A Tale of Two Windy Cities:
Public Attitudes Towards Wind Farm Development

Draft: January 2009

This is a draft; please do not quote or cite without permission of the author.

Sandy Bond, Ph.D., MBS, ANZIV,
Senior Lecturer,
Curtin University of Technology,
P.O. Box 7100,
Karawara, WA 6152
Australia
Phone: + 61 8 9266 2844
Facsimile: + 61 8 9266 3026
E-mail: dr_sandybond@yahoo.com

A Tale of Two Windy Cities:
Public Attitudes Towards Wind Farm Development

Keywords: Wind farms – public attitudes - property values

Abstract:

The Australian government is supporting the development of renewable energy technology, such as wind power, in its efforts to reduce greenhouse gases in line with the Kyoto agreement. While wind technology offers many advantages, property owners have voiced opposition to the siting of wind farms due to concerns over changes in neighbourhood aesthetics, noise, loss of bird life, and loss in property values. Such opposition can result in planning permission being declined and a restriction in the ability to meet Kyoto targets.

This paper outlines the results of research carried out in Western Australia in 2008 to investigate the attitudes of residents from two southern coastal towns towards the development of wind farms. The results indicate that overall the respondents from both Albany and Esperance think of a wind farm in positive terms. The proximity to the wind farm is an important aspect that could determine attitudes with many respondents reporting that they would not want to live "near" a wind farm (usually stated as between 1-5km). Over a third (38%) of the respondents would pay 1%-9% less for their property due to the presence of a wind farm nearby. These results will be of interest to power companies in helping plan the siting of wind farms.

Background:

Currently, the majority of Australia's electricity is produced using coal, accounting for 83 per cent of total generation in 2006-07 (ABARE 2008). Increasing domestic consumption is driving the need for investment in new electricity producing assets. Government policies, particularly relating to the Kyoto Protocol, encouraging lower greenhouse gas emissions and clean, renewable energy technologies together with the Government's Mandatory Renewable Energy Target (MRET) requiring a 20 percent share for renewable energy in Australia's electricity supply by 2020, have generated a surge of interest in renewable energy, and particularly wind power.

One typical (2MW) wind turbine in Australia can be expected to produce over 6000 MW hours of electricity each year. If this replaces coal-fired power, then the CO_2 released to the atmosphere will be reduced by 6000 tonnes each year, if it replaces oil or gas-fired power, CO_2 released each year is reduced by about 3000 tonnes.[1]

In Australia, the total operating wind capacity at the end of 2007 was 824 megawatts (MW). Over 400 MW of projects received planning approval during 2007. Nine projects (over 860 MW) were commissioned although not yet operating as at December 2007; including three new projects totalling 290 MW of capacity. The largest installed wind farm is Lake Bonney Wind Farm in South Australia, with 99 turbines.[2] According to the Australian Wind Energy Association, 563 wind turbines have been built Australia-wide on forty-two wind farms (150 wind turbines on fourteen wind farms in Western Australia).[3,4]

1 Clarke, D. (2008). "Wind Power and Wind Farms in Australia", http://www.geocities.com/daveclarkecb/Australia/WindPower.html#Wind%20power%20capacity%20in%20Australia, accessed 26 November 2008.
2 Clarke, D. (2008) http://www.geocities.com/daveclarkecb/Australia/WindPower.html#Top [accessed Nov 26 2008]
3 Auswind (2007) *Windfarms in Western Australia*. http//www.auswea.com.au/auswea/projects/wa.asp [accessed April 30 2007]
4 Auswind (2007) *Wind Energy in Australia* at http://www.auswind.org/downloads/factsheets/WindEnergyInAustralia.pdf [Accessed Oct 21 2008]

According to the Australian Bureau of Agricultural and Resource Economics (ABARE) at the end of October 2008, there were 11 renewable energy projects at advanced stages of development (around 14 percent of planned additional capacity). These projects are either committed or under construction. Seven of these projects are wind powered and comprise more than three-quarters of the committed additions to renewable energy capacity. The largest of these projects is Acciona Energy's Waubra wind farm in Victoria with an announced capacity of 192 MW (128 turbines).[5] The project is scheduled to be completed in 2009. Pacific Hydro is developing three wind powered electricity generation projects based in Victoria with a combined capacity of 274 MW. The largest of these is the Crowlands wind farm with a capacity of 172 MW (74 turbines). The projects are scheduled to be completed over the remainder of 2008 and into 2009.

Projects in the less advanced category are either still undergoing a feasibility study (in some cases, pre-feasibility study), or are not subject to a definite decision on development following the completion of a feasibility study. It is worth noting that of the 92 projects in this category, 49 (53%) are for renewable energy. Significantly, these projects include 42 wind farms, accounting for around 88 percent of the planned addition to renewable energy capacity. The largest wind energy project is the Silverton Wind Farm in New South Wales with a planned capacity of 1000 MW (400-500 turbines). If developed, the wind farm will be the largest in the southern hemisphere and one of the largest in the world. The project is scheduled to be completed in 2010.

Turbines built in Australia frequently exceed 100 metres in height from base to blade tip. Current generation (2007) turbines such as the Vestas V90 have towers 60-90 metres and three blades each 45 metres long. The height of individual turbines can make them visible for long distances, and they can be prominent features on the horizon when viewed with the sea or sky as a backdrop. The turbines can also stand in dramatic contrast with the height of features of the surrounding landscape (Auswind 2007 p. 31).

In recognition of the value of the Australian landscape, the Wind Farms and Landscape Values - National Assessment Framework was introduced.[6] This is part of a joint project between the Australian Council of National Trusts (ACNT) and the Australian Wind Energy Association (Auswind) funded by the Department of the Environment and Heritage under the Low Emission Technology and Abatement Program. The Framework is intended to provide a rigorous and transparent method for assessing, evaluating and managing the impact of wind farms on landscape values. An important finding of the study is that community values about a landscape affected by a wind farm proposal must be explicitly examined and considered. Direct community input is either 'recommended' or 'essential' in each step. It is a Framework, rather than a set of detailed prescribed methods, tools or techniques. Auswind intends to incorporate the Framework into industry Best Practice Guidelines and monitor its implementation through an industry accreditation scheme.

To meet renewable energy targets many of the current barriers in the planning and siting process will have to be reduced. Between 30 to 50% of contract failures are attributable to siting and permitting issues (CEC, 2006; BWEA, 2003 cited by Loring 2007). Among these siting challenges are claims that wind farms cause changes in neighbourhood aesthetics, noise, light flicker, loss of bird and bat life, and reductions in property values. The National Assessment Framework is an important step towards achieving this. However, the ultimate success of the Framework will depend on the extent to which developers integrate it into their processes.

According to an Acoustic Ecology Institute (AEI, 2008) special report other than visual blight, the most common argument against wind energy is that wind farms are "notoriously inefficient, rarely achieving even half their rated capacities, due to fluctuating winds". However, AEI consider that are more important issue, one that has not yet been highlighted, is that lease agreements between land owners and power companies

5 Although, according to Renewable Energy Development (2008), the largest approved wind farm in Australia is Macarthur with a total installed capacity of up to 450 MW (approximately 150 turbines).
6 Australian Wind Energy Association (Auswind) and Australian Council of National Trusts (2007), "Wind Farms and Landscape Values: National Assessment Framework", http://www.auswind.org/downloads/landscape/NAF07-06-27FINAL.pdf, accessed 27 Nov. 2008.

can be full of holes raising the possibility that land on which wind farms are located, over time, becoming "abandoned junkyards of massive metal hulks, rusting and disintegrating for decades".

In order to examine whether there is any substance to the above claims, and to monitor the effects on residential property values affected by wind farm developments, research is needed. This study aims to determine residents' attitudes towards a wind farm development in two towns within WA. This will inform local government and power companies of any negative attitudes that need to be better addressed to help increase the success rate of planning applications.

Previous Research:
There are two types of studies used to determine any adverse affect on property values from wind farm proximity: (1) analysis of sales transaction data of properties located a specified distance from wind turbines before and after the construction of the wind farm and in comparison to comparable communities without a wind farm, and (2) surveys of public attitudes towards the construction of proposed wind farms.

There has been very little authoritative research on either public perception's towards wind farm development or the impact of wind farms on property prices in Australia. Results from recent overseas studies were reviewed by Bond (2008). Generally, despite inherent weaknesses in some of the studies research methodology, the results of the property transaction price analysis indicate that there is no statistical evidence that wind turbines within an eight to twelve kilometre radius of homes have a negative impact on price. The results of the public surveys generally suggest a high level of support for this technology, although the results were mixed. For example, concern has been raised about the noise and in particular the visual impact since wind turbines tend to be located in highly valued landscapes.

The NZ Parliamentary Commissioner for the Environment (2006) has identified noise as one of the most frequently raised concerns, both in New Zealand and overseas, about wind farms. Recent research suggests that this noise may be impacting negatively on human health and safety. MD Nina Pierpont (2006, 2008) has been investigating a cluster of stress-related physiological effects of turbine noise that she terms "wind turbine syndrome". Her documented study is of 10 families, with 38 members living between 305 m to 1.5 km from wind turbines erected since 2004 in different locations. All the adults and older teens completed a detailed clinical interview about their own and their children's symptoms, sensations, and medical conditions before turbines were erected near their homes, while living near operating turbines, and after leaving their homes or spending a prolonged period away. Symptoms suffered include: sleep disturbance, headache, tinnitus, ear pressure, dizziness, nausea, visual blurring, irritability, panic associated with sensations of internal pulsation, etc. The proposed pathophysiology posits disturbance to balance and position sense due to ***low frequency noise*** or vibration stimulating receptors for the balance system. Pierpont claims that disturbing symptoms of Wind Turbine Syndrome occur up to 1.9km from the closest turbine and in more mountainous terrain they can occur up to 3km away. She recommends a 2km buffer between turbines and homes, but a greater buffer for larger turbines and in more varied topography.

According to the World Health Organization (2004) sound levels during night time and late evening hours should be less than 30dBA during sleeping periods to protect children's health. Even for adults, health effects are first noted in some studies when the Lmax sound levels exceed 32 dBA, 10-20 dBA lower than levels needed to cause awakening. For sounds that contain a strong low frequency component, typical of wind turbines, WHO says that the limits may need to be even lower than 30 dBA to not put people at risk.

The issue of turbine noise commonly centres on low frequency and infrasound noise that are poorly measured or not included in noise standards relating to wind turbine noise. Noise levels are usually quoted in decibels (dB) and these numbers are frequency weighted. Most noise standards are weighted to the dB (A) scale. However, this frequency weighting discriminates against low frequency sounds and therefore is not an accurate indicator of the disturbing effects of such noise. It seems that the wind turbine industry may have taken advantage of the phenomenon to show wind turbines produce sound levels well within recommended community noise limits. The problem is that wind turbines generate far more low frequency noise than high frequency noise where dBA is most sensitive. To overcome this and to be more transparent

it would be useful if the wind industry publish both dBA and dBC noise data. The dBC frequency scale has a flat, uniform response throughout the audible range and thus is a better measure of any noise rich in low frequency sound. When dBC is 20dB more than dBA, or when dBC is 60dB or higher, it is considered an indicator that low-frequency noise is at problematic levels.

Wind turbines also produce infrasound, contrary to misleading statements by some acousticians. Currently there are no standards suitable for dealing with wind turbine infrasound. Fortunately, the International Standard IEC 61400-11 Wind Turbine Generator Systems – Part 11 Acoustic noise measurement techniques deals with concerns around infrasound and low-frequency sound. It concludes that "although infrasound can be barely audible to the human air, it can still cause annoyance". Further, as the A-weighted that does not adequately describe low-frequency noise, the standard recommends the use of G-weighted sound pressure level.[7]

Other factors relating to wind turbine noise that are not fully understood, difficult to predict or not mentioned at all when reporting on noise levels from turbines are: the effects of the atmosphere, time of day, directivity, wind direction, size of the turbine, and topography on noise. Most modern industrial wind turbines are designed to keep noise levels at or below 45dB at 350 metres. However, as noted in the Special report by the Acoustic Ecology Institute (2008) atmospheric conditions can "wreak havoc with nice clean sound propagation models, especially at night". Further, as turbines get bigger they can be quieter at their bases than some distance away. In some wind or atmospheric conditions, a pulsing noise can arise, which is much harder to ignore, making it a major source of complaints. In some cases, the pulses are caused as the blades pass the tower and have been termed Aerodynamic Modulation.

In a study by Phipps (2007) of visual and noise effects experienced by residents living within a notional 3km ring of wind farms in the Tararua and Ruahine ranges in New Zealand. Of the 1100 survey forms delivered, 614 were returned, providing a response rate of 56%. The distances of homes to the closest turbines were reported as 2-2.5km (16%); 2.5km (40%) and 3km (29%). 516 households reported they could see turbines from their home, Of these, 80% considered the turbines intrusive and 73% thought of them as unattractive. Over half (52%) of households located at distances of 2-2.5km and 5-9.5km could hear wind farm noise. Only 36% of households located 2.5-3km away could hear the turbines, while as many as 25% of households located 10km away could still hear them. Wind turbines noise disturbed the sleep of 42% of respondents. Nearly a third (32%) of households felt that noise from the turbines reduces the quality of their life and a quarter reported that they do not spend as much time outside as they would like because of the turbine noise.

When asked to describe the qualitative nature of the wind turbine noise the most commonly identified qualities were: "a train that never arrives", "swishing noise", "hum", "rumbling noise" and "low frequency sound". Most of these sounds are associated with lower frequency component of noise. Interestingly, low frequency noise penetrates a typical New Zealand domestic structure more readily than higher frequency noise. Further, lower frequency noise is more efficiently transmitted and can be heard over greater distances than higher frequency noise. Lastly and importantly, humans perceive low frequency noise as louder and more annoying than higher frequency noises with equal pressure levels (Goldstein, 1994). Overall, the survey results show that wind farms have significant visual and noise effects upon a larger population than is envisaged under current visual assessment techniques and the NZ noise standards (NZS6808:1998), and at a much greater distance.

A number of personal cases reported by the Acoustic Ecology Institute (2008) indicate residents affected by noise from wind turbines have had to move from their homes. For example, in Lincolnshire, UK a house located 900m from a wind farm with eight 2MW turbines spent 60 nights away from their home in the first six months of the wind farm's operation, due to lack of sleep, then moved out permanently at the end of 2006. The local South Holland District Council recorded the noise, but reported that "the noise does

7 Some researchers, in particular Leventhall (2005, 2006) claims that infrasound and low-frequncy noise from wind turbines are not a problem (although this is in contrast to a report published by Leventhall in 2003.

not equate to statutory nuisance at this time." In 2008, the owners attempted to put their home on the market, but local real estate agents refused to list the property due to the noise. One real estate agent, Russell Gregory, wrote to the owners saying until the problems with wind turbines were resolved it was impossible to put a current market value on the property as no prospective buyer would want to live there and no mortgage lender would be prepared to lend on it. He said: "I don't think I have ever refused one before. We have a duty towards the buyer but if you can't sleep there then it is uninhabitable."

The majority of wind farms in Australia do not trigger noise complaints as they are generally sited far enough away from homes. While there is no overall siting recommendation in Australia, with siting decisions being made locally, they are often based on a 35-40dB(A) noise limit, or a setback of 1km from turbines.[8] For example, in Western Australia the Western Australian Planning Commission (2004) has recommended wind farm developments include sufficient buffers or setbacks to avoid adverse noise impacts on the amenity of the surrounding community. As a guide, the distance between the nearest turbine and a noise sensitive building is to be 1km. These guidelines provide that wind farm developments should be constructed and designed to ensure that noise generated will not exceed 5dB(A) above the background sound level or 35dB(A) using a 10-minute LA eq, whichever is greater, at surrounding noise-sensitive premises. It is interesting to note that these guidelines suggest using the A-weighted scale of sound frequency measurement that as shown above may not be measuring problematic low-frequency sound. The ultimate distance between sensitive uses and the wind turbine, may be determined on the basis of acoustical studies, according to the guideline.

A property valuer in Victoria has been studying the impact of wind farms on property values. Hives (2008) states that the more intrusive the wind turbines in “lifestyle” terms, the bigger the impact on price. In some costal areas of Gippsland with high lifestyle value, property values had fallen by as much as a third. However, in other areas where farming was the focus the impact on land value had been insignificant and in cases where there was an income stream from towers, the land price actually increased. At Waubra near Ballarat, where a third of the proposed 128 wind turbines have now been built, Hives said that the impact on land values of town, rural-residential and lifestyle blocks and farming land had been mixed. But this analysis was based on only twelve properties. He does point out that with the market being os strong in recent years that the effect may be masked.

Whilst there may be health affects from living near turbines, there is ongoing controversy about the impact of wind farms on property values with no one study providing conclusive evidence of any impact. In summarising findings from various public surveys, undertaken at pre and post construction stages of wind farms, Boffa Miskell (2003) make the following valid points that are relevant to this study:

- People in favour of renewable energy and wind power are more positive about turbines and wind farms in the area;
- Attitudes towards wind farms in areas where a wind farm is present are more positive than in those areas with no experience of wind farms. The ‘NIMBY’ syndrome (Not In My Backyard) has the strongest effect in areas where there is no or very little knowledge about wind power;
- Public acceptance of wind energy increases with the level of information provided;
- The size of a wind farm project only insignificantly influences public attitude towards a project. Size is a poor predictor of public attitude;
- Public involvement and consultation has a positive effect on people’s attitudes and level of acceptance.

Methodology:

Despite the limited research of the impact of wind farms on property values there have been a number of studies published on the price impact of proximity to similar structures such as high voltage overhead transmission lines (HVOTLs). Studies of HVOTLs within the UK and NZ have focused on opinion based

8 By comparison, the French National Academy of Medicine has called for a halt of all large-scale wind development within 1.5km of any residence and the U.K. Noise Association recommends a 1km separation distance (in Acoustic Ecology Institute 2008).

surveys (Gallimore and Jayne, 1999; Sims and Dent, 2005; Bond, 1995). Priestley and Ignelzi (1989) in the US developed a sound standardised methodology for assessing environmental impacts in residential communities using both postal surveys and hedonic modelling (regression analysis of sales transactions). This latter approach is preferred. However, due to the distance of the wind farms in the case study towns from residential areas (over 10 km) proximity impacts on sales prices are likely to be minimal. This research will focus on the use of postal surveys.

Attitudinal (or perception) studies give a qualitative feel for effects of wind farm's, rather than a quantitative measure of degree of impact. These studies examine how property owners perceive the effects of wind farms on the sale price of property. The research commenced with an investigation into the location of wind farms in WA. A case study approach was used to examine public attitudes towards wind farms. This involved the following steps:

(a) Selection of appropriate case study areas (based on the year the wind farm was commissioned, the number of wind turbines and density of residential properties nearby);
(b) Administration of a postal survey to a sample of residents living in the case study areas to determine their attitudes towards wind farms.
(c) The responses were individually coded, entered into a computerised database, and analysed.

STUDY AREAS

The areas selected for the case studies were Albany and Esperance, two southern coastal regional centres located 409 km and 721 km, respectively, south/south-east of Perth, the capital of Western Australia (see maps in Appendix I). The median house price for the Albany Urban Area as at June 2008 was $413,000AU and for Esperance it was $370,000AU (Perth Metropolitan Area was $442,500AU).[9] Albany's Urban Centre has a population of around 25,196 compared to 9,563 for Esperance. The median age is 39 and 36 years of age, respectively.[10]

Esperance has been the pioneering town in Australia for wind energy with the first wind farm in Australia built in March 1987 at Salmon Beach, near Esperance, as a demonstration project. The Salmon Beach wind farm comprising six 60 kilowatt (kW) Australian made Westwind turbines commenced operation in 1987 and operated successfully for nearly 15 years. The wind farm was built on crown land that was vested in Western Power for the purpose of aero-generation. According to Horizon Power (2007), this wind farm was decommissioned in 2002 due to urban encroachment and the age of the machines requiring increasing maintenance costs. Four of the six turbines from Salmon Beach were sold to a Queensland company. The two remaining turbines were donated to the Esperance community. One remains on as a monument to the town and the other is on display in front of the Esperance Museum. Western Power vested the Salmon Beach Wind Farm site to the Crown for the purpose of Conservation, Heritage and Recreation and contributed financially to the development of a heritage trail at the site. There was debate over whether "Tourism" should be included as part of the proposed future reserve purpose, but in 2002 DOLA conceded that a kiosk could be developed at the base of the turbine and will consider future tourism proposals.

In 1993 the Ten Mile Lagoon Wind Farm, comprising nine 225 kW Vestas V27 wind turbines, was connected to the Esperance grid. This wind farm was the first commercial wind farm in Australia. It is located 16 kilometres west of Esperance. The wind farm now operates in parallel with the 3.6 MW Esperance Nine Mile Beach Wind Farm that replaced the Salmon Beach Wind Farm and consists of six Enercon E40 600 kW turbines, commissioned by Diesel & Wind Systems (a wholly owned subsidiary of Verve Energy) in mid-2003.

The current power system for Esperance comprises two wind farms (5.6 MW total capacity) which operate in parallel with the 30 MW Esperance gas-fired power station owned and operated by Esperance Power Station Pty Ltd. The wind farm includes a control system based on a Master Controller, which talks

9 Sourced from REIWA http://reiwa.com/res/res-urban-profile.cfm?suburb_id=81&census_code=SSC53016&geogroup_id=444&geogroup_parent_id=4, accessed 21 October 2008.
10 Australian Bureau of Statistics 2006 Census Data.

directly with the gas turbine control system to manage the wind farm output. Due to the distance of the wind farms from the power station, the system incorporates sophisticated high reliability communications equipment using digital radio modems and fibre optic within the wind farms. According to Horizon Power (2007) the wind farms generate about 22% of Esperance's electricity.

Albany wind farm is about 12km south-west of the city (see map in Appendix I and photos in Appendix II). It is in an elevated position approximately 80m above the Southern Ocean. This height, nearness to the coastline (where most wind is produced) and small distance to the main electricity transmission system makes this an outstanding wind farm site. The turbines produce a reported average of 75 per cent of electricity for Albany.

The Albany wind farm was the biggest wind farm in Australia when it was first commissioned in October 2001 with 12 1800kW wind turbine generators situated on it. The turbines are fitted to 65m towers and at the time of commissioning were the largest to have been installed in the southern hemisphere. The turbines operate automatically, with three 35 metre long blades adjusted to make best use of power output from any wind direction or strength.

It is claimed that the environmental impact of the Ten Mile Lagoon wind farm near Esperance saved about seven million litres of diesel fuel and prevented over 20,000 tonnes of CO2 per year from being emitted. In comparison, the Albany wind farm has resulted in lowering of GHG emissions by about 77,000 tonnes per year, as less coal and gas has to be burnt by power stations. Albany differs from Esperance in that it is connected to the main Western Australia grid. Therefore, if there is not enough energy being produced by the wind farm (e.g. due to lack of wind) Albany will still be provided with power via transmission lines from power stations.

According to the report by Sinclair Knight Merz (2001), one important aspect of the Albany wind farm was the Biblimum Track, Western Australia's premier walking track. A portion of the track traverses the wind farm site and Western Power had to ensure that this was taken into account. The track needed to be altered and re-aligned toward the coastal cliffs, and the track surfaces hardened. The company also upgraded the road at a cost of $400,000AU for tourist traffic. A further $200,000AU was spent on board walks, viewing towers, lookouts, picnic areas, and interpretive displays to enhance the visitor experience at the wind farm. They also predicted an increase of 100-fold to the tourist numbers to the region due to the wind farm. The wind farm is still a novelty and has created a great deal of interest from both locals and tourists.

SUMMARY OF CASE STUDY FINDINGS

Of the 800 questionnaires mailed to homeowners and tenants in Albany, 38% were completed and returned. However, only 21% of the 500 questionnaires mailed to homeowners and tenants in Esperance were returned. The reason for the difference in response rates may be due to the demographic profile of each town: in the Esperance Urban Area the proportion of the population 60 years of age and over is only 18.31% compared to Albany where it is 22.53%. This difference is even greater in the Statistical Local Area of each town: 16.49% of the population in Esperance is 60 years of age and over, and in Albany the figure is 25.24%. It is expected that a large portion of this age group is likely to be retired or working part-time with more time to answer surveys.

Another possible explanation for the difference in response rates is due to the recent lead contamination event in Esperance and subsequent community surveys that were conducted relating to this event. An initial personal interview survey in August/September 2007 of around 230 people and a further telephone survey in May 2008 of 500 households may have caused Esperance residents to be less reluctant to answer yet another survey.

The majority of respondents in Albany and Esperance are homeowners with the remainder being tenants (98.7% and 100%, respectively). In both towns, nearly two thirds (64.6% Albany (A), 67% Esperance (E)) have lived at the same address for five years or more.

1.1 Preferences for generation options to meet Australia's future electricity needs

To determine respondents' preferences for power generation options, respondents were asked to rank various options in terms of their preferences from 1 (most preferred) to 8 (least preferred). Table 1 below shows the order that respondents' ranked the various options. Results from Esperance are shown in brackets. Wind was most favoured by Albany respondents, followed by solar and wave/tidal. The results were only marginally different for the respondents from Esperance who ranked solar slightly higher than wind. The reasons put forward for these preferences are that they are "clean", reliable, and readily available in Albany and Esperance (wind and solar, particularly). Although some felt these options had high maintenance requirements or were costly (solar), and were ugly with low output/limited base load (wind).

Coal and nuclear were ranked as least preferred options mostly due to the polluting (green house gas emissions) or potentially dangerous nature of these options. Other options suggested by respondents were: geothermal, bio-fuel, hydrogen, nuclear fusion, biomass, double glazing of homes, education to prevent waste and change lifestyles, and hot rocks.

Table 1 – Preferences for generation options

Option	*Percentage:* Albany (Esperance)
1. Wind	52 (55)
2. Solar	41 (55)
3. Wave/Tidal	48 (47)
4. Hydro	39 (37)
5. Gas	43 (38)
6. Coal	37 (40) *
7. Nuclear	34 (30)
8. Other	29 (62)
* Although 40.9% (42.7)ranked this as 7th	

To prevent the responses to this question from being contaminated by the probing questions about specific wind farm effects, the above question was posed early in the questionnaire before the subject of wind farms was introduced.

When asked if they had visited a wind farm with more then one turbine, in Albany 98% responded that they had. Surprisingly, given the nearby location of the two wind farms to Esperance, only 93% of the Esperance respondents had visited a wind farm. They were then asked to report on their feelings about the proposal for the development of a wind farm/s *prior to them being built*. A later question asked if their feelings changed after it was built to determine if their feelings changed before and after construction. Table 2 below, outlines the results of how respondents felt prior to construction.

Table 2 – Feelings about the proposal for the development of Wind Farms

Feelings	***Albany %***	***S. B. %***	***10 Mile%***	***9 Mile %***
Did not live in the town prior to the WF erection	19.2	42.9	37.4	13.1
Strongly opposed	1.3 *(1.6)**	0	0	0
Moderately opposed	3.3 *(4.1)*	1 *(1.7)*	1 *(1.7)*	1 *(1.3)*
Did not bother me	8 *(9.8)*	15 *(26)*	13 *(20)*	15 *(17)*
Moderately in favour	11 *(13)*	6 *(10)*	7.4 *(12)*	8.5 *(10)*
Strongly in favour	58 *(71)*	36 *(62)*	42 *(67)*	63 *(72)*

* Numbers shown in brackets are (% lived in town after WF built)

In Albany over two thirds (68%) of the respondents were either moderately or strongly in favour of the development, 8% were not concerned, and 19% did not live in Albany prior to the wind farm being built. Only 4.6% were either moderately or strongly opposed to the proposal. The results were similar for the wind farms in Esperance with only 1% either moderately or strongly opposed to the proposal.

In both towns, the reasons for respondents' favouring the proposal/s were that they saw the benefits in producing "clean", sustainable, renewable energy. Further, they felt that wind energy is ideal for each town's windy conditions and it provided a tourist attraction. However, for the Albany survey some respondents had concerns about damage to the coastal vegetation and coastline and felt that this area should not have been exploited for power. Further, there was concern that the wind farm would impose on the view of the pristine coastal scenery and cause "visual pollution".

In Esperance, comments were made that the wind farms are less noisy than the diesel plants, reduced the risk of engine breakdown in the plants, reduced the amount of diesel used, and that they can be located away from the residential areas. However, disappointment was voiced about the low percentage of energy that is produced by the wind farms and that they do not reach the design capacity and are restricted to the available load on the system.

Nearly two thirds (61.1%) of the Albany respondents felt more in favour of the wind farm *after* it was constructed. The reasons they suggested for this change in feelings was that it was more aesthetically pleasing and quieter than expected, the road to the surf beach was upgraded, and it provided a popular tourist attraction. Only about a third (30-36%) of Esperance respondents felt more in favour of the wind farm *after* it was constructed with around two-thirds saying it did not change their feelings. Fewer than 2% of respondents from both towns felt more opposed to the development after it was constructed as it was found the wind farm was much less efficient than proposed or thought.

When 59.5% of the respondents in Albany (21.4% in Esperance) purchased/began renting their home the wind farm was not yet constructed. For the majority of them (96.2%A, 97.8%E) the proximity of the wind farm was not a concern. In the Albany survey, the reasons put forward for the proximity of the wind farm been a concern to some residents (3.8%) was that they felt the current wind farm location is pristine and if any more turbines are to be built that they should be built inland, or on rural farmland slightly more remote. Another resident reported that the wind farm is not close but if it had been the noise and size would have concerned them.

When asked if respondents had known at the time of purchase/rental that a wind farm was to be developed the majority (98.3%A, 94.1%E) would have still gone ahead with the purchase/rental. The reason put forward for this was because the wind farm is not close to residential areas and they cannot see it so it was not a concern. As noted by one Albany resident "the buffer area seems adequate for the noise". In Albany some respondents said that their answer would depend on how close the wind farm was to them.

Two of the Albany respondents noted that the process of site selection was not free from bias. A few residents responded in the negative, stating that they do not want a wind farm near them and had they known that one was to be built they would not have purchased/rented. Further, they were not happy about coastal reserve being used for the construction of the wind farm.

1.2 Wind farm impacts

Respondents were then asked whether the wind farm is visible from their home, over three quarters (75% A, 88%E) said that it was not. In Albany for those that see the wind farm/turbines 67% reported that the view was either mildly or very attractive. The responses were much lower for the wind farms in Esperance with this varying with the wind farm: 18% Salmon Beach; 43% Ten Mile Lagoon and 33% Nine Mile Beach. Each wind farm in Esperance was considered to be barely noticeable by 73%, 57% and 56%

respectively. When asked whether the wind farm is audible from their home most respondents (99%A, 96%E) said it was not.

Table 3, below, summarises the ways in which the presence of a wind farm nearby would affect respondents' price/rent decision. For the Albany survey no distance was specified of the wind farm from the home. For the Esperance survey the question was asked twice based on two distance criteria: if the wind farm was within 3 kilometres of the home, and if it was between 3km to 5km of their home to determine if distance from the wind farm influenced their decision. For 86.3% of the Esperance respondents their answer would not be any different if the wind farm was between 3 to 5 kilometres from their home (compared to being within 3km).

Table 3 - Affect on Property Price/Rent

Price affects	*Albany Frequency %*	*Esperance <3km Frequency %*	*Esperance:3-5km Frequency %*
Substantially more for this property	1.0	1.0	
A little more for this property	4.4	2.0	6.1
A little less for this property	17.2	15.7	15.2
Substantially less for this property	7.1	3.9	3
It would not influence the price	70.4	77.5	75.8
As % of price/rental:			
20% higher or more	2.6	0	4.2
10% to 19% more	6.0	10	16.7
1% to 9% more	17.9	22.5	16.7
1% to 9% less	37.6	42.5	33.3
10% to 19% less	25.6	20	20.8
20% or a greater reduction	10.3	5	8.3

Over two-thirds of respondents from each town (70%A, 77.5%E within 3km, 75.8%E between 3-5km), the presence a wind farm nearby would not influence the price they would be prepared to pay, while 16 to 17% of respondents from each town reported they would be prepared to pay a little less in each instance.

From the results shown in Table 3 above, it appears that being further away from a wind farm in Esperance would have a positive influence on the price/rent respondents would be prepared to pay for their home. If the wind farm was further away (between 3-5km) 6.1% of respondents would be prepared to pay more their home versus 2% that lived closer (within 3km) to the wind farm. Further, 20.9% would be prepared to pay ten percent or more for their homes if further away from a wind farm compared to 10% if they lived closer to a wind farm. Only a third (33.3%) of respondents would pay 1 to 9% less for their home if they lived further away from a wind farm compared to 42.5% if they lived within 3km of a wind farm.

Results for Albany and Esperance were quite similar for the percentage affect that wind farm proximity would have on the price they would be prepared to pay for their home. However, overall only 26.5% of Albany respondents would pay more for their property compared to over a third (32.5 to 37.6%) of respondents from Esperance. Nearly three-quarters (73.5%) of Albany respondents would be prepared to pay less for their property if it were located near a wind farm compared to around two-thirds of Esperance respondents (62.4-67.5%). Thus, it appears that Albany respondents are somewhat more averse to living near wind farms than respondents from Esperance.

1.3 Advantages and concerns associated with wind farms

Respondents were asked about their feelings on a number of advantages commonly associated with wind-farms, and their turbines. The majority of respondents from both towns agreed with most of the items listed: environmental friendliness/non-polluting (96%A; 93.3%E); low cost energy source (70.5%A;

75.2%E); renewable resource (94.3%A; 91.3%E). However, the response to the item "boost to tourism/local economy" varied between Albany and Esperance respondents: 85.5%A and only 51.9%E (14.4% disagree). This difference may because the Albany wind farm was specifically set up in a way to attract tourists as evidenced by the amount of money spent moving the Biblimum Track and incorporating walkways, viewing platforms, etc and because it is much newer and is still a novelty. The tourist aspect of the Esperance wind farms is not well advertised nor does it have the extent of infrastructure for tourists that the Albany wind farm boasts.

Both towns' respondents were less certain about "employment opportunities" with 43.5%A (27.9%E) agreeing with this advantage and 47.3%A (56.7%E) unsure. Again, the result for Albany may have differed from the Esperance study because of the perception of respondents that the Albany wind farm is a boost to tourism and presumably this would have a flow-on affect to creating more jobs. Esperance respondents, on the other hand, did not think the wind farms would be a boost to tourism/local economy to the same extent and thus would not have the flow-on affect to employment opportunities. Further, their response may be tempered by the longer period of time they have had wind farms (1987 versus 2001) and any employment opportunities that may have been created with the building/operation of the wind farms had subsequently ended or been absorbed.

Other advantages noted by Albany respondents of the wind farm were the prestige it creates for the community of being "environmentally, sustainable", the educational aspects, and that it is a good place to take visitors. Certainly, it appears from tourist information that the wind farm is promoted much more in Albany than in Esperance. Very little information was available on the Esperance wind farms in tourist information, not even on the website relating to their Wind Festival 2009.[11]

Other respondents commented that they felt the wind farm was only a boost to tourism in the early days and that it was only a low cost energy source if the initial cost is not taken into account. One respondent noted that the wind farm is not as efficient as the public were led to believe. This latter statement was echoed by an Esperance respondent who stated that the price of their electricity bill has not decreased as they expected after the construction of the wind farms. Another Esperance resident notes that the only thing wrong with wind farms is their appearance.

Next, respondents were asked about their feelings towards a number of concerns commonly associated with wind farms, and their turbines. Table 4, below, summarises these responses. Results from Esperance are shown in brackets. The majority of respondents from both towns reported that they do not worry about the items listed: visual intrusion (89% (84%)); radio interference (84.9% Albany only), and sun/light flicker (90% (83%)). Only the potential harmful impact on wildlife worried them somewhat to a lot (32% (30%)).

Results were quite different between Albany and Esperance respondents for the items "noise intrusion" and "affect on property values". Albany respondents seem less concerned about these items than respondents from Esperance (19% versus 32% worry about noise and 14% versus 26% worry about property value impacts). This result seems at odds with the previous questions on the percentage impact of living near a wind farm would have on property price where Albany residents were more averse to living near them (i.e. 73.5% of Albany respondents would be prepared to pay less for their property if it were located near a wind farm compared to 64.5% on average of Esperance respondents).

Table 4 - Concerns about Wind Farms & their Turbines			
Percentage of Respondents: Albany (Esperance)			
Concern	*Don't worry very much*	*Worry somewhat*	*Worry a lot*
Visual intrusion/aesthetic impact	89 (84)	8 (13)	3 (3)

11 See for example: http://www.festivalofthewind.org.au/, http://www.visitesperance.com/default.asp, http://www.albanygateway.com.au/ and http://www.albanytourist.com.au/pages/amazing-albany/, accessed 12 November 2008.

Noise intrusion	81 (69)	16 (28)	3 (3)
Affect on property's value	86 (74)	12 (22)	2 (4)
Radio Interference	85	13	2
Potential harmful impact on wildlife	68 (70)	25 (24)	7 (6)
Sun/light flicker	90 (83)	9 (15)	2 (2)

Other concerns that Albany respondents had about wind farms/turbines were the dehydration of natural vegetation the development causes, the traffic noise and rubbish created from tourists and locals visiting the wind farm, the supplementary fuels used for power when there is no wind, the possible lack of generation capacity if the region is heavily dependent on wind power, and that the general public were not given enough information to make an informed decision about the wind farm site selection. Only one respondent fro Esperance had other concerns. They would not want to see wind farms throughout native vegetation bush from the town to where the current wind farms are. They want careful planning to ensure they are not having what is left of their native environment altered by a horizon of wind turbines.

Lastly, 85.7% of the Albany respondents would favour the construction of a wind farm nearby. The reasons cited for this were: the need for non-polluting green power; wind farms are aesthetically pleasing; they increase tourism; and such construction would lead to the city being viewed as a leader in renewable energy. This question was worded to include distances from wind farms for the Esperance survey. Respondents were asked if they would favour the construction of a wind farm nearby if it were: within 1km (52.1% in favour); between 1-3km (71.3); more than 3km (92.3%); or a self nominated distance from their home (47% would favour construction of a wind farm if it were more than 1km from their home). The results to this question are shown in Table 5 below:

Table 5 - Would favour the construction of a wind farm nearby

Percentage of Respondents: Albany (Esperance)

Response:	*Albany*	*Esperance*
I would favour it	85.7	94.4
I would favour if: within 1km		52.1
I would favour if: Between 1 - 3km away		71.3
I would favour if: More than 3km away		92.3
I would favour if :more than (self nominated distance in km) away		1km (47%); 3km (19%); 5km (12%); 10km (6%)

Many Albany respondents commented that their responses were conditional on how near "nearby" is. Some would be in favour of the construction of a wind farm nearby but only if it was a certain distance from their home, however, respondents' perceptions of how far this distance needed to be varied from more than 0.5km to more than 5km away from their home. Further, respondents would be in favour of wind farm construction nearby but only if it fits into the landscape, produces cheaper, cleaner energy, cannot be heard, and is not an eyesore.

It was because of the above responses that additional questions were added in the Esperance survey to provide for varying distance of wind farms from homes. Not surprisingly, the respondents were more in favour of construction of a wind farm if it was built further away from their home (92.3% would favour construction of a wind farm nearby if it was built more than 3km away). Of the self nominated distances, nearly half (47%) would favour the construction of a wind farm nearby if it were more than 1km from their home; 19% if it were more than 3km and 12% if it were more than 5km away. One respondent would only favour the construction of a wind farm nearby if it were more than 40km away, with the furthest self nominated distance being more than 100km away! Esperance respondents commented that they would be in favour of the construction of a wind farm in Esperance as long as it was distant from residential areas, constructed on the coastline, was efficient (stated by one respondent as more than 30% to the grid).

Another respondent said that the proximity to residential areas depends much on topography, i.e. the geographical formation is some places would allow closer proximity to homes without perceived intrusion.

The reasons given by Albany respondents who would not be in favour of a wind farm nearby included: it detracts from Albany's spectacular coastal scenery; it creates more traffic by people visiting the area; the visual pollution; the noise created by the turbines, and that wind farms would need to become more cost effective if they are to contribute to future energy needs. This latter comment was followed by the perception that Western Power has driven a biased campaign when quoting capacity and contribution of the wind farm. Another respondent felt the wind farm should not be on Crown land and should be away from tourist areas as they felt that the novelty of a wind farm would wear off in a few years and they will be viewed as unsightly rather than as a tourist attraction as they currently are. Only one respondent from Esperance gave a reason for not favouring construction of a wind farm nearby. They felt that they are an eyesore.

Evaluation of the responses to the questionnaire's background questions revealed that in both Albany and Esperance 62% (61%E) of the respondents were male and 38% (39%E) were female. Nearly a third (31.5%) of Albany respondents were aged between was 50-59 years (compared to only 19% of Esperance respondents being in this age group) and 45.7% (47%E) were 60 years of age or older, 41.4%A (44%E) work full-time and 37% (42%E) are retired. In both Albany and Esperance, over three quarters of the respondents had no children under the age of 18 living at home.

Finally, respondents were invited to make additional comments. The comments from Albany residents indicate that residents felt that the information provided to the community about how much power the wind farm would produce once built or how efficient and cost effective it would be was not accurate. This concern was echoed by one Esperance resident asked if the cost and energy used in making and installing the wind farm less than the total income produced by it. Another resident notes that they do now mind wind farms as long as they are not near beautiful beaches, scenery and residents.

SUMMARY:
From the above results and comments it appears that overall respondents are very supportive of wind farms and think of it in positive terms: provision of renewable, clean energy; aesthetically pleasing (Albany respondents felt this more after the wind farm was built than anticipated before construction); far enough away from homes to not affect property owners in terms of noise, traffic, etc; educational benefits, and the increased tourism to the city. However, there are some respondents who think of the wind farm in negative terms: too noisy; ruining coastal landscape, and more particularly concerns about the accuracy of the information (or lack thereof) they were given about the capacity of the wind farm and how energy efficient and cost effective it would be.

Albany respondents are in favour of development of wind farms (84%). Esperance respondents were more favourable towards wind farms over time: Salmon Beach built in 1987 (72%); Ten-mile Lagoon built in 1992 (78%); Nine-mile Beach built in 2003 (82%)

More Albany respondents thought a wind farm nearby would impact negatively on price of their home than respondents from Esperance. Nearly three-quarters (74%) of Albany respondents would be prepared to pay less for their property if it were located near a wind farm compared to around two-thirds of Esperance respondents. In contrast to this result, Albany respondents seem less concerned about property value impacts and noise intrusion than respondents from Esperance (14% versus 26% worry about property value impacts and 19% versus 31% worry about noise). Not surprisingly, respondents were more in favour of construction of a wind farm if it was built further away from their home.

In terms of the advantages associated with wind farms, more Albany residents felt that the wind farm was a "boost to tourism/local economy" than Esperance respondents: 85.5%A and only 51.9%E. This difference may because the Albany wind farm was constructed to attract tourists.

This study is of the attitudes of residents to the development of wind farms in 2008. It must be recognised, however, that these attitudes may vary over time. From more recent research it does appear that perceptions have changed compared to earlier studies of public attitudes towards wind farms. Residents are generally very supportive of wind farm technology, probably due to the wide media coverage globally on climate change and the focus of many governments to reduce green house gas emissions through the use of renewable energy sources such as wind.

LIMITATIONS:
A limitation specific to the study area is the distance to the wind farm. Previous research has shown that turbines and similar structures are not highly noticeable beyond 8km (see Bond and Squires 2006; REPP 2003; Des Rosiers 2002; Bond and Hopkins 2000, and Reichert 1997). Thus, had the current wind farms been much closer to where homes are located the residents' perceptions may have been quite different. Note that the Salmon Beach wind farm was decommissioned for the very reason that it was encroaching on the urban area as the population grew and the town expanded. As many noted in their responses, they were supportive of wind farms if they are not close to their homes and felt that the wind farms were far enough away so as not to have any negative impact on the enjoyment of their homes. However, many respondents commented that if the wind farm was closer it may have been a concern to them.

It must be kept in mind that these results are the product of a single case study carried out in a specific geographic location at a specific point in time and that great caution must be used in making generalisations from them or applying them to other locations. Residents of Denmark, a town which is only 53 km from Albany, fought strongly against the development of a proposed wind farm in their town. This shows how location-specific resident attitudes can be.

CONCLUSIONS

Briefly stated, the results of this study indicate the majority of the respondents think of the wind farm in positive terms. The proximity to the wind farm is an important aspect that could determine attitudes with many respondents reporting that they would not want to live near (usually stated as between 1-5km) a wind farm. The area of concern associated with wind farms for respondents in both towns was the potential harmful impact on wild life. In addition to this concern, for Esperance respondents only, noise intrusion and property value affects were also concerns.

For over two-thirds (70%A, 77%E) of the respondents, the presence of a wind farm nearby would not influence the price they would be prepared to pay for their property, however, nearly a quarter (24%A, 19%E) reported they would be prepared to pay less. Of these, over a third (38%), on average, of respondents from both towns said they would pay 1%-9% less for their property, while 22%, on average, would be prepared to pay 10%-19% less. It would be interesting to investigate actual transaction prices to see whether the perceived negative attitudes are reflected in the price actually paid for property.

According to a study by Loring (2007) if governments want to promote the further development of on-shore wind turbines they will not only need to encourage public participation in the early stages of wind energy projects, but also find ways to address or counter the strong networks of opponents to these projects. It appears from the success of the Albany wind farm project that the WA government handled this aspect very well. This also highlights the advantages of community consultation and careful site selection away from residential areas.

Acknowledgements:
This study was possible thanks to the financial support of the Centre of Research in Applied Economics (CRAE) and the School of Economics and Finance at Curtin University of Technology. A special thanks to the responders to the survey, for without their responses this study would not be possible.

References:

ABARE 2008,"Electricity generation Major development projects – October 2008 listing", http://www.abareconomics.com/publications_html/energy/energy_08/EG08_Oct.pdf, accessed 26 November 2008.

ABC News 2007, "Windfarm application withdrawn", August 15th, www.abc.net.au/news/stories/2007/08/15/2005653.htm, accessed 6 September 2007.

Acoustic Ecology Institute (2008) "AEI Special Report: Wind Energy Noise Impacts", http://www.acousticecology.org/srwind.html, accessed 27 November 2008.

Auswind 2007, "*Wind Farms and Landscape Values Foundation Report: Final Version 27 June 2007*", http://www.auswind.org/downloads/landscape/FoundationReport07-06-27FINAL.pdf, accessed 21 October 2008.

Boffa Miskell. 2003, "*Public Perception of Wind Farms Landscape Assessment Project"*, Resource Consent Application Te Apiti, May.

Bond, S.G. 1995, "Residents' Perceptions of High Voltage Overhead Transmission Lines on Property Values". *Australian Land Economics Review*, Vol.1, No.1, pp.25-30.

Bond, S.G. 2008, "Attitudes towards the development of wind farms in Australia", *Journal of Environmental Health Australia*, publication pending.

Bond, S.G. & Hopkins, J. 2000, "The Impact of Transmission Lines on Residential Property Values: Results of a Case Study in a Suburb of Wellington, New Zealand". *Pacific Rim Property Research Journal*, Vol.6, No. 2, pp.52-60.

Braunholtz, S. 2003, *Public Attitudes to Wind Farms: A Survey of Local Residents in Scotland*, MORI Scotland, Scottish Stationary Office, Edinburgh, Scotland, available at: http://www.scotland.gov.uk/Publications/2003/08/18049/25579, accessed 16 August 2006.

California Energy Commission (CEC) 2006, *"Building a "Margin of Safety" Into Renewable Energy Procurements: A Review of Experience with Contract Failure"*, Consultant Report prepared by KEMA Inc., available at: http://www.abcsolar.com/pdf/CEC-300-2006-004.pdf, accessed 29 April 2008.

Dent, P. and Sims, S. 2007, "What is the impact of wind farms on house prices?" A research report commissioned by the RICS Education Trust. http://www.rics.org/NR/rdonlyres/63D1BF3E-A608-45CD-8086-A6E7924D7F14/0/WindfarmsFiBREversionthreelowres.pdf, accessed 22 April 2008.

Dudleston, A. 2000, *Public Attitudes Towards Wind Farms in Scotland*, Scottish Executive Central Research, Scottish Stationary Office, Edinburgh, Scotland.

Gallimore, P. and Jayne, M. 1999, "Public and professional perceptions of HVOTL risks: the problem of Circularity", *Journal of Property Research*, vol. 16**,** no. 3, pp. 243-255.

Global Wind Energy Council 2007, "*Global Wind 2007 Report*", http://www.gwec.net/uploads/media/Global_Wind_2007_Report_final.pdf, accessed April 23, 2008.

Goldstein, M. 1994, "Lo-frequency components in complex noise and their perceived loudness and annoyance", Work and Health, vol. 2.

Government of Western Australia 2007, May, "Making Decisions for the Future: Climate Change", The

Premier's Climate Change Action Statement, http://www.5starplus.wa.gov.au/uploads/2007006ClimateChangeV3h.pdf, accessed June 4, 2007.

Haughton, J., Giuffre, D., Barrett, J. and Tuerck, D. 2004, *An Economic Analysis of a Wind Farm in Nantucket Sound*, Beacon Hill Institute, Suffolk University, Boston, United States (available at: http://www.beaconhill.org/BHIStudies/Windmills2004/WindFarmArmyCorps.pdf, accessed 16 August 2006.

Hives, A. 2008, "Wind farms: the Local Experience", paper presented at the Australian Property Institute Country Conference, Melbourne, Victoria, 23rd August.

Hives, A. interviewed by Cuming, M. and Skuthorp, L. 2008, "Wind farms change land values", Farm Weekly, 14 November.http://fw.farmonline.com.au/news/nationalrural/agribusiness-and-general/general/wind-farms-change-land-values/1359548.aspx, accessed 27 November 2008.

Hoen, B. and Wiser, R. 2007, "Do Wind Facilities Affect Local Property Values? Results From a Multi-Site Analysis", A paper presented at *WINDPOWER Conference & Exhibition*, Los Angeles, California, June 4-6.

Horizon Power 2007, *Esperance Wind Farms*, www.horizonpower.com.au/environment/renewable_energy/wind/wind_nine_mile.html, accessed 21 October 2008.

Impact Assessment Unit 2003, *Public Opinion on the Impact of the Proposed Westmill Farm Wind Farm, Watchfield, Oxfordshire*, Impact Assessment Unit Oxford Brookes University School of Planning, Oxford.

Jakobsen, J. 2005, "Infrasound Emission from Wind Turbines." Journal of Low Frequency Noise, Vibration and Active Control 24(3): 145-155.

Khatri, M. 2004, "*RICS Wind Farm Research: Impact of Wind Farms on the Value of Residential Property and Agricultural Land*." Royal Institution of Chartered Surveyors. November 3, 2004. http://www.rics.org/NR/rdonlyres/66225A93-840F-49F2-8820-0EBCCC29E8A4/0/Windfarmsfinalreport.pdf

Leventhall. G. 2003, "A Review of Published Research on Low Frequency Noise and its Effects", Department for Environment, Food and Rural Affairs, London, UK, May.

Leventhall. G. 2005, "How the "mythology" of infrasound and low frequency noise related to wind turbines might have developed", paper presented at the First International Meeting on Wind Turbine Noise: Perspectives for control, Berlin, Germany, 17-18 October.

Leventhall. G. 2006, "Infrasound from Wind Turbines – Fact, Fiction or Deception", Special Issue Canadian Acoustics, Vol. 34, No.2. pp. 29-36.

Loring, J.M 2007, Wind energy planning in England, Wales and Denmark: Factors influencing project success, *Energy Policy* 35, pp. 2648–2660.

Parliamentary Commissioner for the Environment, 2006. "Wind power, people and place. Wellington, NZ, Parliamentary Commissioner for the Environment: 144.

Pierpont, N. MD. 2008, "Wind Farm Syndrome: Nina Pierpont's Research", pending publication, http://www.windturbinesyndrome.com/, accessed 27 November 2008.

Phipps, R. (2007). "Windfarm Energy May Be Renewable But Is It Sustainable? A

Palmerston North Case Study Of Noise And Visual Intrusion From Wind Turbines", paper presented at the New Zealand Planners Institute conference "The Politics of Planning", Palmerston North, March 26-30th.

Priestley, T. and Ignelzi, P.C. 1989, *"A Methodology for Assessing Transmission Line Impacts in Residential Communities."* Edison Electric Institute, Washington DC, June.

Regional Centre Profiles: Albany, http://reiwa.com/res/res-urban-profile.cfm?suburb_id=81&census_code=SSC53016&geogroup_id=444&geogroup_parent_id=4, accessed 4 June 2008.

Renewable Energy Development 2008, "Wind Power | Macarthur Wind Farm", http://renewableenergydev.com/red/wind-power-macarthur-wind-farm/, accessed 26 November 2008.

Sims, S. and Dent, P. 2005, "High-voltage Overhead Power Lines and Property Values: A Residential Study in the UK", *Urban Studies*, vol. 42, no. 4, pp.665 - 694.

Sinclair Knight Merz (SKM) 2001, *Socio-Economic and Tourism Environmental Effects Statement* Supplement for the Pacific Hydro Limited Portland Wind Energy Project, Volume C., http://www.pacifichydro.com.au/docs/VolC_SET_Pt6on.pdf, accessed 10 June 2008.

Sterzinger, G., Beck, F. and Kostiuk, D. 2003, *The effect of wind development on local property values*, Renewable Energy Policy Project, Washington D.C., United States.

van den Berg, G. P. (2004). "Effects of the Wind Profile at Night on Wind Turbine Sound." Journal of Sound and Vibration 277: 955-970.

van den Berg, G. P. (2005). "The Beat is Getting Stronger: the Effect of Atmospheric Stability on Low Frequency Modulated Sound of Wind Turbines." Journal of Low Frequency Noise, Vibration and Active Control 24(1): 1-24.

Verve Energy Wind Farm. http://www.verveenergy.com.au/mainContent/sustainableEnergy/OurPortfolio/Albany_Wind_Farm.html, accessed 4 June 2008.

Warren, C., Lumsden, C., O'Dowd, S. and Birnie, R. 2005, '"Green on Green": Public Perceptions of Wind Power in Scotland and Ireland', *Journal of Environmental Planning and Management*, vol. 48, No.6, pp. 853 – 875.

Watts, C.W., Schluter, P.J., and Whiting, R. 2005, "Public Opinion of a Proposed Wind Farm Situated Close to a Populated Area in New Zealand: Results from a Cross-sectional Study", *Environmental Health*, vol. 5, no. 3, pp. 73-83.

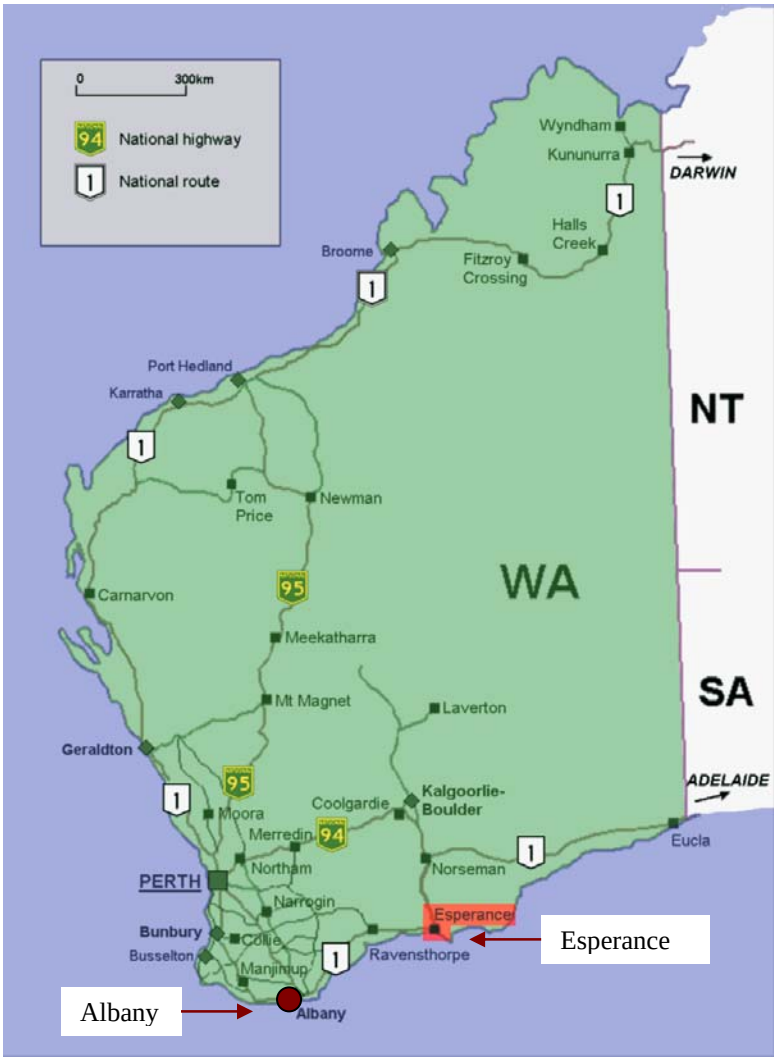
Western Australian Planning Commission 2004, "Guidelines for Wind Farm Development", Planning Bulletin, No. 67.

Windfarms in Western Australia. http//www.auswea.com.au/auswea/projects/wa.asp, accessed April 30, 2007.

World Health Organization, 2004. "Report on the second meeting on night noise guidelines", 6-7 December, Geneva, Switzerland, http://www.euro.who.int/Document/NOH/2nd_NNGL.pdf, accessed 28 November, 2008.

Appendix I – Location Maps: Albany & Esperance

Source: http://maps.google.com.au/maps?ie=UTF8&z=5&ll=-25.335448,135.745076&spn=31.154942,45.834961&om=1, accessed April 2008.



http://en.wikipedia.org/wiki/Esperance,_Western_Australia

Appendix II – Photos of Wind Farms: Albany & Esperance

Photo of Albany Wind Farm from Albany city

Salmon Beach Wind Farm

Ten Mile Lagoon Wind Farm

Source: Dr Sandy Bond, 2008.