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Dear Sir/Madam,

SUBMISSION TO THE SENATE COMMUNITY AFFAIRS COMMITTEE: INQUIRY INTO THE SOCIAL AND ECONOMIC IMPACT OF RURAL WIND FARMS

GL Garrad Hassan is an independent renewable energy consultancy serving the wind, marine and solar sectors worldwide. We offer a broad range of technical and engineering services, industry standard technology products and professional training courses that address the needs of stakeholders at all stages of the renewable energy project lifecycle. We never take an equity share in any development or technology. GL Garrad Hassan works extensively across the Asia Pacific region with offices in China, India, Japan, Australia and New Zealand. In Australia we employ a team of 24 highly trained and experienced professionals in the field of renewable energy.

GL Garrad Hassan welcomes the opportunity to present a submission to the Senate Inquiry into the Social and Economic Impact of Rural Wind Farms.

1 WIND FARM PROJECTS IN THE AUSTRALIAN CONTEXT

The total installed capacity of wind farms in Australia has increased by more than 30% per annum on average over the last 10 years. This growth has largely been driven by the Renewable Energy Target (RET), which mandates that 20% of Australian electricity shall be generated from renewable sources by 2020. Wind farms are expected to make up the bulk of new renewable generators constructed to meet the RET due to the competitiveness of wind energy compared to other renewable technologies.

In addition to the obvious benefit of mitigating greenhouse gas emissions by displacing thermal generation, growth in the installed capacity of wind farms in Australia has numerous benefits including:

- Job creation in geographically diverse rural and regional areas;
- Flow on economic benefits to rural communities (for example, increased demand for local services such as accommodation and restaurants);
- The potential to provide an additional “drought proof” and “flood proof” income stream for farmers;
- Potential upgrades to local infrastructure such as roads;
- Distribution of funds to local community organisations;
- Overall benefits to the Australian economy, including the development of skills and expertise in a sector that is experiencing massive growth around the world.

Another important environmental benefit of wind farms in the Australian context is that, unlike fossil fuel generators, they do not consume water in the process of generating electricity.

Some opponents of the wind industry point to variability of output as a reason for discounting the benefits of wind farms. Despite being variable, wind generation is reliable and predictable in the short term (minutes to hours) and in the long term (months to years). Over long periods of time, months or years, the mean wind, and the energy output of wind farms are very predictable, and typically vary by about 10% from year to year. The main issue with wind is its variability and reduced predictability over periods of hours to days. There is significant investment being undertaken around the world, including Australia, in order to improve the forecasting of wind generation for these time periods.

Typically, predictability improves as geographic diversity increases, that is, the wind generation is not all in one location. This is one reason for encouraging the development of wind farms across diverse regions in Australia.

Wind does not suddenly start and stop, rather it typically varies in strength. Likewise the output from wind farms does not start and stop, but rather varies with time. This contrasts with traditional thermal generation, where the loss of a single generating unit can have a massive and sudden impact on the overall generating capacity in a region. The electricity system operates to cater for variability, both in consumption and for variable generators such as wind.

No single power station is 100% reliable. The electricity system is made reliable by combining the outputs of a number (a portfolio) of power stations and by having sufficient instantaneous reserves available to cover the loss of the largest generating unit in the system. In the Australian networks, the largest units are large coal fired generators. Wind turbines, and wind farms are relatively smaller generation units, and as such do not place additional requirements on the instantaneous reserves that are required in the system.

2 HEALTH EFFECTS

The National Health and Medical Research Council (NHMRC) and the Victorian Department of Health have both recently issued statements indicating that there is no evidence to support the view that wind farms cause adverse health effects:

"There is currently no published scientific evidence to positively link wind turbines with adverse health effects." [1].

"The Department of Health has examined the available scientific literature on wind farms and has concluded that there are no direct health effects that can be attributed to modern wind turbines." [2]

The NHMRC statement is based on a review of literature from a number of sources around the world. The review considered potential health impacts resulting from infrasound noise, electromagnetic interference, shadow flicker and blade glint.

2.1 Low frequency noise, infrasound and wind turbines

Recent media attention has focussed on the potential for infrasound emissions from wind farms to cause adverse health impacts; this is discussed in further detail below.

The pitch of a particular sound is defined as the number of cycles per second of the sound wavelength, where one cycle per second corresponds to one Hertz (Hz). The range of hearing for a healthy young adult is generally between 20 Hz and 20,000 Hz (20 kHz). 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; however the precise sound level intensity at which sound becomes inaudible in the low frequency region varies with the sensitivity of the individual person.

Everyone is exposed to noise (including infrasound) from a variety of sources in their surrounding environment. Environmental noise is a combination of many noise sources, each consisting of a spectrum of differing frequencies.

Low frequency sound and infrasound occur naturally over a range of intensities in both urban and natural environments, without apparent reported problems. Natural sources of infrasound include the human body, surf, rivers, waterfalls and wind, whereas man-made sources include ventilation systems, vehicles, and items of mechanical plant.

The main source of noise from a wind turbine is the aerodynamic noise of air passing over and around the blades. Aerodynamic noise is a broad spectrum sound, generated by random processes of air turbulence and the consequential air pressure fluctuations. In addition there are mechanical sources of noise due to rotating parts and gears which are located in the nacelle at the top of the turbine tower. Wind turbine generators produce sound across the audible spectrum, and like many environmental noise sources, also have sound components in the infrasonic range. The low frequency component in the wind turbine sound is mainly the result of the displacement of air by blades and of turbulence at the blade surface.

The current association of wind turbines with allegedly low frequency noise is possibly due to misunderstanding of the nature of the 'swishing' sound typically heard when standing in close proximity to wind turbines (an effect which attenuates rapidly with distance, and is usually inaudible at greater distances). This effect is actually a modulation (variation in intensity) of higher frequencies, and is not, in fact, low frequency noise or infrasound. In addition, higher frequency sound is attenuated at a faster rate than low frequencies, so the further one moves from the turbine source the more prominent will be the low frequency components. This is common to any noise source with a broad range of frequencies, not just wind turbines.

Studies performed on the effects of infrasonic noise on human health have found that significant levels of low frequency noise and infrasound can be tolerated (over 120 dB below 20Hz) without direct physiological problems caused in humans [3]. These levels are much higher than the infrasonic levels encountered through exposure to wind farms, which is approximately 55 to 75 dB for large megawatt (1.5 to 2 MW), upwind wind turbines [4].

The Department of Trade and Industry (DTI) in the UK commissioned a report into low frequency noise and infrasound after community concerns [5]. Measurements were taken both indoor and outdoor at critical residences in the vicinity of these wind farms. This report concluded that infrasound levels from wind turbines are significantly below the recognised threshold of hearing within this frequency range. The World Health Organisation (WHO) Report on "Community Noise" states that "There is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects" [6].

This position is supported by a recent report by an international panel of independent, scientific experts commissioned by the American and Canadian Wind Energy Associations that was established to review the current literature on the perceived health effects of wind turbine noise in response to community concerns, particularly in the low frequency and infrasonic range [7]. This panel consisted of medical doctors, audiologists and acoustic professionals from the USA, Canada, Denmark and the UK. This panel review concluded that:

- "There is no evidence that the audible or sub audible sounds emitted by wind turbines have any direct adverse physiological effects."
- "Ground-born vibrations from wind turbines are too weak to be detected by or to affect humans"
- "The sounds emitted by wind turbines are not unique and there is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sounds in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences."

Even after a significant history of large numbers of installed wind turbines in many countries around the world, there are currently no peer-reviewed studies where proven links have been established between adverse health effects and infrasound and low-frequency noise.

3 IMPACT OF RURAL WIND FARMS ON PROPERTY VALUES, EMPLOYMENT OPPORTUNITIES AND FARM INCOME

3.1 Property values

A number of recent Australian and international studies have found that wind farms have no statistically observable impact on property values, for example [8, 9 and 10.]. In fact, some studies have found evidence that the presence of a wind farm can potentially increase property values due to, for example, road upgrades and improved access to local services.

A 2009 report into the impact of wind farms on surrounding land values in Australia was prepared for the NSW Valuer General [8]. The study investigated property values around 8 Australian wind farms. The main finding of the study was that "wind farms do not appear to have negatively affected property values in most cases". The study also found that "no reductions in sale price were evident for rural properties or residential properties located in nearby townships with views of the wind farm."

This report included a literature review of a number of local and international studies, which included studies involving statistical analysis of sales data as well as "perceptual" studies. The literature review concluded that "perceptions of negative effect on land values are not borne out by the statistical analysis of sales data, except in very few cases."

3.2 Employment

A recent study by SKM examined the regional economic impact and employment outcomes of the AGL Hallett projects in South Australia [11]. The study found that significant direct and indirect employment has been generated in the local region during the construction of these projects. Direct employment includes jobs in construction, manufacturing, operations, maintenance, and support. Indirect employment results from the flow on effects of workers spending wages and salaries in the local area, as well as local suppliers providing goods for the projects. According to the report, the number of indirect jobs created from a wind farm can be estimated by applying a multiplier of 3 (i.e. for every 1 direct job created, 2 more indirect jobs are created), however the report notes that this multiplier is likely to be quite conservative and a value ranging anywhere from 3 to around 6 seems plausible. It is noted that some job creation will occur in the larger regional and national economy.

The SKM report noted that over the 34 month construction period for the 95 MW Hallett 1 Wind Farm, 66 construction workers were employed in the region on average. At the peak of construction activity the number of workers reached 111. It is noted that these numbers correspond with direct employment in the local region only.

Assuming an average employment rate of 66/95 = 0.7 workers *in the local area* per MW of installed capacity, it can be estimated that a medium sized wind farm of say 50 MW could potentially result in the local employment of around 35 people during construction. After accounting for indirect employment and flow on stimulation of the local economy it is evident that small rural communities can potentially reap very significant benefits from wind farm developments. Furthermore, the large geographic spread of wind farms around Australia means that employment opportunities are provided across large areas rather than being highly concentrated in specific regions, which is often the case for large-scale fossil fuel generation.

In terms of direct employment, the SKM report identifies specific employment areas and business types in rural areas that are likely to benefit from wind farm developments. These include: electricians, transport operators, machine operators, general labourers, and quarry/concrete businesses.

Wind farms also provide opportunities for the provision of training in skill areas that may otherwise be unavailable in the local area.

3.3 Farm income

Wind farms provide an opportunity for participating landowners to earn income from a secure, long term revenue stream. Participating landowners typically earn an annual income based on the installed capacity on their land, the total energy generated from the wind farm, or a combination of both. The benefits of this potential additional income stream to farmers are significant, particularly in light of the challenging climatic events that have been occurring in Australia in recent years.

Wind farms also offer significant opportunities for overall incomes in rural areas to increase based on the flow-on effects of increased employment and demand for local services, as discussed above.

4 PLANNING LAWS

Stakeholder consultation, planning standards and guidelines are important for infrastructure projects of any nature. In Australia, wind farm developments are subject to multiple regulations and requirements at the local, state and federal government levels. These can impose complex requirements which in some cases results in wind farms being held to higher standards of accountability than other forms of generation.

Differences in planning regulations across jurisdictions can be counterproductive to the Federal Government's 2020 Renewable Energy Target. Industry development is one of the desired outcomes of the RET. This is achieved most efficiently when development is encouraged equally across geographic regions.

5 CLOSING COMMENTS

Wind farms are a crucial component of Australia's energy mix and generally provide the least cost option for meeting renewable energy obligations. It is important to encourage the development of wind farm projects across diverse regions in Australia so that the benefits of wind power can be reaped in full.

As with any development, there will always be some opposition to new wind farm proposals. The enormous benefits of wind farms and the overall public good that these projects deliver must be balanced with the concerns of those opposed to their development. GL Garrad Hassan believes that the responsible development of wind farms results in benefits that far outweigh any perceived costs.

I would be happy to discuss this submission with any members of the Senate Community Affairs Committee.

Yours faithfully

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REFERENCES

1. NHMRC Public Statement, “Wind Turbines and Health”, July 2010.

2. Victorian Department of Health website, http://www.health.vic.gov.au/environment/community/windfarms.htm, accessed 9 February 2011.

3. Leventhall, G., “How the "mythology" of infrasound and low frequency noise related to wind turbines might have developed”, First International Meeting on Wind Turbine Noise: Perspectives for Control, Berlin 17th and 18th October 2005

4. Jakobsen, J., ‘Infrasound emissions form wind turbines’, Journal of Low Frequency Noise Vibration and Active Control, Vol. 24 No. 3, 2005, pp. 145 - 155.

5. Hayes McKenzie, “The Measurement of Low Frequency Noise at Three UK Wind Farms”, Report No. W/45/00656/00/00, 2006.

6. “Community Noise”, Edited by Birgitta Berglund & Thomas Lindvall, WHO Report, Stockholm, Sweden, 1995.

7. Colby et al., “Wind Turbine Sound and Health Effects, An Expert Panel Review”, Report prepared for AWEA and CANWEA, December 2009.

8. “Preliminary Assessment of the Impact of Wind Farms on Surrounding Land Values in Australia”, Report prepared for NSW Value General, August 2009.

9. “Land Value Impact of Wind Farm Development Crookwell New South Wales”, Report prepared by Henderson and Horning Property Consultants for Taurus Energy Pty Ltd, February 2006.

10. Hoen et al., “The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis”, Report prepared by Ernest Orlando Lawrence Berkeley National Laboratory for the US Department of Energy, December 2009.

11. “Economic Impact Assessment of the Hallett Wind Farms”, SKM, 8 July 2010.