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Department of the Senate
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

Email: community.affairs.sen@aph.gov.au

# Origin Energy's Response - to the Senate Inquiry into the Social and Economic Impacts of Rural Wind Farms

## 1. Introduction

Origin Energy Limited (Origin) welcomes the opportunity to make a response to the Senate Inquiry into the social and economic impacts of rural wind farms.

Origin is a major integrated energy company involved in gas exploration and production, power generation and energy retailing. With over two million electricity customers and one million natural gas customers we are a significant participant in a range of national and state based energy and climate change regulatory schemes and initiatives. Our customer base will soon grow with the acquisition of the NSW-Government retail businesses: Integral Energy and Country Energy, as we become Australia's largest energy retailer.

We're a significant investor in renewable energy technologies, including geothermal, solar and wind. For example:

- we currently have over 500,000 customer accounts with green energy products such as Government accredited GreenPower and our Green Gas products.

- Origin has commissioned its first wind farm and has over 3,000 MW of wind farm development options.

- we are a joint venture partner with Geodynamics Limited (geothermal).

- in solar, we are in the early stages of commercial production of our leading edge Sliver solar panels. Origin is also a leader in the market for small-scale solar photo voltaic (pv) installations.

- we've announced a joint venture to evaluate the hydro-electric potential of the Purari Hydro Resource in Papua New Guinea. Capturing the power of the existing river flows, the development under consideration would have the capacity to generate approximately 1,800 MW of renewable baseload electricity.

## 2. Overview of Origin's Policy Position

Origin strongly supports a well designed Emissions Trading Scheme (ETS), such as the proposed Carbon Pollution Reduction Scheme (CPRS) as the primary policy measure to reduce Australia's greenhouse gas emissions and facilitate the transition to a low carbon economy. An ETS provides an emissions price signal over the longer term for a range of climate change responses, including investment in renewable energy and transitional fuels such as gas.

Origin has long supported the Renewable Energy Target (RET) as part of a suite of policies in order to develop a range of renewable technologies which are most appropriate for Australia. We continue to advocate for a simple and stable RET market that provides investor confidence.

In addition to a carbon price and the RET, transmission network planning and infrastructure are required to enable the efficient and cost-effective absorption of wind and other renewables into the generation mix.

The ability of Australia to deploy wind energy is intrinsic to meeting the RET at lowest cost and is part of the energy mix required for a low carbon future. Key international economies are rapidly installing wind technology. According to the World Watch Institute[1], wind energy commissioned in 2010 alone reached a record high of 38 GW. Whilst, Europe took the early lead in wind energy, in 2010 it was China at the top, with 13.8 GW added, representing more than

[1] http://www.worldwatch.org/node/6481

one-third of the world's installations - up from just a 2 percent market share in 2004. The United States was second, with 10 GW added. This compares to only 168 MW installed[2] last year in Australia, all of which was in South Australia.

It's a fact that wind energy will remain, in most situations, the lowest cost large-scale renewable option for the foreseeable future. The use of more costly renewables such as large scale solar would put greater pressures on already rising electricity prices and Australian consumers.

Every large-scale infrastructure development requires public scrutiny and local community involvement. All developers of wind farms need to actively engage and work with the local community to ensure successful outcomes. In-turn, rural communities and other stakeholders need accurate and timely information.

Our experience is that many people across Australia and in rural areas strongly support wind energy. A recent Newspoll survey[3] found that in regional areas - 90% of respondents believe Australia should be producing more renewable energy. When focusing just on wind energy, a survey conducted for the NSW Government[4] of over 2,300 respondents showed that:

- 8 in 10 support wind farms being built in their local area; and
- 60 per cent of residents supported wind farms operating as close as one to two kilometres from their properties.

## 3. Adverse Health Effects

The Inquiry has sought views on whether there are any adverse health effects for people living in close proximity to wind farms and we make the following comments on this topic.

Working wind turbines do produce low frequency noise and infrasound. The section below provides background context and a comparative analysis showing that the levels of infrasound

[2] http://www.cleanenergycouncil.org.au/cec/home.html
[3] *Energy Sources*, Newspoll, May 2010. http://www.cleanenergycouncil.org.au/dms/cec/policy/eRET/100503-Energy-Sources-report/100503%20Energy%20Sources%20report.pdf
[4] *AMR Interactive Survey*, http://www.environment.nsw.gov.au/media/DecMedia10111901.htm

are not perceptible, nor does any credible evidence demonstrate they or similar levels of noise from other activities, cause harm to the human body.

Origin takes seriously any concerns about safety and potential impacts on people's health and so has taken steps to investigate the concerns being expressed. We are aware of stories and anecdotal information circulating which allege a link between low frequency noise/infrasound and negative impacts on people's health. However, we are an energy company, not a health authority, and therefore have sought to draw on the advice of relevant medical and professional health organisations which are in a better position to weigh-up the scientific evidence, some of which is outlined below.

We respect the recognised health organisations around the world, which to-date have been definitive that noise from wind farms has no direct adverse impact to human health. However, the fact remains that there are people in some communities that are concerned, this could be due to:

- a lack of credible, accurate, timely and digestible information; or
- it has been suggested that if people are worried about their health, they may become anxious, causing stress related illnesses (as referenced by the National Health and Research Council). This is not unique to wind farms as it can occur for any new technology or major change that people may be concerned about.

### 3.1 Defining Infrasound and Low Frequency Noise

The normal range of hearing for an adult is generally between 20 Hz and 20,000 Hz. Low frequency noise is commonly defined as frequencies between 20 Hz and 200 Hz. Infrasound is generally defined as noise below 20 Hz, which is below the threshold of hearing for most people.

Infrasound is produced from natural processes such as ocean waves, waterfalls, lightning and earthquakes. It can also be generated from human activities such as the operation of machinery, aircraft, wind turbines and explosions.

Infrasound created from the operation of modern wind turbines is very low and is below the hearing thresholds of humans, i.e. it is not audible. The graph below from a report by noise

monitoring experts Sonus[5] provides a comparative assessment of infrasound measurements. The dark green line shows the perception threshold for infrasound as established in international research as 85 dB(G). Under this line, infrasound has been recorded from a range of sources: wind farms (orange), central business district (pink), a gas-fired power station (light green), a beach (blue) and an ambient area (grey).

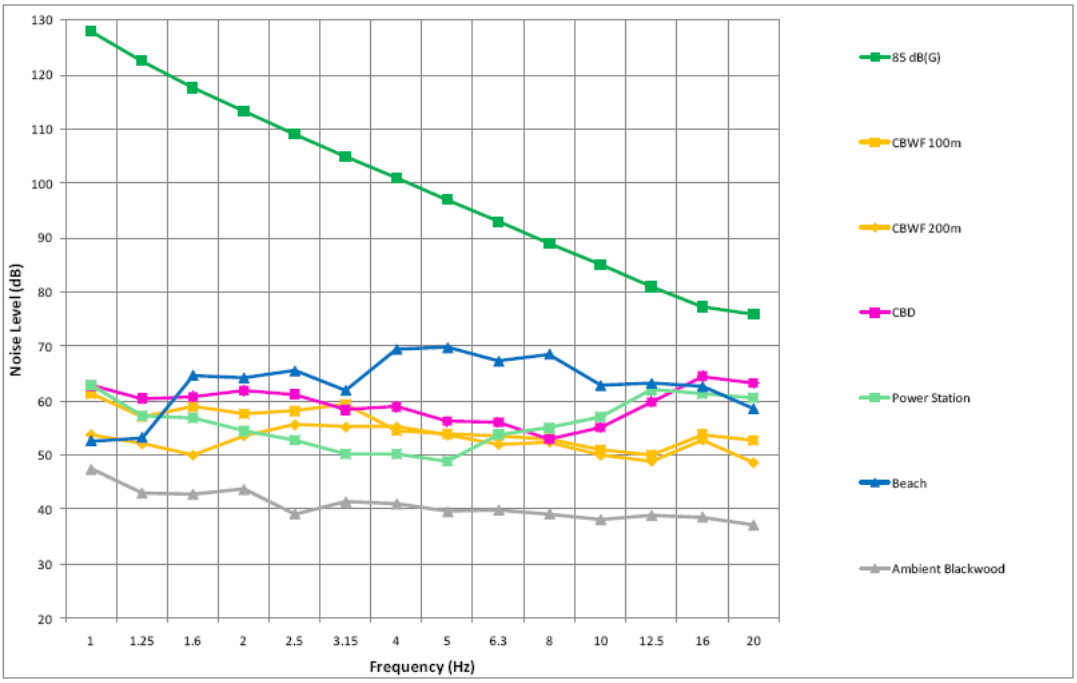



**Figure 12 - Summary of Measurements Cape Bridgewater Wind Farm (CBWF)**

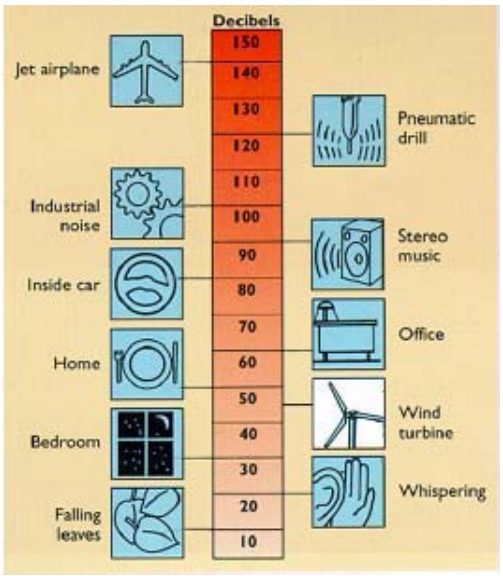
Source: Sonus Pty Ltd, *Infrasound Measurements from Wind Farms and Other Sources*, Prepared for: Pacific Hydro Pty Ltd, November 2010.

The assessment undertaken by Sonus, demonstrates that infrasound from wind farms is at a very low level and is not perceptible to humans. Noise at just 100 m to 200 m from a wind turbine is less than that experienced at a beach and also less than in a central business district. Furthermore, the levels recorded at residences with more than a 300 m separation from a working turbine are significantly lower again, to the point that they approach ambient levels. We are not aware of infrasound from any of these other similar and moderate sources being linked to human health.

[5] Sonus Pty Ltd, *Infrasound Measurements from Wind Farms and Other Sources*, Prepared for: Pacific Hydro Pty Ltd, November 2010.

At very high sound pressures, such as from explosions, infrasound may cause vibrations that can be detected in the human body and in-turn could potentially affect human health. However, turbines do not produce high infrasound pressures[6].

The following figure shows typical sound pressure levels in the audible range. Note that the wind turbine measurement is at approximately 350 m. An office or busy home would typically have higher sound pressure levels than that experienced inside a residence near a working turbine. Again, we are not aware of sound from any of these other moderate sources being linked to human health.




*Typical Sound Pressure Levels*[7]

### 3.2 No Credible Scientific Data

At present, the advice from acoustic experts, recognised health organisations (including the National Health and Medical Research Council) and Government Departments is clear - low frequency noise and infrasound from wind farms have no direct adverse impacts on human health, and the standards in place within the various planning systems are correct and appropriate.

[6] http://www.awea.org/documents/factsheets/Utility_Scale_Wind_Energy_Sound.pdf
[7] http://www.awea.org/documents/factsheets/Utility_Scale_Wind_Energy_Sound.pdf

Sonus' assessment, as detailed above, demonstrates that infrasound from wind farms is well below perception threshold levels and at a short distance, less than that experienced at a beach or in a central business district (both being locations where no known infrasound health related issues arise).

Despite the installation around the world of over 150,000 turbines over the last twenty plus years, there is currently no credible scientific data to suggest that noise emitted by wind turbines affects human health. This is supported by a range of reputable entities, for example:

a) **World Health Organisation**[8]: *wind power represents one of the most benign of all forms of electrical generation (alongside some other renewable technologies) in terms of direct and indirect health effects. There is no safer or healthier alternative.*

*There is no reliable evidence that infrasound below the hearing threshold produce[s] physiological or psychological effects. Infrasound slightly above [the] detection threshold may cause perceptual effects but these are of the same character as for "normal" sounds*[9]*.*

b) **National Health and Medical Research Council**[10]: *There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines.*

*c)* **Victorian Minister for Health**[11], Daniel Andrews, 2010: *The chief health officer is of the view that a considerable amount of international research exists and the conclusions of the validated and peer reviewed research consistently demonstrates that health issues associated with wind farms are negligible.*

*d)* **NSW Department of Planning**[12]**:** *The Department of Planning stated "… currently there is not sufficient information to draw a connection between health impacts and infrasound impacts, or emissions, from a wind turbine."*

A number of industry bodies have also undertaken their own investigations:

[8] http://www.euro.who.int/document/eehc/ebakdoc08.
[9] World Health Organisation report on "Community Noise", 1995, edited by Birgitta Berglund and Thomas Lindvall, Center for Sensory Research Stockholm, pp 1-195
[10] http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/evidence_review__wind_turbines_and_health.pdf
[11] appeared in The Ballarat Courier on 1 November 2009 and subsequently, validated via email correspondence with the Public Health Unit, Department of Health
[12] in evidence provided to the Inquiry into Rural Wind Farms (2009)

a) **American and Canadian Wind Energy Associations**[13]: *There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects. The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans. The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.*

b) **Clean Energy Council, Sonus Report**[14]: *The standards and guidelines used for the assessment of environmental noise from wind farms in Australia and New Zealand are amongst the most stringent and contemporary in the world. [The] rate of complaints relating to environmental noise emissions from residents living in the vicinity of operating wind farms is very low; and there is detailed and extensive research and evidence that indicates that the noise from wind farms developed and operated in accordance with the current Standards and Guidelines will not have any direct adverse health effects.*

c) **British Wind Energy Association**[15]: *Infrasound and low-frequency noise from wind farms are at a very low level, so low that they lie below the threshold of perception, even for people who are particularly sensitive to such noise, even very near turbines.*

Origin continues to monitor the issue and will continue to take advice from relevant acoustic, health and governmental experts.

### 3.3 Dissemination of Information

While the advice from public health bodies is quite clear, it remains the case that concerns about 'wind turbine syndrome' are nevertheless present in at least some rural communities. We invite the committee to consider how much such concerns are exacerbated by sometimes sensationalist media coverage, circulation of inaccurate and unsubstantiated information and the forceful representations made by a minority of wind energy opponents. This process can

[13] *Wind Turbine Sound and Health Effects – An Expert Panel Review* (report prepared for AWEA & CWEA), December 2009.
[14] http://www.cleanenergycouncil.org.au/dms/cec/reports/Sonus-Wind-Farms-Technical-Paper-November-2010/Sonus%20Wind%20Farms%20Technical%20Paper%20November%202010.pdf
[15] http://www.cleanenergycouncil.org.au/cec/technologies/wind/turbinefactsheets/mainColumnParagraphs/0/text_files/file0/wind_turbine_syndrome.pdf

foster what is known as the 'nocebo effect', whereby some people can be impacted by a worsening of mental or physical health based purely on their fears or beliefs in a potential adverse affect. This nocebo effect can occur for any new technology or major change that people may be anxious about.

The NHMRC[16] review also commented on this: "*It has been suggested that if people are worried about their health they may become anxious, causing stress related illnesses. These are genuine health effects arising from their worry, which arises from the wind turbine, even though the turbine may not objectively be a risk to health*".

It is important to understand that 'wind turbine syndrome' is a term introduced relatively recently into the Australian public debate, at least compared to how long wind farms have been operating. It was introduced and disseminated by wind farm opponents for some time before public health bodies in Australia – which tend to work in a more methodical fashion – were in a position to respond. Those bodies are also notably cautious in how they respond - their statements follow medical and scientific norms. They report the absence of evidence rather than making blanket assertions of the form available to supporters of the 'wind turbine syndrome' hypothesis.

This contributes to an asymmetry in media coverage, where the sensationalist assertion appears to carry greater weight than the measured tones of a reputable scientific body. Take for example the ABC Ballarat story[17] (Appendix B), which begins with a brief summary of the NHRMC findings, followed by eight paragraphs of theatrical references to opponents' allegations.

We suggest that the extended period of information deficit and shortage of accurate information was itself a source of anxiety and, unfortunately, created fertile ground for scare mongering. This is supported by the survey commissioned by the NSW Government[18] which found that "97 per cent of residents had heard about wind farms or wind turbines, but a majority of residents felt they needed more information". Mr Simon Smith (Deputy Director General, NSW Department of Environment, Climate Change and Water) said "the study was an important piece of research that showed good information was the key to helping communities understand the renewable energy sector and to make informed decisions".

[16] http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/evidence_review__wind_turbines_and_health.pdf
[17] ABC News, *Residents reject wind farm health findings, 5 July 2010,* http://www.abc.net.au/news/stories/2010/07/05/2944584.htm
[18] *AMR Interactive Survey*, http://www.environment.nsw.gov.au/media/DecMedia10111901.htm

In this regard, we congratulate efforts such as those of the NSW Government to disseminate accurate information and to engage directly with rural communities through its Renewable Energy Precinct program. While a project proponent such as Origin should provide as much information as possible to the communities in which they are developing new wind farms, they do not have the resources or the responsibility to disseminate it to the wider community for public debate. We encourage:

- other relevant State and Federal Government Departments to similarly take action to disseminate independent and accurate information and to better facilitate wider stakeholder engagement.
- relevant public health bodies to undertake greater outreach and extension activities, to ensure their views are more widely known and better understood.

## 4. Noise and Vibration

The Inquiry asked for responses in relation to concerns over the excessive noise and vibrations emitted by wind farms, which are in close proximity to people's homes.

Apart from low frequency noise and infrasound which is discussed in the section above – we believe that noise and vibration are appropriately and stringently managed by existing development planning frameworks.

At Origin, each wind farm is, and will continue to be, developed and its compliance assessed in accordance with relevant Standards, laws and regulations. We are obviously concerned for the wellbeing of our local communities who live and work around wind farms and other interested stakeholders. We take any of their concerns seriously and endeavour to appropriately address potential issues. The standards applied to our wind farms are some of the strictest in the world. As an example, the following is an excerpt from a recent Australian Technical Assessment by Sonus[19]:

> *The World Health Organisation (WHO) established a recommendation of 30 dB(A) inside a bedroom to prevent the potential onset of sleep disturbance effects (WHO, 1995).*

[19] http://www.cleanenergycouncil.org.au/dms/cec/reports/Sonus-Wind-Farms-Technical-Paper-November-2010/Sonus%20Wind%20Farms%20Technical%20Paper%20November%202010.pdf

*The WHO guidelines indicate a noise level of 30 dB(A) inside a typical bedroom correlates to an external noise level with the windows open of the order of 45 dB(A).*

*The typical baseline limit criterion of 35 dB(A) to 40 dB(A) found in Australian wind farm Standards and Guidelines is therefore significantly more stringent than the WHO guidelines recommendation of 45 dB(A), by a margin of at least 5 dB(A) and up to 10 dB(A).*

*For comparison purposes, a wind farm that complies with a 40 dB(A) baseline limit could introduce twice as many turbines again onto the site, or move of the order of half as close to the nearest dwelling, and still achieve the WHO recommendations to prevent the potential onset of sleep disturbance.*

*Based on the above, the baseline limits of Standards and Guidelines in Australia are sufficiently stringent to ensure the potential onset of sleep disturbance effects from the operation of a compliant wind farm does not occur.*

## 5. Property Values, Employment Opportunities and Farm Income

### 5.1 Property Values

Whilst there is commentary on the (alleged) impacts of wind farms on property sales in the public arena (not all of it negative), we invite the committee to concentrate on the reputable and independent studies which have examined this question. These suggest that initial concerns about potential visual and noise impacts could be perceived to temporarily reduce prices marginally in the short-term. However, over the longer–term, wind farms have no discernable or significant financial impact on the local property market.

Studies overseas have also found there is little to suggest that wind farms impact negatively on the value of neighboring properties.[20],[21], [22]

[20] *Wind Energy, Myths and Facts,* May 2007, Sustainability Victoria. (Page 11) References include both American and Danish studies.
[21] Excerpt from MacIntosh, Andrew and Downie, Christian (The Australia Institute), *Wind farms: the facts and the fallacies, Discussion Paper No. 91, October* 2006, (Pages 26 & 27).
[22] http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e-ppt.pdf

The NSW Department of Planning commissioned the NSW Valuer General[23] to prepare a report on land values and wind farms. The key finding was that wind farms do not appear to negatively affect properties. Forty of the 45 sales investigated did not show any reductions in value. Five properties were found to have lower than expected sale prices (based on a statistical analysis) although, it was not determined if this was due to the wind farm or if other factors may have been involved.

Having appropriate and stable development approval processes minimises the risks of adverse impacts on property prices and ensures the long-term viability of wind farms.

### 5.2 Employment Opportunities and Farm Income

Local communities benefit economically, both directly and indirectly from wind farms - whether through direct investment, creation of jobs or the diversification of farm income streams. This is particularly true for rural communities that have historically relied on one or two industries, often with a primary agricultural base.

To demonstrate the significance of wind farms in terms of rural farm income – it's estimated that the total annual revenue directed to Australian rural farms hosting turbines in 2020 would be $35 million[24].

Wind farms create direct employment opportunities, both during construction and the ongoing operational/maintenance phases. For example, we have three staff to operate and maintain our Cullerin Wind Farm which has 15 turbines. A general rule-of-thumb is that for every 25 turbines, three jobs onsite are created. More jobs are created indirectly in the local community to support and service the people employed in the installation and maintenance of the wind farms.

To paint a broader picture - the wind sector worldwide has become a major job creator: in only three years it had almost doubled the number of jobs from 235,000 in 2005 to 440,000 by the year 2008.[25]

[23] http://www.lpma.nsw.gov.au/__data/assets/pdf_file/0018/117621/t0L51WT8.pdf
[24] Basis for calculation: by year 2020 we estimate that installed wind capacity in Australia will be 7,000 MW. Assuming landowner hosts are paid $15,000/turbine/annum (based on published article) http://www.realestate.com.au/property-residential+land-vic-lexton-2799020 and assume the typically turbine size in year 2020 is 3 MW. Then the annual revenue at the end of the RET would be: 7,000 MW/3 MW (i.e. 2,333 turbines) and then x $15,000/annum = $35million/annum.

Another positive is the training and up-skilling provided to local employees that can have longer term flow-on benefits, such as attracting other industries requiring skilled labour to the area. More people employed in the local area means more people to be fed and clothed, more children in schools, more staff needed for medical services, and more need for recreational facilities. The influx can maintain school bus routes, keep young people in the area and provide an injection of vitality into rural communities.

There also is a strong regional development aspect to wind farms in Australia, as they are being built or are proposed in areas not previously associated with energy production. This tends to disperse the economic activity associated with energy production across wider area/communities.

In many cases, wind farms have a strong and positive impact on local government finances, often in rural Shires with few significant sources of rate income other than from farm and household rates. In the case of a project like Origin's Stockyard Hill in Victoria, this would generate rate income for the local Shire in the order of hundreds of thousands of dollars per year, indexed to CPI.

[25] World Wind Energy Association, WWEA Report 2008.
http://www.wwindea.org/home/index.php?option=com_content&task=view&id=226&Itemid=43&limit=1&limitstart=1

## 6. Interface Between Commonwealth, State and Local Planning Laws

Having appropriate and efficient planning processes is critical to supporting the growth of the renewable energy industry. Origin advocates the following aspects as being critical to ensuring robust, judicial and credible processes:

1. **Expediency.** For example a prescribed maximum timeframe for determination.
2. **Well defined and streamlined** approval processes. Avoiding potentially redundant and/or multiple approval hurdles. Ensuring that relationships and responsibilities amongst the various regulatory bodies are clearly defined. Coordination of issues across different departments/authorities within the State system as well as coordination between different levels of Government. In Australia, the States and Local Councils have jurisdictional powers over the planning approval processes for wind farms, so whilst streamlining or harmonisation could be beneficial - it still needs to fit within this state-based context.
3. **Simplified, clearly defined and consistently applied** protocols, standards and criteria for environmental and technical assessment.
4. **Certainty.** Definitive and stable policy and regulatory frameworks enable better investment decisions to be made with respect to the wind industry.

Origin has supported the development and use of best practice guidelines for wind farm developments such as the Australian Wind Association's Best Practice Wind Farm Guidelines. We undertake rigorous technical assessments of a range of issues from cultural heritage, flora and fauna through to visual impacts. During construction and operation we continue to undertake monitoring of aspects such as noise and implement a range of mitigation measures to ensure the safety and environmental integrity of the projects. We also proactively foster continued lines of communication with local communities, maintain complaint resolution processes and actively seek to voluntarily contribute to the local towns and rural areas in which we operate.

We believe the current proliferation of guidelines and standards, i.e. by States and the Draft National Wind Farm Guidelines create a confused, cumbersome and inefficient policy and planning environment. It is an environment that is detrimental rather than supportive of wind farm projects and hampers effective stakeholder engagement resulting in additional costs for project developers. In the long-term this will:

- impact on the investment in the renewable energy sector

- limit the creation of clean energy jobs in rural Australia
- increase the end cost to electricity consumers, at a time when price rise stress is already being experienced
- continue to feed unfounded fears and concerns such as health issues; and
- reduce Australia's ability to meet the RET and our international emission reduction targets.

Origin strongly opposes the adoption of the Draft National Wind Farm Guidelines (2010) in their current form, we believe they fundamentally do not meet the stated objectives as set by the Environment Protection and Heritage Council and the erroneous nature of the noise section causes particular concern. The report by the technical consultancy, Sonus (contained in Appendix A), was commissioned by Origin to investigate the effect of the proposed noise requirements. Sonus found that it would require the removal of two-thirds of turbines from a typical project. This obviously would create an unviable situation for any new wind farm project, which we expect was not the intention of the Guideline authors. We therefore, strongly request that the noise section is rewritten prior to any further consideration of its adoption by the States.

Recently, there has been debate about whether powers for determining planning consents for large-scale wind farms (e.g larger than 30 MW) should be within the jurisdiction of State or Local Councils. Origin would advocate that generally, it is more efficient and appropriate to have the State Planning Department (or Minister) as the determining body for the following reasons:

- other infrastructure projects of a corresponding size are typically determined at State, not Local Council level
- State departments have the appropriate resources, both in terms of capacity and technical expertise
- wind farms can sometimes be divisive within a local community – increasing biases and pressures upon a Local Council. The State Government would most likely be independent from the more localised issues
- large projects can be located across more than one Local Government Area (LGA). Again, State Government would usually be best placed to handle these cross-boundary projects (including where a transmission line associated with the project crosses another LGA); and

- State-based decision makers often have a broader perspective to consider and account for higher-level policy settings such as State renewable energy targets, the RET and Australia's Kyoto target.

## 7. Other Relevant Issues

### 7.1 Prescribed Setbacks

The designation of setbacks is not done for any development in Australia, whether they are in the energy, chemical or transport sector. Additionally, neither are 'right of veto' or shared payment schemes a feature of planning instruments applied to other industries. At a time when action to mitigate climate change is critical and we're building our energy infrastructure for the next thirty plus years – it's counter intuitive to impose unfounded and more stringent requirements on a clean energy source such as wind.

Instead, the existing planning frameworks enable potential issues such as noise, visual amenity, impacts on flora and fauna, etc, to be appropriately investigated and mitigation measures agreed during planning consent. The existing planning systems also allow for representations by interested third-parties and prescribe community consultation requirements.

Unfortunately, setbacks are increasingly being suggested as a solution to perceived issues or unfounded fears. This seems to be especially true for infrasound and low frequency noise – where there is no evidence that they have any causal effect – and where setbacks are touted as an easy solution to placate concerns.

Origin maintains its position that setbacks should not be prescribed, they are: arbitrary and not based on scientific evidence and each development must be considered independently to ensure all site specific and community issues are appropriately taken into consideration. For example, the actual terrain, vegetation and even micro-climates of a specific area can affect a range of parameters such as: fire safety, noise, visual amenity etc. This was also a key factor in the recent decision by the NSW Land and Environment Court[26] in respect to the Gullen Range Wind Farm, whereby:

[26] http://www.austlii.edu.au/au/cases/nsw/NSWLEC/2010/1102.html

> The Court refused to apply the Council's blanket 2 km setback, noting that [it] was an 'unsubstantiated empirical standard' and not founded on any proper basis. The Court said assessment of impacts on properties should be done on an individual basis taking into account topography, orientation of houses, distances to visible turbines, etc.
>
> The Court also rejected the argument from objectors that compensation should be required to offset the loss of value on surrounding properties. It found that the wind farm was a permissible use on the land which meant that the court had no legal basis to decide questions of loss of value to individual properties. To do so would undermine the planning process and its long standing principles.

A report by Carbon Market Economics[27] found that a mandatory setback of 2 km would put between 50 and 70% of proposed wind farms in Victoria in jeopardy.

Origin has undertaken an assessment of our own wind project pipeline to determine the effect of a 2 km buffer or exclusion zone for non-host residents. We found that it would result in the reduction of between 17% and 70% of turbines for projects and would typically equate to at least a 20% reduction in generation capacity, resulting in many of our projects becoming unviable. Another issue associated with the arbitrary setback debate is the ongoing uncertainty it creates for investors and the flow-on consequences, i.e higher costs of energy supply. Again, this outcome is contrary to the Federal and State Government renewable energy policy platforms.

In some cases, setbacks have been discussed not as a response to mitigate environmental impacts but rather to provide a 'right of veto' to neighbouring non-host residents and in-turn to enable those neighbours to enter financial arrangements with the project proponents. Again, we ask: why should this type of arrangement be imposed on wind farms and not other, often more hazardous or imposing developments?

Another problem with this approach continues to be its arbitrary boundary demarcation as opposed to mitigating environmental impacts (as identified in technical assessments and monitoring programmes) and responding directly to the specific concerns of the neighbours. A classic example of the problems that can arise is that of visual impacts, where some neighbours may be within say, 2 km of a turbine but have no view of it, while others considerably more distant may experience a higher impact because of the particular features of the landscape or

[27] http://www.cleanenergycouncil.org.au/dms/cec/reports/Victorian-Renewable-Energy-Policy-Impacts---November-2010/Victorian%20Renewable%20Energy%20Policy%20Impacts%20-%20November%202010.pdf

the turbine layout. Origin argues that privileging one set of neighbours due purely to proximity *vis a vis* other members of the community does not solve the problem, and could actually make it worse. Origin seeks to mitigate environmental impacts commensurate with their effects, and genuinely engage and contribute over the longer-term to the communities where we operate. We believe that this is best done through direct contributions to the local community under targeted grant programs or via other community based enhancement programs.

### 7.2 Transmission Infrastructure and Planning

The RET represents a significant change in the national electricity market (NEM) which to-date has primarily facilitated the entry of traditional forms of generation, e.g. coal and gas. It is imperative that energy market frameworks are sufficiently adaptable to accommodate the changing composition of generation sources.

Whilst some renewables are located relatively close to existing transmission, many of the best resources (in terms of quality and scale) are situated in remote areas. As the trend of incorporating increasing amounts of renewable energy into the market continues the unlocking of these remote renewables will take on greater importance. If we are to meet climate change policy objectives at least cost it simply makes sense that these resources are brought to market where efficient. Unfortunately, the current rules governing network connections do not effectively allow for this to occur.

The problem stems from transmission investment being most efficiently and cost effectively undertaken in large increments in order to achieve economies of scales. This is particularly important in the context of remote connections where long distances and consequently high costs can prove prohibitive.

The proposed Scaled Efficient Network Extension (SENE) mechanism that is now being contemplated by the Australian Energy Market Commission (AEMC) accounts for the difficulties in constructing remote transmission assets by facilitating a more strategic approach. Under the SENE, subject to satisfying of a number of criteria, a larger transmission line can be built in advance of all prospective generators being ready to connect. Importantly this allows for the realisation of economies of scale, and a lowering of the cost of connection, which is ultimately passed through to households and other consumers of electricity. Origin remains committed to

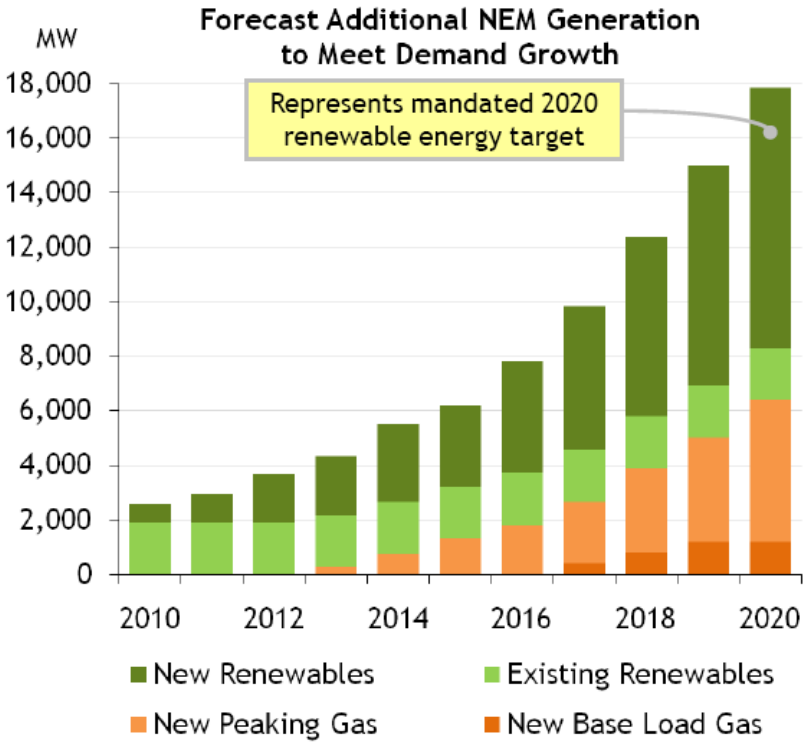
the SENE and considers that the adoption of an appropriately designed mechanism, in a timely manner, is critical to the efficient deployment of wind energy.

### 7.3 Additional New Generation Capacity Required to Meet Demand

With the RET forecast to drive investment in largely intermittent renewable generation, i.e wind energy - additional and competitively priced generation is needed to meet the balance of the market's future peak and base load requirements.

Graph 1 provides a forecast analysis undertaken by Origin of the likely new combined cycle (base load generation, CCGT) and open cycle (peaking plant, OCGT) required to help meet growing demand. OCGT peaking generation is well placed to meet the balance of the market's requirements. It's therefore important that in the absence of a carbon price signal (i.e. under an ETS) that the Government provides ongoing support for gas generation as a transitional fuel to a low carbon economy.

**Graph 1. Forecast of Additional Generation Required in Support of the RET.**




*Source: Origin forecast based on AEMO's SOO 2009 demand data*
*Notes: Excluding non renewable plant currently under construction*

### 7.4 Environmental Benefits

Wind is an intermittent energy source and will always need to form part of a broader mix of energy supply options to ensure peak and base load demands are met. There are various arguments made by wind opponents that suggest that electricity from wind farms does not result in significant greenhouse gas abatement - some argue that this is because wind will not replace non-renewable generation (i.e. primarily coal, but also gas). However, this is clearly misleading given the current composition of the National Energy Market[28].

Some wind opponents have also argued that the carbon footprint of developing a wind farm is large and is not offset by the electricity it generates. Again, this is obviously misleading. The

[28] http://www.environment.nsw.gov.au/climateChange/reprecinctresources.htm

2010 Global Wind Energy Outlook[29] outlines that "modern wind technology has an extremely good energy balance. The CO2 emissions related to the manufacture, installation and servicing over the average 20 year lifecycle of a wind turbine are generally 'paid back' after the first three to nine months of operation".

Again, we support the work done by the NSW Government[30] in disseminating accurate and timely information relating to this issue (including the study and calculation tool they had developed by McLennan Magasanik and Associates). We encourage other relevant government agencies to similarly proactively disseminate independent and accurate information on this issue.

Another benefit of wind farms as compared to traditional baseload energy, particularly coal fired power stations, is the vastly reduced water consumption required[31]. This plays an important role now given water shortages but will also become increasingly important as climate change adaptation becomes a greater priority.

Other environmental benefits include:

- **Pollution (other than greenhouse gases).** The large-scale electricity generation processes of coal, oil and gas fired power stations, are all more polluting than wind energy.

  Coal combustion releases atmospheric emissions of the pollutants Sulphur Dioxide, Nitrogen Oxides and Carbon Monoxide as well as particulates, heavy metals and organic compounds. Furthermore, coal fired power stations typically discharge 25% of the coal fuel as "fly ash" which is disposed in purpose built landfills adjacent to the power station. Many coal fired power stations utilise cooling water from adjacent lakes and/or rivers and the resultant discharged water has elevated temperatures which cause detrimental impacts to the local marine environment.

  Natural gas combustion in gas fired power stations produce the atmospheric pollutants Nitrogen Oxides and Carbon Monoxide. In contrast, wind turbines have no atmospheric or land based emissions or water discharges.

[29] http://www.gwec.net/fileadmin/documents/Publications/GWEO%202010%20final.pdf
[30] http://www.environment.nsw.gov.au/climateChange/reprecinctresources.htm
[31] http://www.nwc.gov.au/resources/documents/Waterlines_electricity_generation_industry_replace_final_280709.pdf

- **Small occupied land footprint.** The direct footprint of a wind farm is relatively small, e.g the Stockyard Hill Wind Farm project area is 15,617 hectares. However, the directly impacted area (when also including connecting roads) will be just approximately 200 hectares[32].

- **Supply chain infrastructure.** Wind farms do not require supply chain infrastructure, such as gas pipelines, railway infrastructure for coal fired generation, increased truck movements for road fuel tanker deliveries (kerosene/diesel) etc.

- **Legacy impacts.** Due to the nature/quantity of materials at wind farms, there is a very low likelihood of land contamination and consequent impacts like those associated with for example, coal fired power stations where there is a higher potential for offsite migration of contaminates through groundwater and subsequent restrictions of future land use opportunities. Restoring a wind farm to pre-existing land-use is a realistic proposition with a low risk of legacy impacts.

### 7.5 Creating GreenPower Demand

The GreenPower market has been one of the most successful state government policies of recent years, with almost 1 million Australian accounts[33]. Growth of GreenPower will continue to build demand for renewable energy beyond the RET market.

In order to maintain a viable and credible market for GreenPower - Origin recommends that the Federal Government takes measures to make all GreenPower purchases additional to Australia's Kyoto commitments, now and under a future ETS scenario.

The Government can also consider further initiatives to continue to promote and educate the community and businesses on the benefits of using GreenPower.

[32] This is assuming a direct impact of 1 hectare per turbine, which equates to 157 hectares.
[33] www.greenpower.gov.au

We at Origin are appreciative of the opportunity to make this submission and are happy to provide any additional information.

Should you have any questions about this submission please direct them to myself or Anne-Marie Kirkman (Manager, Carbon and Renewables Policy).

Yours faithfully,

**Tim O'Grady**
**Head of Public Policy**

**APPENDIX A**

[Click on image to open report]

Sonus Pty Ltd
17 Ruthven Avenue
ADELAIDE SA 5000
Phone: (08) 8231 2100
Facsimile: (08) 8231 2122
www.sonus.com.au
ABN: 67 882 843 130

# DRAFT NATIONAL WIND FARM DEVELOPMENT GUIDELINES

## REVIEW OF NOISE ASPECTS

This report is a summary of the review conducted by Sonus of the Noise Aspects of the Environment Protection and Heritage Council's (EPHC's) Draft National Wind Farm Development Guidelines July 2010

**Prepared for:**

**ORIGIN ENERGY**
**1 King William Street**
**ADELAIDE SA 5000**

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**S2630C9**

## Appendix B

# ABC Ballarat News

## Residents reject wind farm health findings

By Kellie Lazzaro

Updated Mon Jul 5, 2010 3:39pm AEST

Waubra residents say they are sick and are convinced that wind turbines are to blame (ABC Local: Margaret Burin)

Campaigners against wind farms have rejected a report finding no scientific evidence to link wind turbines to health problems.

The National Health and Medical Research Council, which advises the Federal Government, found that there was no evidence that the turbines' low frequency noise or shadow flicker made people sick.

But residents of Waubra in Victoria's south-west who live near the state's largest wind farm, say they are sick and are convinced that wind turbines are to blame.

Noel Dean has a farm at Waubra but he and his family moved out 13 months ago when their headaches worsened.

"Sore ears, pain in and around the eyes, pain on top of the head, pain in the back of the head, behind the ears and early this year, we started to get throbbing pain at the back of the head and tinnitus," he said.

"We couldn't stay there another night - it was that bad."

Mr Dean first complained to the Waubra wind farm operator Acciona in May last year, but the company refused to give him access to the outcome of its investigation.

He then commissioned an independent report into noise levels at his property at a cost of more than $40,000.

He has just received that report by Noise Measurement Services and says it confirms there is a link between the low frequency noise from wind farms and adverse health effects.

"Anything from 1 to 20 hertz can cause adverse health effects and that is what we have found in a pulsing motion. It is a pulsing motion that makes the effects just a lot worse," he said.

But in a rapid review of existing studies, the National Health and Medical Research Council (NHMRC) has found there is no published evidence of direct pathological effects from wind farms.

The director of the council's evidence and advice branch, Professor John McCallum, says they have brought together opinion and evidence from all around the world.

"Shadow flicker is the flicking on and off of wind turbine shadows as the blades rotate. It is the glint off the surface of the blades and those are now minimised by treatment of the blades that prevents reflective glint as well, and they are the kind of four main areas that people talk about health effects from," he said.

He says World Health Organisation (WHO) studies have found no reliable evidence that sound below the hearing threshold will produce physiological or psychological effects.

The NHMRC report refers to a study of three wind farms in the UK that found if people are worried about their health, they may become anxious and suffer stress-related illnesses.

For this reason Professor John McCallum says people who believe they are experiencing health problems should consult a GP, but he says the report commissioned by Noel Dean about noise levels on his farm would need to be further tested.

Donald Thomas also lives at Waubra and was a big supporter of the wind farm, until he too started getting headaches, heart palpitations and high blood pressure.

"We've invited the Health Minister and top health officials to actually come out to Waubra to talk to us and see what the problem is first hand, but none of them have bothered to do that. They just look at overseas studies and pick the ones that suit them," he said.

The National Health and Medical Research Council acknowledges the health effects of renewable energy generation have not been assessed to the same extent as those from traditional sources and recommends authorities continue to monitor research.

The National Environment Protection and Heritage Council has met in Darwin today to consider national wind farm development guidelines.