT**

Mr I. Cohen (Chair)

The Hon. R. L. Brown
The Hon. R. H. Colless
The Hon. C. J. S. Lynn
The Hon. L. J. Voltz
The Hon. H. M. Westwood

**CHAIR:** Welcome to the first public hearing of General Purpose Standing Committee No. 5 Inquiry into Rural Wind Farms. The inquiry's terms of reference require the committee to examine the costs and benefits of rural wind farms. As such this inquiry is an opportunity for all stakeholders and the community to provide input into how New South Wales can ensure wind farm developments equitably balance social, environmental and economic objectives. In addition to today's hearing, two public hearings will be held in Goulburn and Tamworth in the coming months. Evidence will be given from representatives from the Department of Planning, Department of Environment and Climate Change and Water, representatives from the Clean Energy Council, Mr Christian Downie from the Australian National University and representatives from various wind energy companies.

Before we commence I will make some comments about certain aspects of the hearing. The committee has previously resolved to authorise the media to broadcast sound and video excerpts of the public proceedings. Copies of guidelines governing broadcast of proceedings are available at the table by the door. In accordance with the guidelines, a member of the committee and witnesses may be filmed or recorded, however, people in the public gallery should not be the primary focus of any filming or photographs. In reporting the proceedings of this committee the media must take responsibility for what they publish, or what interpretation is placed on anything that is said before the committee.

Witnesses, members and their staff are advised that any messages should be delivered through the attendants or the committee clerks. I also advise that under the standing orders of the Legislative Council any documents presented to the committee that have not been tabled in Parliament may not, except with the permission of the committee, be disclosed or published by any member of such committee or by any other person.

Please turn off all mobile phones for the duration of the hearing, including mobile phones on silent, as they interfere with Hansard's recording of the proceedings. I welcome our first witnesses, representing the New South Wales Government.

**YOLANDE STONE,** Director of Policy, Planning and Systems Reform, Department of Planning, and

**SCOTT McKAY JEFFRIES,** Director of Major Infrastructure Assessments, New South Wales Department of Planning, and

**JENNIFER STACE**, Manager, Emissions Reduction, Department of the Environment, Climate Change and Water, affirmed and examined:

**CHAIR:** In what capacity do you appear before the committee?

**Ms STONE:** As a representative of the department.

**Mr JEFFRIES:** I am appearing in the capacity of Director, Major Infrastructure Assessments.

**Ms STACE:** As a representative of the department.

**CHAIR:** Are you conversant with the terms of reference of this inquiry?

**Ms STONE:** Yes.

**Mr JEFFRIES:** Yes.

**Ms STACE:** Yes.

**CHAIR:** If you should consider at any stage that certain evidence you wish to give, or documents you may wish to tender should be heard or seen only by the committee, please indicate that fact and the committee will consider your request. Do you want to make a short statement to the committee?

**Ms STONE:** I do have a short statement to make. The New South Wales Government is committed to developing a dynamic renewal energy industry and to promote green energy jobs in New South Wales. New South Wales already has a renewable energy target in the State Plan of 15 per cent, and is committed to extending this in line with the renewable energy target of 20 per cent by 2020 at the national level. Currently only 6.3 per cent of electricity consumed in New South Wales is generated by renewable energy, principally by hydro energy. Wind energy is seen to be a very valuable and proven way of reducing carbon intensity of electricity production. Modelling carried out by the Commonwealth Government suggests that almost half the new renewable energy to be built under the renewable energy target scheme is likely to be wind energy. This is because wind is market-ready technology, which is currently cost efficient, relative to other types of renewable energy such as solar or geothermal.

Further, it is a feasible option as can be demonstrated by other countries such as Denmark and Germany having between 18 and 20 per cent of their renewable generation by wind. The Government is positioning New South Wales to attract substantial new wind farm and other clean energy investment, building vibrant sustainable industries, and promoting green jobs is a top priority. Approximately $25 to $30 billion of investment is expected to occur to meet the expanded national renewable energy targets and New South Wales wants to attract a large share of that. There are significant numbers of sites in New South Wales with competitive wind resources. Comparable with other European countries with extensive wind power generation already in place, New South Wales has the advantage of having a large number of windy sites.

Wind farm proposals approved and under assessment by the Department of Planning provide an indication of the scale of interest in investment in wind energy in New South Wales. A total of seven wind farms with a capacity of 1,300 megawatts have planning approvals. This includes Australia's biggest wind farm at Silverton, approved in May 2009, with a capacity of up to 800 megawatts at this first stage, with the second stage in progress. Two of these nine approved farms have commenced construction, Capital at Gouburn-Mulwarree and Cullen at Upper Lachlan. In addition, a further six wind farms proposals are under assessment with a combined capacity of 1,500 megawatts. If all these projects approved and under assessment are implemented, New South Wales will nearly have 3,000 megawatts of renewable energy delivered by wind. New South Wales currently has approximately 18,000 megawatts of installed electricity generation to meet its needs. This addition of wind energy will make a significant contribution.

The New South Wales Government is implementing a range of other measures to increase renewable energy generation and to ensure that renewable energy plays an important part in the State's energy mix. On 17 August 2009 the New South Wales Premier announced the establishment of the renewable energy precincts in the best wind resource areas of the State, as well as a number of other statewide reforms to attract new investment into renewable energy in New South Wales. The initiatives will facilitate wind farms through a strategic approach to grid connection, streamline planning approval processes and enhance community consultation processes.

The key measures announced by the Premier include the reduced critical infrastructure threshold for renewable energy projects from 250 megawatts to 30 megawatts. This will apply across the State and provide greater certainty to investors and the community. There will be a four-month turnaround for the assessment and determination of clean energy projects by the Department of Planning, reducing the current assessment time by half. There will be dedicated go-to people or project managers in the Department of Planning to assist resolve issues with renewable energy projects and efficiently coordinate the assessment and infrastructure delivery issues.

There will be financial incentives, with critical infrastructure fees being waived between August 2009 and 30 June 2011. The Department of Planning and the other agencies will be developing the New South Wales planning and assessment guidelines for wind farms to provide a consistent framework for assessment of wind farms in New South Wales consistent with the national guidelines. This will reduce the level of uncertainty in the assessment process both for communities and for proponents. Better community partnerships is part of the initiatives, with new dedicated environmental officers to be employed in each of the six renewable energy precincts to work with local communities. The six renewable energy precincts that have been announced will be in the New England Tablelands, the upper Hunter, the Central Tablelands, the New South Wales-Act border area, the South Coast and Cooma-Monaro. These precincts will be based on local government areas known to have high wind resources.

Extensive community engagement and consultation will be undertaken within each of these precincts to address community concerns and improve the community's understanding of wind farm issues. Precinct advisory committees will be established in each of the precincts, with a role to provide advice on regional issues to be considered in the assessment of wind farms. These committees will also be very important in education of the community programs on renewable energy generally but also relating to wind energy. In order to provide a New South Wales based source of information to add contextual objectivity to this debate, the New South Wales Valuer General has engaged a consultant to undertake a study on the impact of wind farms on the surrounding land values. This report is currently being finalised.

The New South Wales Government is implementing a range of measures to boost investment in wind and clean energy generation in the State. These include establishment of the precincts, streamlined planning and better partnerships with community. Wind power is a commercially viable proven solution to reducing the carbon intensity of electricity generation, and wind farms are likely to play a key role in New South Wales changing to a low-carbon economy. They will also play a key role in making sure New South Wales is able to take advantage of the economic activity and investment that will be driven by the Commonwealth's renewable energy target.

**CHAIR:** You mentioned the creation of the precincts. What were the main factors that influenced the creation of the precincts and how does the creation of these precincts allow for more coordinated engagement with local communities, which I am sure you must be aware there is quite a degree of concern from various areas about the impacts of these wind farms? How do the precincts work out in that respect?

**Ms STONE:** In New South Wales, unlike in other States, our winds are along the range. In Victoria and in South Australia they have more systems of Roaring Forties winds that are along the coastline. I think in a lot of the communities there is not an understanding where the wind is and the Sustainable Energy Development Authority [SEDA] back in 2002 did initial mapping to identify winds based on the knowledge in about 2000. That information has been upgraded by the Commonwealth now and we have a slightly more refined mapping, which shows that there is a lot more wind than SEDA had anticipated. However, industry now is out there doing much more detailed mapping and it appears that there are a lot more wind opportunities in New South Wales than originally anticipated.

One of the important things with working with the precincts is that these communities are made aware of the importance of these areas for renewable energy generation from wind and they are given that information

on sort of a precinct basis so that the issues that are important, say, down in the Snowy, are appropriately considered compared with those in the Goulburn Mulwarri area, which is a different set of issues compared with, say, around Glen Innes. So we felt that because there were local differences it would be important to look at those community issues on a precinct basis and to have those put in the guidelines that will be considered by the proponents doing their assessment.

So there were two things. One is providing information to those communities—how important their areas are for renewable energy and what opportunities there are for the farmers. One of the things that is very interesting is that farmers that have got wind are really drought proofed because if they have a renewable energy facility on their site they get an annual income. So there are opportunities for farmers that have got windy locations on their farms. So that is part of the information to be provided to the community and those precincts. On the other side is having the community provide information back to us about issues that are important to them.

It is interesting to see the councils that have been involved with developing development control plans—the enormous variability that we get in those control plans. Some of it because they understand the differences; some of them perhaps do not. So we want to get greater consistency across precincts and provide better information to those communities.

**CHAIR:** In terms of the creation of those precincts, are they intended to make these areas more attractive to investment?

**Ms STONE:** That is the intention, yes.

**CHAIR:** Will the precincts end up in the role of being representatives or advocates for development applications? Is there any sort of plan on that with the precinct areas at all?

**Ms STONE:** We see the precincts more at the strategic level rather than getting involved in the detail. However, they certainly could make submissions to the development assessment process. It could be that if the PAC was having an inquiry about a particular wind farm they could get that committee along to provide their views. But we are more interested in having them provide the strategic planning, the policy context, and have a feed into that.

Just in that context, we are moving towards a national approach with regard to national guidelines, which the Commonwealth is working currently with all the States in providing common rules about noise assessment and noise criteria, about visual assessment. So rather than each State make up their own rules we have now got this task force, which Scott represents the State on, developing a national approach to performance criteria and assessment methodology. This has been one of the sources of delays maybe where there is uncertainty about what assessment methodology you should use and what performance criteria. The national people are taking a lead on that, but there are ways that the local precinct committees can feed into areas where they have not provided criteria.

**CHAIR:** Perhaps Mr Jeffries could answer this question. I know when I read the submissions there are assessments taken on the noise factors, for example, and also mitigation in terms of CASA requirements. Noise levels are taken at the base, for example, on the ground, yet there is a lot of complaint that, especially with the enlargement of the actual facilities, the actual generators themselves, there is quite a degree of difference in terms of assessments with the height. Has that been accounted for?

**Mr JEFFRIES:** It is an issue that has gained attention recently.

**CHAIR:** When you talk about getting the SEPP national guidelines, I see a lot of discrepancy.

**Mr JEFFRIES:** Certainly. If you look at the way the various States currently deal with noise issues, there are essentially two camps: there are the States that adopt the approach taken by the South Australian authorities, and the States that look at the New Zealand standard and follow that approach. The two of them do not really produce fundamentally different outcomes, although they do use different methodologies and processes to arrive at that outcome. As part of that, and as part of the national work, we are looking to get a more consistent approach across the authorities, the jurisdictions, to make sure that it is very clear that we have one process to determine noise impacts and monitor noise impacts and so forth.

As part of that work, we are looking at the issue of differential meteorology and noise emissions from ground level, 10-metre monitoring height and hub height as well. That feeds into issues such as the Vandenberg effect, which you have probably heard of, in which under stable weather conditions at night, for example, we may experience much greater noise impacts than predicted, simply because there is that differential between wind speeds at the ground level and at hub height. That issue has certainly been looked at in careful detail. It is getting more focus, particularly for the most recent wind farm developments and is being taken into account on a project-by-project basis at the moment, until such time as we get that single consistent approach across the jurisdictions.

**CHAIR:** Will the part 3A streamlining and such like shorten or affect the consultation process with local communities? You have said that there will be adequate consultation, but there is a great deal of concern that that consultation will be cut short because of the strategy that the Government is taking.

**Ms STONE:** The time that will be cut short is the assessment officers time rather than the consultation. Under part 3A there is a requirement, from the very beginning, to put the director general's requirements on the web. Compared with projects assessed by council, the community is aware that this wind farm is coming six or nine months earlier than it would if a council were dealing with the project. So, already they know very much up front that a wind farm proposal is being assessed. Then, they have an opportunity to approach the proponent, or, vice versa, the proponent will do the consultations. Certainly in our director general's requirements we very often require them to consult with the community before they lodge their environmental assessment, so that they can take community factors into consideration.

Once the development assessment is lodged, there is a mandatory requirement to exhibit it for 30 days. The community has an opportunity to make comments or put in submissions. After that comes off, the proponent gets to see the submissions and respond to those submissions. That step is not part of the council's DA process, it is a special step that we put in part 3A to give greater respect and importance to community submissions.

**CHAIR:** Is that included in the announced four-month turnaround target?

**Ms STONE:** Yes, it is.

**CHAIR:** What will be the role of the dedicated environmental staff in the new energy precincts? Will they be mediators in planning consultation with locals? How will they drive the clean energy agenda and work with local communities?

**Ms STACE:** I will touch on that. For the local environment matters an officer will be appointed for each of the six precincts in the Department of Environment, Climate Change and Water who will work closely with the planning officers and the local councils in that region. They will provide a secretariat role for the precinct committees and be able to consult and work with the community people in that area. Does that answer your question?

**CHAIR:** Will they be mediators in planning consultation with locals? How will they drive the clean energy agenda and work with the local community?

**Ms STONE:** Their main role will be to work with the precinct committees. As already identified, the committee's focus is more at a strategic level in looking at what are the community issues, and working with the planning officers rather than on a particular project-by-project consultation process, which already exists. It has been outlined. They will be able to promote the education and information that the communities will develop for their region, given that those areas that have been identified for the precincts are where the wind resources are, communicating the message about the opportunities for renewable energy in that region, and those types of things.

**The Hon. RICK COLLESS:** Following on from that, are you talking about the post-approval process?

**Ms STACE:** No, in terms of community consultation , this is additional to the consultation processes that would happen on a project-by-project basis.

**The Hon. RICK COLLESS:** I am not sure that there has been a lot of consultation. In your submission, about two-thirds of the way down page 1, you talk about the critical infrastructure proposal under

part 3A. You say that it provides for increased certainty for investors and the community. I do not see that there is any certainty in there anywhere for the community. I have spoken to a lot of communities that surround these proposals—I am not talking about the people who have them located on their properties, I am talking about their neighbours. They see that they have absolutely no come back to preventing these developments going ahead.

We are talking about 150-metre high turbines that are less than two kilometres from people's homes, and are a huge visual impact on their amenity and where they live. I am talking about some of the most beautiful country in Australia, where these things are. As you rightly said, they are in the highlands, which provide some of the most spectacular scenery. People live there for a reason; they live there because it is a beautiful place to live. And suddenly they have these huge, industrial structures right at their front door basically. What come do communities have when that happens? These areas are zones as rural and farmland.

**Ms STONE:** Yes.

**The Hon. RICK COLLESS:** The argument put to me, with which I tend to agree, is that once you have 15 or 20 or 30 turbines that are 150-metres high in that area, it is no longer farmland; it is now an industrial area.

**Ms STONE:** You could argue also that farming is an industry. We have agriculture—

**The Hon. RICK COLLESS:** We are talking about zoning issues, planning. Zoning industrial or zoning farmland?

**Ms STONE:** Traditionally, energy generation has been a permitted use in rural areas. A lot of our power plants are in rural areas. That is where the Liddell and Point Piper power plants are located, in regional areas.

**The Hon. RICK COLLESS:** Are Liddell and Point Piper and so on zoned rural farmland, or industrial?

**Ms STONE:** Both are zoned special use, because that was back in those days. Certainly a lot of the little hydros are in rural zones.

**The Hon. RICK COLLESS:** But they do not impose on the community like the 150-metre wind turbines?

**Ms STONE:** No.

**CHAIR:** You have made your point, Mr Colless. Ms Stone, would you like to add to that?

**Ms STONE:** You went from one issue to another. The first issue was about people who will be in the Department of Environment, Climate Change and Water team, and will be very much about promoting and raising awareness about renewable energy and the opportunities at both the micro level as well as the large level. Those officers will be very important in making people aware, both industry and individual households, of opportunities with regard to funding and other programs on renewable energy. They also will feed into and coordinate community input into the committees, and are looking at the policy context for planning around wind farms.

With regard to the critical infrastructure and the provisions there, in New South Wales the merit appeals are only attached to what is called "designated development", which is set in a schedule in the Environmental Planning and Assessment Regulation. It is called schedule 3. Those things that need development exemption under schedule 3 have had merit appeals so objectors could appeal to the court. Energy generation larger than a certain level, 30 megawatts, has traditionally had merit appeals. With critical infrastructure, when it is determined that there is a critical reason for getting these projects up, we can remove those merit appeals. We also remove the right of the applicant to appeal as well, because he has separate appeal rights.

**The Hon. RICK COLLESS:** That is the problem these people are facing. They have no right of appeal. It is imposed upon them and they have absolutely no say in the process.

**Ms STONE:** They have no right of appeal.

**CHAIR:** Perhaps that could be a question.

**Mr JEFFRIES:** I can touch on the visual impact issues. Visual assessment is a highly subjective area. Some people think wind turbines are attractive, others do not.

**The Hon. RICK COLLESS:** It depends on where you live.

**Mr JEFFRIES:** Exactly. I think it would be extremely difficult to locate a wind turbine in a wind resource area anywhere in the State such that it was not visible from someone's property. When we assess the visual impact of a wind farm we look at two levels of assessment: one is the broader landscape value. In that sense we are not looking at the local issues, we are looking at the landscape and asking, "Is this landscape so significant in the context of the availability of these sorts of landscapes across the State and the nation that we should not put a wind farm here?" Let us take a hypothetical example, such as the Blue Mountains National Park. You would never put a wind farm there, all other issues aside, because of visual amenity.

**The Hon. RICK COLLESS:** In the case of Scone, is Castle Rock National Park not as significant as the Blue Mountains? Is that what you are saying?

**Mr JEFFRIES:** Kyoto is currently under assessment so it is difficult to state anything conclusively until we have finished that assessment. I can talk about the assessments that have been completed. As I was saying, there are two levels of assessment. One is on landscape values, which is a broader assessment, and the other is the direct visual impact at a particular visual receiver, which is obviously much easier to mitigate by moving turbines and landscaping and so forth. The broader landscape values are the sticking point for the assessment. It is highly subjective and it is difficult to get consensus. I do not think you ever will. Everyone thinks their locality is of pristine beauty, and that is a subjective issue.

As a department, when we are assessing a location we ask what are the values of this particular landscape in the context of the availability of similar landscapes across the State. To be frank, there is a lot of farmland across the State. So if we are protecting the visual amenity of the farming community it would be difficult to suggest that that is so high that it should be protected over other more sensitive visual landscapes, for example.

**The Hon. RICK COLLESS:** I have to say that 99.9 per cent of the farming community of New South Wales and Australia would disagree with that comment. We are talking about "not in my backyard", obviously.

**CHAIR:** Perhaps that could be a question.

**The Hon. RICK COLLESS:** I am getting to that, thank you, Mr Chairman. In your view, if you were living in a place that you thought was a beautiful place to live and some structure suddenly appeared that imposed upon your visual amenity, would you consider it something that had been improperly imposed on you?

**Mr JEFFRIES:** There are two arguments, the emotive argument—

**The Hon. HELEN WESTWOOD:** Point of order: The witnesses are here in their capacity of representing the department, not as individuals. We asked that at the beginning. Their personal opinion is not relevant.

**The Hon. RICK COLLESS:** To the point of order: The whole point of this line of questioning is that we are talking about the imposition on people's lives in the areas surrounding these wind farms. That is a very big issue that this Committee needs to settle. It is a very important issue for people who are suddenly faced with these 150-metre high structures.

**CHAIR:** To remedy this I will put a question: in what way has the department taken into account these very real issues that Mr Colless has raised? Perhaps you could respond from the point of view of your department's assessment of this and how you are dealing with it, and how seriously you consider this to be a reasonable objection, given the sentiments raised by Mr Colless are reflected in many of our submissions.

**Mr JEFFRIES:** Visual amenity and landscape impacts are probably the most frequently raised issue in public submissions to wind farm proposals. Sometimes it is exceeded by noise concerns. It is across the board; we see it every time in submissions. As I said, we have distance ourselves from the emotive arguments about "This is where I live. This is my special place", and look at it very dryly and rationally, based on the availability of similar landscape values across the State. That does not align with someone's desire to look after their locality. It needs to be looked at at a broader State and nationally based level. If we look at every wind farm and its impact on a visual receiver and say that no wind farm turbine should be visible from anyone's property, as I said, it would be very difficult to locate any wind turbine in this country.

**Ms STONE:** The other part of it is perception as well. It is interesting to hear the comments now on the Capital Wind Farm, which is well under construction and part of which is being commissioned. People's perceptions of it are very positive. You hear comments quite often such as, "Isn't that interesting? It looks good. Didn't think it would look that good." I think sometimes the perception changes after the wind farm is built. It would be interesting to go back and ask people what they think after it is built.

**The Hon. RICK COLLESS:** Can you tell us why the Government has so vigorously embraced wind energy technology at the expense of other renewable technologies? You mentioned the cost factor and I am looking forward to questioning the industry people on some of the cost assessments later on. Why are other technologies not being considered with the same vigour that wind is?

**Ms STONE:** I do not think you can say they are not, it is just that this one has come first because the technology is more ready to use. There are quite a number of other initiatives coming with regard to solar and biomass and certain other technologies as well. There are quite a number of initiatives going on that you will hear about shortly. One of them is making a whole range of solar panels, both PV [photovoltaic] and solar concentrate, exempt and complying development. This is something we will put on exhibition very shortly. There is also a demand from a number of councils to do some complying development with micro wind. If you have a windmill pumping water, why can you not have one generating electricity? There is an interest in a number of councils about having micro wind. That is another thing we are looking at. There are a number of initiatives that will be announced shortly about other technologies that we are very keen to encourage. It is just that wind is ready to go; it is there. I think wind provides 18 per cent of power in Germany and 20 per cent in Denmark.

**The Hon. RICK COLLESS:** And 80 per cent in France is nuclear, so is nuclear in the mix too?

**Ms STONE:** I think there is a Federal Government statement about that.

**The Hon. RICK COLLESS:** There is. I am just wondering what the New South Wales Government's position is.

**Ms STONE:** We are part of the Federation, so—

**The Hon. RICK COLLESS:** So you do not have one individually?

**Ms STONE:** No.

**The Hon. ROBERT BROWN:** The whole-of-Government submission refers to the Renewable Energy Development Program administered by DECC and states that the program has allocated funds to Smart Storage, or Ecoult. Could you please explain what Smart Storage and Ecoult are, and what impact does this project have on wind farm developments? Is it something that will increase the feasibility of part-time generation, because that is what wind farms are—part-time generation.

**Ms STACE:** I can comment on that issue. Under the New South Wales Climate Change Fund there is $40 million for the Renewable Energy Development Program. It provides funding, in particular, for the demonstration and early commercialisation of new energy technology. In regard to your earlier question about whether are we focusing on wind, that technology is more commercially ready to roll out. The Renewable Energy Development Program is targeted at taking it from the concept and pilot demonstration phase into commercialisation. The particular fund allocation that you mentioned is targeted at storage and it links into the issue of wind intermittency. Obviously that is one of the issues in the overall supply, reliability, security and efficiency of the wind resource that is being captured. That project is targeting storage in particular. That is a new area and it needs more testing before it is rolled out. It is targeted at that.

**The Hon. ROBERT BROWN:** I have not heard of that technology before. I do not think anybody would try to claim that wind turbines are baseload generation-type machines. I do not think that the technology is there, and certainly the land area is not there. I refer to the Smart Storage, or Ecoult, investigation. How closely linked is it to the current generation of wind-farm technology? Could the development of that technology change the need for the size of turbines, the number of turbines and their location, or is it something that is happening off to the side?

**Ms STACE:** I am sorry, I do not know the details of the project to that level.

**The Hon. CHARLIE LYNN:** My question relates to noise. The submission from the Australian National University states that the noise pollution from wind turbines is negligible. You can have a conversation among them and it does not make any difference. However, another submission claims, for example, that people adjacent to wind farms in Ballarat have said:

> The noise levels are vastly exceeding the developer's predicted noise levels. The fact that, in addition, residents are experiencing totally unacceptable levels of subsonic infrasound, is distressing. The production and provocation of the latter noise is not well understood but its biological impacts are unequivocal. The DEC should be required to reinstate the New South Wales industrial noise policy—the proper noise instrument for the assessment and control of noise from wind farms.

I wish to ask two questions. What is the New South Wales industrial noise policy and why do we not abide by it? At what frequency do you measure noise?

**Mr JEFFRIES:** You asked two questions but I suspect that there will probably be five or six when we go into the details. Infrasound is an interesting concept. If you are not familiar with infrasound, it is the frequencies below about 20 hertz that the human ear cannot hear. A lot of people in the media have recently suggested that it is a wind farm-specific issue. In fact, currently there are a lot of infrasound sources around us. A lot of them are natural, for example, meteorological, earthquakes, tsunamis and those sorts of things can generate infrasound. There are also a lot of man-made objects. Anything motorised, in most cases, produces infrasound of some sort. It is not unusual that something such as a wind turbine may be considered to produce infrasound.

Some health studies suggest that there are impacts from extended exposure to infrasound and some of them are particularly interesting. There is some speculation that it is the cause of people seeing paranormal phenomena. Referring to the wind turbines themselves though, currently there is not sufficient information to draw a connection between health impacts and infrasound impacts, or emissions, from a wind turbine. I guess that the school is still out, first, as to whether the infrasound generation from wind turbines is significant to start with and, second, as to whether that generates a clear and verifiable health impact on affected parties.

You referred also to noise standards. The industrial noise policy in New South Wales is applied, as the name suggests, to industrial developments, which are fixed facilities that operate under specific meteorological conditions. New South Wales has adopted the South Australian standard for wind farms because wind farms are different in their noise impacts compared to a normal industrial facility. Because they operate under windy conditions, under low wind conditions there is low background noise because you do not have that hissing from the wind. There are also low noise impacts from the wind turbines because they are operating at a lower level.

**The Hon. ROBERT BROWN:** Or they are not running at all?

**Mr JEFFRIES:** That is probably splitting hairs. When we get to high wind levels we increase the background noise level and we increase the noise from the wind turbine itself. So we need to account for noise levels across a range of wind speeds, whereas in a normal industrial facility we do not have that variability in the noise output from the industrial facility because it does not operate differentially under different wind conditions. Basically, that is why we do not apply industrial noise policy to wind turbines.

**The Hon. CHARLIE LYNN:** At what frequencies do you measure noise?

**Mr JEFFRIES:** Typically, over the audible noise range for the human ear.

**The Hon. CHARLIE LYNN:** Which is?

**Mr JEFFRIES:** Which is 20 hertz upwards. I am not sure what is the upper limit. Recently, for wind farms and for other industrial developments, in particular, power stations, we have looked at that lower frequency noise and compensation has been applied to deal with it. Without getting into the technical detail, it is a basic measure between the A-weighted and the C-weighted decibel ratings for a particular noise impact. When you are looking at the difference between those you can determine whether the low frequency noise is a significant contributing factor to noise impact and compensate for that in the modelling for the particular noise emission and in the noise limits imposed for a particular development.

**The Hon. CHARLIE LYNN:** I want to talk about the financial viability of wind farms but I cannot recall in which submission it was referred to. What level of subsidy is involved in the development and establishment of wind farms? Would these be commercially viable without a government subsidy?

**Ms STACE:** I can kick that off. One of the main financial incentives from Government is the national renewable energy target. Through that scheme generators will generate renewable energy certificates, which would then supplement the ongoing income from those facilities. National legislation for that scheme has just passed and will be in place until 2020. It is a transitional measure. As the commercial viability improves over the course of time, the scheme will eventually ramp down, and that is triggered at a point when the Carbon Pollution Reduction Scheme is intended to be in place. We will then be charging a carbon price for alternative sources of energy.

**The Hon. KAYEE GRIFFIN:** My question relates to the whole-of-government submission, which refers to a preliminary study commissioned by the New South Wales Valuer-General on the impacts of wind farms and on surrounding land values. Is the Valuer-General's study available to the Committee?

**Ms STACE:** It is my understanding that the study is still underway. I do not think it has not been finalised.

**Ms STONE:** It has not yet been finalised.

**CHAIR:** Perhaps you can find out when it will be finalised and whether it is available to the Committee. That would be helpful.

**Ms STONE:** Okay.

**The Hon. HELEN WESTWOOD:** Have you examined the experience overseas and in other States when dealing with the community's concerns about noise emissions and visual amenity? Could we apply strategies here that might alleviate concern in the community about those two aspects of wind farms?

**Ms STACE:** I can comment briefly that, yes, that is something that, obviously, we would be looking at and look at more, particularly as the precinct committees are being established. The key role is looking at what are the issues for the community in terms of wind farms and how to communicate the opportunities in renewable energy in those regions. In terms of experiences from other jurisdictions, such as South Australia, which already has probably a larger renewable supply than we have in New South Wales at this time, the key thing is that early engagement with the community is something we have learned from their processes. That has been a contributor into the design in wanting to set up precinct committees in New South Wales.

**The Hon. HELEN WESTWOOD:** Will there be different guidelines or, say, the equivalent of a DCP for each precinct, or will there be one that is across all New South Wales wind power projects?

**Ms STONE:** That is going to be an evolving thing to see what comes out of these committees. We are in the process of finalising the expression of interest process. The terms of reference for the committees are being finalised. So we are in the process of getting them going. Certainly in places like Scotland, they have used them to get them involved in landscape assessments to look again at the strategic level. In places like Denmark these sorts of committees actually evolved into being cooperatives and the landowners started having an interest in the farms. Certainly, there are a number of places in New South Wales where communities have said they would be quite interested in the cooperative model. We are doing a handbook about cooperatives and how you can approach them. Maybe that is a model that will be attractive within some precincts and not in others. It very much depends. It is something that we will let evolve.

Certainly, there are areas that are quite supportive or more supportive. Upper Lachlan did a referendum to see the level of support and there was 70 per cent for wind farms. There is a variability and knowledge about and support for. The South Coast seems to be quite supportive of the concept. They have been very proactive with regard to solar energy and there are some cooperatives and various community initiatives down the South Coast on solar, which is pretty exciting to see them doing that. It appears that they are also supportive. It will depend and we will let it evolve, I think.

**CHAIR:** You mentioned South Coast community involvement. Some witnesses will be giving evidence about small-scale wind turbines. What has been projected, particularly in support packages, is very much for large turbines. There can be resolutions for start-up costs to access the existing grid and such like for small community-based turbines, but I understand there is no similar government support for the smaller-size turbine as there is currently for the bigger projects. Can you comment briefly on that?

**Ms STONE:** We are calling those micro wind. We have a discussion paper about to go out about micro wind and making them complying development if they meet certain criteria.

**CHAIR:** Would they receive similar support or relatively similar support to that which the big projects currently enjoy and therefore are able to go ahead?

**Ms STACE:** Depending on their size, they may also be eligible for the renewable energy certificates under the National Renewable Energy Target scheme. Also, New South Wales has announced a solar bonus scheme. We have just had a consultation process looking into the eligibility whether micro wind should also be eligible under that scheme.

**CHAIR:** What is the output cut-off point you are classifying with the big projects primarily to the smaller community-based ones? Perhaps you could take that question on notice?

**Ms STONE:** Yes, it is a scale thing and I cannot remember.

**CHAIR:** We have run out of time. The Committee has more questions that will be forwarded to you by the secretariat for your response.

**Ms STONE:** Yes.

**(The witnesses withdrew)**

**KEN ANDREW McALPINE**, Government Relations manager, Vestas Wind Systems, 312 St Kilda Road, Melbourne, and

**ROBERT OWEN MOORE JACKSON**, General Manager Policy, Clean Energy Council, 18 Kavanagh Street, Southbank, affirmed and examined:

**CHAIR:** Mr McAlpine, in what capacity are you appearing before the Committee? Are you appearing as an individual or a representative of an organisation?

**Mr McALPINE:** I am appearing as a representative of two organisations, Vestas, as I mentioned, but I am here with Rob Jackson from the Clean Energy Council, which is our industry body. I am the chair of the wind directorate of the CEC.

**CHAIR:** Are you conversant with the terms of reference of this inquiry?

**Mr McALPINE:** I am.

**CHAIR:** Mr Jackson, in what capacity are you appearing before the Committee?

**Mr JACKSON:** As a member of the Clean Energy Council.

**CHAIR:** Are you conversant with the terms of reference of this inquiry?

**Mr JACKSON:** Yes.

**CHAIR:** Before we proceed to questions from the Committee, if you have a short statement to make, it would be of assistance.

**Mr JACKSON:** I will start with a short statement and Ken may add to that. For the Committee's information, the Clean Energy Council is the peak industry body for the renewable and energy efficiency sectors. Its membership encompasses the majority of the major wind farm developers, operators, manufacturers of turbines and components, consultants and other suppliers supporting the businesses, and welcomes this opportunity to appear before you. The recent increase to the renewable energy target to 45,000 gigawatt hours by 2020 will see a significant increase in investment of renewable energy in general and wind generation in particular. New South Wales was an early mover in the wind generation with sites such as Crookwell, but has since fallen behind the southern States where the Roaring Forties winds have prevailed.

Wind generation is one of the most developed of the renewable energy technologies and is expected to be the biggest winner of the newly expanded renewable energy target. Recent changes to the national electricity market, such as the wind forecasting system and the semi-dispatch rules, ensure that the national electricity market operator has the tools to manage large amounts of wind energy as they are delivered into the marketplace. The key element of any new generation is the planning approval process.

The current changes being proposed for the New South Wales process to streamline this, while maintaining a strong community engagement, will reduce the time and cost of bringing in new wind generation to market. The Clean Energy Council [CEC] has done some studies and has estimated that the expanded renewable energy target will deliver something like $20 billion of investment nationwide and a net increase of approximately 26,000 jobs. Much of that employment of course will be in rural areas. This will provide vital investment to country New South Wales.

**Mr McALPINE:** I support Rob's comments. I will introduce the company I work for, which is Vestas Wind Systems. Vestas is a global company with its headquarters in Denmark. In many respects it is one of the pioneers of the industry when it comes to wind energy. For almost 30 years we have been developing wind turbines and we have come on in leaps and bounds in terms of technology and efficiency, in particular in terms of the energy you can get out of these machines.

Vestas has been involved in Australia since the commencement of the decade. We have a couple of hundred employees here. At one stage in the past we used to manufacture here as well, but that ceased in 2007.

We employ a lot of people on the installation of wind farms and also on the operation of them. We have installed more than half of the wind farms in Australia.

We have headquarters in Melbourne. It is also the headquarters of what we call our Pacific Region. There are a lot of other companies that operate out of Melbourne. We would love to do more business in New South Wales. We have found that there have not been very many projects in recent years, as Rob has said, but we note the announcements by the State Government on 17 August. That will help and I think you will hear from other developers today who will talk about the impact of those changes and what that could mean for jobs and investments.

I wish to clarify that Vestas is not a developer of wind farms. We are a technology provider and we are engaged in the operation makers of wind farms. You will never see Vestas seeking a planning permit or owning the assets. We are a supplier to the industry and our focus is necessarily on making sure that our machines run as well as is possible and that the technology is ever increasing. Worldwide it is big business. We are involved in more than 60 countries. We employ more than 20,000 people. We would love to employ more here in Australia.

**CHAIR:** How many people do you employ in Australia?

**Mr McALPINE:** Just over 200. We see the Federal Parliament's decision on a renewable energy target as a catalyst to this. We hope that there will be a lot more wind farm development in all States, but particularly in New South Wales because it has not managed to get a slice of the investment that you would otherwise hope it would. There are some great wind resources in New South Wales. People from the Department of Planning partly focused on that in their presentation prior to our appearance here.

We are really just at the start of New South Wales. There is a bit of catching up to do. But hopefully the combination of the great wind resources, the Federal policy that will help development of renewable energy over the next decade or two and the recent changes announced by the State Government will help us to build a larger business in New South Wales, particularly in rural areas. Hopefully we will be able to employ a lot more people in the State and that will lead to a lot more investment by our customers as well.

**CHAIR:** Could you speak generally about the level of additional income that farmers who host wind turbines would receive?

**Mr McALPINE:** I can, but I think it is probably a question that is better addressed to a developer. As I said, we do not own the assets or the sites. We supply to the industry. I suspect developers will tell you that they probably do not want to give out that information because it would lead to almost a bidding war on how much more they should pay. But it has been published in newspapers over the years that it may be anything between $5,000 and $10,000 per turbine per year.

For a farmer or a farming community, that is quite a lot of money. I have seen comments in newspapers where farmers refer to wind turbines as their superannuation fund. If you work on a farm and most of your income is subject to the vagaries of the weather and the climate, it is kind of nice when you have that guaranteed income. Once you are hosting turbines on your property, that money rolls in year after year whether the wind blows or not, whether it rains or not, and whether you are in a drought or not. That adds some stability to the budget of those farms.

**CHAIR:** Could you comment on the variability of wind power perhaps being a problem if the fluctuating electricity needs of consumers are to be effectively met?

**Mr JACKSON:** As I said in my introduction, over the last 12 months or so, there have been two significant changes to the national electricity market. First is the implementation of a federally funded piece of work on a wind forecasting system, which is world class. I test my memory but I think it is described as the Australian Wind Energy Forecasting System [AWEFS]. It is a wind forecasting system that takes into account a number of weather effects into the system plus the current output of wind farms all over Australia to provide the Australian Energy Market Operator [AEMO] with an estimate of the forward generation of the wind farms moving out over a period of days. It goes from a very short period, from five minutes ahead, out to a couple of days and potentially even out two years to give an estimate of the generation. That certainly makes it easier for the market to be managed and for the correct generation to be scheduled.

In addition to that, we now have in place what I describe as the semi-dispatch rules. In the early days of wind development in Australia, wind farms were declared to be non-scheduled; that is, they ran when the wind blew and they stopped when the wind stopped. The semi-dispatch rules now give the market operator the ability to wind back a generator if there is too much generation in an area at any one time that is constraining the lines and making the dispatch inefficient. Those two things are making big inroads to assist. New South Wales also has the advantage of significant amounts of hydro-generation in the State, both in the Snowy region and at Shoalhaven. That means that there is rapid start and rapid generation available to balance supply and demand.

**CHAIR:** In submissions from groups such as the Australian Landscape Guardians, it is suggested that greenhouse gas savings are only approximately 0.06 tonnes of carbon dioxide per megawatt hour. Is this figure accurate? Can you comment on that?

**Mr JACKSON:** I do not believe it is accurate, no.

**CHAIR:** What would your estimate be?

**Mr JACKSON:** My estimate? Wind generation is displacing coal and gas-fired generation at average intensities of approximately 0.08 a tonne per megawatt hour.

**CHAIR:** In your submission you list factors considered when deciding potential wind farm location. I note that community reception is not one of them. How important is the general support of the community in deciding where to develop a wind farm? What are your processes in going about that? How do you attend to that issue?

**Mr JACKSON:** As an association, we do not develop the wind farms ourselves. We just represent our members. However, we have developed, with the aid of our members, a best practice guidelines document that assists them in working through the community and other issues of developing a wind farm.

**The Hon. ROBERT BROWN:** I will follow from some comments made by Mr McAlpine earlier. Gentlemen, you may or may not understand that if I am a coalmine developer in New South Wales and there is an area in which I wish to develop a coalmine, I buy the land on which the coalmine will be developed and I am required to purchase all the properties that will be affected by that coalmine. I notice in your submission you make this comment:

> The wind energy industry contends that the impact on property values is not a relevant consideration when determining whether a development proposal should proceed.

How do you suggest that your industry should address concern raised by affected residents who claim that their properties are being significantly devalued as a result of wind turbines in their immediate surrounds? I gave you the example of a coalmine for exactly that reason. A coalmine developer has to take into consideration those sorts of issues. What is the industry's view on that?

**Mr JACKSON:** As our submission also states, to the Clean Energy Council's knowledge, there is no documented evidence in Australia that demonstrates that wind farms have had an impact on property values. That would be our starting point.

**Mr McALPINE:** I suppose I could add to that by pointing to the comments from the department just now about the Valuer-General having a look at this. You can make a claim about something, and that does not mean it is true. It is good that the Valuer-General is taking a proper look at this.

When it comes to the impact on property values and the impact in a rural community, a wind farm compared to a coalmine, it is a massive difference. Once a wind farm is built the farm can keep operating. It is a pretty low level sort of impact on the rural landscape, despite what some people will claim. When you compare it to a coalmine it is completely different and it allows farming to proceed and the farmers hosting the turbines are very happy with them. You only have to think about a current coalmine development being proposed in New South Wales like Liverpool Plains and you think about what that will do to farming communities in your best food-bowl area in the State. Would you prefer a wind farm or two? I think the answer would have to be yes. The Liverpool Plains development and proposal, to my knowledge, does not have its own upper House inquiry, and I wonder sometimes why wind farms are having this focus from the upper House. Liverpool Plains has turned up in the newspaper a couple of times but it will have a massive impact on a significant farming community.

**The Hon. ROBERT BROWN:** Also, there is a considerable difference, is there not, in the production value of a coalmine feeding a power station or that power station in terms of the energy that it produces than the wind farm?

**Mr McALPINE:** I guess that is the trade-off that people have to make. Some people think that it is okay to keep using coal for the production of electricity and do not really worry about greenhouse pollution. Other people do. Poll after poll shows the majority of people in Australia do, and that is why government policy is heading in that direction to encourage renewable energy and get away from coal production. You cannot shut down coal-based energy overnight, but if you do not take steps to change your energy mix then we are heading down a path of global warming and climate change worldwide. In election after election most people have expressed a view that they want those policies to change. So if we are going to talk about coal versus wind, we could sit here all day.

**The Hon. ROBERT BROWN:** No, I am not going to talk about coal versus wind. What I am trying to establish here is the industry's position. You have stated the industry's position. You do not believe there is any evidence that this is a valid issue and that is why you made the comment, is that correct?

**Mr JACKSON:** Correct.

**Mr McALPINE:** Yes.

**The Hon. CHARLIE LYNN:** The New South Wales Wind Energy Handbook 2002, which is published by the Sustainable Energy Development Authority, mentions the 5R8R rule, which relates to the desired spacing of individual turbines one from the other. Briefly, it states that wind turbines will be spaced five rotor diameters apart within rows, and eight row diameters over 20 rows. What is your comment on that? What rule do you subscribe to?

**Mr McALPINE:** As I said, Vestas is not a developer of wind farms so it does not really have a view on that. Mr Jackson will probably give you an answer in a second from the Clean Energy Council. But in terms of the rules that are applied to wind farms in this State and others, we expect that members of the Clean Energy Council will abide by those rules and in addition will abide by the best-practice guidelines that the Australian Wind Energy Association, which is now part of the Clean Energy Council, brought into existence a few years ago. The actual merits of that turbine spacing and so on, I do not believe that I am qualified to comment on those. I could take a question on notice and give you a written answer if you think that might be helpful, but perhaps it is probably best if I throw to Mr Jackson.

**The Hon. CHARLIE LYNN:** Sorry, if I could just continue on that, in one of the submissions we received, it refers to a copy of the specifications for two of the proposed wind turbines from the Vestas company. The manufacturer of these wind turbines says, "… this particular model turbine and indeed one of those under consideration for the recently modified proposal. So these specifications are relevant and pertinent. In particular we draw attention to section 1.4 of that document. Here Vestas specify a minimum spacing between turbines of at least four rotor diameters, which is given as a definitive." Are you aware of that?

**Mr McALPINE:** No. As I said, I would probably have to take it on notice. You have not mentioned which wind farm development you are talking about or who made the submission.

**The Hon. CHARLIE LYNN:** It is the Taralga proposal.

**Mr McALPINE:** Taralga, yes. As I said, I am happy to take it on notice. I do not know who has tried to paraphrase what Vestas says in whichever document.

**CHAIR:** Perhaps you can take that on notice.

**Mr McALPINE:** That would be much better. He is quoting from a document that I have not seen and he has not stated which group is making those claims about what Vestas says.

**CHAIR:** It is not available. I think the Committee can deal with it at a later stage.

**Mr McALPINE:** That is probably a good idea.

**The Hon. RICK COLLESS:** Following on from the comparison with coalmines—I do not want to get involved in that—it has been raised with us that in the case of a coalmine they have to pay a substantial security deposit to ensure that the site is rehabilitated once they have finished their mining operations. What arrangements are put in place for the decommissioning, dismantling, removal and rehabilitation of wind farms at their end of life? Are you required to pay a security deposit to make sure that happens?

**Mr McALPINE:** I can answer the second part of your question first because I am almost 100 per cent sure that we are not required to pay a bond in the manner that a lot of coalmine developments are. As to why this is the case, I think it is mainly about the size of the environmental footprint. We are not chopping the top off a mountain and digging out the resource and then trying to rehabilitate a large land mass back to its original condition. We have to dig to put in concrete foundations for wind turbines. The diameter of these tends to be in the range of 50 meters thereabouts, and what happens after the foundations have gone in is that soil and grass are placed over the top so that footprint is even smaller. Comparing that to a coalmine, you have seen the size of some of the open cuts across this State and in others. That is possibly the reason why there is no requirement for a bond.

**The Hon. RICK COLLESS:** I am talking about decommissioning of the wind farm, the dismantling, deconstruction and removal and then rehabilitation.

**Mr McALPINE:** I would have to say I do not actually know what the current requirements are for decommissioning. Possibly that depends on the planning permit conditions set by the responsible authority, whether it is a local government or whether it is a Minister if it is a large-scale development. I do not know if Mr Jackson can fill us in on that.

**Mr JACKSON:** Unfortunately it is an area that I do not know the details of as we are speaking, but I can certainly investigate and look back and get back to you.

**Mr McALPINE:** You will have a series of developers who have obtained planning permits in this State, and I venture to say that they are in a much better position to answer that sort of question because it is a question about getting a development permit and the steps you have to take in order to get one of those.

**The Hon. HELEN WESTWOOD:** From your evidence this morning it is clear that you believe that wind farms and agricultural farms can co-exist. Is there any time when you think that a wind farm will sterilise land from agricultural use? Perhaps can you also give me some information about access you may need for maintenance purposes and the impact that might have on the farm.

**Mr McALPINE:** I can do that, yes. The short answer is that the impact is minimal. Obviously when construction occurs you have to build access roads and clear the foundations for the turbines and allow cranes to come in and build them. But a wind farm is actually quite quick to build once you get started. Typically, depending on the size of the wind farm, you can wrap it up within six months. So in the life of a farm or even the life of a wind farm that is not a long time. In terms of access, though, there is periodical access where maintenance vans and sometimes cranes have to come in to replace parts, much as you would with any power station. You have to remember that these are all mini-sized power stations, two or three megawatts capacity and sitting up there about 100 metres in the sky so you will usually require a crane. We have not encountered any problems. The farmers that face the turbines are being well paid for the access rights that the companies seek.

In relation to the question earlier about how farmers view renewable energy and what it means for them in terms of the disruption to their property and the co-existence, a lot of submissions went to the Federal Government in advance of its decision on the renewable energy target at the national level. I happened upon one from the National Farmers Federation [NFF] which, as I understand it, is the main representative body for farmers and the farming community in Australia. I will table this submission, if it suits the committee, and quote it because it encapsulates where it is in a policy sense. It states:

> The NFF believes that it would be strongly in the nation's interests to provide policy incentives for utility scale renewable power stations based in regional centres. These power stations could be associated with manufacturing facilities for renewable technology, further increasing local employment and co-location with intensive agriculture and processing that will benefit from cheap, renewable power, steam and desalinated water.

That is from the main representative body for farmers. Some farmers will see these as their super fund, as I mentioned, and others, I suppose, are sorry that they miss out and do not have their farm in a windy enough place. But overall in terms of co-existence with the farming environment a wind farm is well supported amongst

the farming community. I dispute the comment of Mr Colless earlier that the views of the Department of Planning are in contrast to 99.9 per cent of the farming community. I think the NFF would better represent the farming community.

**The Hon. RICK COLLESS:** I said, if you recall, excluding those farmers with a wind farm proposal on their property. The adjoining landowners to whom I have spoken certainly would represent that percentage of opposition to it.

**The Hon. HELEN WESTWOOD:** In relation to concerns of adjoining landowners, obviously, Mr McAlpine, your company has done work overseas?

**Mr McALPINE:** Yes.

**The Hon. HELEN WESTWOOD:** Have those same issues arisen in other parts of the world and Australia? How have you been able to resolve them?

**Mr McALPINE:** People will always complain about development of any kind with any proposal. Sometimes there is quite a fierce campaign and other times there is not. This is not something that is just about wind farms it is just about development anywhere. Reference was made during the hearing with the last witnesses to this concept of Nimby-ism and this "not in my backyard" factor. That is not an Australian thing, it is world-wide. Some people will believe the "not in my backyard" concept anywhere, and that is not just for wind farms. Typically, we work with our customers and representative bodies in those communities to make sure that the community gets the greatest benefit from any development.

In Australia a number of other customers set up community funds to ensure that it is not just the farmers who are hosting the turbines on their property who get a benefit from these new developments in their community. Aside from the local employment benefits you will also find that typically a developer will set up a trust fund, if you like, based on the size of the wind farm so that once that wind farm starts generating energy an amount per turbine is contributed into a community fund. The fund is administered by community representatives, and that happens a lot in Victoria and in South Australia—I am not sure what the case is in New South Wales but, as I said at the start, this is early days.

Overseas there are other concepts of, I suppose, compensation for the community but I think the ones in Victoria and South Australia are worth investigating further. They are not under a requirement of any planning permit, they are things that responsible power companies have done off their own bat. It is similar to what happens in the resources industry as well. I think it is a sensible way to move forward, giving the community that greater financial benefit, as well as the employment that comes into the towns, the extra accommodation that is taken up by workers on the site, the money that goes into their local pub and milk bar and those sorts of businesses in each community. Whether it is during the construction phase of a wind farm or during the operation and maintenance of it there are a number of ways. But we encourage our customers to work with those communities because they are going to be there for a long time.

Typically wind farms are in existence for 20 to 30 years—these are long-lived assets. We think that the people who are setting them up should be involved with their community and, typically, they are doing that. They are doing it in a voluntary way. Once these projects are actually completed a lot of the complaints go away. A lot of it is the fear of the unknown. A lot of people have never seen a wind farm before, and they will think about the concept of these 100 metre tall towers. But once they are actually built, as was mentioned earlier, the Capital wind farm is a good example but there are so many others, the community really comes to accept these facilities and see it as their contribution.

**CHAIR:** They have to accept them once they are built. Mr Jackson, as a peak industry body, representing many large wind farm developers and stakeholders, what is the view of the industry on establishing a minimum two kilometres distance between wind farm developments and residents of other properties? How will a minimum distance affect the industry?

**Mr JACKSON:** A minimum distance would impact on the industry because obviously it would limit the sites that are available, and some of the best sites may be missed. I think the use of prescriptive numbers like that has some problems. I think that the guidelines to do more with measurement and actual impact is a much more valid way to approach the subject.

**CHAIR:** A lot of debate has been held about impact and aesthetics, which are hard to quantify. Do you believe that a minimum distance will allay a lot of resistance to wind farm development?

**Mr JACKSON:** That is a very difficult question. As we have said, I think some of the complaints are very much fear of the unknown and fear of change. And if its one, two or five kilometres some people may still feel that they are going to—

**CHAIR:** That may be so, I appreciate that, but to devise a recommended buffer zone. You know the lay of the land, if you like, in terms of your projects, and the various issues that might arise with local communities, but if a minimum distance is given as a rule of measure, would that be reasonable for your industry to deal with? It would be reasonable to assume it would allay a lot of concerns. Is that something your industry will deal with or is it really not on?

**Mr JACKSON:** In some ways you would be better to ask some of the developers who will be speaking later. As I said, at the moment, we do not believe that the prescriptive answer is the right way to go and it is much better to follow the guidelines and look at where the issues, such as they may be, are likely to arise and site the turbines appropriately.

**Mr McALPINE:** I would add to that by saying that if you brought in a requirement like that it would be a different requirement to other States. New South Wales has already fallen behind in terms of getting investment and jobs in wind farms compared to other States.

**CHAIR:** Earlier it was said that the topography, the wind map of New South Wales, is very different. It is like comparing apples with pears in terms of the roaring forties and coastal developments in Victoria, for example.

**Mr McALPINE:** You are quite correct I did not say that, it was the Department of Planning who made that representation. But I would say that the current approach is to look at the circumstances of each particular development. That is usually the rule in a lot of planning applications for all kinds of facilities. I see no reason why an arbitrary two-kilometre buffer would solve anything. I do not know exactly what that would be based on, not any kind of science or subjective view that two kilometres is enough. People oppose wind farms for all kinds of reasons. I am not sure that this would solve that.

**CHAIR:** I appreciate that.

**The Hon. ROBERT BROWN:** Chair, Mr McAlpine offered to table the Federal document from which he was reading.

**CHAIR:** That has been accepted.

**The Hon. ROBERT BROWN:** Mr McAlpine, you used a technical term that I would like defined. In that report the words "utility scale" were used. What is a utility scale wind farm development? How big? Is it bigger than 30 megawatts?

**Mr McALPINE:** It would not be a defined term, but 30 megawatts and above is probably a good starting point.

**The Hon. ROBERT BROWN:** That corresponds with what the Planning people have told the Committee?

**Mr McALPINE:** Yes.

**Mr JACKSON:** The National Farmers Federation has not defined it here, but you can assume that is what they are saying.

**The Hon. ROBERT BROWN:** I thought there might have been an industry standard for a utility scale.

**Mr JACKSON:** No, not a defined term.

**The Hon. ROBERT BROWN:** How many turbines is 30 megawatt?

**Mr McALPINE:** It varies, depending in the size of the turbine. These days on the common market turbines are as small as 850 kilowatts. The main standard kilowatt currently being installed in Australia varies between 2 megawatt and 3 megawatt, so you are looking at between 10 and 15 towers for a 30-megawatt development.

**The Hon. ROBERT BROWN:** For a 30-megawatt station?

**Mr McALPINE:** Yes.

**The Hon. RICK COLLESS:** What size tower and what blade diameter are they?

**Mr McALPINE:** Are you asking about the height?

**The Hon. RICK COLLESS:** Yes.

**Mr McALPINE:** Height and diameter?

**The Hon. RICK COLLESS:** Height and blade diameter?

**Mr McALPINE:** Towers can be as high as 110-metres. They vary, they can be as low as 80-metres these days. I am talking about current market standards. The blades go out to about 44 or 45 metres.

**The Hon. RICK COLLESS:** So at the top of the blade it would be 150-odd metres, is that correct?

**Mr McALPINE:** I would have to check, but it is in that range, yes.

**The Hon. HELEN WESTWOOD:** Is there a technological answer to the issue of noise emissions? Has the new generation of wind farms addressed that question?

**Mr JACKSON:** I will answer that in a couple of ways. First of all, any noise produced by the wind turbines, of course, is wasted energy. That is energy that they are not capturing, it is going out in noise rather than in electrical energy. It is in the best interests of the turbine manufacturers to keep noise to a minimum. Secondly, over the years there have been changes in the design of turbines. One of the prime reasons for that was noise reduction. That is why we have settled on the current design. All major turbines that I can think of at the moment are three-blade turbines with the blades up wind of the tower. Previously the blades were down wind. We have had anything from one, two, three, four blades or more. The three-blade up wind appears to be the quietest and the most efficient. That is why it is driven in that fashion.

**CHAIR:** Although I do not expect the Committee to go and inspect this at the drop of a hat, but is there an example of a noisy turbine still operating in New South Wales, compared to the state-of-the-art turbines?

**Mr JACKSON:** Not that I can think of off the top of my head.

**CHAIR:** Perhaps you can take that on notice. The secretariat may forward questions on notice to you to assist the Committee.

**The Hon. ROBERT BROWN:** Despite the line of my questioning, I think they are beautiful.

**Mr JACKSON:** Can we get that on the record!

**CHAIR:** Later I will be asking whether the turbines are always white, and why?

**Mr McALPINE:** Mostly they are. I am not sure of the origins.

**CHAIR:** Darker colours would blend in with the sky, such as a darker grey.

**Mr McALPINE:** Some of them are grey.

**CHAIR:** I would have thought that that would minimise the visual impact.

**Mr JACKSON:** I am not sure whether there are aviation issues with the colouring.

**Mr McALPINE:** They should not blend in too much, because pilots must get a bit upset.

**CHAIR:** Thank you for attending today.

**(The witnesses withdrew)**

**MARK DIXON**, Project Manager, Pamada Pty Ltd, 16 College Street, Sydney 2010,

**WILLIAM GILL**, Commercial Manager, Pamada Pty Ltd, 16 College Street, Sydney, 2010, sworn and examined; and

**JAMIE CHIVERS**, Project Manager, Pamada Pty Ltd, 16 College Street, Sydney, 2010, affirmed and examined.

**CHAIR:** Thank you for appearing before the Committee. Would any of you like to make an opening statement before Committee members ask questions?

**Mr DIXON:** We all work for a property development company called Pamada. We have a wind energy section in that company. At the moment we have a single project in the Upper Hunter Valley, at Scone. Kyoto Energy Park is a renewable energy project with wind turbines, a solar photovoltaic array and a mini hydro plant, so it is a renewable energy park, not just a wind farm. We are currently going through the planning stages with the Department of Planning and we are near the end of the planning investigation stages and looking forward to a favourable response from the Department of Planning.

The project was initially formulated in 2005 with Scone Council when the local environmental plan [LEP] was rezoned to allow for consideration of renewable energy projects in the area. Since that period quite a lot of work has been done on the project. Basically we are up to the stage where we are looking at approval or non-approval. It is an energy park and not just a wind farm and we are looking forward to some new technology with a couple of key institutions, BP Solar and CSIRO. There is some innovation in the park and we are looking at merging three renewable technologies to get a better supply of electricity to the grid. While wind turbines are a key component of the project, it is also a combined electricity supply, which is something we are keen about.

**Mr CHIVERS:** I refer to how the project might add to the renewable energy target. It has a 350-gigawatt hours output every year. In the first few years of operation of the renewable energy target it will make up just short of 1 per cent. When that full 20 per cent target of 45,000-gigawatt hours is required it will be just short of 1 per cent. In the early years it will be just over 2 per cent. That is how much it contributes.

**CHAIR:** You are referring to 1 per cent or 2 per cent of what?

**Mr CHIVERS:** The renewable energy target, that is, how many renewable energy certificates [RECs] will be produced from the park.

**CHAIR:** We have received a significant number of submissions from concerned residents in the Scone area. Why do you believe there such vocal resistance to wind farms and the other aspects of your project? Are there other aspects, or does it relate only to the wind farm?

**Mr DIXON:** We have been with the project from day one and it has been a long process. It was one of the first renewable energy parks in New South Wales—not the first, but certainly the first in northern New South Wales. As I said, it has been on the cards since 2005. I am not aware of any outstanding issues. We have had a lot of community representation and we have engaged with the community quite a lot. There always are aspects in a community that need resolving. We are not aware of anything untoward to do with this project.

**CHAIR:** You are not aware of any opposition?

**Mr DIXON:** There is opposition to the project in the community, in particular, from residents in close proximity to the park.

**CHAIR:** What is their main argument? How are you dealing with it, or do you feel that you need to deal with it?

**Mr DIXON:** Basically, we are dealing with it. First, the main opposition is to the wind turbines and things like visual impact. I think that is a large factor for a lot of people, especially when there are not too many of these things around to get a perception of what they are like. Generally people have a fear about the overall scale of a wind turbine, and specifically when it is located as high as possible on the landscape. There are other

factors relating to noise, and obviously property devaluation is another aspect. People fear that there will be significant impacts, especially people living downwind from the property.

As I understand it, these are the same principles with which every wind farm deals. The way in which we deal with it is to speak to local residents. We look at the real impacts and, obviously, we have consultants who work out and measure what they are likely to be. We then design around that. It is an evolving process going through a wind farm application. You have to move turbines and you have to reduce the model of the turbines to lessen the impact. It is a continuing process. That is why we go through the process of environmental investigation.

**CHAIR:** Your submission refers to renewable energy technology such as wind power as being embedded generation. You state that this is presented as an advantage over more centralised generation. Could you explain that further? You also mentioned that embedded generation is preferable to extending networks to wind regions in outlying areas. Could you explain your position on that?

**Mr DIXON:** We identified a number of areas when doing this renewable energy project. Scone is a rural community; it is not at the end of the line of a network. Currently, a lot of network augmentation works are going on in that area. We identified that a lot of money is spent on networks. We see an advantage, not necessarily with this project but an advantage generally, with supplying renewable energy projects to prop up the grid and to support capacity deficits on local grids. We see it as an area that could be further developed. As I said, it is not specific to this project because there does not seem to be a capacity deficit in the network there.

But they are spending a lot of money on the network in that area. There is a potential for renewable energy projects and, specifically, for integrated renewable energy projects—not just with wind turbines but also with solar PV panels and mini-hydro plants to support the capacity that is used on networks. Having spoken to some of the network operators, specifically it would be end of line networks in rural communities, for example, in the west of the State, or in places like that.

**CHAIR:** We have precincts in the Upper Hunter, New England, the Tablelands, Central Tablelands, South Coast and Cooma. Those precincts have been recommended or set up. How does that fit with your strategy?

**Mr DIXON:** The Kyoto Energy Park is an embedded generator. I think that more work needs to be done on how renewable energy projects fit into the network. The reason we included that in the submission is that there is a lot of network capacity and network limit issues. If we are building a renewable energy park we are generating electricity and it has to get to the consumer. How does it do that? It goes through a network. Generally, when you do a project you find that you have to satisfy a lot of network issues and there are a lot of constraints on the network, which obviously adds cost to the project, whether it be distance to the farm and also things like thermal constraints and fault considerations.

At the outset no consideration is given to how these parks fit into the network. It is an end of thought process. You look at where the wind is, you look at the topography, you establish whether any outstanding social issues are apparent, and you look at the planning constraints. You then say, "Okay, now I need to get connection." It just seems to be an afterthought. It is a major issue.

**CHAIR:** That could be one of the most difficult pieces in the jigsaw, so to speak?

**Mr DIXON:** Yes, I think so.

**CHAIR:** You require sufficient capacity to carry the energy that is developed to a particular site so it can be utilised?

**Mr DIXON:** Yes. It is quite a long process to go through. For our park, when we are wanting to get electrical grid connection with the distributor we are looking at a 12-month process at least, and that is after we get consent. That is an additional period we have to go through; it is another step in the process.

**CHAIR:** How does the Smart Load system reduce the need for large-scale storage mechanisms?

**Mr CHIVERS:** That technology is being developed by the CSIRO. It expressed an interest in rolling out Smart Load technology into the Scone area as it is about the right size for commercialisation for the technology.

**The CHAIR:** Does this link in directly with your project?

**Mr CHIVERS:** Yes, it does. The nature of the technology is that it communicates with the wind farm, or the solar panels, to tell the appliance or the household to which it is connected when the renewable resource is generating electricity. As opposed to having to store it and then draw it when you need it, it draws it only when it is being produced. There needs to be a synergy between the technology and the park—communication between them—and also accurate forecasting from the park's output.

**Mr DIXON:** Could I just add one thing. It is not in our DA. We have collaborated with CSIRO as a potential for a project to do this. It is their technology. We have not canvassed anything as yet and it is not part of the DA, but it is a potential factor that we are looking to incorporate into the energy park or the CSIRO is looking to trial this technology. They are currently at the centre at Newcastle. The attraction with our energy park is that there are three different technologies and that would, as Jamie said, blend in with what they are trying. The device is a small device, which can be fitted to a household appliance like a fridge. It basically programs itself with the energy park. So, when the wind is blowing or when the sun is shining, it is telling us, okay, well now we will use electricity and we will use green electricity rather than dirty electricity. Obviously, there is a lot of intricate programming that is built into it, but essentially that is what it does.

**CHAIR:** It is a very brave new world. I think I understand you.

**Mr DIXON:** It is a facility at Newcastle and they have a display up there. We went up there and had a look at it. It is quite amazing technology. It is something that, hopefully, is rolled out.

**CHAIR:** In some way I suppose this will assist the often stated criticism, rightly or wrongly, that wind energy generation cannot be considered a reliable base load because it fluctuates too much?

**Mr DIXON:** Exactly.

**CHAIR:** But you actually are fitting the end-of-line user in with those fluctuations in certain instances?

**Mr DIXON:** Exactly. It is quite amazing how our appliances can be programmed to match supply. So, it is the demand matching supply or trying to get closer to demand matching supply. It is a start. I guess it is the tip of the iceberg. Once you get a fridge, for example, using the demand more consistently with what the supply is, then it goes on from there. It is the start of new technology I guess.

**Mr GILL:** The key thing really is that we talk about the grid. We are working with nineteenth century technology with the grid in Australia at the moment. There is an 8 per cent loss throughout the whole grid throughout the country. If you take the amount of electricity produced and the electricity actually used, there is about an 8 per cent difference. The grid has got to be made more nimble. If we can send a man to the moon and bring him back in one piece, surely we can do something about wind farms. Also, with embedded power, if you put your supply closer to your demand, you are going to save those line losses you are getting. Really, we have a cultural issue here because what is happening is that you have a system that has been set up with belts and braces and high levels of redundancy. What they do is produce power at one end of the country, ship it all across the country and allow wash-off because the stuff is so cheap. So, embedded power really is the most important thing and what it is doing is forcing the grid owners to look at it and make those grids more nimble and be able to react a lot more to surging power and changing demands and keep the quality of the energy at a high level.

**CHAIR:** This would be a strong argument for more encouragement or more financial incentive for rooftop solar and those types of things?

**Mr GILL:** It really runs out into that. It runs into rooftop solar, into smaller wind farms, community wind farms. But the most important thing is getting the power supply closer to the demand areas and supporting the grid more by doing that.

**The Hon. RICK COLLESS:** What are the boundaries of the park at Scone? How do you define your park area?

**Mr DIXON:** The property boundaries? There are two.

**The Hon. RICK COLLESS:** I do not know. You talk about the Kyoto Energy Park, but what is it? Where is it? What area does it entail? What is it bounded by?

**Mr DIXON:** There are two properties situated 10 to 13 kilometres west of Scone in the upper Hunter Valley. They are two separate parcels about 2,000 hectares each.

**The Hon. RICK COLLESS:** I understand those two properties belong to the same owner?

**Mr DIXON:** That is right.

**The Hon. RICK COLLESS:** How did you select that site? Was it purely on wind capacity or that it just happened to be that this is owner agreed to have it on his place?

**Mr DIXON:** No, it was purely on the wind. I think SEDA put up a tower in 1999. I think a few towers were put up across the State and that was one of them. That has been collecting data for the last 9 to 10 years through the CSIRO. That is how we have identified the site. Initially, SEDA put up the tower in 1999. I think in 2004 the Spanish EHN Pacific looked at the site.

**The Hon. RICK COLLESS:** Why did you select that property and not the adjoining property, for example?

**Mr DIXON:** Really, to have confidence to build a wind farm or wind turbines you have to have pretty good data. They say at least 12 months, but if you can get more than that—

**The Hon. RICK COLLESS:** Are you referring to wind data?

**Mr DIXON:** Wind data, and that is from a mast of at least 40 metres to 60 metres. So you want good data to start the process of determining where you want to put it.

**The Hon. RICK COLLESS:** How many other wind towers did you have in that vicinity?

**Mr DIXON:** Currently we have two, but initially we had one wind tower.

**The Hon. RICK COLLESS:** So you have one on each of those blocks belonging to that same man?

**Mr DIXON:** Currently there are two towers there separated by I think probably a kilometre. How did we identify the site is the question?

**The Hon. RICK COLLESS:** Yes, why did you choose that particular property?

**Mr DIXON:** There are a number of factors: single landowner, proximity to the grid, strong connection point, also wind resource obviously. There is a good wind resource on that site. Specifically, it gets a strong south-easterly from the valley and also from the western plains. There are a number of factors to consider, but they are the three major factors: wind resource, connection, Proximity to the grid.

**The Hon. RICK COLLESS:** When you talk about the park being an energy park and you talk about wind, hydro and solar, how much of the 350 gigawatt hours you plan to produce will be wind, hydro and solar?

**Mr DIXON:** There is about 92 per cent wind. Accompanied with the 3 to 10 megawatt solar plant you are looking at about 3 per cent to 8 per cent, I think, and the hydro is literally 1 per cent. While they each have this capacity they also have a significance as well. Solar is well correlated with demand. During a hot day you need solar to match demand. Specifically, this energy park, and if we do go ahead with the smart loads, is very valuable. Also, hydro is not really used for capacity. It is used for balancing supply and also matching demand as well. We can discharge it when we need to. It has a low capacity. Basically it is a storage as well.

**The Hon. RICK COLLESS:** Where will that be located? Is that on one of the properties?

**Mr DIXON:** On the properties, yes, on the southern side.

**The Hon. RICK COLLESS:** It will be in the form of a large dam with a generator?

**Mr DIXON:** No. It is actually a man-made structure in tanks. Basically it is just tanks connected, header tanks and bottom tanks connected by a series of pipes. It is a simple system. During a surplus electricity in the park they pump water back to the tanks and then they discharge it through a series of mini turbines. Basically, it is like a water battery, I guess, if you want to coin a phrase. It is storage of electricity that can be used later on during peak pricing or during times when we need to balance our supply.

**The Hon. RICK COLLESS:** Given the Sustainable Energy Development Authority [SEDA] wind atlas, there is an area that would approximate the current coalmining areas between Muswellbrook and Singleton, and it has the same wind rating as the park, according to the map. I do not know what the individual tower results are, so you might be able to correct me if I am wrong. In terms of industrial development that has occurred in the mid-Hunter area, why would you not look at installing wind turbines on rehabilitated coalmine sites?

**Mr DIXON:** We would. One thing you have to look at is that that map, which was originally produced by the Sustainable Energy Development Authority [SEDA], was a general map and it is meant to be used as a general map.

**The Hon. RICK COLLESS:** I understand that.

**Mr DIXON:** As I said before, you would really need to go into the fine details of where the localised wind patterns are to nail down a good site. A lot of the times that can be difficult. There is a combination of factors. I will mention the three main factors. You need to get a land agreement with landowners. Fortunately we have one landowner, and he is very pro renewable energy. He is a good landowner. I understand that most wind farms involve anywhere up to nine landowners so you need to get individual agreements with those people, and that can be a long process. Also you need a strong connection point. Up at Muswellbrook, obviously you have a strong connection point. There are other issues, such as foundations and flora and fauna. I do not have a list with me, but it is not just a simple process.

**The Hon. RICK COLLESS:** I would have thought that flora and fauna issues would be of less significance on a rehabilitated mine site than on a site that is adjacent to a national park, like the Kyoto Energy Park is.

**Mr DIXON:** Specifically, yes, but the question has been brought up in the community before. Once again, we are not aware of the wind patterns down in Muswellbrook. I know where they are in Scone: we get a strong south easterly and that site is exposed to a good strong breeze. You need a consistent breeze. You do not just need a windy area; you need something that will sustain a wind farm. There are not too many. It is difficult to find a location that can sustain a wind farm.

**The Hon. RICK COLLESS:** It is 25 towers—is that correct?

**Mr DIXON:** We have a proposal for 42 towers.

**The Hon. RICK COLLESS:** That will be 42 all together?

**Mr DIXON:** Yes, on two sites.

**The Hon. RICK COLLESS:** On two blocks that are the same property.

**Mr DIXON:** Yes.

**The Hon. RICK COLLESS:** What will be the maximum height of those towers?

**Mr DIXON:** One hundred and fifty metres above ground level.

**The Hon. RICK COLLESS:** Is that to the hub or to the top of the blade?

**Mr DIXON:** The tip.

**The Hon. RICK COLLESS:** What arrangements do you have with the landowner in terms of reimbursement of fees you will be paying per tower?

**Mr DIXON:** It is a commercial arrangement that we have with the landowner. Obviously I will not give you the details of it, but it is basically a lease arrangement that is similar to any property leased, or royalties. We pay the landowner a fee. Specifically our arrangement is per turnover of income. He gets a flat percentage of income. Then to protect his interests, there is obviously a hedging there; if it goes below a certain factor, we pay him that. That is the arrangement we have with the landowner. In our case it is not the turbine. It is actually a percentage of the turnover.

**The Hon. RICK COLLESS:** This question relates to the issue of the Civil Aviation Safety Authority [CASA]. That site is adjacent to or on the flight path into the Scone airport. What arrangements or discussions have you had with the Civil Aviation Safety Authority? What restrictions, if any, has it placed on your development?

**Mr DIXON:** Actually, we are going through that process now of looking. There are turbines of those 42 turbines on Middlebrook Station that are in the flight path. There is a let down procedure from Scone airport. We have been looking at ways of modifying the height or going into even the more difficult process of looking at ways of modifying the flight procedure, but that is a difficult process and one that we might not take. Of those 42 turbines, there are turbines at Middlebrook Station that we may look at deleting from the application.

**CHAIR:** I am interested in small-scale turbines. I understand they do not attract the same public or government subsidy as the large-scale ones. If it were different, would that be a situation whereby on that particular path you could replace the bigger turbines with some sort of small-scale units? Is that something that could work?

**Mr DIXON:** Generally in the world at the moment, the news that we hear is that turbines are getting bigger, specifically to get more energy out of the infrastructure installation. There are economies of scale in the case of the dimension of the turbine. The bigger is the turbine and basically the longer is the blade, the more torque and the greater is the power. That includes taller turbines and longer blades. Generally around the world, turbines are getting bigger. That reflects the economies of wind turbine technology.

But on the other hand, there is also a market developing for small to medium size turbines. Their application is probably even more suited to urban and semi-urban/rural areas. But I guess for class one sites on the southern strips of South Australia-Victoria, you need bigger turbines. In our case, we are on an inland site. We are on a class three site with lower wind speeds, which is typical of inland New South Wales. We need bigger turbines to get that pulling power and torque to make it work. I guess if you have smaller turbines, they just really do not generate enough torque to generate that amount of electricity.

**The Hon. RICK COLLESS:** Gentlemen, my last question relates to the lifespan of the turbines. What happens at the end of their lifespan? What arrangements are in place for decommissioning, dismantling, removal and rehabilitation of the sites?

**Mr DIXON:** I think we have allowed for something like a 25-year life. The renewable energy park includes solar panels. At that time we hope to renew the technology and install a better machine on top of the tower—for example, a wind turbine or a solar photovoltaic [PV] plant that comes on a frame. It is quite easy just to take a panel off and put on a new one. It will probably triple the percentage of efficiency by that stage, in 25 years. Once again there is an option there to decommission it in 25 years time. Anything could happen. We might not even be in it then.

**The Hon. RICK COLLESS:** What is the term of the lease that you have with that the landowner?

**Mr DIXON:** We have a 99-year lease with the landowner. Obviously with a generating facility, there are huge up-front capital costs.

**The Hon. RICK COLLESS:** What I am getting at is this: If the technology changes in between now and 2050 and wind turbine energy becomes redundant, what happens to those towers? Your company may not even be around at that time. However, the last thing that we would want to see is an energy company walk away

from that as redundant technology and simply leave it there. It would be like having a disused coalmine as a hole in the ground. That has caused lots of problems in the past.

**Mr DIXON:** We understand that we have conditions of consent to remove the structure, all structures, from the site if we decommission.

**The Hon. HELEN WESTWOOD:** I am sorry if you answered this question when I was out of the room. Issues have been raised by the community in the development approval process and in their objections. Could you give the Committee an indication of what the main area of objection was during that process and the areas of concern? How have you addressed those in your application? Has the department, as the consent authority, requested any amendments to your development application? I realise it has not been approved yet, but do you have any indication of what conditions may be placed on that consent, or on that approval?

**Mr DIXON:** As I said, we have been through a long process and there has been quite a lot of work done on the project already. There have been a lot of responses from community. The main issues have been visual impact and also noise. There have been issues of property devaluation, mainly for people living next to a wind farm and specifically lifestyle blocks. They are the main issues that have come up. The other ones are more minor issues, but they have been the main ones. We have removed five turbines from the original proposal based on noise and visual impact. There have been a lot of little things which I will not go into, but in the EA we obviously go through a process where we do this and we do that and we narrow this or make this bigger.

**CHAIR:** So you removed those turbines based partly on noise. How far away were they from adjoining or potentially affected property or dwellings and residences?

**Mr DIXON:** We have one resident within 1.5 kilometres of a turbine. We only have one resident within that distance. There were nine turbines in proximity to that one resident and we could not get the noise to within acceptable limits so we basically removed four of the turbines in proximity to that resident, specifically to address noise concerns.

**CHAIR:** Has that satisfied the resident?

**Mr DIXON:** The resident?

**CHAIR:** Yes.

**Mr DIXON:** No, it has not satisfied the resident. He and she are still concerned over noise. It is a process of talking to the resident and basically getting them to feel comfortable that we can satisfy the noise criteria at their residence.

**CHAIR:** Are you able to say to them, "You will get a noise of X number of decibels under these conditions"? Have you been able to assess that at a 1.5 kilometre distance, in terms of your arguments?

**Mr DIXON:** Obviously you do a noise modelling. The consultant does a noise prediction of what the noise will be, and obviously they take real time background noise limits and they say, "Okay, how much more will that be over the background level at that particular residence." Obviously we have had a logger at that residence so we know what the background levels are. Once again, that is a prediction. We feel that that noise level is still exceeding at that residence. What we have proposed for that particular resident is a ramping down or what they call a sector management of offending turbines. For example, when the wind is blowing in that direction, and these turbines are controlled automatically through computers—if the wind is blowing in that offending direction then the turbine ramps itself down to 70, 80 per cent of efficiency and you measure what the noise levels are at the residence and if they are complying you go back and maybe build it up. So it is a case of measuring real time what the noise levels are at that residence.

**CHAIR:** When you are measuring that, one thing that I must admit confuses me a little because I live in the bush so when there is wind howling—you have a stiff southeaster or northeaster on a hill top you are getting quite a high level of noise. Are you able to add and subtract, so to speak, and make an efficient assessment of the noise produced above the normal background noise?

**Mr DIXON:** I think you are referring to a lot of noise coming out of the trees, for example.

**CHAIR:** Yes.

**The Hon. ROBERT BROWN:** Ambient.

**Mr DIXON:** Ambient noise. That actually is included in the background noise level. You take a background level and obviously if you have a background above 10 metres you might get a lot of noise from trees so that is actually included in the logger measurements. So that is why I am saying to realistically determine what the noise levels are you need—the model is quite accurate and it is conservative. It is a conservative model. Particularly that resident, we have found that we are exceeding noise but we have received advice to say that it is not a considerable amount that we cannot reduce the turbines as a way of controlling the turbines so they can reduce their output automatically in a wind direction, for example.

**The Hon. HELEN WESTWOOD:** The Chair's point about the noise of wind, just in particular environments, does the nature of that noise of a level or type change because of the turbines?

**Mr DIXON:** The nature, sorry.

**The Hon. HELEN WESTWOOD:** If there is no turbine within a certain level of noise and the nature of the noise as well as its level, will that then change if a turbine is there? Is it different? Does it change the noise at all?

**CHAIR:** Does it drown it out or accumulate it?

**The Hon. HELEN WESTWOOD:** Does it change it? It is not just its level.

**Mr DIXON:** There are different frequencies and wavelengths of noise and they each have a different attenuation with distance. They dissipate with distance at a certain level, and that is taken into account in the noise assessment. Generally, what you hear, those different noise levels, you get mechanical noise, for example, you get blade noise. They all have a different effect on the person listening to it. So you are right. A rustling of the trees might have a calming effect whereas mechanical noise may have a worse effect. But they are all audible. To be honest, in the noise assessment we deal with DVA, which is audible to the human ear. We have to remain within a certain level of DVA, and that is the way they determine noise.

**The Hon. HELEN WESTWOOD:** Returning to my original question about the main areas of objection, you talked about visual. The Chair raised with an earlier witness the issue of colour of the turbines. Have you considered that because of community concerns about the visual impact?

**Mr DIXON:** Yes, we have. There are options for colours, depending on the backdrop. Generally, you have a backdrop of sky which is blue or white, so they like to generally get an off-white or a soft grey that they use, and that is it. In other cases you might have mountains as a backdrop so you might decide to go for—if your visual impact is in a community that has a backdrop to large mountains they might say they will use a different colour, which might be a softer green or an olive green. It depends on the backdrop, but generally the backdrop is blue or white. I think that is the way the visual consultants generally decide on what colour is best. It depends on what is behind the viewer. So if you have a community that is looking at turbines and you generally have the sky in the background they will opt for off-white or a very soft grey, which is generally considered in the industry to be the best colour.

**The Hon. HELEN WESTWOOD:** And that is something that you have taken into account in design?

**Mr DIXON:** Yes, that is something we looked at in the visual assessment. Obviously you have different areas where your receivers are looking from, because you have turbines spread over such a great area, and you look at the worst areas, the highly impacted areas and then you look at the colours for those. Towards the end of the environmental management plan we look at colours in turbines.

**CHAIR:** Whenever I see wind turbines in magazines and in the media they are always white and they stand out quite blatantly.

**Mr DIXON:** I guess that is to take into account quite similarly the clouds. In inland areas like where we are you generally we have a lot of cloud cover, whereas if you go out west where there is not so much wind

you have blue sky. So it is taking into account whatever the back scope is. Generally that is why they are off-white.

**The Hon. RICK COLLESS:** Mr Dixon, I think you mentioned that the area has lifestyle blocks and horse studs with horse felling paddocks. You also said that noise is unmeasured in the audible range. What impact does noise have on animals, particularly horses? It has been brought to my attention that horses are impacted by low frequency noise that is not audible to humans. Have you done any studies in that regard?

**Mr DIXON:** No, we have not done any studies in that respect. We basically follow the guidelines that are set down, and currently adopted in New South Wales, from the South Australian guidelines. I think the inaudible ranges of noise, which humans cannot hear, but some animals can hear are referred to as infrasound, for example. I am aware that there were measures of infrasound in the older-type turbines. Those turbines were a case where the blades were behind the tower. In modern turbines most of them are all up-wind so infrasound issues are not considered, and certainly not in the planning codes we have had to adopt a testing for infrasound. It is something that has been raised by the community but obviously a lot of reports have been done on it, especially in the United Kingdom where there have been complaints about infrasound. Some have been saying that people are getting "infrasound" confused with "blade modulations", which is audible.

**The Hon. RICK COLLESS:** What is blade modulation?

**Mr DIXON:** A blade modulation is an audible sound that is basically when the blade goes past the tower it causes a bit of whoosh. That is okay when all the turbines are in phase, but then when they are out of phase you get a whoop, whoop noise, a different modulation. It is a different sound; it is not just continual. There might be an up and then down, and then up and down because they are all operating out of phase. So that is a blade modulation which is an additional effect, while it is still measured within the guidelines, it is an audible sound and we have to be below criteria on that. I guess it is a characteristic of a noise that may have an additional perceived impact because it is a different sound.

**CHAIR:** Can that be modified? Can a proponent put them into sync or is it impossible?

**Mr DIXON:** Once again we have to be within the criteria on it so it is a case that we have to satisfy criteria with blade modulation exceeding noise levels. It is not an issue really because it is already considered. It is something that obviously in offending times it is possible to hear.

**The Hon. RICK COLLESS:** The noise levels of a resident within 1½ kilometres, and you referred to an incident where you deleted a number of towers. What is the allowable level for noise before you remove towers or whatever?

**Mr DIXON:** It is basically the greater of 5dBA above background noise level, or 30dBA, whatever the greater is, so that is normally our noise criteria. We measure background noise level at the worst affected residents around the site and then we predict what the noise levels will be above those background measurements. If they are more than 5dB above then after that we look at it.

**The Hon. RICK COLLESS:** When is the background noise measured? Is it at the noisiest or quietest time of the time?

**Mr DIXON:** In our case we measure them over 1 to 1½ years at two different seasons, for example, two weeks at a time. The noise consultant puts out noise loggers for a two-week period at each of these residences. I think there were eight residents in each and they measured background noise level from those loggers on two separate occasions. Then they basically predict what the noise levels will be above those background noise measurements.

**The Hon. RICK COLLESS:** A concern that has been expressed to me is that one does not necessarily notice the noise level during the day when background noise is at its highest, but it is the middle of a quiet night that you hear them working in the background that drives people mad.

**Mr DIXON:** Yes, they did take account of day and night time noise levels, and also seasonal. Obviously winter when you have colder nights you might get noise travelling further. It did take account of the different periods.

**The Hon. RICK COLLESS:** In relation to the structural dimensions of these 150-metre towers. What are the dimensions of the foundation and the towers in terms of diameter to the base, diameter to the top? How many tonnes of steel and concrete are involved in each tower?

**Mr DIXON:** I can give you relative, because obviously it depends on the geotechnical foundation and also the design. Generally for a large turbine, you are talking about a hub-height of currently 80 to 100 metres, a diameter at the base of about 4 metres tubular steel, a concrete foundation of about 3 metres deep by—

**Mr CHIVERS:** About 230 cubic metres, and 80 tonnes of steel foundation.

**Mr DIXON:** And then you have grout anchors or rock anchors into rock. So that is for an anchored turbine foundation. There are other turbine designs, dead-weight designs, but specifically you want to anchor the turbine into rock, if you can.

**The Hon. RICK COLLESS:** They are 230 metres deep of concrete and 80 tonnes of steel?

**Mr CHIVERS:** Yes.

**The Hon. RICK COLLESS:** That 80 tonnes of steel is in the foundation.

**Mr DIXON:** In the foundation, reinforced.

**The Hon. RICK COLLESS:** What is the tonnage of tubular steel in the construction of the tower?

**Mr CHIVERS:** I think each section of 24 metres is 60 tonnes, but I will have to check that.

**Mr DIXON:** They do vary because obviously they get thinner as you go up.

**CHAIR:** If the committee has further questions it would be fantastic if you could answer them as well.

**Mr DIXON:** Yes. Thank you.

**(The witnesses withdrew)**

**(Luncheon adjournment)**

**JONATHAN TRACY UPSON,** Senior Development Manager, Infigen Energy, Level 22, 56 Pitt Street, Sydney, sworn and examined:

**CHAIR:** In what capacity are you appearing before the Committee? Are you appearing as an individual or as a representative of an organisation?

**Mr UPSON:** Today I am representing the company Infigen Energy.

**CHAIR:** Are you conversant with the Committee's terms of reference?

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

**CHAIR:** Before we commence asking you questions would you like to make a short opening statement?

**Mr UPSON:** Thank you for the opportunity to appear before this Committee. After a brief introduction about our company I will attempt to provide a bit more of a global view, rather than going through my submission. Infigen Energy is the largest owner of wind farms in Australia. Currently, it has 500 million watts of electricity capacity either operating or under construction. That is enough electricity to power over 300,000 Australian homes. Infigen Energy is the owner of the Capital Wind Farm, which is the first major modern wind farm in New South Wales. It is also by far the largest wind farm. We are actively looking at other development projects in New South Wales, including the Flyers Creek project south of Orange—a project that I manage.

I have been working on wind farm development for over six years. For quite a lot of that time I was working on projects in Victoria. If it interests the Committee, I could provide some information comparing the New South Wales and Victorian planning schemes and things like that. Let me give you a global look at the industry. Over 100,000 wind turbines have been installed worldwide and they produce 260 trillion watt hours of electricity, which is more electricity than the electricity generated in all of Australia by all our different sources. The global industry employs over 400,000 people. Last year in the United States 42 per cent of all new electricity plant investment was for wind energy.

In Europe it was 36 per cent. In fact, in Europe, of all the different technologies that generate electricity, wind energy led all the other technologies. In Europe more money was spent on putting in wind farms than any other technology to generate electricity. In Europe over half the money spent on electricity generation went to renewable energy sources. The market penetration in Europe is quite interesting. Spain and Germany both have 18 per cent of their electricity generating capacity from wind, which by the way is fairly similar to South Australia. Denmark is at 24 per cent. At times during the evenings in Denmark the entire country is powered by wind energy. One hundred per cent of all the electricity in Denmark is supplied by wind energy and the lights do not know out when the wind goes down or up.

In regional market penetration there are even higher levels. The German state of Schleswig-Holstein has 25 megawatts of wind energy installed, providing 36 per cent of electricity generation. That one state has twice as much wind energy than we do in our whole country. The Navarra region in Spain has 70 per cent of its electricity supplied by wind energy, and again the lights do not go out. Massive investments, primarily in regional areas, are occurring in wind energy throughout the world. Tens of thousands of new jobs are created every year. We believe that with the renewable energy target legislation that was passed just last month, Australia is well placed to realise the benefits of this investment, and job creation in the generation of clean energy.

As the Committee might have noted today, it was reported that Australia has the worst per capita emissions for its electricity generating system of any country in the world. One could say that New South Wales did not receive its fair share of the investment and job creation in the original Renewable Energy Target [RET] scheme. South Australia led the way. As the largest owner of wind farms in New South Wales and in Australia, Infigen Energy looks forward to the opportunity to assist New South Wales in obtaining its fair share of the expanded Renewable Energy Target scheme to realise the benefits of investment and job creation in our local communities and building clean, pollution-free energy. I would be happy to take your questions.

**CHAIR:** Thank you for your introduction, which begs a question—for me anyway—relating to Denmark and Navarra. You said that they were using 100 per cent of wind-powered electricity. Is that on a

regular basis and at certain times in the evening? What happens when the wind stops? Is it covered by regional representation? How does it achieve baseload generation?

**Mr UPSON:** As I said, 100 per cent of Denmark's electricity is created by wind energy on some evenings. Basically, that happens when there is a very windy evening and the wind farms are generating near their capacity. Of course, during the evening the electricity demand is lower, so they end up supplying all the electricity. They do have interconnectors to other parts of Europe, primarily Germany. As the wind dies down obviously Denmark starts to import electricity, or it starts up other generators. If it got down to below what the wind was supplying it would have to start up new generation, or import electricity from the interconnectors.

**CHAIR:** What is their backup?

**Mr UPSON:** Their backup is mostly gas-fired and coal-fired. Coal-fired would not be a backup in that instance, but gas-fired generation, or simply importing electricity from Germany. This is the same situation that South Australia faces. It has a lot of wind energy penetration, but it is also connected to the electricity grid, so that helps to stabilise its system.

**CHAIR:** You have built what currently is the largest wind farm in New South Wales—the Capital Wind Farm. Can you discuss your experience in developing the farm with reference to how you address the residential and environmental impacts on surrounding areas? In particular, how do you deal with community complaints? Do you believe you have satisfied the community's complaints regarding the project as it has been developed?

**Mr UPSON:** Unfortunately, that is not a project on which I worked, so I am probably not best placed to answer that question. It is better if I referred to some of the projects on which I have worked. There will always be some people who decide that they do not like a wind energy project. As was discussed earlier this morning, primarily it is to do with the visual amenity of the project. My personal philosophy of consultation is to meet with the neighbours who are near the project. I offer to see them or to talk to them on the phone one-on-one. Of course, we also have community open days when we put out information about the project, the turbine layout, photomontages showing how the wind farm will look from different areas, and information such as that. I think it is a very important part of the process to address the different concerns of the community, but it is pretty inevitable and certainly with the Capital Wind Farm some objections were lodged. I am not across what they particularly were, but I imagine they were probably to do with the appearance of the turbines.

**CHAIR:** The noise factor has been a major concern in many communities.

**Mr UPSON:** The noise standard in New South Wales utilises a South Australian standard. I think most people feel that standard is slightly stricter than the New Zealand standard, which is used in Victoria and some other States. It is basically a standard written around not disturbing sleep. The kind of headline noise level is 35 decibels from outside the house. That is quite a low decibel level. I feel that any wind farm that complies with that standard should not provide any disruption or annoyance. That is what it is written for. That is how the standard was developed.

**CHAIR:** Does the 35 decibels take into account background noise? Often it is said that there is no background noise in the quiet rural areas.

**Mr UPSON:** That is why I said the kind of headline level is 35 decibels. The actual limits say that the wind farm can create noise up to either 35 decibels or 5 decibels above the background noise, whichever is greater. Background noise is determined essentially by having microphones at nearby residences for a period of around three weeks, taking thousands of data points that are then collated with the wind speed to come up with a graph of wind speed versus background noise to determine what the background noise is at that residence. That is the curve that is used to add the five decibels. So, if, for example, a house has no vegetation around it, then presumably it would have lower background noise than one that had trees or shrubs, but that is accounted for in the background noise measurements.

**CHAIR:** Your submission states, in part, that there could be potential increases in tourism benefiting the local hospitality industry. Is that an Australian or overseas experience?

**Mr UPSON:** It is certainly the experience in Victoria. I think we had two wind farms that had an actual tour operator running tours to the wind farm, actually driving people out to a turbine to actually stand right

underneath the turbine. Challicum Hills wind farm had a tour that took in not only the wind farm but some other scenic areas around the project. That is a real experience in Australia. At the Capital wind farm it is certainly something we will be monitoring to see, whether the local cafés and things like that do more business or not because of the wind farm. But I think as the first large modern wind farm in New South Wales I would expect that some people would take a detour from the highway and have a look and then maybe stop and have lunch and things like that.

**The Hon. ROBERT BROWN:** At what stage is the development of which you are currently the project manager? Would you be able to comment on the procedure you will go through in regard to the community consultation process?

**Mr UPSON:** Sure, I would be happy to.

**The Hon. ROBERT BROWN:** Would you take us through how, from a greenfields approach, you go through the community side of it?

**Mr UPSON:** Okay. The project has received its director general's requirements. We put in our preliminary environmental impact assessment, I think it is called. Basically we are at the stage now of conducting the environmental and technical studies and also, obviously, monitoring the wind data. The towers have not been up for a year yet. There are a few things I do with community consultations. One is that I advise all the landowners in the project. If any of your neighbours have any concerns about the project, if they want to join the project, I want you to give them my phone number because I am happy to talk with them. Or you can ask them if it is okay if you provide your details to me. I proactively try to meet neighbours who have concerns about the project. There is inevitably media about the project. As far as it being secret or something, we have had two front-page stories in the local papers. So I do not think there is probably anybody in the district who does not know that the project is there.

**The Hon. ROBERT BROWN:** If I could interrupt you, were the two front-page stories supportive or negative?

**Mr UPSON:** I guess I could answer your question by saying that we were quite satisfied with the articles. If it would interest the Committee, I could certainly send them to you.

**The Hon. ROBERT BROWN:** No, I just wanted to clarify that. Please continue.

**Mr UPSON:** Basically identify the neighbouring residences. Obviously the ones that are closer to the project, we call them up and visit them. Some of them say, "Look, I think it's a great idea. I think wind energy is terrific. No, you don't have to come see me. Just put me on a list and send me updates on how the project's going." I find that some people ask should you have a community open day very early in the project. I actually have found that that is not necessarily very helpful because the three questions people in the community want answered are: how many turbines, where are they going to be and what is it going to look like? Before you have any wind data or before you have a sufficient amount of wind data, you cannot answer any of those questions. All you can do is show a property boundary and say, "Well, here's the boundary of the project. We don't know where the turbines are going to go. They're likely to go on the high ridges, but they may not." There may be some ridges that are not that windy.

So, you cannot answer the questions they want to know. I think having a big meeting and basically not being able to answer the questions that everyone is interested in is not necessarily helpful. Once we get a preliminary turbine layout and we have the photomontages so you can show people what it is going to look like in different places, they can see where the turbines are going to be and how many there are going to be, then you have a community open day and get the feedback from the community. Neighbours who have expressed an interest—"Look, I want to get a look at that right away"—you might see them individually as well and see what their feedback is as far as the layout and the photomontages. We then take that feedback, then finalise the layout for the project, and then submit a planning application. Of course, at that point the community has the opportunity to put in submissions.

**The Hon. ROBERT BROWN:** You are now at the stage where you have just received the director general's requirements for your development application, is that correct?

**Mr UPSON:** We actually received them a few months ago.

**The Hon. ROBERT BROWN:** Given a normal development approval process and so on, what is the normal time frame for you to go from this stage through to the completion of your project?

**Mr UPSON:** Do you mean actually building it?

**The Hon. ROBERT BROWN:** Yes. Generally speaking.

**Mr UPSON:** We would hope that construction might start in, say, 2012.

**The Hon. ROBERT BROWN:** So it is a fairly long process?

**Mr UPSON:** That is right.

**The Hon. RICK COLLESS:** You mentioned the worldwide production of wind-generated electricity. I did not catch the figure you mentioned. Could you repeat that figure?

**Mr UPSON:** What I quoted was 260 trillion watt hours of electricity—in other words, 260 terawatt hours.

**The Hon. RICK COLLESS:** 260,000 gigawatts, does that sound right?

**Mr UPSON:** It would be 260,000 gigawatt hours, that is right.

**The Hon. RICK COLLESS:** Do you have any figures for other forms of renewable energy that has been produced worldwide—in particular hydro, geothermal and nuclear?

**Mr UPSON:** The short answer is that I do not have that information to hand, but I can give you some information on it. Certainly there is very substantial hydroelectricity installed, so that would be a very substantial part of renewable energy production. Solar would definitely be much further down the list. I guess I would argue that nuclear is not a renewable electricity-generating source.

**The Hon. RICK COLLESS:** It is a non-greenhouse gas emitting form of electricity, is it not?

**Mr UPSON:** The generation of electricity does not generate greenhouse gas emissions. But, of course, the mining and processing do generate quite a bit.

**The Hon. RICK COLLESS:** But that is the same with wind energy as well. We took evidence last session that indicated that there was something like 230 cubic metres of concrete, 80 tonnes of steel and 60 tonnes per 24-metre section of steel of the tower itself. So when you talk about thousands of wind towers, there are also a lot of greenhouse gas emissions going into the production of those commodities, are there not?

**Mr UPSON:** Did you ask the gentleman from Vestas how long it takes to pay back the greenhouse gas emissions from making a turbine?

**The Hon. RICK COLLESS:** You might be able to tell us that. That is one of the questions I wanted to ask. I am interested in what the worldwide production of various forms of energy is. Obviously, if we are going to look at things like wind, nuclear, hydro, geothermal, solar, or whatever, all those forms of electricity do not emit greenhouse gas in the production phase but they all have a certain amount of greenhouse gas production in the construction phase.

**Mr UPSON:** Obviously those figures are available, but I do not have them with me at the moment. But I will say that, with regard to nuclear power plants, there are just a handful being constructed today, and for the past few years as well. In Europe wind energy was the leading source of new electricity plant, and in the United States it was just nosed out by gas-fired generation; nuclear was hardly on the page. So I think that would give you some indication. Off the top of my head, I think solar was something like 14 or 16 per cent of the new capacity in Europe.

**The Hon. RICK COLLESS:** What is the relative production time, or the number of kilowatt hours or whatever, that is required for a turbine to become carbon neutral?

**Mr UPSON:** I have been told by people who make wind turbines that it is less than a year. In other words, they offset enough greenhouse gases in the generation of electricity in less than a year to make up for the greenhouse gas emissions taken by the construction and the actual manufacturing of the turbine.

**The Hon. RICK COLLESS:** With regard to the production of wind energy, I think a 100 metre turbine is three kilowatt hours capacity?

**Mr UPSON:** Three megawatt hours.

**The Hon. RICK COLLESS:** That means it can produce three megawatt hours of electricity per year?

**Mr UPSON:** Its capacity is three megawatts.

**The Hon. RICK COLLESS:** Three megawatts per hour?

**Mr UPSON:** That is right.

**The Hon. RICK COLLESS:** Over a 12-month period, what would be the average production out of that? At three megawatts capacity, that is operating at a wind speed of how many kilometres per second? How many hours a year do you achieve that wind speed, and what is the production from that three megawatts per hour tower on a 12-month basis? What does it average on an hourly basis?

**Mr UPSON:** The term that you are getting at is what we call the capacity factor, which is the average percentage of the turbine's rated capacity that it generates in a year. Obviously it depends on a number of things. It obviously depends on the wind speed at the project site. It also depends on the turbine. If you have a larger capacity turbine, you tend to have lower capacity factors than some of the ones that might be tuned for a particular wind regime; you might have smaller generators. A reasonable average—in fact, the average they use in Victoria—is 35 per cent capacity factor.

But it is very important to recognise that that does not mean the turbine is running 35 per cent of the year. The turbine is actually running probably 75 or 80 per cent of the year, but it is not running at capacity. A three megawatt turbine would average out at generating one megawatt 100 per cent of the time. You might say that is not very good. But you have to understand that, firstly, you are not paying for the fuel. And it is economic to do so; otherwise you would not have 100,000 wind turbines operating in the world today. So, the fact that it is variable, and the fact that it does not generate 100 per cent of its capacity, that is all figured into the economic case.

**The Hon. RICK COLLESS:** I am with you there. When you build a wind farm, and you say it is a 500 gigawatt-hour capacity, is that the 35 per cent level, or is that the 100 per cent level?

**Mr UPSON:** When I was quoting our generation, that was the actual generation that we expect to get, or are getting, from the wind farms.

**The Hon. RICK COLLESS:** That is the 35 per cent?

**Mr UPSON:** Yes, or thereabouts. Our windfarm in Western Australia is in the mid-forties as far as capacity factor is concerned, because it happens to be particularly windy there.

**The Hon. RICK COLLESS:** What is the cost per kilowatt hour?

**Mr UPSON:** That is a topic I could probably talk about for two hours. But it is a very important point. The long-range material cost, or the marginal cost of wind energy, is roughly twice that of a coal plant, if the coal plant does not have to pay for its emissions. However, that is not how the wholesale electricity market works. The wholesale electricity market is an auction system where you bid at a certain price, and you tend to bid at your short-run marginal cost, not your long-run marginal cost. Once you have built a coal-fired facility, once you have built the windfarm, you have sunk the cost, and then it is an issue of your incremental cost of operating it. Of course, as you can appreciate, the incremental cost of operating a windfarm is near zero. That is obviously a lot less than a coal-fired or gas-fired generator, where you are paying for the fuel.

Wind energy actually functions in the market as a price taker; if we have to bid into the market, we can bid in at essentially zero, or $5 a megawatt hour, undercutting all the fossil fuel generators. Three out of four independent studies—none of which were written by companies that favour the Renewable Energy Target Scheme, or were sponsored by companies that favour the scheme—show that the Renewable Energy Target Scheme will apply downward pressure on wholesale prices of electricity. Basically you are building additional electricity-generating capacity that would not otherwise have been built. By simple supply and demand, if you increase the supply, the price tends to fall, other things being equal. All those studies show that, even though it is an impost on the retailers under the Renewable Energy Target Scheme, the actual impact in real life of how it is going to run in the wholesale electricity market is that the Renewable Energy Target Scheme could end up reducing the wholesale prices more than the impost on the retailers.

**The Hon. RICK COLLESS:** That does not include the cost of providing the shadow capacity, does it?

**Mr UPSON:** There is no cost of providing shadow capacity today.

**The Hon. RICK COLLESS:** I put it to you that there is. Whether or not you include that cost is the issue. If there were no coal-fired power stations in Australia and we were going to have everything driven by wind power, we would need some shadow capacity there to generate when the wind does not blow. You have talked about Denmark and how they fire up their generators or buy power from Germany, and in effect that is shadow capacity. It has to exist in the system somewhere.

**Mr UPSON:** Yes, but you just made the point. It already exists. No one has to pay for it. It already exists today.

**The Hon. RICK COLLESS:** But what I am getting at is that I am not saying it does not exist: it is a matter of whether you include that as part of the cost factor with the cost of wind generating.

**Mr UPSON:** But there is no incremental cost. If you build another wind farm, you do not have to build another gas turbine generator to back it up. That surplus capacity exists in the marketplace today. It is built by companies that do that work, and they do it profitably. There is no additional charge to the wind farm owner or anyone else for that. The wholesale national electricity market exists in a continual state of oversupply. It has to accommodate the loss of the largest generator or of the largest transmission line at a moment's notice. Here in New South Wales the largest generator is 660 megawatts. That 660 megawatts can disappear like a snap of the fingers. It can just trip off line and it is gone. Do the lights go out? That has happened. Did the lights go out? That does happen during the year. Do the lights go out? No, they do not because the market has systems and hardware in place to support that kind of loss in generation.

Say a wind farm generates 140 megawatts and say it is going flat out and then the wind dies down over 10 or 20 seconds and it is down 100 megawatts. That gradual loss over 10 or 20 seconds of 40 megawatts is nothing compared to losing 660 megawatts in an instant. The market can accommodate those kinds of variations, just like it accommodates the changes in demand. They can forecast the changes in demand in the electricity market, but there is no guarantee. Someone can turn on and off this dairy, this factory, this office building or whatever; the demand is constantly changing. The national electricity market has to accommodate those changes in demand just like it has to accommodate changes in wind energy generation.

At some point, if you got up to 50 per cent wind energy penetration, you might have to then build another gas-fired generator to smooth it out in that particular State. But we are so far away from that now, with less than 1 per cent of electricity New South Wales made by solar and wind, that we will not have to worry about that problem for a long, long time.

**The Hon. RICK COLLESS:** I take your point that their capacity is already there, but you do agree, do you not, that if we go down that line of more than 50 per cent wind energy, there still needs to be a shadow capacity for when the wind does not blow?

**Mr UPSON:** At some point you reach a point in a certain region—it is really region by region the way that the Australian national electricity market is organised and you have States within interconnectors in between them that are not infinite in their capacity—basically to get the next wind farm built, and somebody has to build a gas-fired generator or something else. But historically, in Europe that has not happened yet. There has never been a wind farm that was held up because somebody else had to build a gas-fired generator. In the future

at some point, that may happen. I am not aware of it ever happening anywhere in the world. But theoretically at some point you might have to do that.

**The Hon. HELEN WESTWOOD:** What is the life of leases you have with landowners?

**Mr UPSON:** I guess I would prefer to answer your question in a more general way because I do not really want to necessarily talk about commercial documents. But it would be appropriate to say that most wind energy developers have leases that run anywhere from 20 years or 30 years. That would be a kind of a typical length.

**The Hon. HELEN WESTWOOD:** We heard evidence earlier of a 99-year lease. That is not common in the industry?

**Mr UPSON:** You could probably guess from my answer that our company does not use those.

**The Hon. HELEN WESTWOOD:** In your submissions with reference to land valuations, you say that there is not enough evidence around or you do not have enough sales to get an accurate picture of the impact on land valuations. Is the company monitoring that or looking at land sales around wind farms?

**Mr UPSON:** Our submission stated that it is incredibly difficult to quantify the effect of having a large infrastructure project like a wind farm next to an adjoining property. Say you have a proposed wind farm—take the example of our one near Orange—and somebody sells a farm next door to a proposed project and they get X amount of money for it. How do you prove that they would have gotten more or less if the wind farm was not there? There is no parallel universe where you can now go and say, "Okay, what would you have gotten if the wind farm wasn't there?" It kind of reminds me of the former Prime Minister. I thought it was very clever when he promised just before the election before last that interest rates will always be lower under a Liberal Government. That is very clever because of course that promise will never be disproved.

Likewise, doing studies of neighbouring landowner values—I was interested to hear that the Government is undertaking that—is quite problematic, but I think it is good to at least try to do them. However, I think you have to recognise that it is pretty difficult. We certainly are aware of reports in the paper of real estate agents saying that property values are going to go down 30 per cent. Another issue you have to think about is that if everyone is in the newspaper saying that, basically they are talking down the property prices. If you were going to buy a property in that area, you would take note of that and you probably would not necessarily offer top dollar.

But I will give you some information on an experience I had in Victoria. I had one hobby farm and one actual working fair dinkum farm sold next to a proposed project of mine. Both the sales ended up with going up by 30 per cent over a couple of years. The properties were actually bought without the wind farm being known about, or at best the wind farm had not started, and then they were sold once the wind farm project was well known in the community. They still went up quite high. No-one complained about the price they received from it. On the other hand, there also was not an article in the paper saying what a disaster the wind farm was going to be.

**The Hon. HELEN WESTWOOD:** Do you pay into a community fund for services back to the community?

**Mr UPSON:** With all our projects we certainly do. As a good corporate citizen, we make donations to various community funds and sporting clubs and we make donations to various organisations. Here in New South Wales it is basically mandated by section 94 contributions. We would do it anyway, but it is actually mandated here so it gets done anyway as a matter of course.

**CHAIR:** In terms of setup, has your organisation received any complaints about siting, vegetation clearing involved in siting, and any concerns about communication between your organisation and the local community, such as that there is an expectation that the wind farm would be going ahead and the local community was somewhat left out of that?

**Mr UPSON:** I guess there are two separate questions there. I was kind of thinking of your second question first. Your first question was?

**CHAIR:** I have heard some complaints that the reality is quite different to the presumption that these installations will be on cleared land.

**Mr UPSON:** That is it, native vegetation.

**CHAIR:** I heard complaints that there is actually significant vegetation destruction.

**Mr UPSON:** Normally, some of the projects that I initiate and work on are primarily on cleared pastureland. There are usually some scattered trees around and we typically design the project around those trees and try to minimise the number that would have to be removed. I have worked at a number of projects where there is no native vegetation removal. I think that is one of the real advantages of wind energy: It typically goes on cleared farm paddocks. Yes, there might be some native scrub and things like that that might have to get removed for tracks and stuff, but it is usually pretty minimal and it is still of course farmlands anyway. It is not really a nature reserve.

The farmer obviously wants to maximise his production anyway and have more cropping land. I think it really is a very compatible use of farmland. If the farmer loses six metres in diameter for each turbine, which is of course not of any consequence, once the wind farm is built that is all he has lost as far as production is concerned. The second question was?

**CHAIR:** Community consultation. If you have had any experience of where there has been dissatisfaction with the level of community consultation?

**Mr UPSON:** To be honest, some of the projects I have worked on there have been some complaints about and—as you might not find surprising—I probably had a differing view. But I think it is important to recognise that sometimes in community consultation if you talk to someone and they say: Look, this is the worst thing that could ever happen. I think these things are the most ugly monstrosities that could ever be put on a hillside. I do not want the project to go ahead in any shape or form. And then if you decide to proceed with the project, despite their objection, they can sometimes complain they have not been consulted. Of course, they were consulted but we simply did not agree with their view. On the other hand, if you talk to someone and they say: Look, I think the project is basically okay can you not have a turbine over there because that is really going to be a problem with views, or whatever, and I would really prefer if could try and find a way not to do that. We can certainly work with neighbours on that kind of basis. But if someone says they want the whole thing not to proceed—we put in our planning application first, they make their submission and it is obviously up to the Government to decide whether the project goes ahead or not.

**CHAIR:** Where are the turbines made and how much market penetration would be necessary before it is even worthwhile for production of aspects of the equipment being undertaken in Australia? Or is that just pie in the sky?

**Mr UPSON:** No, it was not pie in the sky two years ago. Tasmania had a nacelle factory—a factory that assembled nacelle—that I had the pleasure of touring. The nacelle is the housing at the top of the tower that the blades are attached to. It does not look like much when you are standing on the ground but when you actually see what is inside of it, there is 80 tonnes of hardware, gearboxes and generators and structural members inside. It is a very, very complicated piece of machinery. Those were assembled in Tasmania and then basically when the Howard Government decided not to extend the renewable energy target that factory was closed. There was also a blade factory in Portland. Unfortunately that factory ended up being closed as well.

At the moment basically the great majority of towers are made in Australia. Towers are similar to pipelines and other things, so there are companies that make the towers. There is a very successful company in Victoria; Keppel Prince, that employs over 100 people doing that. There are three or four other companies that make towers as well. Unfortunately today the nacelle and the blades are imported, which is regrettable, but with the renewable energy target legislation being passed I certainly would hope that a manufacturer will see fit to open up a factory making some of those components in Australia. Certainly the blades are a huge transport expense; they are very cumbersome to transport. We hope that one of the companies will get enough business and see enough future in it that they will locate a blade factory or some other factory here, but obviously you will have to talk to them as to whether there is a real business case. I think there is certainly a real possibility. There is no possibility without the renewable energy target scheme, but now there is one.

**CHAIR:** In your submission you discuss the issue of grid stability and how intermittent renewable sources such as wind do not currently pose a problem as they represent little market penetration. So even in 2020 if the variable energy generation rose to 10 per cent it would not be a significant issue. However, what would happen if wind penetration exceeded what the grid was capable of managing, and how would that issue be resolved?

**Mr UPSON:** By citing the overseas examples I think you will see we are not going to approach anywhere near where we are overseas with wind penetration here in New South Wales for quite a long time to come. It is not like falling off a cliff. In other words, the next wind farm does not send the grid into absolute chaos. It is really an issue of getting the equipment you need to keep the reactive power and the frequency control and things like that in the international grid rules, which are very tight. In order to keep that stability might require a little bit more equipment, or a little bit more expensive equipment to do that. It is an incremental thing. It is not just that the next wind farm send the grid into chaos. It is more an issue of the stability hardware that you need might be a little bit more once you get to 15 or 20 percent. But you can see these other countries and other regions are much higher—even South Australia—than New South Wales. It is really a problem firstly that we can look to overseas to see how it is solved and, secondly, it is not something you are going to have to worry about for a long time.

**The Hon. ROBERT BROWN:** You worked in Victoria and now you are working in New South Wales?

**Mr UPSON:** Yes.

**The Hon. ROBERT BROWN:** From the point of view of the planning laws and the requirements for getting your developments up, how would you compare the two? Which is the strictest? Are there any problems with the planning laws in New South Wales from an energy developer's point of view?

**Mr UPSON:** It is not really an issue of planning law; it is just an issue of how the process is run. In Victoria we actually have wind energy guidelines that were written quite some time ago—probably six or seven years ago—that actually detail exactly what is expected from the wind farm developer, what kind of information and studies they require. In New South Wales there is a draft set of guidelines that were not enacted but are quite similar. As far as the level of studies required and things like that, and I guess the rigour of the planning assessment system, I would say it is quite similar between Victoria and New South Wales. Victoria is quite a bit slower, which is not such a good thing. They have a planning panel system that tends to lengthen the process quite a bit, which you do not have here. That is why takes a bit longer in Victoria.

**The Hon. RICK COLLESS:** The Committee took some evidence before lunch about the life of wind farms. I think you mentioned something like a 25- or 30-year lease that you have on property?

**Mr UPSON:** Yes.

**The Hon. RICK COLLESS: W**hat are your plans for dismantling and rehabilitating the site when that wind farm is decommissioned?

**Mr UPSON:** In our agreements with the landowners, and typically, of course, the State Government, the development approval conditions will specify the same thing. Basically all the hardware above ground is removed, so all the turbines are taken away and the substation switchyard; however, it is not practical to remove the concrete foundations so we put—I do not know the exact amount—probably almost a metre worth of soil or three-quarters of a metre, or whatever, of soil and resew over it and basically when you are done you would not know there had been a wind farm there at all. So it ends up probably a year later, once the deconstruction activity had settled and the pastures had been resewn, that you probably would not even know that the wind farm had even been there. That is one of the real advantages of wind energy. In a lot of other things such as a coal-fired station with a mine next to it does not get any rehabilitated anything like that.

**The Hon. RICK COLLESS:** I want to ask about the structural integrity of the towers. Are they given a particular wind speed rating or a storm rating in terms of damage?

**Mr UPSON:** It may have been discussed before, but when the wind speed exceeds a certain level—it is roughly 100 kilometres an hour for a sustained period, depending on the model of turbine—then the blades are actually turned to face the wind. Then there is no reason for them to go around and eventually the turbine comes

to a stop. There is a braking system that grabs the rotor at that point and holds it still. If you had a class five hurricane or something come through you might actually knock it over. But short of a catastrophic storm such as that you would never cause a turbine to fall over.

**The Hon. RICK COLLESS:** So tornado intensity winds could damage them?

**Mr UPSON:** If a tornado actually struck a turbine or had a direct hit on a turbine it would probably break it, yes. But it would be turned off so you would not have the issue of the blades flying any more than they would have just because of the tornado.

**CHAIR:** Thank you for your evidence. Do you have something to add?

**Mr UPSON:** I do. Actually I was kind of surprised because I figured after the *Current Affair* television show I might have been asked this—if it has not been brought up before. As you know, New South Wales uses South Australian noise guidelines and they are in the process of getting revised. I did note in here—this is essentially the final draft of the guidelines—they actually talk about infrasound and I thought the comments might be useful for the Committee. The document, which is from the South Australian EPA, states:

> Infrasound was a characteristic of some early wind turbine models that has been attributed to early designs in which turbine blades were down wind of the main tower. The effect was generated as the blades cut through the turbulence generated around the down wind side of the tower. Modern designs generally have the blades up wind of the tower—

in fact, they basically all do—

> Wind conditions on to the blades and improved blade design minimises the generation of the effect. The EPA has consulted the working group and completed an extensive literature search but is not aware of infrasound being present on any modern wind farm site.

**CHAIR:** Thank you for that. It is good information for the record and our deliberations.

**(The witness withdrew)**

**CHRISTIAN DOWNIE**, PhD Scholar, RegNet, Australian National University, Canberra, ACT 2000, sworn and examined:

**CHAIR:** In what capacity are you appearing before the Committee? Are you appearing as an individual or as a representative of an organisation?

**Mr DOWNIE:** In my personal capacity.

**CHAIR:** Are you conversant with the terms of reference of this inquiry?

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

**CHAIR:** Before we ask you questions, would you like to make an opening statement?

**Mr DOWNIE:** First, I thank the Committee for inviting me along to give evidence today. I will give a brief statement which comes from the submission. In recent times concerns have been raised about the growing number of wind farms and their impacts on communities and the environment. Many of these concerns, in our research, have been fuelled by well-organised anti-wind farm groups, modelled on similar establishments in the United Kingdom and the United States. By spreading some disinformation about wind energy, these groups have, I believe, successfully persuaded many people that wind energy does not have a legitimate role to play in addressing the challenges posed by climate change.

As you would have seen in the submission, we went through and had a look at some of the main arguments used to justify opposition to wind farms. They include that wind energy is not competitive, that wind energy increases the cost of electricity, it is not efficient, and that the variability of wind energy causes problems. Other arguments include the fire risk from turbines, the noise pollution that you just spoke about, impacts on biodiversity, landscape and heritage values, and the impact that wind farms have on property prices. Essentially, as it says in the submission, we went through and looked at each of these arguments one by one, and we found that the evidence indicates that almost all of these arguments lack substance. Of these, the only concerns that have merit as far as we were concerned are the impacts of wind developments on biodiversity and landscape and heritage values.

**CHAIR:** Your submission suggests that wind energy is the most cost efficient source of renewable energy and that if social or environmental costs were taken into account wind energy could be competitive in price with coal- and gas-fired power stations. Having said that, the unit cost of wind power is currently still much higher than coal or natural gas. In relation to the feasibility of using wind energy to contribute to the Government's proposed renewable energy target, how can wind power be a viable alternative when the unit cost remains at its current level?

**Mr DOWNIE:** As you say, wind energy is probably the most competitive of all the renewable energy sources, but it is still more expensive than fossil fuel per megawatt hour, particularly coal and gas. The evidence indicates that if electricity generators had to internalise the costs of pollution, wind energy would be competitive with coal- and gas-fired power stations. And also, of course, economies of scale and continuing technological improvements are likely to improve the efficiency of wind power. Projections suggest that wind power would be competitive with all forms of electricity by 2020. But the point is that even as we stand companies are investing in wind energy and wind energy is a commercially proven technology that is currently financially viable and growing as part of the energy mix in the national energy market.

**CHAIR:** You mentioned in your statement and in the material that you have presented to the inquiry the relationship of wind farms on the value of property. I note the number of studies that have been undertaken in this area. I am interested in the studies that relate to the actual, rather than the perceived, impact on property value in areas where wind farms have been constructed. Can you speak a little more about such studies and any limitations in their findings at all?

**Mr DOWNIE:** There has been limited evidence, as the last speaker mentioned, of the impact on property prices, especially in Australia. In our submission, the only real evidence we could find was from overseas studies. Confining my answer to the transaction-based studies, which are those that look at the changes in price, rather than survey-type studies where they interview real estate agents, realtors, et cetera, the transaction-based studies found that wind farms do not on the whole have a negative impact on prices. But to

date there is only a small amount of studies done overseas. So to say that that is conclusive is probably stretching it a little bit. But the findings from those limited studies indicate that there is no real impact on property prices. If you were to add that to the survey-based studies, the evidence indicates that even when there is a negative impact on property prices initially that seems to dissipate rather quickly.

**CHAIR:** The previous witness went into some detail explaining the newer design of wind farms in terms of noise mitigation. In your submission you have stated that noise issues are somewhat negligible. Can you go into more detail about that in terms of noise, type of terrain, type of environment, when the wind is blowing hard, and associated noises? Some submissions in general have been keen to point out that in these country areas you can hear a sheep on the next ridge line, so to speak. So there is a low level of background noise naturally. Can you perhaps enlarge on that or reinforce your perspectives on that?

**Mr DOWNIE:** What we did when we were going through this argument, like all the rest, was we surveyed the current literature and looked at the studies that have been done of them. Some of the studies that we sighted have been done by the Wind Energy Association, some by community groups, some by independent universities, et cetera. On the whole the evidence suggested that noise pollution is negligible and the studies state that in fact it is possible to stand beneath a wind turbine that is moving and have a conversation without raised voices. That gives you an idea of how limited the noise is.

The studies also show that a modern, 10-turbine wind farm would create a sound pressure level of about the 35 to 45 decibel level. I think the previous witness said about 40, so within that band. To put that into perspective, there was a table in our submission which compared: a wind farm of 10 turbines is 35 to 45 decibels; a car travelling at 64 kilometres per hour, if you are 100 metres away, is about 55 decibels; a jet engine plane at 250 metres is about 105 decibels. It is still much lower than all of these. Talking about background noise in rural areas, obviously it changes depending on whether the sheep on the hill is making much noise. But essentially it is about 20 to 40 decibel levels. On the whole, we are talking about the equivalent background noise to what you would find in a rural area at night.

**The Hon. RICK COLLESS:** In relation to background noise, I will relate a personal experience. When I am in Sydney I have a unit at Erskineville, right alongside a busy road. With the window open, it is possible to have a conversation inside the unit without raising voices. But I cannot sleep at night with the window open, and it took me quite a long time to learn to sleep at night with the window closed because of the road noise. With the window closed the road noise is probably 35, 40 decibels. But for someone who lives in a remote area, that is a lot of noise at night. That is one of the issues that has been raised with me. For people who live next to existing wind farms, it is that gentle, low intensity noise at night that really aggravates them—more than anything else, more than the noise in the daytime. Noise does not particularly worry me in the daytime either, but it is the noise at night. These people live in areas remote from busy roads, traffic noise and aircraft noise. That is where these wind farms are located. It is the background noise at night that annoys people.

**Mr DOWNIE:** If I could respond by referring to some of the surveys that we cited in the submission. We cited European surveys that have been done of residents asking them basically the questions that you are talking about. To give you the exact figures, these European studies of residents in Denmark, the Netherlands and Germany found that over 90 per cent of residents were "not annoyed by noise from wind turbines". There is a lot of survey data from residents. Obviously 10 per cent were; there will always be people who are annoyed. But over 90 per cent were not annoyed by the noise from wind turbines.

**The Hon. RICK COLLESS:** Do you have any figures for people who live next door to wind farms in Australia?

**Mr DOWNIE:** We did not find any data. This was done in 2006. We did not have any resident survey data on that for Australia. In most cases, the technology is not that dissimilar.

**The Hon. RICK COLLESS:** The technology is not that dissimilar, but surely the people who live in rural areas in Australia would be vastly different from the people who live in much more closely settled areas in rural Europe—yes or no?

**Mr DOWNIE:** The noise from a wind turbine is, as we said, 35 to 45 decibels. I can only cite the survey data that is there. On all accounts, the data indicates that the noise pollution from wind turbines is negligible.

**The Hon. ROBERT BROWN:** Reading the title on your submission, you are from the Centre for Climate and Environmental Governance and the Regulatory Institutions Network of the Australian National University. I take it your PhD dissertation has something to do with the regulatory side?

**Mr DOWNIE:** It is in the area of climate change. It is more focused on international regulation. What I am talking about today is work that was done in my previous job.

**The Hon. ROBERT BROWN:** Is most of the research upon which the institute based its submission literature study?

**Mr DOWNIE:** Yes. Obviously they are not the views of the institute. They are my personal views.

**The Hon. ROBERT BROWN:** I understand. I am trying to get the background.

**Mr DOWNIE:** It is based on literature surveys, but for some of the issues we did primary research. For example, in the area of fire risk we did some telephone surveys, et cetera. So it is a mix.

**The Hon. ROBERT BROWN:** Will you do any further direct research on these issues, such as telephone surveys on noise?

**Mr DOWNIE:** In my personal capacity I will not and I am unaware whether the institute will in the future.

**CHAIR:** It has been suggested that baseload power cannot be met through the use of wind farming alone and that wind farms still depend on coal-fired power stations to support them. You have reported that wind power should be seen to reduce load rather than supply baseload power. Given the current position of wind energy in New South Wales, does your research suggest it is feasible that wind power in New South Wales could ever supply or make up baseload power?

**Mr DOWNIE:** As it stands, wind power does not provide baseload power. But as the previous witness said, the way the national energy market is structured it really does not matter at the moment. These issues of variability—people say the wind does not blow all the time—and efficiency, to be very blunt I think the response is it does not matter if wind farms are very efficient because wind farms, like all other types of electricity, do not operate 100 per cent of the time. They usually generate between 20 per cent and 40 per cent of their maximum capacity. The fact that they do not operate 100 per cent of their capacity 100 per cent of the time is immaterial. The critical issue is whether they can supply electricity at a price that is competitive in the market so that it will be sold. The fact that they do, the fact that financiers and big companies continue to invest in them is testament to their efficiency.

Also on the issue of variability, at the moment there is a very low penetration of wind power and other intermittent sources in the national electricity market. The study suggests that, I think, about 0.5 per cent—the exact figure is in there—at the moment is from wind energy or intermittent sources and that we can go up to about 20 per cent penetration of wind power or other intermittent sources. So we have a long way to go—I guess I am repeating very much what the previous witness said—until we would have any trouble with wind power not being able to provide baseload power.

**CHAIR:** We are seeing an industry and technology moving forward at a very rapid rate. There has been comment that turbines were situated downwind and now they are situated upwind, which is making a difference in noise levels and, I presume, efficiency. Is it possible that we could end up with an obsolescence problem with the older forms of turbines? Should this issue be addressed?

**Mr DOWNIE:** To be very honest, it is not something we investigated. I would be happy to take that question on notice.

**CHAIR:** Yes, if you could get back to the Committee on that.

**The Hon. HELEN WESTWOOD:** In your submission you did not discuss the issue of visual amenity, which is one of the main objections to the development of wind farms. Did you examine that issue or did you consider it such a minor issue that you did not report on it?

**Mr DOWNIE:** I think we did kind of refer to it in the section where we are talking about landscape and heritage values. Landscape values are essentially the aesthetics as well. At the beginning I did say that most of the claims lack substance. This was one of the ones that does have merit. When poorly sited, obviously, wind farms can have an adverse impact on landscape and heritage values. If appropriate planning procedures are put in place the risk to landscape and heritage values should be minimal.

This is a very subjective issue. Some people like the look of wind farms, some people simply do not care and others do not like them. You have to start looking at resident attitudes. You can take anecdotal evidence as well but if you are going to go down the evidence-based policy-making role it is good to look at survey data. As I mentioned before the survey data suggests from European studies that most residents on the whole do not find them to be a problem.

**The Hon. HELEN WESTWOOD:** In your literature search was there a remedy? Did some developers have discussions about changing colours, for example?

**Mr DOWNIE:** As far as changing colours or particular ideas like that, that is not something we came across but the general consensus is that it is about getting the proper planning procedures in place and making sure that they are adhered to.

**CHAIR:** In relation to bat and bird strike and the impact on biodiversity, how effective is the siting of wind farms to avoid that? Evidence has been given that the strike rates are small compared to other activities such as land clearing. Will you clarify the impact particularly in relation to endangered species? I understand raptors are vulnerable. Will you comment on that?

**Mr DOWNIE:** As seems to be the sad case, most of the evidence is from overseas because there is nothing in Australia on bird and bat collisions. Again we had to turn to overseas research. It basically says that the mortality rate for bird and bats is approximately five per year per turbine. So if you take that as a rough guide, just to extrapolate it out for Australia, that is around about 2,500 bird and bat deaths per year from all wind farms in Australia in 2006. As you mentioned, that is a lot less than we see from other things. We did cite land clearing. WWF did a study of the effect of land clearing in Queensland alone in the 1990s and there were approximately 8.5 million deaths from birds. So when you are talking about 2,500 deaths from birds and bats, it is much smaller.

Obviously, of course, you have got to make sure that when you are siting wind farms you take into account migratory routes of birds. Ideally you would give preference to protecting native species. There could be some environmental benefits from non-native species. So it is about properly siting it. But I think with all those issues what are we working towards with wind power? Well, we are facing the dire threat of climate change which will have a much greater impact on biodiversity and habitat. I think those risks at 2,500 birds dying have to be considered in light of the damage that will be done if we do not move towards a more carbon-constrained economy.

**CHAIR:** Do you have any information on threatened or endangered species that have been impacted on?

**Mr DOWNIE:** Yes, in the submission we touched on Tasmania, where I think there was concern about the wedged tail eagle. I do not have the exact figures in front of me. From memory, I think they said that most of the deaths of the wedged tail eagle came from other human causes, such as cars, shooting and poisoning. I think they said from wind turbines about one or two out of the 170 that died in the year the study was done.

**CHAIR:** Should we look at collecting Australian data on that type of impact? You say, you have a lack of Australian data and you are relying on overseas material. Would that be the responsibility of, say, the proponents or companies who are setting up the wind farms?

**Mr DOWNIE:** It is definitely something that might be worth looking into, I think, especially where there is existing evidence of studies of a wind farm being proposed where there are migratory routes, especially of endangered species, then it is something I think should definitely be considered. But I think it is probably best that it is something that is written into the planning that is looked at on a case-by-case basis because obviously there are cases where wind farms are being sited on cleared farming land where perhaps there is not much bird life as it stands. It is probably something that needs to be looked at case by case.

**The Hon. RICK COLLESS:** A lot of bird species including the wedged tail eagle live in forested areas and feed in cleared areas. Just because wind farms are located on cleared land, but forested land is adjacent, which it is in many cases, birds could still be at risk, could they not?

**Mr DOWNIE:** I guess that is a perfect example of why you would take it on a case-by-case basis because if there is cleared land with adjacent forest that would be a case where you have to perhaps look into it. On another case where there is cleared land, and no adjacent forest, perhaps you would not.

**The Hon. RICK COLLESS:** For example, if there were a known population of wedged tail eagles adjacent to a proposed wind farm, would you consider that is enough reason to review that proposal very carefully?

**Mr DOWNIE:** I think it is one of many factors that have to be considered. Then again if there is a small number of wedged tail eagles being killed—I think these things can be exaggerated and manipulated as well. We saw what happened in Victoria under the former Federal Government with the Bald Hill wind farm and the orange-bellied parrot. I think we have to make sure that we do not use two or three bird deaths—let us not go to exact numbers—but a small number of bird deaths to justify scrapping a big wind farm. We have to take it into account along with all the other factors. But certainly it is something that we should consider.

**The Hon. ROBERT BROWN:** Referring to regulatory requirements for the planning of wind farms, the planning authorities, no matter where they are, have developed lots of plans and regulations based around things that can be needed. Noise is a perfect example. Noise monitors can be set up 2½ kilometres away and the noise from a wind turbine can be measured. The Hon. Helen Westwood referred to landscape and heritage values—in other words, what it looks like—is not something to which you can attach measurements. Given that most objections appear to be either noise, and even more so, visual impact, how do you see regulation approaching something that is so objective such as "I don't like the look of it"?

**Mr DOWNIE:** When you have got something that is subjective by definition it is very hard, as you correctly point out, to come up with a measurement, and measure it like noise. So as in most regulatory frameworks you have to deal with it with community consultation by explaining the pros and cons of the proposals to residents. But, just like any other form of development, there will always be aesthetic impacts whether it is a new high-rise or whatever it happens to be. So I do not think it is particularly different to any others. Of course, a wind turbine, on the whole, will have a less negative impact than setting up a coal-fired power plant or digging a big mine. The aesthetics are quite clearly a lot less. You are right, it is a very subjective thing, and as I said some people are going to like them and some people are going to hate them and most people, according to the survey data, suggest that they do not mind and they do not find it to be a big problem.

**The Hon. ROBERT BROWN:** Is your answer that because it cannot be measured the regulatory approach to it is probably just to flesh out the consultation side of any setting of regulations and leave it at that? In other words, talk to people and see what they think to try to get an idea of the overall view? A planner will then try to make a decision based on that.

**Mr DOWNIE:** Yes, but obviously you have to take into account the other motivations for why you would be building a wind turbine in the first place, and that is, most of this push towards renewable energy and the main reason that the Federal Government has raised the mandatory renewable target is to address the problem of climate change. So there are other considerations to take into account when you are developing policy around these areas. The aesthetics of wind farms are one, but I do not think that they should be exaggerated to wipe out all others. But certainly the community's perceptions need to be taken into account, there is no doubt about that.

**CHAIR:** If I understood you correctly, you did not see a great noise issue with current contemporary engineered turbines on site. What about infrasound, the sound that is below the level that humans can detect? Do you have any information on those impacts? Also, would you comment on the idea of some sort of two-kilometre buffer zone to be given to residents in the area that are not part of the wind farm project? I understand that sometimes neighbours are closer to the apparatus than the owner of the property who is getting the benefit from the wind farm.

**Mr DOWNIE:** I have not looked into a two-kilometre buffer zone. I am not sure whether one, two or three kilometres would be appropriate. But, as we were saying, noise is something more objective so it could be measured to see where an appropriate buffer zone would be, if there should be one. That is something that

would need to be investigated. I do not have evidence on that, so unfortunately I would not be able to provide any commentary on that.

**CHAIR:** What about infrasound, the sound levels below what humans are aware of?

**Mr DOWNIE:** Again, we did not look at that. Unfortunately, I cannot provide any testimony on that.

**CHAIR:** Thank you very much for appearing today and for the information you have given us in your written submission. It is very valuable for the deliberations of the committee.

**(The witness withdrew)**

**MARTIN POOLE**, Managing Director, Epuron Pty Ltd, Level 11, 75 Miller Street, North Sydney, sworn and examined:

**ANDREW ROBERT DURRAN**, Executive Director, Epuron Pty Ltd, Level 11, 75 Miller Street, North Sydney, affirmed and examined:

**CHAIR:** Are you conversant with the terms of reference of this inquiry?

**Mr POOLE:** Yes.

**Mr DURRAN:** Yes.

**CHAIR:** We have your written submission. Would you like to make a short statement before we ask questions?

**Mr POOLE:** Thank you for the opportunity to appear. I just want to use a couple of minutes to give you some background to our company and also to highlight the three most important areas that we believe are presenting themselves through this inquiry and through the evidence you are hearing today. First of all, Andrew and I established Epuron in 2002 and incorporated the company in 2003. We did that because we could see then that New South Wales energy demand was continuing to grow and that there was going to be a continuous need for new capacity into the future. We had a belief then, which is even stronger today, that wind is an important part of the future energy mix. We could see back in 2002 there was very little wind around and nobody was prospecting much for any new wind. That was a very interesting opportunity to us.

You obviously have our submission. We would like to emphasise some points, and having heard some of the evidence and questions these are obviously things that are important. First of all, New South Wales has enormous potential for wind power. There is enormous scope to supply all of our energy consumption growth from wind and more. New South Wales has wind resources as good as most of the rest of Australia—better than most Australia and as good as the best bits of South Australia, which pick up the Roaring Forties. There are not so many wind explorers in New South Wales at the moment, which is good for us commercially because it is less competitive here than it is in some areas like western Victoria. People are now realising that New South Wales has a great wind resource and are looking around. New South Wales is going to see a lot more wind capacity.

One big advantage that New South Wales has over other windy areas such as South Australia and western Victoria is the sheer size of the State. The diversity in New South Wales of the windy areas that we have is unparalleled in Australia. There are opportunities for wind generation in the Northern Tablelands, the Southern Tablelands, right out at Broken Hill where our company is working on a big project, and the Monaro region. The wind is diverse between different areas, which means that if you distributed a large capacity of wind around New South Wales it would be much less intermittent or variable than any individual turbine or individual wind farm. That is an enormous benefit to New South Wales and it is really just luck. It is to do with climate and topography and the size of the State.

We have a network of monitoring masts around the State, as you will have read, and we have used data from those masts over the last seven years to compare with electricity supply in the national electricity market on a half-hour basis, and we have done a lot of analysis of how energy demand would have been met by a certain amount of capacity of wind distributed around the State, and the results are highly encouraging. Wind carries a very large fraction of its capacity factor in terms of baseload and peak power supply. So wind power is adding power when the system needs it, and it can do that reliably in New South Wales—possibly more reliably than the South Australian wind farms—because of the sheer diversity and size of the State and the different wind regimes that we have. I am happy to go into that in more detail.

The last point we would like to bring out is, having been through five planning processes under the New South Wales Environmental Planning and Assessment Act Part 3A, we think it is rigorous, it is exhaustive and it covers all of the considerations that need to be taken into account in siting and planning wind farms in New South Wales. It is possible, as an earlier witness mentioned, that the process could be more efficient and streamlined, but it is our belief that the underlying process, which has been in place for many years, is well proven and sound.

**CHAIR:** We have often debated in the House alternative energy and coal, and there are those who are very strong adherents to the belief that the coal-fired power industry is here for the foreseeable future and we cannot avoid it. Would you care to comment on that?

**Mr DURRAN:** I think it is perfectly true, we cannot avoid it, and there is an argument as to whether we want to or not. At the moment coal makes up 90 per cent of New South Wales' electricity consumption. It is going to be doing that for quite a few years yet. The question for us really is—we are still growing in terms of energy use and there are a number of coal-fired power station proposals on the drawing boards at the moment—should our growth be coming from coal or should our growth be coming from something cleaner? And how does coal continue to generate power and take into account the emissions that it causes, which is clearly something that it has to do into the future and has not had to do in the past.

**CHAIR:** The Committee has had discussions about the New South Wales wind operators that are required to adhere to the South Australian Environment Protection Authority guidelines when determining maximum noise levels of wind power infrastructure. Could you outline the processes that Epuron undertakes in the event that a complaint regarding noise from a wind farm is received from a local resident? How are such issues resolved by your company?

**Mr DURRAN:** I am happy to explain the process that we go through. Obviously it is a core part of the planning process in New South Wales to focus on noise, because it is one of the biggest issues. The noise assessment starts a year or two before we get an approval by putting background monitoring stations around the residences, around the site, to measure the background noise levels and understand what is going on. We then go through a fairly lengthy process of analysing that to predict the expectations and we present that to the Department of Planning. The department assesses it and confirms that the predictions are within the guidelines. After we have built the wind farm, we reassess the wind farm and prove that it was built in accordance with the predictions.

For the life of the wind farm we have control measures that come out of the consent conditions to make sure that we are managing noise, even if there is a problem. Those include things like providing acoustic mitigation for new houses in the areas that have not been built on the day that we start operating. We have to provide acoustic mitigation if there is a noise problem.

**CHAIR:** Are you talking of soundproofing individual dwellings?

**Mr DURRAN:** Or other mechanisms. There are a number of mechanisms for adjusting noise output once the wind farm is in place, but soundproofing is a pretty good way of doing it. Helping them with appropriate building design is another good way of doing it for a new building. Obviously the existing building should already be covered adequately. Even after that, you can always get complaints. I am not going to pretend that the models are perfect, and I am not an acoustic engineer, so I am not going to pretend that I fully understand the science. The Department of Planning has taken that into consideration in the way that it assesses wind farms. It puts a requirement on wind farm operators to maintain a complaints line for a number of issues, one being noise. The department has the ability to require us to go out and carry out additional assessments of noise at any time.

If a problem with noise is demonstrated, that is, if we are not meeting our consent conditions, we have to mitigate. In the first instance, that means to switch the thing off until there is a better way of reducing the noise. In the second instance, it is freely up to us to find a better way of keeping noise levels down if they are not complying. That can come back to turning off particular turbines in specific weather conditions that are causing noise problems. It can come back to going to individual residences and offering mitigation that we had not offered in the first place. It can rely on switching off the machines permanently or pulling them down. But there are a number of mechanisms available to manage noise, and that is why I personally like it as an issue, because it is one I know we can fix. It does not matter where we go, we will be able to sort out the noise issues.

**CHAIR:** In terms of management, you mentioned soundproofing and slowing down the turbines in certain circumstances. Are there any other actions that you regularly take?

**Mr DURRAN:** There are other ways of doing it, but they are the two most obvious ones. If noise is an issue, it is an issue in a very small band of weather conditions. Typically, that is when the wind is blowing at a very light speed, not at a heavy speed, which is what people expect. It is when the wind turbines are blowing at between six and eight metres a second, which is about 20 to 30 kilometres an hour. It is a relatively light breeze,

but the trees around the houses are not being blown around and shaking, so there is not a lot of background noise under those conditions. The turbines are moving, so there is still noise. There is a relatively small window in which you can still get an issue. It is in that very narrow band that we can run into noise problems with wind turbines.

The advantage for us is that the wind is not blowing very strongly, and, therefore, while we might be producing power we are not producing a lot of power. So, if we need to turn off individual turbines in that operation band, we can do that.

**CHAIR:** Is that something that the turbines in that particular locality can be calibrated to shut down automatically under those circumstances?

**Mr DURRAN:** Yes, each turbine measures the wind speed independently. Each turbine has its own control system. You can choose the individual turbines to modify the control system to switch off, for example, at night between six and nine metres a second when it is blowing from the south-west. You can put all of those conditions in and automatically switch them off. So it can be managed, even if there is a design problem up front. To date there has not been a design problem in New South Wales that we know of. That means that not one wind farm is not meeting the consent conditions. Certainly there have been news reports of problems in Victoria and other places, and we are not able to comment on the validity of those, because we do not know what tests have been done. But there has not been an issue in New South Wales to date in terms of an actual wind farm breaching its consent conditions.

**CHAIR:** That is very interesting. How are safety issues addressed in the design of wind power infrastructure with particular reference to the distance between blades and the colour and range wind farm?

**Mr DURRAN:** In answering that, I will pick up on a question you asked earlier. Wind turbines have a number of safety margines built into their design. One key one is that turbines are all designed for a maximum 50-year three-second gust. So there is a prediction carried out on each site as to what the maximum three-second long wind speed might be over a 50-year period. That is the withstand capacity that the turbines are designed for, which is typically 200 to 300 kilometres an hour for a site that they have been designed for. Certified engineers do those designs, and they are all checked by people like Germanischer Lloyd and other international standards organisations to ensure that the turbines have been designed properly.

Part of that involves looking at the specific site to make sure that there are not any particular wind conditions or different directions that the wind might be blowing from that could cause a problem. That analysis is done in the first instance, but, to be honest, the spacing between turbines is not really the issue. The turbines are spaced far enough apart in any case to maximise the energy production of them. There is never going to be an issue where blades are hitting each other from different turbines, or that any structural issues will come into effect because of the proximity of turbines to each other. They are deliberately moved apart to ensure that the windshield from one turbine does not affect the next turbine to maximise its production.

**CHAIR:** As wind blows intermittently, it has been suggested that wind power is required to be backed up by sources such as coal and gas due to the alleged unreliable nature of wind power. How confident are you in calculating emissions savings achieved through wind power?

**Mr POOLE:** Very confident. The reason that we are very confident, and I think this came up in the statement from Jonathan Upson from Infigen Energy. The reason is that the electricity market has a large number of generators in it. Minute to minute the market operator has to decide which generators will run and which generators will be on standby and which generators will be off. The market operator knows what the demand is now, and has a pretty good idea of what it will be in five minutes time—the generators that want to run, be it into the market price at which they are prepared to run. As Jonathan Upson said earlier, wind will generally be a very low or zero price because with zero fuel costs and having already paid for the wind turbine, it makes absolute sense for it to be running whenever it can.

In that case, wind is very likely to be what they call "dispatched" or asked to run, and will very rarely be asked to switch off. The effect of having that bid at zero in the market is that all the other bids move down a little bit and there is a reduction in the wholesale market price of electricity. As Jonathan said earlier, plenty of independent calculations and studies have come to the same conclusion. The other factor about the market, in terms of emissions intensity—which is the point of the question—is that hydro-generators, the largest zero-emission generators on the system, are also bidding low prices if they want to run, or they are bidding extremely

high prices if they are saving a limited amount of water for use as peaking capacity, or emergency recovery capacity.

That all means that what is called the "marginal generator", that is the one that is going to get switched on and off on a typical day, is very often a fossil-fuel generator. In the case of New South Wales, it is a coal generator. When wind is putting capacity into the system, it is very often coal-fired capacity in New South Wales that is being displaced. Therefore, coal is not being burnt and carbon dioxide is not being emitted.

**CHAIR:** Do they actually turn down or turn off the coal-fired generators? I was under the impression that it was a long, slow build up?

**Mr POOLE:** They do not like to turn them off, particularly brown coal generators. But the output is variable.

**The Hon. RICK COLLESS:** What is the percentage? Like the Chairman, I was under the impression that once they are going they are going. That is, they are either going or not going and they cannot be turned up or down very much.

**Mr DURRAN:** Our submission contains a chart indicating a typical daily profile. The minimum night - time load in New South Wales might be 6,000 megawatts or 7,000 megawatts and at the peak on that same day it might be 14,000 megawatts. You get almost a doubling in capacity between the minimum at night time and the maximum during the day. There is a 7,000 megawatt variation on a day-to-day basis. The coal-fired power stations already ramp up for that and take it into account every day. Our adding 1,000 megawatts of wind variation to that is irrelevant.

**The Hon. ROBERT BROWN:** I refer to selling into the market. Did you ever overcome the problem with the New South Wales Government vis-a-vis other State governments about shielding and protecting their own wind generators from having power sold into their grids, or are you still operating with that disadvantage?

**Mr DURRAN:** I will answer that slightly differently. The disadvantage that we have in New South Wales at the moment is that the existing State Government retail companies are not buying renewable energy. AGL and Origin Energy—the dominant retailers in the market—are buying renewable energy because they need it. However, they buy it only in Victoria and South Australia where their load is. There is no-one in New South Wales buying a lot of renewable energy at the moment. That is why you are not seeing lots of wind farms being built. It has nothing to do with how cost effective we are; it is because the New South Wales Government retailers are in the middle of a transaction.

**The Hon. ROBERT BROWN:** In any other industry that would be called transfer pricing. In your opening statement you said that the planning process was robust, but that there were some areas in which you felt the New South Wales planing process could be improved. Can you elucidate?

**Mr POOLE:** I think I referred to it being streamlined or made more efficient. We feel the process is good, but there are times when both we and the Department of Planning could potentially achieve the same result in less time and with less effort being expended. The issue is the number of steps involved and the back and forth discussions that happen in the preparation of an environmental assessment.

**The Hon. ROBERT BROWN:** And?

**Mr POOLE:** It could happen more quickly if there were the will.

**The Hon. ROBERT BROWN:** Do you have any proposals that you could put to the Department of Planning about how that could happen, or is it just a feeling?

**Mr POOLE:** We try to have more than a feeling. We have discussed concrete ideas with the Department of Planning, and it has been receptive. However, change takes some time to occur.

**Mr DURRAN:** The system itself is very robust in terms of the outcome. The process is a bit long and a bit expensive. About 80 per cent to 90 per cent of the cost of a wind farm development is in the development application. Of that, about half is the planning fees that we end up paying the Government. It is an expensive

process and it takes about two years. It is a very time-consuming process. But it is robust underneath all of that, and that is the aim.

**The Hon. ROBERT BROWN:** If you are an aggressive developer, it works in your interests because it takes other people out of the market.

**Mr DURRAN:** You could say that.

**CHAIR:** This inquiry makes recommendations to the Government that it can duly ignore or take on board.

**The Hon. RICK COLLESS:** And it usually does ignore them.

**CHAIR:** I would not agree. If you do have recommendations or areas where you are finding unreasonable roadblocks, please feel free to make recommendations to the committee and we will incorporate them in our report. You can take that as an offer on notice and provide a further written submission if you think it would be valuable for the committee to have certain information.

**Mr POOLE:** We will do that.

**The Hon. RICK COLLESS:** Mr Poole, you mentioned in your opening statement that the potential for growth in wind farms is huge in New South Wales. Do you have a vision of in 20 or 30 years driving from Melbourne to Brisbane on the Hume Highway and having a constant view of wind towers?

**Mr POOLE:** No. A great advantage that we have in contrast to countries like Germany and Denmark, which have very high levels of wind power, is that we have a lot of space. Even if we were to have several thousand megawatts of wind generation in New South Wales, that would be nothing like a continuous row of turbines from border to border.

**Mr DURRAN:** The Silverton wind farm is 1,000 megawatts and it is on a block of land about 20 kilometres by 30 kilometres. The ridgeline of the Great Dividing Range in New South Wales more than 1,000 kilometres long. Therefore, with 2,000, 3,000 or 4,000 megawatts there would be the occasional blip every now and again. There would be little concentrations of them and there would be plenty of space in between.

**The Hon. RICK COLLESS:** Planning issues have been raised with me by various communities around New South Wales and we discussed them earlier today. Part 3A, which these things now fall under, removes the right of local communities to have a significant input into the approval process. It is out of the hands of local government and community organisations and rests with the Minister alone. Can you understand how that has got communities off side when they suddenly have these things imposed on them? I refer particularly to adjoining landowners who will not necessarily get any financial benefit. All of a sudden they hear stories about a wind farm being erected next door and there is absolutely nothing they can to do stop it.

**Mr DURRAN:** I reject the assertion that it gets communities off side. There is a couple of impacts related to what you are saying. First, local councils do not get much of a say. They get a say in terms of the impact on their infrastructure. That is fine and it certainly happens. Frankly, the ones we know do not want a say; they do not want to determine whether or not they are approved because they understand exactly what is going on. That is why the State Government has done what it has done.

Secondly, the communities themselves are not one body; they are individuals. We will table a perception study that examines what people think about wind farms. By far the majority of people like wind farms in Australia, and in the Southern Tablelands, which is where they have been living with them in New South Wales. About 70 per cent of people are willing to live within a kilometre of a wind farm and 90 per cent of people support them. To say that communities reject them is not true. A small number of vocal people do not like them and I do not think we will ever change their minds. However, it is not true to say that communities reject them.

**The Hon. CHARLIE LYNN:** Who conducts these surveys?

**Mr DURRAN:** We have a survey here that was carried out by an independent market research consultant based in Melbourne. I will table the document. It was conducted by ERM and Reark, who are market

survey specialists. They did a random telephone survey of 300 to 400 people in the Goulburn-Yass area. The survey was designed to establish community perception. We specifically chose that area for two reasons: First, there were already wind farms there. The Crookwell wind farm had been there for many years when the survey was carried out. Secondly, there are about to be a lot more and everybody knew that because the proposals for the Crookwell II, Taralga, Gullen Range and the Cullerin Range wind farms had already been lodged when the survey was conducted. In a sense, it is the hotbed of development in New South Wales.

The results surprised us. To be honest, we were nervous about carrying out the survey because you cannot tell from outside how many people in the community are behind what is being published in newspapers or being said publicly. However, the results were compelling and they were backed up by a poll carried out by the Upper Lachlan Shire Council at the last election that produced very similar results.

**The Hon. RICK COLLESS:** That is obviously different from the submissions that have been sent to the committee. I have 17 submissions about the Scone proposal. Of them, 15 oppose the proposal and two support it.

**Mr DURRAN:** I think that is typical. To be honest, the people who support them or who do not care about them do not jump up and down. People who do not like them—

**The Hon. RICK COLLESS:** But the people who are opposed to them are the people closest to them.

**Mr DURRAN:** No, that is not true.

**The Hon. RICK COLLESS:** That is certainly the case here.

**Mr DURRAN:** It is not true as a generalisation. There are people close to them that do not like them; there are also people close to them that do like them. This is the reality of it; we cannot pretend otherwise. It comes back to what was said earlier by both of the previous witnesses I heard. This is a perceptions thing. It typically comes down to one, or a combination, of three things: People do not tend to care about biodiversity even though we would like to. What they seem to care about is noise, visual impact and the risk that their land value might be degraded. It is always one of those three things that get people offside. At the end of the day that is what we deal with. We do our best to mitigate those three things. We do not believe there is a property valuation impact. We know we can manage the noise impact. We cannot change whether people like it or not. If they do not like the look of them, we cannot stick them underground, so they are going to be on the top of the hill and they are going to be seen. That is what we need to deal with and what the planning system tries to deal with.

**The Hon. RICK COLLESS:** I understand that and that is the point we are grappling with—the people that do not like the look of them. There is a case in Crookwell where a particular property has them on three sides.

**Mr DURRAN:** There is.

**The Hon. RICK COLLESS:** In that case do we just say that is bad luck for that individual for the greater good of the nation? How many other people will be impacted in the same way? I know that at least one property in Scone will have a similar impact on it. We are talking about turbines within two kilometres of this house that is sitting on a hill and has the most magnificent views across the Scone Valley. Wind towers are going to be erected on two and a half sides of the property. That is a serious impact on that person's lifestyle.

**Mr DURRAN:** It is. It can happen, and what the courts have done in the case at Taralga and what the Department of Planning tries to do in terms of assessing that impact and mitigating it is to say there are places where it is inappropriate to leave a landowner surrounded by turbines. They say either you cannot build those turbines or you buy out that landowner and let them go somewhere else where they are happy to live. That option is there and the Department of Planning already uses it in that circumstance. It is not the norm.

**Mr POOLE:** I think there is a secondary factor, which is that it is something to do with the unknown nature of the wind business. There are a lot of turbines in northern Europe and have been for decades. New South Wales has a very small number of wind developments at the moment but it is generally understood that more developments are coming. People do not have direct experience of them, by and large, and spending a few minutes on the Internet is enough to scare anybody when they look at some of the misinformation that is

published about wind. There is a study from Scotland that we have circulated in that set of documents, which researches the perceptions of wind farms before and after they have been installed. In general, the level of concern always goes down.

**CHAIR:** Is this in Europe?

**Mr POOLE:** In Scotland.

**The Hon. RICK COLLESS:** Is that because they then cannot do anything about it—people just accept it and say, "It's finished, it's over, there's nothing we can do about it. We still don't like them" or "We love them"?

**Mr POOLE:** No, it is more positive than that. It is about people's concerns not being realised. When you read the misinformation about wind farms on the Internet you find it talks about all sorts of terrible things that allegedly can happen. When people realise that that is not true and the thing just sits there and you cannot hear it most of the time and it becomes an understood part of the landscape, concerns decrease.

**CHAIR:** Would you not agree that in this instance it is an inappropriate comparison because Europe has had a much more intensively modified landscape in many of these instances for a far longer period of time, with greater population density? There are a lot of factors, whereas here people are often dealing with a place they have moved to quite deliberately, specifically for the landscape in certain instances. That is a priority for people in the Australian environment. They are certainly not out there for the culture, so the impact can be really significant.

**Mr DURRAN:** I think that is a fair statement to make. It is fair to say Australia is going to be different, it always is. We do not have the data points to be able to test that yet. I will pick up on your reference earlier to the Cullerin wind farm. You described that as an untouched landscape. The Cullerin wind farm has a powerline going over the top of it and two right next to it. The freeway goes through and the railway line from Sydney to Melbourne goes through the middle of it. The old highway goes through the middle of it as well and there is a mine just around the corner from it. These are not untouched landscapes.

The issue is that people are used to seeing ugly steel tower powerlines. I do not know anybody who likes the look of those. At least some people like the look of wind turbines and they will get used to it over time. This same effect that we are seeing internationally should happen in Australia in time. I am not saying that everybody is going to love them at the end of the day, but some people do. Some people will be comfortable with them. All we are trying to do as a developer is do our best to develop something that people can be comfortable with. We do not want something that is going to keep people awake at night. We do not want something that is going to make mincemeat of bats and all that sort of stuff, which is what people worry about. We do the best we can to make sure that these are appropriate developments.

**The Hon. ROBERT BROWN:** Getting back to the question of making some recommendations on the planning process, in your submission you raise the issue of local development control plans. Could you address that if you come back to us and expand upon it a bit?

**Mr POOLE:** Yes, certainly.

**The Hon. HELEN WESTWOOD:** Can I ask about the wind farm at Silverton? We heard earlier about the need to locate it close to the grid because of the loss of energy and the impact on energy efficiency. I thought that that originally was an issue with the Silverton site. Were you able to overcome that satisfactorily and how was that achieved, or is that commercial in confidence?

**Mr DURRAN:** I can touch on that at a publicly available level, if I can describe it that way. The Silverton wind farm is about 25 kilometres from Broken Hill and Broken Hill had a very large powerline built to it many years ago for no apparent reason. So in a sense we lucked out. The existing powerline has enough transfer capacity to take around half the output of the site. To get the other half out—

**The Hon. RICK COLLESS:** That goes into South Australia, does it not?

**Mr DURRAN:** No, that connects to Buronga in New South Wales and from there it splits in two directions, one to Victoria and the other across to Wagga. Once we hit about 3, 4 or 500 megawatts, to get the

rest of the wind farm output out we need to build a new powerline to Buronga or Mildura, somewhere in that part of the world, where there are enough strong lines connecting to the rest of the system. The issue for us is: is that cost effective or not? The work we have done says yes, it is. We know how much it costs to build a powerline. There is enough wind out there to make sure that that is viable, and that is really what it comes down to. We have to pay for these costs of upgrades, so we build that into our economics and see if we are still viable. If we are, we do it.

**The Hon. HELEN WESTWOOD:** How many turbines will there be at Silverton?

**Mr DURRAN:** At the moment the planning approval is for 282 and there is a concept approval for a total of 598, so it is potentially 500 to 600 turbines.

**The Hon. HELEN WESTWOOD:** Was the visual impact on the Mundi Mundi Plains assessed and considered by you in the design and do you have any real understanding of what the visual impact will be on the Mundi Mundi Plains?

**Mr DURRAN:** We do. It was assessed. There is a full visual impact assessment that is part of the development application we always do with our projects. I can refer you to that on the Internet or I can send it to you.

**The Hon. HELEN WESTWOOD:** I am really interested in that because I think it is a unique landscape internationally as well as nationally.

**The Hon. RICK COLLESS:** What are the wind characteristics of New South Wales coastal areas?

**Mr POOLE:** Quite good.

**The Hon. RICK COLLESS:** Why have they not been considered for wind farms?

**Mr POOLE:** Population density, I think, is the short answer.

**The Hon. RICK COLLESS:** Hang on, that is a point. People do not want them there—is that what you are saying?

**Mr POOLE:** No, what I meant by that was that blocks of land on the coast tend to be quite small because the coast has been more intensively settled for a long time. We see the practicalities of wind farm development on the New South Wales coast as being harder at the moment than in rural areas inland.

**Mr DURRAN:** I would describe it as housing density along the coast makes it hard for us. It is too hard to get enough turbines in one place and be able to manage the noise impact on the houses, which we intend to do. It is easier for us to go somewhere else where there is better wind for a start, because the wind on the range in New South Wales tends to be better than on the coast—not necessarily stronger but better. We have a lot less housing pressures and we have lower land values and we can make real financial contributions to the communities. It is hard to do that on the coast. Other people will do it. That is fine. We think there will be coastal wind farm developments in New South Wales at some point, probably small ones. I think the South Coast regional organisation of councils—I am not sure exactly which organisation it is—is currently looking at trying to establish community wind farms along the South Coast. That is fine for them—it is not what we do.

**CHAIR:** Have you looked at the feasibility of offshore?

**Mr DURRAN:** Only in passing. In Europe, offshore wind turbines are certainly the go at the moment, primarily because in places like Germany they have literally run out of land to put turbines and they have a very different offshore mechanic in that their sea is only 20 metres deep and they are, sort of, walking along it all the time. The offshore in Australia is very deep very quickly and it is not really practical. There are some places like the Gulf of St Vincent where some companies are looking into it, but the cost of offshore is significantly higher than the cost of onshore. The wind speeds are not significantly higher, they are not enough to cover the costs, so you are looking at higher cost of development. At some point that may happen in Australia, but we still think of Silverton as being the onshore-offshore wind farm—very few people anywhere near it and a very large piece of dirt that we can put turbines on. It will be a lot cheaper to do it there than to try to go off the coast and do it.

**The Hon. RICK COLLESS:** Gentlemen, I have asked this question of the other witnesses here today too. What is the life of your proposal and, at the conclusion of that life what are the plans for decommissioning?

**Mr POOLE:** Plans for decommissioning are to remove everything above the surface. The concrete foundations or footings would be covered in topsoil and reseeded with appropriate vegetation. The environmental impact of taking away all the concrete far outweighs—well, there is no downside to leaving it in the ground. It is made out of mostly local material, completely inert, and it will just sit there. In Europe the first generation of turbines has basically reached the end of its life. What happens in many places is that the original generators are taken down and they have been replaced by modern generators, which invariably have larger capacity, and in some places this enables some of the towers to be decommissioned. You will hear stories that the Europeans are already taking down their wind turbines. What is actually happening is that wind capacity is still growing rapidly in Europe and in some cases the original wind farms are being upgraded to use modern technology, which requires fewer towers than it did 20 or 25 years ago when they were first built.

**CHAIR:** Is there much waste in that process? In other power generation there is massive waste, toxic materials.

**Mr POOLE:** No, there is very little waste. There are no toxic materials in a wind turbine. You could eat most of one, if you had enough time.

**CHAIR:** So, it is recyclable, reusable?

**Mr POOLE:** It is largely steel. All the steel involved in the nacelle, in the generator, will eventually be tossed into a blast furnace and turned back into something else made out of steel. There is probably non-recyclable fibreglass around in a nacelle but it is a few hundred kilograms in a structure that would, taken together, weigh 250 tonnes. The blades are probably not reusable because they are quite complex structures of wood and fibres and various synthetic materials. It would be quite hard to separate all of that and start again. Again, the blades, in terms of the weight of the whole thing, are only a few percent. So, it is largely recyclable. As far as the life of the towers, as I just mentioned, in Europe towers are being used to support new generators, so we will have another 20, 25 years life. As Jonathan said, the energy payback on a turbine—even though you have all the steel and concrete and it takes lots of diesel to deliver everything to the site and so on—is six or seven months for a typical two or three megawatt turbine. It takes six months to generate enough energy equivalent to all the energy that went into its production, including all the steel and concrete making, and then for the next 20 years it is generating clean energy without using any fuel and, importantly in Australia, without using any water.

**Mr DURRAN:** At the end of the life there is a reasonable chance these days—of course, it is hard to predict 20 years ahead—that generators put on in 20 years will be roughly the same size as they are today. That allows you to put a new generator on the existing tower, leave the roads there, leave the cables there, leave everything else, and that new generator will be about half the capital cost of the original project and it will run for another 20 years. So, there is a potential in this re-powering phase for significant drops in the cost of wind energy on existing sites.

**CHAIR:** And, I assume, greater efficiency therefore significantly more output from the same unit?

**Mr POOLE:** Yes, every year there are incremental improvements in efficiency and noise performance and transport and ease of installation, and so on. In 20 years we cannot even imagine.

**CHAIR:** Could you perhaps give the Committee your take on colours?

**Mr DURRAN:** What colour would you like?

**CHAIR:** Every picture I have seen of wind turbines, they are bright white on either green or blue backgrounds and quite striking.

**Mr POOLE:** It is safety driven. They are a colour that is meant to blend in as much as it can to the blue or white sky but from the air the light colour stands out because the ground is always dark as perceived from the air.

**Mr DURRAN:** It also stands out to birds and bats more easily. You can laugh, but that is real. There are two other aspects I would like to add. The white tends to look cleaner to people and therefore tends to look better. That is always arguable.

**CHAIR:** You have not been looking at the fashion in fridges these days.

**Mr DURRAN:** You can have polka dots if you want. I point out there is a project called Windy Hill in northern Queensland—I do not know exactly where it is—which used a turbine where they graded colours from the base of the turbine to about a third of the way up, from a grass green colour up to white. Feel free to look at that if you get the chance. I am sure you can justify a visit up there to have a look. The impact of that tends to be that the turbines seem to be floating on the ground as opposed to anchored on the ground. So, it can be more disturbing for people as a result of that. There are things people have tried to improve this but they do not always work out. What people still come back to is that off-white, light grey, relatively clean looking colour on the background. On a cloudy day it tends to disappear a bit more easily; on a really bright blue-sky day it might be blue right at the top but when you are looking at a distance across to the turbine, the bottom of the horizon is a lot whiter and it tends to disappear more easily. It is one of those colours that tends to blend in a bit.

**The Hon. HELEN WESTWOOD:** Just following on from that and back to the Silverton site, I wonder whether safety would be as much of an issue at that location as it is at others where the visual landscape should take a higher priority? Do you weigh those considerations depending on the location?

**Mr DURRAN:** It is almost independent. We do not do it specifically in terms of weighting. We carry out the visual assessment and make a call on what should happen. Consultants keep coming back to us saying no, just leave them white, leave them that off-white colour, that is the right colour, leave them like that. It does not cost us a cent more to change the colour. We will paint any colour anybody wants. But nobody comes up with a colour that is going to work for them. For example, at Silverton do you paint the bottom bright red to match the dirt to the west and the top bright blue, and then what happens with this funny line in the middle? How do you try to balance that? It is not an easy thing to do.

**CHAIR:** I take your point on the safety features and aircraft, and suchlike, but white has such an expansive impact whereas a darker colour contracts any structure one is looking at. But, I think the safety issue of course has to be taken into account.

**The Hon. HELEN WESTWOOD:** Is the technology continually improving? Is research still going on to improve things like noise as well as, obviously, energy efficiency?

**Mr POOLE:** Yes, all the time.

**Mr DURRAN:** There is, and I put it in the same way that motor vehicle research is still going on. Each year somebody comes up with a new slightly different something or other and you get an extra little bit out—slightly quieter, slightly more production. There tends to be a trade-off between production and quietness. In the first 10 or 15 years of wind turbine development everybody was focused on getting the most energy output they could.

In the late 1980s early 1990s they started running into noise complaints in Europe so they decided to design more noise mitigation into it. They slowed down the speed of the rotors to reduce the noise from them and they looked at different shapes for rotors and all those sorts of things. That research is always going on and it will continue to do so. Some suppliers have slightly more efficient turbines and some have slightly quieter turbines, and that technology gradually filters down through the mechanics of the system.

**The Hon. HELEN WESTWOOD:** In your submission to the inquiry you referred to the wind farm precincts that have been announced. Given your experience of designing and developing wind farms, do you think that is an appropriate response, or an appropriate approach, to wind farm development in New South Wales?

**Mr POOLE:** It is helpful for communities in windier areas to be able to get hold of more information and to understand the possible future role of their region in the wind industry. As I said earlier, I think some of the problems that we have at the moment—in particular in New South Wales—are to do with a fear of the unknown. To the extent that the wind industry is most likely to locate where there is wind, we identify those

areas and we say, "We understand that some people like wind and that some people do not, but it will probably go into these windy areas." That is a proactive and constructive thing to do.

**The Hon. RICK COLLESS:** I refer to the blades on the fans. Could you tell us approximately what is the blade area? What is the area of an individual blade?

**Mr DURRAN:** It would depend on the machine. Most of the turbines that are going in at moment in Australia have a blade diameter of between 80 metres and 100 metres. If you need me to work out the square metre area I can do that. However, I am not sure whether that was the question you asked.

**The Hon. RICK COLLESS:** From a distance they look very small. We are all familiar with water-pump windmills that have lots of blade area on the fan.

**CHAIR:** We note you concede that.

**The Hon. RICK COLLESS:** Windmills are Australian icons.

**CHAIR:** We note you concede that the blades are very small.

**The Hon. RICK COLLESS:** I am referring to the thickness of the blades. The blades have a big diameter, but their width is narrow.

**Mr DURRAN:** At the bottom, where the blade is connected to the turbine, is about two metres in diameter, or thereabouts, at the widest part. So they are relatively small. It is hard to tell from a distance as they probably do not look that big, but it is about two metres across and it tapers as you go further towards the tip. At the tip it is probably 70 centimetres across.

**The Hon. RICK COLLESS:** What is the speed at the tip of the blade?

**Mr DURRAN:** The tip speed obviously is very fast because it is a long way out. However, the rotational speed varies between the turbines—it is between 10 revolutions per minute and 20 revolutions per minute. Some of them are a little more than that. The slower ones tend to be a little quieter, and that is why they have been designed that way. Sometimes they tend to be a little less efficient. But the tip speed is a lot higher than that because of the distance of the tip away from the centre of the machine.

**The Hon. RICK COLLESS:** Are we talking about 100 kilometres an hour?

**Mr DURRAN:** To be honest, I do not know. I guess it would be about 100 kilometres to 200 kilometres an hour. It is quite fast at the tip. It is the tip and the way that the wind comes off the tip that make the noise. For that reason a lot of research is going into the design of the tip. Part of the reason why they have changed the rotational speed was to reduce the speed at the tip to reduce noise. It has a small impact on energy production. Because of the way they are optimising things these days they use a different blade profile and a slower speed, and they basically get the same energy production at a quieter output.

**CHAIR:** Thank you, gentlemen, for your written submissions, for the material you have presented, and for your appearance today. Committee members might have some other questions arising from issues that have been raised. Your input has been invaluable and we appreciate your support.

**Mr DURRAN:** I would like to table a document that has some more detailed answers to some of these questions. There is a bit of research from the National Health Service in the United Kingdom, referring to the health impacts of wind farms. The Victorian Energy Networks Corporation [VENCorp], the regulator in Victoria, has done some work relating to the capacity of wind farms in the Victorian network. There is some information on the acceptance of wind farms in the community from the United States, and also the perceptions from Scotland and Ireland that we mentioned earlier.

**CHAIR:** Thank you very much.

**(The witnesses withdrew)**

**(Short adjournment)**

**RONALD GARRY YOST**, Managing Director, Eco Energy Solutions Australia Pty Ltd, 11 Twin Rivers Lane, Grove, Tasmania, 7109, sworn and examined:

**CHAIR:** Are you conversant with the terms of reference for this inquiry?

**Mr YOST:** Yes.

**CHAIR:** Before Committee members ask you questions, please feel free to make a statement to the Committee about anything you want to raise as an issue that you might think is pertinent to the terms of reference because now is the time.

**Mr YOST:** First of all, Mr Chairman and members, I would like to thank you for this opportunity. It was a late submission and I am most appreciative of the opportunity to talk to you. We have what is commonly known in the industry as mid-range wind turbines and mid-range wind turbines are largely misunderstood or even unknown. We also are the only people that have the full range of mid-range wind turbines. In other words, we go from 30 kilowatts to 850 kilowatts and we have a number of other turbines, 150s, 300s and 500 kilowatts in that range as well.

One of the unique features of our turbine is that it has two synchronous generators. So if you purchase a 150-kilowatt turbine and in three years time you are starting to make a lot of money out of it, you might want to increase it to 300 kilowatts, so you just take the 275 kilowatt generators out, put two 150s in and convert it to a 300, so it is very easy to upgrade. And you can do it in the air; it has an in-built hydraulic crane in the nacelle that allows you to work on it in the air.

One of the key things that struck me—and it seems to be in the industry as we promote our new mid-range product—is that everybody has the mindset that big is better and bigger again is even better still. If you look at the wind industry at the moment, all the effort that is being put in is being directed mostly at bigger and bigger turbines. Infrastructure, construction, all that kind of thing, is just getting harder and harder and much, much bigger cranes are required. They are talking 5½, 6 and 7-megawatt turbines that you literally need 1,000 tonne cranes to install them.

Our turbines are in that mid-range market that we talked about but they are very easy to install. They can in fact be put up in less than half a day. As I said earlier, there is a crane in the nacelle, so you can take pieces in and out; you can service them in the air. They are extremely good for what we call island installations. Our agency covers the whole of Asia and the Pacific and they are particularly good in remote locations and in island locations because of the size and the flexibility of them.

The other thing that is really important and is of significant consequence to this inquiry is that because there are two turbines, we are able to direct the energy from the turbine in different ways. A dairy farmer, a crop farmer or a vegetable farmer can use one generator to drive a pump and fill up a dam, irrigate or whatever when the wind is blowing and use the other generator to feed the grid, so he is saving money on the one side and he is generating an income on the other. You can also infinitely vary that process from one kilowatt to 150, say, on a 150-kilowatt turbine.

What that means is that the farmer can reduce his operating costs, which, in turn, will increase productivity and make his farm more profitable. By having the ability to generate power back into the grid—and one of the real unique features of our turbine is the output is 415 volts three phase, which, for the non-electrical people, means you can just stick it straight into your switchboard and connect it straight to the grid. Our turbines do not have gearboxes; they are all hydraulic or what we call hydrostatic. They are less noisy than conventional turbines; much, much less maintenance and they only have two blades, not three. We actually can put the blades on the nacelle and lift the nacelle up on to the tower with the blades already fixed, whereas if you have three, it is very, very difficult.

It reduces the cost of the third blade and it is a known fact that 94 per cent of the energy created by a wind turbine comes from two blades and the third blade produces only 6 per cent, so the impact is significant from that point of view as well. The other key thing is that our turbines generally are installed in rural farming type areas or island communities in what we call an end-of-line situation where these farms are right out and they usually on the end of a power line, which is where utilities have the biggest problem in feeding these

properties. By being able to grid connect in an end-of-line situation, we are able to put power back down the line and help the utility in terms of its infrastructure and the requirements of the properties along the line.

The other key thing, of course, is that by having the two turbines and being able to increase productivity, reduce costs and, at the same time, make money by putting power into the grid, we soften that real harsh income cycle that farmers in particular generally have—and business for that matter—because we actually create a second income and even in times of drought and things like that there is still wind. It does have huge benefits in, particularly rural communities, from that point of view. That is the sort of key.

**CHAIR:** What is the dimension of the biggest of your products?

**Mr YOST:** The largest of our turbines only has a 22-metre blade diameter rather than the 80s and the 100 metres. The largest tower is only 60 metres high. They are manufactured in three pieces not two and we do not have the big footprint that you would see with a multi-megawatt type turbine.

**CHAIR:** Obviously the bigger industrial turbines in great part rely on government support and subsidy to get going as a viable industry. Does your niche in the industry get benefits like that or do you miss out?

**Mr YOST:** At the present moment there is no benefit; there are no government grants or funding. The only benefit that is available at the moment is a low-interest loan, which is offered by the Tasmanian Government for farmers who implement ways of increasing productivity. By putting in a wind turbine and irrigating and reducing costs means that they have more money for fertiliser and those kinds of things and, therefore, increase productivity and so they qualify. But other than that, there are no incentives for our turbines. Of course, one of the things is that in this mid-range market they have become very affordable. A 150 kilowatt turbine is roundabout $500,000 installed and over a 20-year life cycle the farmer can earn about $1.2 million in profit from that turbine. They are a much more affordable type of renewable energy. The 30 kilowatt, which is the smallest one we make, comes in at about $85,000 and the owner would still make around about $380,000 over the 20-year life cycle of the turbine.

**CHAIR:** Do big grid operators in any way prevent the mid-range turbines from connecting into the grid and also getting financial support? Why have you been left out? Is it that you are not big enough or that you have not been thought of? What is the situation?

**Mr YOST:** I suppose the honest answer is that the focus has been on solar PV and the really big wind turbines. They are the people who have had the ability to lobby and to motivate more with the Clean Energy Councils and the Federal political regime. Up until recently there has not been anybody in the world that has a suite of mid-range turbines. One company will make a 500 kilowatt, there is one that does a 600, there is another one that does a 750 and there is one that does a 200, but they are all different. There has not been anybody that has really had the suite of products in that range.

To answer the other part of your question, the utilities will give us power purchase agreements, but they will only give us the price for our black power at the same price as they buy it from the big guys. So, if you took the typical example at the moment in Tasmania where the domestic customer pays 19.5 cents per kilowatt hour, that utility sells green power, which is either solar or wind, for 26.5 cents and they will give us 5 cents. So, by the time we get the 5 and we get, let us say, 5 cents for the renewable energy credit, the maximum we can get is still only 10 cents, 10.5 cents.

**CHAIR:** Is that the same for people with solar panels on their houses feeding back into the grid?

**Mr YOST:** No. People with solar panels on their roofs now, in most States, get up to four times feed in tariffs. It varies from State to State. New South Wales has gone 20 years, not 15 years, and you can get up to four times your tariff in your export or import rebate. If you are paying 50 cents a kilowatt hour in Victoria for coal-fired electricity and you put three kilowatts of solar PV on your roof, you will get 60 cents for every kilowatt hour you export back to the grid. So, financially it is very beneficial.

**The Hon. RICK COLLESS:** What are the New South Wales comparisons?

**Mr YOST:** I should have brought the sheet.

**CHAIR:** Perhaps you can supply the Committee with something in writing at a later stage, but go through now what you recall?

**Mr YOST:** Yes, I can. I have a table that goes through each State. In the ACT it is 50 cents for the first 10 kilowatts, 40 cents for 20 kilowatts and then 30 cents for 30 kilowatts. In New South Wales I think it is 50 cents up to 30 kilowatts. All of the schemes apply only to solar PV.

**CHAIR:** Is there anything to stop your technology, other than price structure, from being a useful, if not small, green energy supplier into the grid and getting acknowledgement or financial compensation for that? Is there any other reason why that should that happen?

**Mr YOST:** No, absolutely not. Because the turbines are hydraulic it means that we can control the speed. Frequency and speed are directly proportional. We do not have any of the connectivity problems that large turbines have with the grid because we can connect straight onto the powerline going down the road on to the 415 volt low voltage side and synchronise with the grid automatically. It is all synchronised. It is very clever technology. There is no impediment to us selling to the grid if the utilities were amenable. It is very difficult to get them to take all the power that you can produce from the turbine.

**CHAIR:** I understand Eco Energy maintains wind infrastructure. How many incidents relating to wind infrastructure, fire or other issues have occurred? Do you have a problem with that sort of thing?

**Mr YOST:** No. In fact, that was a part of the change. Nordwind, for whom we own the agency, had a complete change in technology from standard gearboxes and inverters and things like that in the nacelle. The main reason they changed from that technology to the new hydraulic and synchronised generators was because of those issues, fire, connectivity and synchronisation problems that happened with conventional turbines. We do not have any of those issues.

**CHAIR:** The new policy announced on 17 August 2009 speeds up planning decisions and waives infrastructure fees for wind farms over 30 megawatt capacity. Could you elaborate on the comments in your submission that this threatens "to provide unfair regulatory disadvantage for mid-range machines"?

**Mr YOST:** Yes. Obviously, in terms of scale to start with, we have to allow between $35,000 and $50,000 on a $500,000 turbine just for planning and environmental approvals. We are completely at the mercy of the individual shire or council. Some are very amenable to it and we do not have too much trouble with getting planning approvals. Some are absolutely totally against it. Some shires just say, "We don't want your turbines" and "You're not going to get a planning permit and that's all there is to it." Others tend to view it as a bit of an opportunity to be busy with something else and to drag it out to make it last longer and therefore earn a bit more money out of it. Because there is no legislation, it is hard to get people to rush and it is a big cost impost. If we could reduce that by having some reasonable legislation that required the shires, for example, to go the four-month process, that would speed up the whole thing dramatically.

**CHAIR:** Have you ever had any neighbour complaints about the equipment being installed in any areas?

**Mr YOST:** No. The fact we are hydraulics and only have two blades, our turbines are a lot less noisier than a conventional turbine. We run at about 56dB. The analogy they use is that it is exactly the same noise that a BMW doing 90 kilometres an hour down the autobahn in Germany could make, at 60 metres distance. So, you can barely hear it.

**The Hon. RICK COLLESS:** But no BMWs travel that slowly on the autobahn!

**Mr YOST:** No. Had to find one.

**The Hon. RICK COLLESS:** You gave us the dimensions for, I presume, the 150 kilowatt tower?

**Mr YOST:** No, that was the 850. That was the largest one we make.

**The Hon. RICK COLLESS:** What are the dimensions of the 30 kilowatt tower?

**Mr YOST:** It is only 13 metres high and the blades are 11 metres in diameter.

**The Hon. RICK COLLESS:** They require a foundation and so on?

**Mr YOST:** Yes. There is a very complex concrete base that is full of reinforcing steel, and they have what we call a pot, which gets cast into the concrete and steel, and the tower sits on top and it is bolted all around the bottom.

**The Hon. RICK COLLESS:** When you say 30 kilowatts or 150 kilowatts, I assume that is the capacity in kilowatt hours?

**Mr YOST:** That is the electrical kilowatt capacity output of the machine. There is a 13 per cent additional energy that is created through the heat of the hydraulics, which allows us to take 80 degrees centigrade hot water from the Narcell, pipe it down the tower, and distribute it. Dairy farmers use it for hosing out their dairies with hot water. It is also used in hydroponics. People with greenhouses use it. It is also used in abattoirs; it is great for cleaning abattoirs and things like that. So it has a lot of good applications.

**The Hon. RICK COLLESS:** I am interested to have a look at the feed-in tariffs that you have been talking about. It is an issue that has been on the agenda, as you rightly said, particularly for the solar PBs. I was unaware that your equipment is unable to access that.

**Mr YOST:** We do not attract any increased tariff in terms of our inputs, and we get absolutely slaughtered. If we were getting the 19¢, or even 15¢, it would be okay, but 5¢ out of nearly 20¢, the current rate—

**The Hon. ROBERT BROWN:** There is a big difference between, say, a 30-kilowatt machine and a 30- megawatt machine, where the planning laws cut in. Are you arguing for a change in the application of part 3A for small turbines, or do you think it could be solved by applying more conventional shortening up, shall we say, of local government approval times?

**Mr YOST:** Yes. I think that is really where the real benefit would come from, if there were some methodology whereby local government had some time constraints on approval—whether it was 90 days or 160 days—where there was at least a timeline that had a start and a finish, so that it did not go on ad infinitum and there were all kinds of spurious things that come up—not just orange-bellied parrots and wedge-tail eagles, but there are a lot of other idiosyncrasies that come out of the woodwork that just do not really apply.

**The Hon. ROBERT BROWN:** What is the major part of your market in terms of volume? Is it multi-machine, mini power stations, for want of a better word, or just single units?

**Mr YOST:** Single units. Individual farmers who want to reduce their power can see that their power costs are going up at the rate of 15 or 20 per cent a year. A reasonable sized dairy farm has an annual power bill of between $170,000 and $200,000, because they do a lot of irrigation.

**The Hon. ROBERT BROWN:** Both the planning and energy regimes—energy in terms of feed-in tariffs and planning in terms of modest-type development—are the areas that, if modified, would most suit your size application?

**Mr YOST:** Correct. It is that simple really.

**The Hon. ROBERT BROWN:** A solar ray on a roof probably does not add anything to the landscape, but I could not imagine that a 13-metre wind tower would add much to the landscape either.

**Mr YOST:** The interesting thing is that wind will produce double the energy of solar. Solar is good for, let us say here, 4½ or five hours a day; wind is good for nine at least. In any given regime, there is usually twice as much wind as there is sun.

**The Hon. ROBERT BROWN:** With your particular style of technology, would you still need the same sort of wind profiles as the large generators?

**Mr YOST:** No. There are two other things. One of them is that, because turbines are a hydraulic, they get going a lot easier. You do not have anywhere near the restriction against the inertia that you have with a

conventional gearbox. The other thing is that ours is the only turbine in the world that is black start. All wind turbines require that they be connected to the grid, and they take energy from the grid to get excitation and to get going before they start putting power back into the grid when they reach speed. We produce our own excitation from the hydraulics. As the blade starts to move, the hub turns, the hydraulic pump starts to move, and it drives a little hydraulic alternator, which provides the energy for the excitation on the generators. Also, because they are synchronous, it is so much easier. So, we can be literally islanded, if you like, and we can start up without any power at all from any other outside source.

**CHAIR:** You have the potential to be a complete stand-alone generation system?

**Mr YOST:** Correct. That is why being in an island community in the middle of the Pacific or whatever, it makes it so much easier as well.

**CHAIR:** Where are they manufactured?

**Mr YOST:** We are now in the last stage of negotiations with the Tasmanian Government and the Federal Government to establish a manufacturing plant for the full range of turbines, blades and towers here in Australia and in Tasmania.

**CHAIR:** Is that the entire product?

**Mr YOST:** Yes. At the moment we import them in what we call a CKD, a custom knock-down form. They come in 40-foot containers. We pull them out, put it all together, commission it, and put it up. By the end of October we will be fully manufacturing the 30-kilowatts ourselves, and by next year we will be doing the 150s, then the 300s, and by year three we want to make the 500 blades. We will create 387 new jobs over the three years, 42 people in the first year, which is now, then 186, and then 387.

**The Hon. ROBERT BROWN:** I missed the description of your 500 machine. How long are the blades on the 500 machine?

**Mr YOST:** They are about 20 metres in diameter.

**The Hon. ROBERT BROWN:** About 10 metres in length?

**Mr YOST:** Yes, about 10 metres each.

**The Hon. ROBERT BROWN:** Even a 500-kilowatt machine is quite transportable?

**Mr YOST:** Yes. The 850-kilowatt machine, the Narcell, fully assembled, weighs just under 40 tonnes. We can transport it with conventional road transport, and the blades can be transported quite easily on a proper trailer.

**CHAIR:** Could you comment on your mid-range turbines integrating with local community ownership, as a share management, if you like, of this type of technology, as opposed to the big systems that are very much a corporate activity?

**Mr YOST:** This is a good story all round. A farmer may have a power bill of $170,000 or $200,000 a year, but he cannot necessarily afford the $500,000 to put up a turbine. And money is very, very hard to get. So we have developed what we call a wind farm cooperative. The idea is that, instead of buying a turbine outright, a number of farmers can buy 50 kilowatt units in the windfarm. The Tasmanian Farmers and Graziers Association just loves this idea.

The idea is that we would put together, let us say, 20 farmers. They do not have to be just farmers; they could be anybody in the community who wants to participate. They would buy units in a cooperative. We would build the wind farm, and there would not be more than seven or eight machines maximum in each one. They would pay their power bill on the one side of their operation, but then they would get the profit from the power that is sold from the wind farm into the grid as a portion of their unit holding in the farm. We are very close: I meet with the lawyers next Wednesday in Melbourne to finalise the cooperative arrangements. There are some issues with it. It is not an easy thing to set up, but it is looking pretty good.

**The Hon. ROBERT BROWN:** Typically what size would those cooperatives be in terms of kilowatts? How big is the installation?

**Mr YOST:** I certainly do not want to go above 3 megawatts. I am trying to stay at around the 1.5 to 2.5 megawatts so that we keep it at that really comfortable level where community participation from individuals, farmers and industrialists—people who have factories—can do exactly the same thing. If they have a process with intense electrical energy requirements, they can offset their electricity bills by having shares in a wind farm cooperative.

**CHAIR:** Could this sort of unit be placed only on the ground with special footings, or is it something that could be rigged onto a building?

**Mr YOST:** At the present moment, we have gone away from what we call building integration with these models of turbines, but because the frame and the concept lends itself through the hydraulics. We are looking at making a base with the frame and everything to sit on and having a vertical integrated turbine. In probably two and a half or three years we will have a vertical access building integrated turbine that runs on the exact same hydraulic concept. You can imagine a multistorey building with a turbine on top of the building. The hot water would feed into the building itself to the hot water system. You can imagine that the energy savings as well as the money made from the turbine would be huge.

**CHAIR:** Have you had any experience of interested communities from other jurisdictions setting up community-owned wind farms?

**Mr YOST:** At present there is a group of people in Victoria, but most of the interest—probably because most of the media coverage has been in Tasmania—has come from Tasmania. We have not received individual inquiries for turbines in New South Wales. We have had some very big interest from mining companies in Western Australia. We quoted a deal for four 850s for one particular mine site. The other day they came back and asked if they could upgrade it. Because of the pricing, they have actually asked us to now make six 850s rather than four. The mining industry is seeing it as a very good opportunity as well.

**CHAIR:** Have any of them reached end of life yet? I suppose the industry is not that old. How old are your oldest turbines that you have been producing?

**Mr YOST:** The new hydrostatic drive turbines are less than two years old installed.

**CHAIR:** What is the life expectancy? Are there any issues with end of life or decommissioning and dealing with that?

**Mr YOST:** The short answer is no. We have a very sophisticated system control and data acquisition software process [SCADA]. Depending on the wind regime and because of the hydraulics and the way that the turbine works, we monitor the hours of operation. There are key milestones with the hydraulics, such as the hydraulic pump and a few things like that, so that if you are in a wind regime on the north-west coast of Tasmania where the average wind speed is nine metres a second compared to, say, country Victoria where you might get five or six, the software automatically tells us that the turbine is working twice as hard as it should. Therefore we need to start looking at maintenance earlier. We get all that information.

In the prices I have quoted you we also include a maintenance contract that we sign with the customer on day one. Every year he pays a set fee, which goes into what we call an eco-maintenance trust. Each turbine has its own account. The money gets put into that account. If we do not use all the money in years one, two, three and four, by year five there is a healthy amount of money there for when there is some major maintenance to be done. It accrues interest and all that as well. We try to siphon the whole thing. We want to make sure that the turbines are serviced and maintained properly. That is why we lock the maintenance contracts in when we sell the actual unit.

**The Hon. RICK COLLESS:** Is there an annual service requirement on them?

**Mr YOST:** There is a three-year warranty on all the parts sent from the manufacturers in the first place. Then the first parts of it are just really checking hydraulic hose connections or cable connections and that type of thing. There is not anything that we are expecting to need any kind of major maintenance on for probably six or seven years under an average wind regime.

**CHAIR:** If I understand you properly, there is no gearing down on your turbines in high winds. With the big ones, they actually break it down; the blades turn, and then they shut down in stronger winds.

**Mr YOST:** We start manufacturing energy or producing power at less than three metres per second. We make power all the way up the curve to 12 metres per second and then we stay flat on the 12 metres at full production all the way through. If the wind gets stronger, we then start to take it off. You can pre-program that, depending on where you are. We can start tapering off at 25 and 30 metres a second. The turbine is cyclone-ised to 75 metres per second, which is approximately 240 kilometres an hour. We park the blade in the vertical position. There are two blades.

**The Hon. ROBERT BROWN:** So you do have feathering.

**Mr YOST:** Park is when the blades are vertical, and it can stay up in a cyclone.

**The Hon. HELEN WESTWOOD:** I will take you back to the issue of the barriers that you face in New South Wales.

**Mr YOST:** They are across the country.

**The Hon. HELEN WESTWOOD:** Could we deal specifically with New South Wales?

**Mr YOST:** Yes. I am with you.

**The Hon. HELEN WESTWOOD:** I would like to think our jurisdiction goes beyond New South Wales, but regrettably it does not.

**Mr YOST:** That is right.

**The Hon. HELEN WESTWOOD:** I want to ask about the problems that you have or that you are experiencing with local government. I know one of the things that you are suggesting to us is that we look at that standard development control plan [DCP] across New South Wales councils. I have to say that my experience of local government is that that is unlikely. Local government tends to say, quite rightly, that one size does not fit all and that you need to take into account all the different contexts for each development or the characteristics of each local government area. With that in mind, have you had any contact with the Local Government and Shires Associations of New South Wales?

**Mr YOST:** Not associations per se, but there have been discussions with individual shires. As I said earlier, the level of interest and acceptance varies from zero to 110 percent. Some people are very enthusiastic, and some are extremely negative. I am not suggesting there needs to be some absolutely definitive rules, but perhaps some guidelines? If a large 100 or 200 megawatt wind farm can have now fast-track approvals of four months, it is reasonable that a 150 kilowatt turbine should be able to be approved in the same sort of time frame because it is all the same.

**The Hon. HELEN WESTWOOD:** I would have thought the 40-day requirement under the New South Wales Environmental Planning and Assessment Act would apply to these developments as well? Have you had that experience?

**Mr YOST:** No, we have not had one where we have actually gone the 40-days. You see the problem is that it breaks down into a number of different issues. You have got the environmental part, but then there is the actual planning and the building permit. It sort of gets broken up into a number of different categories. But we have not really pushed the test. It is just what we have seen with other turbines where the delays were just astronomical. In fact, in the end the turbine was put up incorrectly and blew over—it actually fell over.

**The Hon. HELEN WESTWOOD:** I take your point that it may mean that people who are assessing these applications within local government have limited experience?

**Mr YOST:** What we have done, we found that it was so difficult that we have now engaged a Hydro Tasmania consultant to do all of our environmental planning and building permit issues. They have people who

are specialists in it and, with respect to the Chairman, I would end up with no hair too if I had to keep dealing with these guys.

**CHAIR:** A hydroelectric commission—that is a turnaround.

**Mr YOST:** They do some good work actually. We found to put them between us and the shire or the council works.

**The Hon. HELEN WESTWOOD:** Have you had any experience where a shire or a council has a development control plan? Does that make the process of the development application up to approval any faster or easier for you?

**Mr YOST:** There has not been here in New South Wales but in Victoria, the Griffith shire in particular, had some very good processes already in place. They had done a level of energy audits within their own shire to look at their carbon footprint. They applied for Federal funding but not being a marginal seat, as they say, they did not get a lot of hearing. So they have actually applied for the funding from within their own budget with the view that they want to build their own wind farm as a shire, to produce energy and to offset their own emissions.

**The Hon. HELEN WESTWOOD:** That is a very interesting development.

**Mr YOST:** They are very forward thinking.

**CHAIR:** On that line, that is one great example. Do you see any other areas that mid-range wind farms could play in supporting the Government's proposed renewable energy target?

**Mr YOST:** The classic—I mean I do not know how many tens of thousands of dollars I spent trying to do it and to my knowledge at this point it still has not happened—is Lord Howe Island.

**CHAIR:** I was going to bring that one up.

**Mr YOST:** Look, when they put the new roof on the airport I do not believe that the solar panels that they had have even been reinstalled. But when you look at how much diesel gets pumped through those generators on Lord Howe Island every day and every night, and with the wind regime that exists, to have a couple of turbines out near the airport they could generate pretty much all the power requirements that the island needs and it could be a community-based process. There are a number of opportunities like that.

**CHAIR:** How many turbines would you need to cover a community or to facilitate the energy supply in a community like that?

**Mr YOST:** Two.

**CHAIR:** With, perhaps, a small diesel backup or something such as that?

**Mr YOST:** You would have the safety of a diesel generator backup but it would be what we call hybrid process, where you could have solar, wind and diesel and it just all connects—when one is not working the other one is. Invariably if you have not got wind you have got sun, and if you have not got sun you are guaranteed you are going to have wind.

**CHAIR:** You have got plenty of everything up there.

**Mr YOST:** Yes.

**The Hon. ROBERT BROWN:** I wish to clarify something. In your answer did you say two?

**Mr YOST:** Correct.

**The Hon. ROBERT BROWN:** Two. What size would they be?

**Mr YOST:** Gee, I would have to be—

**The Hon. ROBERT BROWN:** No, just roughly.

**Mr YOST:** 500 or 850 would cover Lord Howe Island comfortably, because they have an excellent range wind regime there. I mean the wind blows there at reasonable speed for probably 14 or 16 hours per day.

**CHAIR:** Do you have a case study regarding implementation of a mid-range turbine on a residential property, or something similar to that?

**Mr YOST:** On a farm?

**CHAIR:** Farm, residential or—

**Mr YOST:** We have what we call a 20-year lifecycle calculation. We cannot project the future too much but what we do is we look at the price of the electricity based on what people will pay today, what utilities will pay for the black power, we apply three per cent CPI, then we put in all the costs for the installation, commissioning, the whole lot, and then extrapolate that over a 20-year period. That is when I can say on a 150 kilowatt turbine for $530,000 installed they will get a payback of around about five years, or less than six years, and they will generate about $1.2 million in profit income from the turbine.

**CHAIR:** I appreciate the weakest link in the chain is the battery or energy storage capacity. Do you have any experience with storage capacity of energy by this mid-range technology on a property, for example?

**Mr YOST:** No. I did install the vanadium redox batteries on King Island, and I have had quite a bit to do with the carbon storage facility that was developed here in Cooma, in New South Wales. That was part of our proposal for Lord Howe Island originally. The storage of energy is typically a really tough one. With a 30 kilowatt wind turbine it would be quite reasonable to have a set of batteries and to charge batteries as a backup. One of the problems that we have though is it is a lot of energy, 30 kilowatts, for 10, 12, 14 hours per day, and you would need a big battery—

**The Hon. ROBERT BROWN:** A couple of acres.

**Mr YOST:** In theory, yes. If you were going to explore that kind of energy you would only sort of store enough for your needs and then everything else would go.

**The Hon. ROBERT BROWN:** Into the grid?

**Mr YOST:** Yes, or go into a dummy load—a dump load. On King Island we put the dump load into spas and swimming pool heaters and all kinds of different things. A guy boils his crayfish, for example, because there is always wind and there is always spare energy so you use the energy to boil the water.

**CHAIR:** We are out of time, but it is interesting that one of the previous witnesses on their energy farm in the Hunter talked about getting the excess, because of the different rates and when the wind is happening or solar or whatever, but actually using the wind to pump water up to a dam and then getting the hydro functioning. That is so many energy forms but it is an interesting concept.

**Mr YOST:** That is happening in Tasmania now. When the wind is blowing they fill up their dams and the winch is at a high head and then they let the fall create energy out of the water flow, as it is going down to irrigate. So they use the hydro turbine, micro- and mini-hydro turbines, and then the water goes back in and keeps going, and then it is used for irrigation. You asked about specific opportunities. Turbines were originally developed with the two generators for water purification and sewage treatment—this was in Germany in the Baltic Sea, there is an island up there where it is done, and they have just finished one now on a Greek island—but by having the two generators you can dedicate one to the process of sewage treatment, water purification, desalination, and the other one can be feeding into the grid and generating power at the same time. So we see that as a big part of our future. As part of our agency, we own the water treatment technology.

**The Hon. ROBERT BROWN:** That is handy.

**Mr YOST:** That goes with it. Yes.

**CHAIR:** I am sure all members can see that, not only dealing with this particular inquiry but in terms of a niche to be efficiently creative about the energy, your products are fantastic.

**(The witness withdrew)**

**KATRINA ANN HODGKINSON**, member of Parliament, before the Committee:

**CHAIR:** In what capacity are you appearing before the Committee today?

**Ms KATRINA HODGKINSON:** As the local member of an area that is affected by a lot of proposed wind farms.

**CHAIR:** Before we ask you questions, would you like to make a statement to the Committee on the issues as you see them?

**Ms KATRINA HODGKINSON:** I would, with your indulgence. First, I would like to thank the Committee for going ahead with this inquiry. I wrote to the Hon. Rick Colless some months ago asking that the inquiry be established, and I was hopeful such an inquiry could cut across much of the differing information that has been circulating in relation to the erection of industrial wind turbines. I am encouraged by the number of submissions that you have received. I heard that you have received something like 108; there may be more by now. I think that shows that it is a subject that is worthy of investigation. So thank you again for holding the inquiry.

Wind farms are a source of renewable energy. They are proliferating at the moment due to mandatory renewable energy targets. I believe that if these targets were pulled the turbine explosion currently being experienced would probably cease. Green power from renewable sources is generally more than 7¢ per kilowatt-hour more expensive than black power from non-renewable sources. I have not come across a single turbine construction company that has told me that it is operating because of its concern for the environment. They are in this business to make a profit and that factor alone raises the question of why a local resident should lose any of the benefits that they enjoy because of their location and lifestyle so someone can make a profit.

My electorate is the proposed location for multiple turbine developments. There are at least eleven industrial wind turbine developments operational, under construction or proposed in the region of Burrinjuck, which is in the southern tablelands, totalling more than 500 turbines. It has been my experience that as soon as turbines are suggested for a regional area, a proportion of the local population will automatically become extremely vocal and strongly opposed to its development. The reasons for this are many and varied, but there are a few that keep coming back time and time again: loss of land value; loss of visual aesthetics; concerns for adverse health consequences, including noise and shadow flicker; and concern for bird life.

Turbines can be extremely divisive for communities. The small town of Taralga was a close-knit community. By the time that it was redistributed out of the Burrinjuck electorate at the last election, Taralga had become a community where lifelong friends and even family members were not talking to each other because of the industrial wind turbine development. If a particular development is handled properly in an open and forthright manner, information is provided to local residents and a free and open dialogue is available to the member of Parliament and other community leaders, then the outcome can be quite different. The Capital Wind Farm near Bungendore and the turbines at the Woodlawn Waste Facility are examples of developments that attracted little adverse comment, although both of these developments came very early in the piece. It was quite a number of years ago, before the proliferation started coming into my electorate.

In the case of the Capital Wind Farm, that company moved turbines at the request of neighbours, and was very hospitable and open and transparent in its dealings. The following is a summary of comments made to me by a number of my constituents. Where developments are strongly opposed by the community, the general feeling amongst opponents is that the company proposing the turbines is being less than honest with the community and has something to hide. An example of this is the proposed turbines to be located near the Crookwell airfield at Grabben Gullen. Instead of listening to the concerns of local residents and aviation users of the airfield, the company involved started bringing in its own aviation experts to defend the siting of towers close to the airfield's circuit.

One local informed me that he felt physically threatened by this process as if the company was successful his business would be forced to close. The approval issued by the Minister required the removal of a number of turbines because of their proximity to the airfield, but the process itself has been very unpleasant. I met with the company recently again last week and they said they are objecting to the removal of those turbines; they want to put them back. So there is continuing conflict in that community. A person neighbouring the

proposed development who is going through a very rough patch at the moment is concerned for his livelihood and his future.

An infrastructure development should not have that sort of impact on people. If it does then I believe there is something seriously wrong. I grew up on a farm at Yass and I know the stress involved in trying to make a living in the face of uncertain crop prices, bushfires and prolonged drought. I cannot fault a farmer for seeking security of income by having turbines on their property. However, I can understand a neighbour's desire to protect their properties from having massive structures placed right next to their boundaries that they consider intrusive, that they believe will devalue their properties and which some sources claim are bad for their health. A further concern that has been highlighted to me by many constituents is where the power comes from when there is no wind.

The Capital Wind Farm turbines are located about 30 kilometres away from the Bureau of Meteorology recording site at Canberra Airport. The data recorded from 1939 to the present shows that the wind is calm during 4 per cent of the 9.00 a.m. readings. The early morning fogs delaying flights from Canberra, if anyone has experienced them, are legendary! You can often be sitting at Canberra Airport until 2 o'clock in the afternoon. Of course, when there is fog there is not a lot of wind. As a result the capacity factor of the Capital Wind Farm, the measure of the energy that a power plant actually generates compared to its maximum rated output, is only 37 per cent. To keep the demand for electricity fed, whenever turbines are providing power to the grid, there must be another source of power generation that can cut in instantly if the wind fails. I suggest to Committee members that this is a subject that merits considerable further investigation as part of this inquiry.

Another issue that constituents have raised with me is shadow flicker produced by the rotating blades passing in front of the sun or fixed and flashing lights during night time. The Cullerin turbines, which I believe you will be visiting on 30 September, are located close to the Hume Highway and are an excellent example of this. They are very distracting to drivers travelling at night in particular. The lights do not flash all at once. They are very close to the highway. They are quite high in the air. There is nowhere to pull over if you are a driver if you want to investigate what is going on. It is quite unsafe, and I can say that from experience. Shadow flicker has also been associated with adverse health outcomes in some susceptible people.

A further and final point that I wish to raise with the Committee are the concerns expressed to me by the Buru Ngunawal Aboriginal Corporation, which is a traditional owners group. They have been involved in the assessment of some of the turbine locations for the presence of burial sites and camping and ceremonial areas of importance to the traditional owners. Their concerns centre on not being fully informed of the location of all work sites, temporary and permanent. As traditional owners of this land they are also concerned at what they term the unnecessary and indiscriminate destruction of trees and natural habitat during the construction phase. They are told that the turbines will be on a certain strip of land, but what is not being revealed to them is that roads might need to be constructed to the different turbines. That is where their concern comes from; they have not been fully informed of the entire area that will be affected. In one case they believe that they may have lost one of the graves at Cullerin, which is distressing for them.

The erection of massive concrete turbines can be extremely divisive for local communities, as I am sure you will hear during submissions from my constituents when you visit Goulburn on 1 October. Once again, I would like to sincerely thank the members of this Committee for agreeing to my request to hold this inquiry. I am grateful that you have taken the issue seriously. I only hope that the Government takes on board the findings that you make. I can table this document.

**CHAIR:** Yes, thank you very much.

**The Hon. CHARLIE LYNN:** A document entitled, "Report on community perceptions towards wind farms in the Southern Tablelands" was tabled earlier today.

**Ms KATRINA HODGKINSON:** Who by?

**The Hon. CHARLIE LYNN:** It was commissioned by Epuron. It covers the Goulburn, Crookwell, Yass region. The outcomes of the study show:

- 80% of respondents are concerned, right now, with the threat of global warming and its impact on the environment. 16% said they were unconcerned.

- Awareness of wind turbines was very high. Almost all respondents had seen a wind turbine and almost 9 in 10 claimed to have actually seen one. More than 8 in 10 had seen the Crookwell wind farm.

- In terms of the local rural area, 90% of respondents were aware of announcements of wind farms to be built in the Southern Tablelands.

- 89% of respondents were in favour of wind farm projects being developed in the Southern Tablelands, 5% were opposed and 83% of respondents stated *"I would be happy to see a wind farm built on farm land near where I live"*.

- When respondents were asked regarding the acceptability of the wind farm near where they live, 87% supported a wind farm within 25 kilometres, and 71% of respondents favoured a wind farm within one kilometre of their home.

- In considering multiple wind farms 75% accepted two "typical" wind farms (15 to 80 turbines) in their local rural area (17% opposed).

**Ms KATRINA HODGKINSON:** So long as they are not in sight of a town or village.

**The Hon. CHARLIE LYNN:** Does that accord with your experience?

**Ms KATRINA HODGKINSON:** I think you will find they are placed not in the sight of a town or village. As to the Crookwell wind farm, the first one there that they are talking about, "Have you seen it?", this survey was done, I think, in the Crookwell area. I want to say at the outset that I am concerned about global warming and I am into renewable energy as well, but I want it to be sustainable, low impact and affordable and I want it to be real. I refer to a quote, Dr James Lovelock said:

> At the best, wind power cannot provide more than a tiny fraction of the energy needs of civilisation. I think it's one of those things politicians like because it can be seen that they're doing something.

I thought that was a great little quote. With the survey, I love the thought of renewable energy, and I think that everybody does—certainly my generation and the younger ones and probably right across the board, for that matter. You might check this out if you have any councils appearing, but I do not think that wind farms are allowed to be placed within sight of a township. So when you are doing a survey like that and you are surveying towns, those towns are not actually impacted by the wind farms because wind farms are not located in close proximity to towns and villages. They are in a rural setting and it is the neighbours and the people who do not stand to get anything out of the wind turbines who are the ones contacting me. I am here to tell you about their concerns. They are not making anything out of it; they are not getting anything out of it. They have moved to a rural community or they have lived there for generations, whatever the situation, then suddenly 130 metre concrete structures are going to be placed near their boundaries and there are all these unanswered questions about the impacts that might happen on their health.

I have seen quite a number of documentaries about wind turbine impacts on health. Whether or not they are true, I do not know. I do not live close to a wind turbine. I think it is serious enough that it warrants investigation. If you are a wind company and you are undertaking a survey, you are going to ask the right questions and try to get the result that you want. Any multinational is going to do that. If you can ask generic questions, you get a positive answer that you can put before an investigating committee. If I were in their position I would probably do the same thing. But the people they are asking at a broader level will never actually be impacted by it. Once you are faced with something in real life, it is a bit different from thinking you might be and trying to put yourself in somebody else's shoes. Does that answer your question?

**The Hon. CHARLIE LYNN:** Yes, I wanted your feedback because you are on the ground dealing with real people as opposed to a survey.

**Ms KATRINA HODGKINSON:** By the same token, there are farmers who stand to benefit from it. We have been through a shocking drought and commodity prices have been terrible. A lot of people have destocked and are looking for money and income. This is where the divisiveness comes in. If a wind farm company comes up to you and says, "I will give you $10,000 per turbine. You have 1,000 acres. Will you take 150 turbines or 80 turbines or 20 turbines?", or however many it is, what are you going to say—"Hooray, hallelujah."

**The Hon. CHARLIE LYNN:** One of the earlier witnesses said that some farmers saw it almost like their superannuation, where they had continuous money.

**Ms KATRINA HODGKINSON:** Absolutely. But that is when the conflict comes in because the neighbours stand to get nothing. I have received letters, and I am sure you will get many letters and submissions. One lady wrote to me, she is on 25 acres of land at Taralga. She moved there to have a beautiful vista. She could not afford to buy any more land, but she did up the front of her house and had a beautiful aspect. Then comes the wind farm. She is going to have three turbines all around her and the closest one will be 900 metres away from her house. Obviously, she is very concerned about that, and rightly so. That is fair enough.

**CHAIR:** Do you have any further information on the flicker impact?

**Ms KATRINA HODGKINSON:** It has come to me in letters.

**CHAIR:** Have you referred to any articles?

**Ms KATRINA HODGKINSON:** I may have something in the file, Mr Chairman. I am happy to look through my file and send anything in.

**CHAIR:** It is mentioned often. It would be helpful if you have a scientific article.

**Ms KATRINA HODGKINSON:** I may have.

**CHAIR:** If you do, would you provide us with a copy?

**Ms KATRINA HODGKINSON:** Yes.

**CHAIR:** I sympathise with the issue that these companies are not necessarily raging greenies, as I am. I appreciate your concern about the issues as well. However, does that negate the potential of business people to take on an area that is potentially an important component in changing our energy mix away from coal-fired power stations, which also have a huge impact on many rural people throughout the State?

**Ms KATRINA HODGKINSON:** That is a good question, Mr Chairman. You might take up with the Government why they are not being put in national parks and State forests and why they have to go on rural landholders' land.

**The Hon. ROBERT BROWN:** Excellent idea.

**Ms KATRINA HODGKINSON:** If they are so environmentally friendly and good for the environment, why are they not going into national parks? There is a very effective road network through national parks.

**The Hon. ROBERT BROWN:** And a few power grids.

**Ms KATRINA HODGKINSON:** There is very little traffic. Could it be because of the carbon footprint per turbine, which is about five years? Is that taken into consideration as well? Compare the carbon footprint of a turbine to a solar plant and its effectiveness as far as renewables are concerned. I know I am convinced. I have not said during my statement that I am pro or against wind farms. In my statement I outlined the Capital wind farm where the negotiations were very good. They came to me. I had concerns from constituents, neighbours. They met the concerns. So I had no issue. I did not have an issue with it. It is my constituents that I am here to represent today.

**CHAIR:** I appreciate that.

**The Hon. HELEN WESTWOOD:** Are any of the wind turbines you have talked about in your electorate operating?

**Ms KATRINA HODGKINSON:** Yes, they are. You are going to have a look, I believe, at the one at Cullerin, which is just on the Hume Highway. It is only a very small one; it is only 15 turbines. I would love it if members of the committee went there at night after dark because then you will see the impact of the flashing lights as you are driving past. You are trying to deal with B-doubles, it is the Hume Highway with a lot of traffic at high speed—everybody travels at 120 kilometres per hour—you are negotiating traffic and then you are also looking at this strange new development up on the horizon. You do not know what is there because most people

do not travel the Hume Highway a lot—I do—so they are going to see 15 red flashing lights flickering on and off and not really know what is there. It is natural to want to slow down and investigate it.

Actually I approached the Roads and Traffic Authority about putting in a rest stop there. They said to me, "We didn't build the wind turbines, therefore, we are not responsible for it" to which my response was "There are a lot of environmental landscapes in which you do put in rest areas so that people can stop and have a look" but they have not got back to me since then. The Crookwell 2—I am not sure whether you are going to Crookwell—is only very small. It is one of the first ones and the turbines are actually quite short. The turbines at Cullerin are quite short as well compared with, I think the committee will look at the Capital wind farm and you will see the size of those turbines. They are quite tall, so they come in different shapes and sizes and numbers.

There are proposals all over the place. There are also three proposals for new industrial wind turbine areas to be established at Yass, two on private property which, I believe, may be relatively uncontentious—I do not know yet. The third one to be erected at Burrinjuck down near the dam which I would be extremely concerned about because the road access is appalling. It is an eagle breeding ground. A lot of eagles are bred around that area between Canberra and Yass. I think the flora and fauna does not lend itself to a massive industrial development like that. Two may go through relatively uncontentiously, and then the third? They are with Epuron as well. There are also proposals coming up for the Nangus area, which is between Cootamundra and Gundagai.

**The Hon. HELEN WESTWOOD:** Do the responses from your constituents vary and you find that one farm receives less complaint than another?

**Ms KATRINA HODGKINSON:** This is still a relatively new phenomenon. It has been about 10 years since the first ones went up. At Woodlawn it was tied in with a waste facility and there was a good message sold with it. Capital was a very early one as well. The little farm at Crookwell was a nice, fuzzy, warm feeling thing. You would stop in the little rest area there and have a look "Oh, isn't this nice?" The Teralba one was extremely contentious. It has been through the courts once. I think it may be back there again now, I am not 100 per cent sure of where that is. That is now in Pru Goward's electorate because of the redistribution so I am not up to speed on that one.

Some are really contentious and it has got to do with the size of the turbines, the neighbours, how long they have been there, probably the size of the properties as well. I said to Epuron, "Would you ever consider constructing turbines in the Southern Highlands area, a bit closer to Sydney?" They said, "No, too hard" because the closer you get to Sydney the smaller the blocks, the more landholders you have to deal with and the more contentious it becomes and it becomes a bit of a legal minefield. You probably have more professionals living closer to Sydney on smaller blocks as well who go out and have weekenders, or whatever.

**The Hon. HELEN WESTWOOD:** Is the consent authority the local council?

**Ms KATRINA HODGKINSON:** No. It is all part 3A. Ms Westwood you raise a really good point because that is also an issue of real concern. Communities feel that they do not have a voice with wind farms. They write to me. I forward their letters to the Minister for Planning, Ms Kristina Keneally, and then she gathers them all up and sends me a bland reply, which does not help anybody usually. So issues are just not getting sorted, which is one of the reasons why I wrote to this inquiry to try to get some of these issues on the table.

**The Hon. HELEN WESTWOOD:** Mr Yost, the previous witness, talked about smaller wind farms which have been certified by the local council. Do you have any in your electorate?

**Ms KATRINA HODGKINSON:** No, I have none.

**CHAIR:** You have concerns about visual and noise impacts. Would an advantage be gained, for example, if there were a two-kilometre buffer from neighbours—something a bit more rigid than what we are operating under at this point in time? Would that be support for people who feel they are put upon by these projects?

**Ms KATRINA HODGKINSON:** It is probably a question that would be best directed to the people who come and see the committee who are actually directly impacted.

**CHAIR:** You obviously get feedback from a lot of people in the community and possibly you would have a better overview.

**Ms KATRINA HODGKINSON:** I would say if there were not a visual impact it would significantly negate or lessen the concern of neighbours if they did not have to look at it. But unfortunately wind blows on top of hills.

**The Hon. RICK COLLESS:** I refer to your description of these sites as industrial areas. Do you believe they should be zoned industrial rather than farmland?

**Ms KATRINA HODGKINSON:** I do, because these are industrial wind turbines. They are very large structures of 80 metres, 130 metres and some taller. That is about the height of the pylons of the Sydney Harbour Bridge.

**The Hon. RICK COLLESS:** The new ones will be 150 metres from the top of the tower.

**Ms KATRINA HODGKINSON:** That is even higher than a pylon of the harbour bridge. It is a big construction. I would argue with the committee that if that were to be constructed in a residential area it would not stay as a residential zoning, I do not think so, so why is it any different in New South Wales? Why would they remain zoned rural? To me it is a big carbon footprint per turbine. It is a big development. There is a lot of concrete used in it and a network of roads have to be established and solid maintenance has to be established. These are big electricity generating beasts, if you like, so constant maintenance has to be done. You don't want them breaking or a propeller falling off or whatever.

I have seen some dreadful photos of wind turbines that have caught fire overseas. Some of the photos that I have seen are really awful. I would not suggest that that would happen here in New South Wales because, I suppose, it has happened once overseas then companies would learn from that and make sure that did not happen again. That is why they need to have this constant maintenance and activity around them.

**The Hon. HELEN WESTWOOD:** In relation to industrial zoning, the committee heard earlier that rural wind farming and true farming can co-exist in the one location. If the land were re-zoned industrial and that land were lost for agricultural production would you be concerned?

**Ms KATRINA HODGKINSON:** It would be a way to get the local community more engaged with the process if it were up to the council to determine whether that land was suitable to become an industrial zoning so that would be a positive development of it, I think. I think that local government should have more of a say about what happens in their community, particularly with the erection of such massive structures. Industry and rural absolutely go hand in hand. We see it all the time. We have got abattoirs and all sorts of developments in rural New South Wales. I am very pro-development too. We need the jobs, but let us get the system right.

**The Hon. HELEN WESTWOOD:** It may mean that other types of activity may also then be permitted on that site that may prevent farming on that site?

**Ms KATRINA HODGKINSON:** If a solar plant were to be put on a farm would special planning be needed? It might be a question you could ask, I do not know. They look very nice—public art.

**The Hon. CHARLIE LYNN:** What do you think about the colour of them?

**Ms KATRINA HODGKINSON:** The colour is fine.

**The Hon. HELEN WESTWOOD:** I hear from what you are saying that you think wind farms are acceptable but you think that there should be more input from local communities in the assessment of their appropriateness, in particular, location?

**Ms KATRINA HODGKINSON:** My personal view?

**The Hon. HELEN WESTWOOD:** In terms of representing your constituency what would you like to see?

**Ms KATRINA HODGKINSON:** My personal private view is that I think we should be looking at different renewable energies, and we are the most advanced nation as far as solar is concerned but we are not implementing it. My personal point of view is stop building wind farms today and let us get into solar and other forms of alternative renewable energies. My view in being here today is to tell you that my constituents, who are going to be impacted by wind farms, are not happy. It causes me a lot of grief as a local member to be the shoulder to carry those people through a really distressing time.

Suicide rates are not going down, they are going up. There has been enough stress in rural communities; we just do not need any more division. We do not need it and it has been extremely divisive for a lot of my communities. My fear is that as they continue to proliferate and people really start to be impacted by them it is just going to get worse. So I would like to see the system improved. If we have to have them, let us improve the system and let us get communities having a greater say.

**CHAIR:** Thank you very much for showing your obvious interest on behalf of your community. We will be continuing on with our deliberations and we will be going out there. I think I speak on behalf of all members of the committee that we will be looking forward very much to experiencing noise and visual impacts and getting out on the ground and having a look at them. I am sure we have all seen them in various ways but I will be very interested to see them from the perspective of neighbours and those sorts of impacts. Hopefully we will come up with some reasonable conclusions in our report.

**The Hon. ROBERT BROWN:** Stick an RTA stop on that piece of road, particularly going south.

**CHAIR:** That is a good point.

**(The witness withdrew)**

**(The Committee adjourned at 4.52 p.m.)**