



Australian Environment Foundation  
Submission to the Inquiry on  
The Social and Economic Impact of Rural Wind Farms  
by the  
Senate Standing Committee on Community Affairs

February 2011

Australian Environment Foundation

## **Terms of Reference**

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

- (a) Any adverse health effects for people living in close proximity to wind farms;
- (b) Concerns over the excessive noise and vibrations emitted by wind farms, which are in close proximity to people's homes;
- (c) The impact of rural wind farms on property values, employment opportunities and farm income;
- (d) The interface between Commonwealth, state and local planning laws as they pertain to wind farms; and
- (e) Any other relevant matters.

This submission is presented on behalf of the members and board of directors of the Australian Environment Foundation.

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## **About the Australian Environment Foundation**

The Australian Environment Foundation is a not-for-profit, membership-based environmental organisation having no political affiliations, dedicated to informing and educating Australians about environmental issues and solutions to environmental problems.

The Australian Environment Foundation takes an evidence-based, solution focused approach to environmental issues. Many of the Australian Environment Foundation's members are practical environmentalists – people who actively use and also care for the environment – appreciating that environmental protection and sustainable resource use are generally compatible.

People are an integral part of the natural environment and provide the means to protect and enhance it, recognising that the health of each depends critically on the other.

## **Key points of this submission**

- Wind farms produce very expensive electricity
- Wind power is an inefficient method of reducing greenhouse gas emissions
- The cost of greenhouse gas abatement from wind power is exorbitant
- Wind farms negatively affect adjacent property values
- The environmental effect of wind farms is largely unknown
- Increased fire risk due to inability to extinguish turbine fires
- Widespread and growing global opposition to wind farms
- The existence of an overwhelming body of evidence suggesting wind farm operations cause adverse health effects
- Current policy settings are producing negative unintended consequences

## Executive Summary

Support for wind power generation has been driven by a desire to reduce greenhouse gas emissions (GGE) and a diversification of energy sources. Policies, guidelines, subsidies and mandates have been implemented to encourage private investment in wind power in an attempt to satisfy these policy goals.

Recent history demonstrates that when subsidies are inadequate in the view of energy companies, investment in projects is halted. In all markets globally, wind power generation is not viable without government or consumer subsidy.

It remains very doubtful that wind power generation of electricity will attain competitiveness with other current forms of electricity generation, even if a price on carbon dioxide emissions is legislated by government, given the wide gap between the cost of wind generated electricity and the range of emission penalties currently discussed.

If it is accepted that wind power generation has the potential to reduce GGE, the questions are: by how much and at what cost? This submission and a plethora of data and evidence argue that GGE reduced by wind power are insignificant and are attained at great cost. It is also argued that GGE could be reduced by a far greater amount than ever possible from wind power by further embracing natural gas generation of electricity, at less than half the cost of wind power generation.

Even ignoring the unfavourable unintended consequences of large industrial wind farms and their growing unpopularity in Australia and overseas, wind power generation does not satisfy the basic requirements of a valued contributor to the national electricity grid. Wind power cannot supply peak load, load following or base-load power because of its proven erratic and intermittent supply constraints. Wind power is neither cheap, reliable nor ever likely to supply power in quantity required by a growing economy. Furthermore, its *raison d'être*, significant emissions reduction, has shown to be an ineffectual, economically crippling pipe-dream.

Apart from the economic and energy policy dilemma created by the desire to reduce GGE, whatever the cost, many other unintended consequences of wind farm establishment are now manifest.

One of the foundational principles of democratic societies, individual property rights, is weakened by the proliferation of wind farms across many hundreds of thousands of hectares of the Australian landscape without compensation for loss of amenity or loss of property value. Wind farm investment, often by multi-national energy companies supported and subsidised by Australian governments and electricity consumers is having an

adverse effect on many rural communities with the only beneficiaries being hosting landholders and wind farm operators.

Increased fire risk through an inability to extinguish wind turbine fires is now an unwelcome extra burden to many rural communities.

Adverse health effects of wind turbine operation are only now starting to attract widespread attention from medical professionals. It is acknowledged that not all people suffer adversely from wind turbines, just as not all people in a community are afflicted with cancer or other serious medical conditions.

The growing number of case studies and clinical observation of people affected by low frequency sound emanating from wind turbines is of such a magnitude to suggest that a strong prima facie case exists for government sponsored research to determine if government energy policy is responsible for making people sick.

The reluctance of governments and wind industry operators to accept the possibility that large wind farms populated by enormous wind turbines with a demonstrated ability to generate low frequency sound adverse to human health is symptomatic of responses to previous public health issues.

Many everyday activities in the past that were thought benign such as some food processing and additives, asbestos use, exposure to sun, some pesticide use and exposure to smog were later shown through research to have serious public health implications. All of these issues took decades to be recognised as health threats, partly because no immediate threat or symptom was self evident, but all became the subject of extensive research.

Poor health due to wind turbines on the other hand manifests itself quickly and on a continuing basis with the symptoms being consistent globally. With the number of planned wind farms to grow exponentially, Australian citizens potentially at risk from multiple debilitating 'wind syndrome' symptoms is likely to number in the thousands.

Good governance dictates that instead of off-hand denials of threat existence the issue warrants immediate research.

The Australian Environment Foundation has not yet found any redeeming features of wind power generation to justify its continued use, let alone expansion, and requests the committee to carefully review our recommendations contained within this submission.

A key interest of the Foundation is the promulgation of evidence based public policy that provides good outcomes for the environment and communities. We are appalled that energy policy, guidelines, mandates and subsidies applied to encourage the establishment of wind farms is unlikely to ever achieve neither intended goals of significant greenhouse gas reductions nor true diversification of energy sources. That such egregious policy has

escaped rigorous examination until now is an indictment of our political process, particularly given long available data indicating very poor cost benefit outcomes and multiple unintended negative consequences for many Australians for little or no gain.

The Foundation supports the concept of renewable energy, diversification of energy fuel sources and recognises that many people in our society desire a reduction in greenhouse gas emissions. However the capital cost, electricity cost and unintended consequences of wind power generation are of such a negative magnitude to require mandates and subsidies to be withdrawn at the earliest opportunity.

The Australian Environment Foundation urges the committee to encourage the Australian Government to foster a national public discussion on the costs and benefits of nuclear energy to secure base-load electricity production, address greenhouse gas emission reduction and energy diversification.



# The Economic Impacts of Wind Farms

## 1. Cost of power produced by wind turbines

It is beyond dispute that electricity produced via wind turbines is very expensive compared with natural gas and coal fired generators and second only to solar as the most expensive means of producing electricity in Australia.

It is also beyond dispute that we can produce electricity from wind power. The questions are: At what cost? And; how does this compare with other electricity generation?

Engineer Peter Lang says in a 2009 study<sup>1</sup> wind power costs \$121 MW/h. Wind farm operator Origin Energy CEO, Grant King is on the public record stating that wind power costs \$120 - \$130 MW/h compared to base-load gas at \$50 MW/h<sup>2</sup>.

This compares to the volume weighted annual average price of electricity in NSW of \$42 per MW/h<sup>3</sup>.

The stated purpose of producing wind power, at three times the cost of coal generated power and twice the cost of natural gas produced power, is to reduce greenhouse gas emissions [GGE] and to diversify our energy sources. GGE will be dealt with in the next section.

Given particularly that Victoria is heavily dependent on coal as a fuel source, diversifying fuel sources could be seen as a worthy long-term goal. However, as Victoria has over 300 years of coal reserves the headlong rush into mandated, subsidised wind power funded by electricity consumers seems at best premature.

The other flaw in this premise of diversifying away from coal or natural gas is that intermittent, erratic wind power must be backed up by natural gas turbine generators to ensure all important grid stability. With this comes the enormous capital cost of building

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<sup>1</sup> Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation 2009  
<http://bravenewclimate.files.wordpress.com/2009/08/peter-lang-wind-power.pdf>

<sup>2</sup> Interview with Grant King in the Business Spectator Aug 21<sup>st</sup> 2009  
<http://www.businessspectator.com.au/bs.nsf/Article/KGB-INTERROGATION-Grant-King-pd20090820-V43N8?opendocument&src=rss>

<sup>3</sup>  
[http://www.ret.gov.au/energy/Documents/facts%20statistics%20publications/key\\_facts\\_aust\\_energy\\_industry.pdf](http://www.ret.gov.au/energy/Documents/facts%20statistics%20publications/key_facts_aust_energy_industry.pdf)

two generating systems – wind and gas – to guarantee supply when one system, gas turbines, could achieve this while reducing GGE by 40 per cent through partial phased replacement of coal generation with natural gas.

Supporters of wind power deny that increasing wind power generation capacity in the grid will affect grid stability, however Origin Energy's Grant King is well aware of the dangers posed in this interview in August 2009:

*"We're building what will be a 550-megawatt open-cycle power station in Victoria, because as a retailer we don't want to be exposed to any potential unreliability in the system. Whether or not that unreliability arises because of an increasing amount of wind and the intermittency of wind, or whether it arises because of end-of-life issues in respect of base-load generation plants."*

Kathy Russell, vice president of the Australian Landscape Guardians highlighted some very salient points in an article published in Quadrant magazine in August 2010<sup>4</sup>. In this article she published an extract of an important speech to the Committee for Economic Development of Australia in Sydney on April 13 in which Grant King, the CEO of Origin Energy, predicted massive increases in electricity prices driven:

*largely by the current policy environment, large amounts of renewables being forced into the system, uncosted charges for those renewables given current policy settings and substantial increases in transmission and distribution costs.*

Also published were extracts of an Origin Energy technical paper submitted to the Victorian Government in February 2006 entitled: "Driving Investment in Renewable Energy in Victoria – Options for a Victorian market based measure".

*Unreliable capacity requires additional generation support. Additional wind capacity will require two forms of generation support because of the intermittent nature of the underlying energy source*

The Origin document goes on:

*The costs of both forms of generation support are ultimately borne by energy consumers. Moreover, these costs are magnified as greater amounts of wind generation are connected to the system and more generation support is required. This is compounded by inter-connector constraints from time to time as more generation support is required from other regions in the NEM [National Energy Market]*

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<sup>4</sup> The Great Renewable Energy Rort, Kathy Russell <http://www.quadrant.org.au/magazine/issue/2010/7-8/the-great-renewable-energy-rort>

The Origin document continues in its criticism of policy which promotes renewable energy such as wind over more economic forms of greenhouse gas abatement:

*The economic cost of gas-fired generation is lower than wind generation—the combined capital and running costs of a gas-fired power station are approximately half that of a wind turbine (adjusted for the intermittency of wind and including higher running costs of running a gas-fired power station);*

*Gas-fired generation is a more cost-effective source of greenhouse gas abatement than wind generation—at approximately half the economic cost, a gas-fired power station reduces emissions up to twice as much as a wind turbine, because of the better utilisation of the gas-fired power station and the relatively low emission intensity of gas-fired electricity (which makes gas at least 4 times more cost-effective on a \$/tCO<sub>2</sub> basis than wind);*

*Gas-fired generation is more reliable than wind generation which is reliant on the vagaries of nature—gas-fired generation can be turned off and on to meet demand requirements while wind generation is regarded as firm for about only 8 per cent of the time (according to ESIPC in South Australia);*

*Gas-fired generation can provide much larger increments to generation capacity to satisfy growing demand—a large scale gas-fired power station may be up to 1000MW which is all available to generate on average 95 per cent of the time compared to a 1000MW of wind generation which is available to generate on average 33 per cent of the time; and*

*Diversity and security of supply are improved by gas-fired generation and diminished by wind generation—gas-fired power stations stimulate gas supply sources (potentially expanding the range of viable gas production in regional Victoria available for other uses) and connect to the transmission system (potentially in more remote areas) without lowering supply security (as would be the case with wind)*

These revealing statements about costs and efficiencies are from a company that is now an established wind farm operator because the policy framework of mandated and subsidised wind power generation provided by government is too lucrative to ignore. It is however, as Mr King observes, the consumer who is footing the bill for this policy largesse.

## **2. Cost of Greenhouse Gas Emissions Abatement**

While various reasons are proffered for the necessity of establishing industrial wind farms, the primary driver stated by legislators is the need to reduce GGE. The need, extent and urgency of GGE reductions are a contentious subject, however it is well accepted that many taxpayers desire to see progress in GGE reductions.

The key questions in the context of wind power generation and emissions reduction are:

- i How much CO<sub>2</sub> will be reduced?
- ii How much will CO<sub>2</sub> abatement cost?

The answers to these questions provide the foundation for a significant portion of the opposition to the adoption of wind power as a meaningful contributor to emissions reductions at an affordable price. If the data and evidence demonstrate abatement is not significant, or the cost too high, the key premise supporting wind power generation is undermined or simply unaffordable.

Numerous studies in Australia and overseas have shown that wind power is an inefficient means of reducing GGE and more widespread adoption of natural gas as a power generating fuel would result in emissions reductions of up to 40 per cent and at a much lower cost than wind power. Natural gas would therefore satisfy the primary driving factor supporting wind power generation.

Lang in his 2009 paper details the practical limitations imposed on grid operators with the introduction of increasing amounts of wind power to the grid.

If wind power is available, it is unscheduled, highly variable and may cease to be available over a wide geographical area in a matter of minutes<sup>5</sup> therefore requiring back-up generation to ensure all important grid stability.

Substantial capacity in the form of Open Cycle Gas Turbines [OCGT] is required to be built to provide the necessary back-up when wind power generation drops out of the grid. Apart from the large capital costs incurred for this 'back-up' power, over and above the capital costs incurred in providing wind power generation, these turbines are required to run as 'spinning reserve' to come on line immediately when wind power generation ceases. In 'spinning reserve' these turbines are producing emissions without producing power.

Wind farm operators claim these OCGT are operating in 'spinning reserve' to provide security to the grid regardless of the volatility of wind generation, so emissions cannot be attributed to wind generation. There is merit to this claim, particularly when the total wind generation capacity in the grid is small, but as more OCGT are added to the grid specifically to back-up the volatility of increased wind generation capacity, the integrity of the claim is weakened considerably. The more wind generation capacity added to the grid, the higher the potential for grid instability without more back-up.

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<sup>5</sup> Miskelly A and Quirk T, "Wind Farming in South Eastern Australia", Energy and Environment, Volume 20 No.8 2009/Volume 21 No.1 2010, Multi Science Publishing Co. Ltd.

Further evidence provided by Lang and others show that the more efficient Combined Cycle Gas Turbines [CCGT] would be constructed and used more widely if it were not for the fact OCGT are required for the rapid response to wind generation fluctuations, a task less suited to CCGT. More wind capacity equals more inefficient OCGT running in ‘spinning reserve’ and emissions from this extra ‘spinning reserve’ must be attributed to wind generation.

It is widely accepted that wind turbines produce on average about 30 per cent of their nameplate MW/h capacity, therefore for large periods of time they are not providing power to the grid. During these substantial periods of time, these massive turbines draw power from the grid to maintain normal operations and provide cooling for equipment. This power drawn from the grid and the emissions produced are directly attributable to wind power generation, but are rarely included in GGE calculations for wind power.

Lang in his 2009 report compared figures for emissions avoided with two other reports. These were the “South Australian Wind Power Study”<sup>6</sup> and the Royal Academy of Engineering [U.K.] report “The Cost of Generating Electricity”<sup>7</sup> from which he constructed the table below.

	Emissions (t CO <sub>2</sub> -e / MWh	Emissions Avoided (t CO <sub>2</sub> -e avoided / MWh	Cost of Emission s avoided (\$/t CO <sub>2</sub> - e avoided)
Wind (including back up generation) (Aus)	0.519	0.058	\$1149
Wind (including back up generation) (UK)	0.310	0.090	\$830
‘Clean Coal’ (IGCC + CCS)	0.176	0.765	\$56
Combined Cycle Gas Turbine + CCS	0.108	0.833	\$47
Combined Cycle Gas Turbine	0.577	0.364	\$33
Nuclear	0.060	0.880	\$22

The figures clearly show the quantity of emissions avoided is miniscule when back-up is properly considered and the cost of avoiding emissions using wind power is untenable.

<sup>6</sup> South Australia Wind Power Study by Electricity Supply Industry Planning Council, March 2003

<sup>7</sup> [http://www.raeng.org.uk/news/publications/list/reports/Cost\\_Generation\\_Commentary.pdf](http://www.raeng.org.uk/news/publications/list/reports/Cost_Generation_Commentary.pdf)

In his 2010 report “Emission Cuts Realities – Electricity Generation”<sup>8</sup> Lang looks at electricity costs and emission avoidance costs through to 2050 using various technology options and comes to the conclusion that wind and solar are the highest cost ways to cut emissions.

This conclusion is reinforced by the findings of the final report of the Rhine-Westphalia Institute for Economic Research<sup>9</sup> which concludes that “although Germany’s promotion of renewable energy is commonly portrayed in the media as setting ‘a shining example’, we would instead regard the country’s experience as a cautionary tale of massively expensive environmental and energy policy that is devoid of economic and environmental benefits”.

One perspective in the debate about meeting the recently upgraded federal Renewable Energy Target of 45,000 GW/h by 2020 is not often publicly discussed.

This is the extra capital cost of backing-up a much larger wind power generation capacity with OCGT. The table below gives an indication of the costs and benefits of meeting the additional production required to meet the legislative target.

	<b>Wind/OCGT</b>	<b>CCGT Alone</b>
Additional Production to Meet Target	21.7 GWH	21.7 GWH
Capital Cost	\$32 billion	\$12 billion
Power Cost \$/MWh	\$120/MWh	\$54/MWh
Annual Power Cost - \$	\$2.6 billion	\$1.2 billion
GGE Produced - kg/KWh	0.31kg/KWh	0.40kg/KWh
Annual Production GGE - tonnes	6,740,000	8,700,000
Annual Savings by Replacing Coal – tonnes	19,300,000	17,400,000

Meeting the target via wind and OCGT combined comes at a capital cost of \$20 billion more with an annual power cost more than double from CCGT alone. The very modest extra displacement of coal produced GGE comes at a cost of \$55 billion over the 25 year lifespan of wind farms. This additional cost will ultimately be borne by the electricity consumer and/or taxpayer.

<sup>8</sup> <http://bravenewclimate.com/2010/01/09/emission-cuts-realities/>

<sup>9</sup> [http://www.instituteforenergyresearch.org/germany/Germany\\_Study\\_-\\_FINAL.pdf](http://www.instituteforenergyresearch.org/germany/Germany_Study_-_FINAL.pdf)

A further important consideration is that the table above does not take into account that in most cases wind power generation displaces relatively clean natural gas electricity in the grid rather than coal produced power.

If public energy policy's ultimate goal is to reduce GGE **at any cost** then wind power generation will play a small part at a huge cost. If policy aims to reduce emissions quickly at modest cost, then the focus should be on broad-scale adoption of abundant natural gas for a partial phase out of coal power generation.

### **3. Wind industry jobs supported by electricity consumers**

Wind farm operators, industry lobby groups such as the Clean Energy Council and vested interests involved in the manufacture of wind turbines and other infrastructure are vocal in their claims of employment and capital investment due to wind farm establishment. This is understandable given these are probably the only redeeming features of the wind industry.

There is no doubt jobs are created on a short term basis in regional areas associated with wind farm establishment, however these jobs and the capital expenditure involved are entirely reliant on legislative mandates, subsidies and production of electricity that is two to four times more expensive than current generation methods. These jobs only lasting contribution to society, while bankrolled by taxpayer and electricity consumer subsidy, is to perpetuate the production of expensive electricity and at best, a nominal reduction in GGE.

Delays in passing the Renewable Energy Target legislation and other regulatory reform to guarantee the framework of favourable subsidies to the wind industry saw proposed further investment in wind farms stall. The continuation of the industry and the jobs within is predicated on being perpetually propped up by taxpayer subsidy and artificially high prices or risk collapse.

While job creation in regional areas is admirable, this should be a consequence of good policy initiative that produces a beneficial outcome. Manufacturing multi-million dollar wind turbines to produce expensive electricity mainly for the benefit of multi-national energy companies in the name of regional jobs constitutes economic lunacy.

Wind industry's plaintive assertions that further restrictions to protect people in local communities through realistic setbacks of wind farms from houses would cost investment, jobs and be detrimental to regional economies. This contrasts sharply with the empirical German experience which has been "a cautionary tale of massively expensive environmental and energy policy that is devoid of economic and environmental benefits."

Based on international experience, the prospects for any meaningful level of local employment at established wind farms is grim, local employment all but evaporates at the end of construction.

#### **4. Effects of wind farms on real estate values**

Establishment of industrial wind farms has the potential to affect land values on the properties where turbines are located, adjacent properties and any other property in the general locality where there may be noise or visual impacts from turbines.

Whether noise impacts at any particular property are proven or unproven as detrimental is largely irrelevant in the context of property valuation, as it is the perception of the intended purchaser that is the determinant factor.

Visual impact of wind turbines in any given locality appears to be the predominant determining factor of influence on land values to prospective purchasers.

This factor of purchaser perception is overlooked in analysing surveys taken on people's attitudes to the influence of wind farms on property values in that the people being surveyed have no intention of imminent purchase of real estate.

Due to the relatively recent phenomena of large industrial wind farm development in Australia and the modest number of property sales in rural areas where wind farms are located, we are unaware of any comprehensive studies yet conducted in Australia on the subject of wind farm stigma affecting property values.

We are aware of a report prepared by PRP Valuers and Consultants titled *Preliminary Assessment of the impact of wind farms on surrounding land values in Australia* which noted in its Executive Summary, "As a result the small samples of sales transactions available for analysis limited the extent to which conclusions could be drawn." The report however goes on to nevertheless draw conclusions, which are at odds with statements below from practicing Australian and U.S. real estate professionals.

We have reviewed a number of studies and appraisals conducted in the United States on this subject and consider it appropriate to use such studies comparatively given similar cultures and land use.

According to real estate professionals the value of a property is largely dependent on the perceptions of the market and the prospective purchaser, accordingly the value of any property will be affected positively or negatively by real or perceived influences.

In the U.S., the Appraisal Institute has developed methodology and techniques for evaluating the effects of environmental contamination on the value of real property. The three potential effects that contamination can have on real property: cost effects, use effects, and risk (stigma) effects. All three effects are recognised as being present with utility-scale wind energy projects.



**Cost effects** can include neighbouring owner costs to attempt to mitigate against sound intrusion, shadow flicker, medical costs to deal with sleep deprivation related conditions, as well as, in some instances, the cost to rent substitute housing and potential legal costs incurred to protect individual owner's property rights, etc. For Agricultural property, there can be increased costs due to the loss of ability to retain aerial spraying services, which can result in increased cost for ground spraying methods and/or decreased crop yields.

**Use effects** include the loss of peaceful use and enjoyment of their homesteads for many turbine neighbours, and there is evidence that livestock has been adversely impacted by the noise from turbines, ranging from death (goats in Taiwan) to reproductive disorders (See Wirtz case in Wisconsin) and behavioural changes and irritability of horses and cattle. These may also represent cost effects, in some cases, or other forms of financial impact.

**Stigma effects** can range from loss of aesthetics, diminished views and character of neighbourhoods, to fear of health issues and noise disturbance, etc. This effect is often manifest in the lack of marketability of homes in the "footprint" and nearby properties most impacted by active turbines, and to varying degrees the known and unknown cost and use effects are also contributing factors to stigma effects.

A study by the Appraisal Group One company<sup>10</sup> in the United States found that significant negative perceptions existed in the real estate market due to perceived impacts from wind farms and that the value of improved property could be reduced between 24% - 39%. They also found "there were less sales available within the wind turbine area than without – substantially less."

Michael McCann, a state certified real estate appraiser offered his professional opinion in testimony<sup>11</sup> at a wind farm application hearing in Illinois in June 2010.

Mr McCann stated:

*Residential property values are adversely and measurably impacted by close proximity of industrial-scale wind energy turbine projects to the residential properties, with value losses measured up to 2-miles from the nearest turbine(s), in some instances.*

*Impacts are most pronounced within the "footprint" of such projects, and many ground-zero homes have been completely unmarketable, thus depriving many homeowners of reasonable market-based liquidity or pre-existing home equity.*

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<sup>10</sup> <http://www.wiwindinfo.net/impacts/Kielisch%20-%20Wind%20+%20Property%20Value.pdf>

<sup>11</sup> [http://aefweb.info/data/McCann Appraisal.pdf](http://aefweb.info/data/McCann%20Appraisal.pdf)

*Real estate sale data typically reveals a range of 25% to approximately 40% of value loss, with some instances of total loss as measured by abandonment and demolition of homes, some bought out by wind energy developers and others exhibiting nearly complete loss of marketability. Serious impact to the “use & enjoyment” of many homes is an on-going occurrence, and many people are on record as confirming they have rented other dwellings, either individual families or as a homeowner group-funded mitigation response for use on nights when noise levels are increased well above ambient background noise and render their existing homes untenable.*

*The approval of wind energy projects within close proximity to occupied homes is tantamount to an inverse condemnation, or regulatory taking of private property rights, as the noise and impacts are in some respects a physical invasion, an easement in gross over neighbouring properties, and the direct impacts reduce property values and the rights of nearby neighbours.*

The subject of uncompensated reduction in property rights is addressed in the following extract of a submission to the Victorian government:

***Alienation of Property Rights***

*One effect of the Guidelines is to strip off or effectively appropriate certain of the assets implicit in owning land. These relate to the environment pre-existing on and around a property, including the setting or landscape, the right of quiet enjoyment, the liveability and workability of the property, the certainty of a healthy lifestyle and the presence and experience of wildlife.*

*The lifting of these otherwise unalienable assets from a property has the obvious follow on: at worst, but not uncommon, a property becomes uninhabitable and even unworkable by the owners; at the minimum properties are devalued or become unsaleable*

In comments reported in *The Weekly Times* February 2<sup>nd</sup> 2011, Elders Rural Services national sales manager Shane McIntyre said wind turbines were seen by most of the market as “repulsive” and could lead to a 30 to 50 per cent drop in the value of the land.

Mr McIntyre said a proliferation of wind towers adjacent to a property had the same effect as high voltage power lines, rubbish tips, piggeries, hatcheries and sewage treatment plants, “in that, if buyers are given a choice, they choose not to be near any of these impediments to value”. When buyers became aware of the presence of wind towers or the possibility of wind towers in the immediate district of a property advertised for sale, “the fall-out of buyers” was “major”. “Very few go on to inspect the property and even fewer consider a purchase”. There was “absolutely no doubt” the value of lands adjacent to wind towers fell significantly in value.

“The ambience of a rural property is important and oftentimes, the sole reason why a purchaser selects a particular area or district. The imposition of wind towers destroys this ambience forever” he said.

Wind industry proponents are opposed to the recognition of the sanctity of property rights or, if project approval is attained, compensation for diminution of property rights suffered for the ‘public good’ of providing renewable energy. This ‘public good’ attained is of course primarily for the benefit of private profit.

A straw-man argument often proffered is the ‘right to veto’, whereby further regulation regarding property rights might offer the potential for one opposing landholder in a locality to use property rights to veto a wind farm proposal. This is a vacuous argument that seeks to muddy the waters of property rights principles. These principles determine that property owners should have rights to enjoy and utilise their property and if these are encumbered for the public good, there should be compensation for diminution of rights. There is no suggestion that an individual’s property rights extend beyond his property boundaries.

The wind industry seeks to justify its opposition to the application of property rights by comparing the diminution of an individual’s property rights by multi-national wind companies operating for profit, subsidised by taxpayers, as similar to instances of diminution of property rights for the public good such as, a new highway affecting a property or high voltage power transmission lines etc provided by public agencies for the public good. This comparison fails to recognise the difference between private gain by wind farm companies at the expense of individuals and public gain for public good by public agencies.

The as yet unquantified impact of wind farm approvals on Australian property values and the diminished property rights of individuals needs to be researched.

Further wind farm approvals should require an indemnity on property values be provided by wind farm operators to property owners within a designated distance of the approved wind farm. If as the wind industry claims, there is little negative influence on property values from wind farm establishment; this initiative will dispose of the issue at little or no cost to wind farm operators.

## Environmental Effects of Wind Farms

Environmental effects of wind farms, along with adverse health effects and negative influences on property values have not yet been the subject of comprehensive research in Australia.

Hearings into proposed wind farms have heard evidence of wind farm impacts on birds, bats, reptiles and native vegetation removal, identifying just some of the concerns from communities resulting from rapidly proliferating wind farms. In these hearings there is little dispute there is an impact on these and other aspects of the environment, the point of contention is the degree of impact. In the U.S. some wind farm sites have been well monitored and it is generally accepted the bird kill from wind farms in the U.S. is in the many tens of thousands.

These issues are unlikely to be satisfactorily resolved in Australia without further research to quantify measurable effects. The unfortunate result of environmental objections to wind farm applications generally being overruled and the application proceeding in the absence of quantifiable research is the 25 year lifespan of most projects and the subsequent unknown degree of impact on environmental values. Given the large number of proposals for new wind farms in most eastern states there is an urgent need for government sponsored research to quantify wind farm effects on the environment.

### Wind Turbine Fire

One environmental effect of wind farms that is easily quantifiable and has the potential to inflict more harm on the environment than any other ill effect of turbines is turbine fires.

According to bushfire scientist, David Packham from Monash University<sup>12</sup> *“It has been reported that about 20 turbines catch fire [globally] and burn each year”* and so *“Applying the global data to the 2000 or so turbines installed in Australia we would expect a 60% probability of one turbine fire each year.”*

While the number fires due to turbines is low compared to other ignition sources it is a preventable cause and is an increasing risk with the increasing number of turbines.

The potential for catastrophic damage from turbine fires in the high risk locations where many turbines are sited is magnified by the fact that even if brigade attendance is immediate, and this is unlikely given the generally rural locations, rural fire brigades are not equipped to extinguish fires in turbines exceeding the height of an eleven storey building.

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<sup>12</sup> Fire in the sky: Bushfire threat from wind generators. David Packham January 2011

According to David Packham *“What can be said is that from the time of [turbine] failure until the time of fire brigade attendance a fire on the ground in extreme fire danger conditions would have spread beyond any possibility of control.*

*The problems confronting the fire agencies are increased by the lack of accessibility to the burning turbine and in many cases, the ground in the vicinity of the turbine.”*

The procedure adopted in recent turbine fires in South Australia is for the brigade to withdraw to a safe distance of 500 metres and endeavour to stop fire spread.

This type of response is completely contrary to established fire-fighting procedure in suppressing wildfire, but unavoidable given the equipment limitations of first response units. The risk potential of such fires is highlighted by one of the main fire outbreaks on Black Saturday 2009, the Kilmore East fire, started by a power line failure. The financial cost alone of this fire was calculated in the hundreds of millions of dollars.

Given the difficulty of turbine fire suppression, the risk of catastrophic losses and the apparent inability of wind farm operators to detect turbine fires in a timely matter, a mandatory protocol for turbine shutdown on high fire risk days should be introduced.

## Social and Health Impacts of Wind Farms

Wind farm establishment and interface with local communities in various countries around the world over the last two decades have shared some common characteristics that have been subject to sharper scrutiny following the rapid growth of large industrial wind farms.

Generally speaking, over the first decade of the promotion of wind power as a clean renewable energy source that would 'one day replace coal fired electricity' there was little public questioning of the data, evidence or rhetoric provided by wind farm operators, environment groups or governments supporting this new method of producing power.

Acceptance of wind power was a 'given', a self evident truth. It ticked all the right boxes. How could you possibly question the value of something that provided clean, perpetually renewable and cheap power?

And if anyone harboured doubts, how could they possibly confront the unlikely triumvirate of big business, environmental groups and government? For these three significant players in the energy sector to be singing from the same hymn sheet, when on almost any other issue, two, if not all three groupings would be in serious disagreement over policy, surely signalled that the enthusiastic adoption of wind power must be 'right'.

Such was the background for the establishment of wind power generation in most countries which suited each of these groups for their own reasons.

In Australia over the last few years in particular, wind turbine numbers have grown exponentially with some districts having multiple wind farms and this unsurprisingly led to more scrutiny of turbine placement and wind farm operations.

Initially, opposition to wind farm establishment was largely categorised as suffering from the NIMBY syndrome and this is still a factor, but from this awakening of dissent and closer scrutiny, hand in hand with the spread of wind farms to more and more communities came the growing realisation that wind turbines were not as benign as people had been led to believe.

In recent years claims of adverse health effects, loss of landscape amenity and cultural values, environmental effects and increased fire risk have predominantly originated from locally affected rural communities with few skills or available time to broadcast their message of dissent to government or the urban masses. Stories of dissent that were able to be broadcast did not resonate with the conventional wisdom that wind power generation was universally beneficial.

These factors enabled the wind farm triumvirate, far more skilled in shaping public opinion, to suppress and portray dissent as a result of selfish nimbyism.

What has emerged though to counter this perception of a minority of disaffected rural landholders is widespread dissent from globally scattered communities, most of whom have no contact with or knowledge of one another, with remarkably similar grievances and experiences.

### **Globally shared characteristics of wind farm establishment and operation**

- Approaches to and commitment of local hosting landholders without community knowledge prior to public consultation
- Generous corporate sponsorship by wind farm operators to low income rural communities
- Mandated purchase of power produced by wind farms
- Subsidies and financial rewards above market price to wind farms for power produced
- Purchase of properties close to wind farms by operators after local opposition
- Legislative guidelines favouring wind farm establishment over local communities
- Dissent from landholders over uncompensated loss of property rights
- Reduction in local property values
- Formation of local community groups opposed to wind farms (U.K. 240, Aust over 70, European 357, U.S and Canada number unknown)
- Remarkably consistent adverse health effect claims from globally scattered communities
- Universal denial of adverse health effects from wind farm operators
- Previous public support for wind farms from some locals turns to opposition after turbines commence operation and health effects become evident
- Reluctance of governments to commission comprehensive health studies
- Public safety concerns

- Depopulation of communities in the vicinity of wind farms, which includes abandonment (without sale) of family homes

Despite the many globally shared grievances covering a wide range of issues that will require a suite of mechanisms to resolve, it appears the principal social and amenity concern is the health and well being of individuals living in the vicinity of operating wind farms.

This concern has been universally denied by wind farm operators and in many cases by government keen to sponsor wind power generation. It should be noted there is no comprehensive peer reviewed research available demonstrating that there are **not** adverse health effects from wind farm operations.

The wind industry and the previous Victorian government in particular, repeatedly incorrectly stated there is no peer reviewed research indicating adverse health effects from wind turbine operations. Both however, consistently base their denial of health effects on the now discredited, non peer reviewed National Health and Medical Research Council paper entitled “*Wind Turbines and Health: A Rapid Review of the Evidence*”.

The June 2009 report<sup>13</sup> on sleep disturbance and wind turbine noise by British physician Christopher Hanning, BSc, MB, BS, MRCS, LRCP, FRCA, MD provides a useful survey of up-to-date evidence-based literature by a physician who is more qualified than most to carry out this peer review. Dr Hanning highlights that research into wind farm noise and health issues in the U.K. is virtually non-existent and of poor quality and it is perverse to suggest there is ‘no problem’ when presented with such a large body of evidence suggesting otherwise.

Dr. Hanning’s credentials and experience are beyond dispute. He is an expert in sleep medicine and sleep physiology. Dr. Hanning founded and ran the Leicester Sleep Disorders Service, one of the longest standing and largest services in the United Kingdom. His report concludes:

*“In weighing the evidence, I find that, on the one hand, there is a large number of reported cases of sleep disturbance and, in some cases, ill health as a result of exposure to noise from wind turbines, supported by a number of research reports that tend to confirm the validity of the anecdotal reports and provide a reasonable basis for the complaints. On the other, we have badly designed industry and government reports which seek to show that there is no problem. I find the latter unconvincing.”*

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<sup>13</sup> Sleep disturbance and wind turbine noise Dr Christopher Hanning  
<http://www.windaction.org/documents/22602>



*"In my expert opinion, from my knowledge of sleep physiology and a review of the available research, I have no doubt that wind turbine noise emissions cause sleep disturbance and ill health."*

Dr. Hanning has also stated:

*"There can be no doubt that groups of industrial wind turbines ("wind farms") generate sufficient noise to disturb the sleep and impair the health of those living nearby. Families whose homes were around 900m from wind turbines found the noise, sleep disturbance and ill health eventually drove them from their homes."*

Hanning emphasises that:

*"inadequate sleep has been associated not just with fatigue, sleepiness and cognitive impairment but also with an increased risk of obesity, impaired glucose tolerance (risk of diabetes), high blood pressure, heart disease, cancer and depression."*

Hanning refers to a very detailed peer reviewed case control study conducted by Dr Nina Pierpont that:

*"offers compelling evidence that these symptoms [anxiety, fearfulness, sleep disturbance and irritability] are related to low frequency sound and suggests very plausible physiological mechanisms to explain the link between turbine exposure and the symptoms."*

Dr Nina Pierpont's 2009 book *Wind Turbine Syndrome* quotes distinguished U.S. noise engineer, George Kamperman:

*"After the first day of digging into the wind turbine noise impact problems in different countries, it became clear the health impact on persons living within about two miles from 'wind farms' all had similar complaints and health problems. I have never seen this type of phenomenon [in] over fifty plus years of consulting on industrial noise problems. The magnitude of the impact is far above anything I have seen before at such relatively low sound levels. I can see the devastating health impact from wind turbine noise but I can only comment on the physical noise exposure. From my viewpoint we desperately need noise exposure level criteria."*

Adding some urgency to the numerous calls for wind turbine noise studies and better wind turbine noise guidelines is the view formed by Dr Hanning that attempts to reduce wind turbine noise after plant becomes operational are unlikely to be successful as turbine noise is affected primarily by external factors such as topography and wind strength.

These characteristics differentiate turbine noise from other sources such as traffic or amplified music.

The only mitigation for wind turbine noise in the opinion of Dr Hanning is to place sufficient distance between turbines and human habitation.

Wind industry proponents continue with the simplistic argument that wind turbine infrasound is generally at a level below the perception of the human ear, therefore if it cannot be heard, it can't harm us. Skin cancer sufferers no doubt could not see the ultra-violet rays that were adverse to their health either!

There is sufficient prima facie evidence to warrant government supervised study into possible adverse health effects from the operation of wind turbines, this in fact was the recommendation<sup>14</sup> of the panel appointed by the then Victorian Planning Minister on the application for the Moorabool wind farm.

What becomes increasingly clear after studying research and reports on wind turbine noise is the low quality of industry reports such as the November 2010 Sonus Report<sup>15</sup> on Environmental Noise and the compelling weight of evidence the industry has a problem that needs resolution.

Further indicators to the inadequacy of the data, guidelines and framework available in determining wind farm permit approvals is highlighted by comments and recommendations in the panel report<sup>16</sup> into the Moorabool Wind Energy Facility permit application in 2010.

*“The validity of some of the criticism of NZ6808:1998 [the outdated 1998 New Zealand wind turbine sound assessment which is still the used in Victorian planning hearings, despite the existence of more rigorous updated NZ Assessments] should not be dismissed.” And “that its use should be the subject of a review to determine if it remains appropriate.”*

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<sup>14</sup> Moorabool Wind Energy Facility Panel Report September 2010 p188  
[http://www.dpcd.vic.gov.au/data/assets/pdf\\_file/0014/52142/Moorabool-Wind-Energy-Facility-Panel-Report.pdf](http://www.dpcd.vic.gov.au/data/assets/pdf_file/0014/52142/Moorabool-Wind-Energy-Facility-Panel-Report.pdf)

<sup>15</sup> Environmental Noise – Sonus Report <http://www.cleanenergycouncil.org.au/cec/mediaevents/media-releases/November2010/sonus-report.html>

<sup>16</sup> Moorabool Wind Energy Facility Panel Report September 2010 pages 142-144  
[http://www.dpcd.vic.gov.au/data/assets/pdf\\_file/0014/52142/Moorabool-Wind-Energy-Facility-Panel-Report.pdf](http://www.dpcd.vic.gov.au/data/assets/pdf_file/0014/52142/Moorabool-Wind-Energy-Facility-Panel-Report.pdf)

The panel further notes that:

*There are two major components missing from the framework currently available for the control of noise from WEFs [Wind Energy Facilities] in Victoria:*

- prescribed methodologies for setting noise limits, assessing applications and testing compliance, developed for Victorian conditions; and*
- the involvement of the main government authority with acoustic expertise, i.e. the EPA, in the assessment of proposals and compliance testing and enforcement.*

*We see a significant need for the development of procedures to be applied for the control of noise from WEFs in Victoria. This would provide the opportunity for development of what might be described as best practice balancing of the needs of the industry and the community, would increase the level of confidence within the community in the regulatory process and would put the up dating of procedures in the hands of the State.*

These comments by a government appointed panel to hear wind farm applications point to fundamental flaws in planning guidelines and the framework available to panel hearings to have access to the best evidence to make application recommendations. The complex areas of noise assessment and operational compliance do not currently involve the only government agency with some expertise in noise assessment, the Environment Protection Authority. Many Victorian wind farms are operating following approval under this flawed process.

## Recommendations

The Australian Environment Foundation recommends that:

1. An independent comprehensive cost benefit analysis is undertaken into producing electricity from wind power generation that includes consideration of health and social costs
2. An independent comprehensive cost benefit analysis is undertaken to determine the cost per tonne of carbon equivalent of greenhouse gas abatement from wind power generation
3. Regulations be implemented to indemnify property owners from loss of property value due to wind farm establishment
4. A study is conducted to determine the environmental benefits and environmental costs of wind farm establishment on a national basis
5. Regulations be implemented to minimise fire risk from wind farm operations on high fire risk days
6. Independent research be conducted into health effects from wind farm operations
7. A moratorium be implemented on further wind farm approvals and construction commencement of approved wind farms until the key aspects of emissions abatement cost benefit, property value issues and adverse health effects have been determined
8. The Australian Government actively encourages a national public discussion of the merit, or otherwise, of nuclear energy development in Australia