

# **SENATE SELECT COMMITTEE ON WIND TURBINES**

## **THE APPLICATION OF REGULATORY GOVERNANCE AND ECONOMIC IMPACT OF WIND TURBINES**

**Dr Alan C Watts OAM**

HDA., B.Sc., MB. Ch.B., L.R.C.P., M.R.C.S.

**Dr Colleen J Watts OAM**

B.Sc.Agr.(Hons), M.Phil., PhD.

**MARCH 2015**

# SENATE SELECT COMMITTEE ON WIND TURBINES

## THE APPLICATION OF REGULATORY GOVERNANCE AND ECONOMIC IMPACT OF WIND TURBINES

### TABLE OF CONTENTS

Disclaimer	3
1. Introduction	4
2. How effective the clean energy regulator is in performing its legislative responsibilities and whether there is a need to broaden those responsibilities	6
3. The role and capacity of the national health and medical research council in providing guidance to state and territory authorities	8
4. The application and integrity of national wind farm guidelines	14
5. The effect that wind towers have on fauna	16
6. The energy and emission input and output equations from whole-of- life operation of wind turbines	21

## DISCLAIMER

The subject matter of this submission should not be used to infer any bias for or against wind energy and any other form of electrical power generation including coal, gas, solar, geothermal, hydro, and tidal or wave.

This submission should not be used to characterise any individual nor organization.

No social, intellectual or financial support for the research, authorship, or publication of this submission has been sought or received.

The authors of this document have no affiliation with, financial support from or financial interest in any industry associated with electrical generation.

Any and all errors or omissions are unintended.

## 1. INTRODUCTION

It is essential to consider wind turbines and the generation of electricity via wind power within the context of the total supply and demand of electricity to and from the electricity grid. Industry, business and individuals require a constant supply of energy, one that can seamlessly meet the vagaries of changing demands, on a minute by minute basis.

Difficulties arise because electricity cannot presently be stored to any degree. Supply has to constantly be adjusted to meet demands. Wind, being an unreliable and intermittent source of electricity, cannot do this. For 70% of the time it is a **net user of electricity** not a producer. When it produces electricity during the remaining 30% of the time it requires coal and gas plants running inefficiently in the background to provide back-up or a spinning reserve of electricity able to cut in with little or no warning. This occurs, when wind generated power falters. In Australia it is generally considered that back up coal or gas plants need to run at 90-100% to be able to do this. While in this mode they produce nothing.

The question that needs to be answered is:

If the objective of electricity generation by wind turbines is to reduce carbon dioxide (CO<sub>2</sub>) and other greenhouse emissions is there any net saving of CO<sub>2</sub> and burned fuel (coal or gas) resulting from the use of wind energy?

The answer is:

There are **no net savings in CO<sub>2</sub> emissions** and that the cost of running parallel systems is prohibitive.

Why then are we pursuing wind energy at all?

Further, wind energy:

1. Is expensive,
2. Has detrimental impacts on society,
3. Impacts on national competitiveness,
4. Impacts on fuel poverty (unbelievably an already emerging concern in Australia).  
It thus becomes an urban, as well as rural concern.
5. Impacts on health,
6. Impacts on community,
7. Reduces property values and results a host of other tangible and intangible, intended and unintended consequences.

It is our contention that the **pursuit of renewable wind power generation has been at the cost of the greater social, environmental and economic good.** There has been no cohesive analysis of government policy or studies to determine an overall cost benefit analysis. Ad hoc government policy has developed as a response to vested interests, lobby groups and a certain hysteria that has gripped society as a whole regarding possible (but unproven) global warming and climate change.

In the light of often uninformed and panicked government response to these issues objective assessment and clear strategic thinking has suffered.

This submission cannot attempt to address the myriad issues that are connected with the appalling performance of wind turbines and the social ills they have created.

This submission will therefore deal specifically with the following terms of reference:

- How effective the Clean Energy Regulator is in performing its legislative responsibilities and whether there is a need to broaden those responsibilities;
- The role and capacity of the National Health and Medical Research Council in providing guidance to state and territory authorities;
- The application and integrity of national wind farm guidelines;
- The effect that industrial wind towers have on fauna;
- The energy and emission input and output equations from whole-of-life operation of wind turbines.

## 2. HOW EFFECTIVE THE CLEAN ENERGY REGULATOR IS IN PERFORMING ITS LEGISLATIVE RESPONSIBILITIES AND WHETHER THERE IS A NEED TO BROADEN THOSE RESPONSIBILITIES

The Clean Energy Regular (CER) administers the distribution of **renewable energy certificates (RECs)** as created via the **Renewable Energy (Electricity) Act 2001**.

Only accredited renewable power stations (for instance, state approved wind turbines) are eligible to receive RECs which are on-sold to the appropriate energy retailers.

The questions are:

1. How effective is accreditation?
2. What role does the CER play in accreditation?

The current situation is that state authorities approve the development and construction of wind turbine installations. With that approval there are accompanying **Conditions of Consent**.

It should be mandatory that wind power generators **comply** with their Conditions of Consent **before** they receive RECs. But wind generating company receive RECs ahead of time instead. Evidence of compliance should be provided before the CER issues RECs.

Currently monitoring is a disgrace. There appears to be little or no monitoring of industrial wind turbine plants to ensure that they are operating within the limits of their operational licence.

The CER appears to unbelievably take the **self-reporting of the wind power operators as valid** and issues RECs without **any checks or balances**. State authorities compound the error by accepting self-reporting as authoritative despite instances in Australia where industrial turbine wind plants have patently been operating outside their conditions of consent. A reported instance is that of Waubra Wind Farm which was reported in the **Victorian Parliament as never receiving its final approval and which has therefore been operating illegally for the past five years**. Yet its operator has been receiving and profiting from the RECs that have been presented to it by the CER.

There is an important disjoint here. The CER must have certainty that the wind power operator is operating legally **before** RECs are issued. To do otherwise amounts to fraudulent behaviour.

## CONCLUSION:

The CER under its current guise is allowing wind farm operators to operate and receive RECs. In whose interest are they working? Plainly not the taxpayer and electricity consumer. The following needs to be acted upon as a matter of urgency:

1. Accreditation is plainly not reliable.
2. The CER must take a more active role in ensuring that Conditions of Consent are adhered to and are supported by objective monitoring.
3. The CER must take better responsibility (and be accountable) for issuing RECs to wind electricity generators which may be operating illegally.
4. If the CER could be relied upon to be at “arms-length” it could play a more productive role in the regulation of safe renewable energy. Wind farms would thus be forced to ensure they met their Conditions of Consent.

### 3. THE ROLE AND CAPACITY OF THE NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL IN PROVIDING GUIDANCE TO STATE AND TERRITORY AUTHORITIES

In February 2015 the NHMRC released its long awaited statement: Evidence on Wind Farms and Human Health<sup>a</sup>. In part it states:

*“After careful consideration and deliberation of the body of evidence, NHMRC concludes that there is currently no consistent evidence that wind farms cause adverse health effects in humans. Given the poor quality of current direct evidence and the concern expressed by some members of the community, high quality research into possible health effects of wind farms, particularly within 1,500 metres (m), is warranted.”*

It differs very little from the Systematic Literature Review and the Draft Information Statement February 2014 that the NHMRC put out for public comment. As such our criticisms at the time remain. These are expressed as our submission to the NHMRC in April 2014<sup>b</sup> and are detailed below:

[The] review has looked, however cursorily, at an astounding **3354** documents consisting of:

**1778** Peer-reviewed articles in the “black” literature, of which you excluded all but **seven**.

**1070** Non-peer-reviewed articles in the “grey” literature, of which you excluded **all**.

**506** Public submissions to the NHMRC, of which you excluded all but **four**.

The reviewers report a very rigid and fine-grid examination of this literature, and in so doing excluded all but **eleven** studies, and indeed only looked at **seven**, which they considered met their futile and restrictive criteria.

The **2697** submissions from **3354** documents were excluded on title or abstract alone. This does not represent a rigorous analysis of the available literature. Each and every step of discovery, review and rejection with the assembled criteria used represented an opportunity for error or bias.

If as much time had been spent reading and analysing literature as had been spent establishing, justifying and complicating the rejection process, then this document may have had more validity.

This represents a failure of your research criteria, not a failure of the value of available literature. The elimination of **99.7%** of viewed material is staggering and can hardly be described as representative.

While I applaud scientific rigour, repeatability and the application of statistical analysis to research, I am of the opinion that this review has entirely missed its whole purpose.

The purpose of this review is quite clearly stated:

*“NHMRC is responsible for ensuring that Australians receive the **best available**, evidence-based and reliable advice on matters relating to improving health, and to preventing, diagnosing and treating disease. Some members of the community have reported that living near a wind farm has affected their health. Therefore **NHMRC is investigating whether there is reliable evidence that exposure to specific emissions from wind farms — noise, shadow flicker and electromagnetic radiation — could cause health effects in humans”**.*

The reviewers, in attempting to define “reliable evidence”, **have excluded 3343, or 99.7%** of potential sources of information, many of which go a long way to describing and reporting adverse health effects and/or looking at potential or hypothetical physiological pathways that represent mechanisms by which adverse health effects may manifest.

Even taking into account the fact that some of the 99.7% of literature reviewed may have been duplicated, may not have dealt directly with adverse health effects or may have, for whatever reason, been “off topic”, it is beyond belief that the bulk would not have contributed to the current knowledge on wind turbines and health effects in a meaningful and contributory way. This slash and burn approach to the assembled literature, while the NHMRC claims it is “*Australia’s leading expert body promoting the development and maintenance of public and individual health standards*”, is farcical.

Does this mean that the NHMRC only examines adverse health effects from sources that meet its rigid criteria and will **only** make a public policy statement if it fulfils this arbitrary standard? I would suggest that Medicine is part art and part science, and there is an essential role for opinion, experience, observation and anecdotal evidence as well. After all, it does form the basis for the study of epidemiological, population and environmental medicine.

It is this type of information that your review is lacking or ignoring. The history of research, after all, often starts from a point of anecdotal evidence. From this, hypotheses may evolve and research will be undertaken to reject a null hypothesis. Beyond that, however, the art of medicine will often precede this, or at least look to find a cure before waiting for the inevitable slow results of research to present. A need exists, therefore, for case studies, retrospective studies and a more profound examination of the mechanistic evidence for the possible and probable pathophysiology influencing individual responses to infrasound and low frequency noise (ILFN).

**I am thus surprised that several researchers’ work was excluded from your review. I particularly note the exclusion of Professor Alec Salt and his team at the University of Washington, who have looked in considerable detail at possible physiological pathways and the role of inner and outer hair cells of the ear.** You state that “*A mechanism by which ILFN could harm human health could not be determined*”. Professor Salt is very clear on possible associations between “ILFN and intermediate physiologic effect”. Even accepting that there is much research yet to be done to validate these pathways and health outcomes in the affected human population, work done to date cannot be dismissed as irrelevant to this review. There are many other notable examples of exclusions, such as Dr. Nina Pierpont who first described Wind Turbine Syndrome in her book titled by the same name, as well as research by NASA as far back as 1985.

I note your statement *“One of the largest identified problems with the literature is the sample selection bias in the studies”*. I accept that in a new field of research, such as the adverse health effects of wind turbines, it may be difficult to obtain the perfectly designed prospective cohort research study from available literature. However, it is beyond cavalier – it is actually outrageous – that so much information concerning adverse health effects and industrial wind turbines has been excluded from your review. A more complete review needs to include much of the additional information and research available to you, even with the caveat that it needs to be improved, validated or expanded. By examining a **mere seven studies** in your review the conclusions are inevitable and even pre-ordained.

A summary of our objections to the NHRMC statement can be found in this document and remains unchanged, viz:

The Statement is:

- i. Too restrictive;
- ii. Too narrow in its terms of reference;
- iii. Too dismissive of much valuable information;
- iv. Improper in its classification and interpretation of much research, and thereby unfairly exclusionary of valuable data;
- v. Is censorial rather than reflective of current literature;
- vi. Does not ensure “that Australians receive the best available, evidence-based and reliable advice on matters relating to improving health, and to preventing, diagnosing and treating disease”;
- vii. Does not sufficiently support further debate and research, despite the desperate and long overdue need, and is therefore in defiance of recommendations by the Federal Senate Enquiry of June, 2011;
- viii. Fails to disclose commercial dealings and other conflicts of interest within the review panel, which obviously tarnishes the document and is an infantile oversight; and
- ix. Demonstrates the glaring absence (in this information paper) of any precautionary principle from a national body entrusted with a nation’s health, which is beyond alarming.

The Statement does note that high quality research may be required into the possible health effects of wind turbines but neglects the opportunity to expand on possible avenues of investigation. Why?

We note that recent work by S. Cooper<sup>c</sup> connects infrasound from wind turbines with unacceptable health impacts. While this is an indicative study it points the way for further in depth research.

It should be the role of NHMRC to direct such research.

It should also be the role of the NHRMC to ensure that relevant recommendations such as those forthcoming from the June 2011 Senate Inquiry into the Social and Economic Impact of Rural Winds Farms<sup>d</sup> are carried forward and effectively progressed, viz:

***Recommendation 1***

*2.44 The Committee considers that the noise standards adopted by the states and territories for the planning and operation of rural wind farms should include appropriate measures to calculate the impact of low frequency noise and vibrations indoors at impacted dwellings.*

***Recommendation 2***

*2.58 The Committee recommends that the responsible authorities should ensure that complaints are dealt with expeditiously and that the complaints processes should involve an independent arbitrator. State and local government agencies responsible for ensuring compliance with planning permissions should be adequately resourced for this activity.*

***Recommendation 3***

*2.69 The Committee recommends that further consideration be given to the development of policy on separation criteria between residences and wind farm facilities.*

***Recommendation 4***

*2.101 The Committee recommends that the Commonwealth Government initiate as a matter of priority thorough, adequately resourced epidemiological and laboratory studies of the possible effects of wind farms on human health. This research must engage across industry and community, and include an advisory process representing the range of interests and concerns.*

***Recommendation 5***

*2.102 The Committee recommends that the NHMRC review of research should continue, with regular publication.*

### ***Recommendation 6***

*2.103 The Committee recommends that the National Acoustics Laboratories conduct a study and assessment of noise impacts of wind farms, including the impacts of infrasound.*

### ***Recommendation 7***

*3.99 The Committee recommends that the draft National Wind Farm Development Guidelines be redrafted to include discussion of any adverse health effects and comments made by NHMRC regarding the revision of its 2010 public statement.*

All recommendations are commended to the current Senate Inquiry. The NHMRC should specifically have carriage of recommendations 4 to 7. To date its only input has been the its recent, inadequate Statement as discussed.

The NHMRC has noted “the Senate Community Affairs References Committee has made recommendations on the future of the Guidelines in its inquiry report, 'The Social and Economic Impact of Rural Wind Farms'. At this stage the Australian Government is still considering its response to the inquiry report.” The NHMRC is not taking an active role in promoting the Senate’s recommendations.

## **CONCLUSION:**

The NHMRC should have a proactive role to play in the elucidation of health effects of wind turbines. Other than its previous 2010 Statement and its current 2015 Statement it appears to have had little role in advising state and territory authorities.

High quality research should be undertaken but the NHMRC appears to have little input into this, despite being the obvious national body to direct research and investigation. Moreover its current position of ignoring much of the medical research, reports, investigations etc undertaken both in Australia and internationally is regrettable. While some of this work may fall outside the strict parameters the NHMRC seems to have set itself, the bulk of this literature strongly indicates the required direction of research which must be undertaken as a matter of urgency. To have Senate recommendations so flagrantly ignored for the past four years is a travesty and begs the question whether such Senate Inquiries have any real purpose.

## REFERENCES:

- a. NHMRC Statement: Evidence on Wind Farms and Human Health (Feb 2015)  
[https://www.nhmrc.gov.au/files\\_nhmrc/publications/attachments/eh57\\_nhmrc\\_statement\\_wind\\_farms\\_human\\_health\\_0.pdf](https://www.nhmrc.gov.au/files_nhmrc/publications/attachments/eh57_nhmrc_statement_wind_farms_human_health_0.pdf)
- b. Watts, Dr Alan C. OAM – Open Letter to NHMRC re Draft Information Paper (April 2014). <http://waubrafoundation.org.au/resources/watts-dr-alan-c-oam-open-letter-nhmrc-re-draft-information-paper/>
- c. The Acoustic Group (Cooper, S. principal) (November 2014) *The results of an acoustic testing program, Cape Bridgewater Wind Farm. 44.5100.R7:MSC.*  
<http://www.pacifichydro.com.au/files/2015/01/Cape-Bridgewater-Acoustic-Report.pdf>
- d. Australian Parliament, Senate Community Affairs References Committee (June, 2011) *The Social and Economic Impact of Rural Wind Farms.*  
[http://www.aph.gov.au/Parliamentary\\_Business/Committees/Senate/Community\\_Affairs/Completed\\_inquiries/2010-13/impacruralwindfarms/report/index](http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Community_Affairs/Completed_inquiries/2010-13/impacruralwindfarms/report/index)

#### 4. THE APPLICATION AND INTEGRITY OF NATIONAL WIND FARM GUIDELINES

The draft National Wind Farm Guidelines that were delivered to the community and stakeholders for comment in 2010 have no application of integrity, and have basically been abandoned. The statement from the Environment Protection and Heritage Standing Committee 2013<sup>e</sup> needs no further embellishment:

*“In light of the expected increase in wind farm developments in coming years the Environment Protection and Heritage Council (EPHC) directed a Working Group of officials to draft the National Wind Farm Development Guidelines (the Guidelines) in January 2009. The draft Guidelines outlined best practice for industry and planning authorities and were not mandatory, nor did they seek to change existing jurisdictional statutory processes. The draft Guidelines were released for public consultation in July 2010 for a period of twelve months to allow jurisdictions time for further consultations with relevant stakeholders.*

*As a result of these consultations, it has become apparent that jurisdictions have developed, or are currently developing planning application, assessment and approval processes within their own planning frameworks to manage community concerns about wind farm developments such as turbine noise, shadow flicker, electromagnetic interference and impacts of landscapes and wildlife. The Environment Protection and Heritage Standing Committee has therefore decided to cease further development of the Guidelines.”*

However consideration should again be given to producing a national industrial wind electricity generation guideline.

Presently, each state has developed its own draft guidelines (no state seems capable of producing a final document) which means that regulation and **planning guidelines differ between states**. For instance, NSW introduced its Draft Wind Farm Guidelines early in 2012, called for public submission and promised the final Guidelines by the end of 2012. To date the final document has failed to materialise. This fragmentation defies logic and is reminiscent of non-agreement of colonial rail gauges!

An important difference between states are the setback distances allowable between residences and wind turbines. NSW Draft Guidelines call for a 2 km setback. Other states are less eg. South Australia. Maximum allowable noise levels also differ between states and this all inevitably creates an environment of confusion and, where limits are less generous, of resentment.

If renewable energy via wind power is considered a desirable objective at all (and we argue here that it is not) then there needs to be a national and cohesive approach to guidelines and regulations.

This is completely lacking.

#### **CONCLUSION:**

Effectively the National Wind Farm Development Guidelines have been abandoned. If renewable energy via wind power were to **inadvisably** continue as government policy there should be a national approach. Consistency and cohesion of policy, under Federal regulation, would be an improvement (if that is conceivable) over the current situation which is totally unacceptable.

#### **REFERENCE:**

- e. Environment Protection and Heritage Standing Committee (2013)  
<http://www.scew.gov.au/resource/future-national-wind-farm-development-guidelines> :

## 5. THE EFFECT THAT WIND TOWERS HAVE ON FAUNA

### **Industrial wind towers do not positively assist Australian Fauna in any way**

Fauna principally affected by wind turbines are birds and bats, although habitat destruction will inevitably force mammalian death or migration. This is an intractable problem and research appearing in the scientific literature over the last decade or so is providing compelling evidence of this.

C. Hambler (zoologist from Cambridge University) recently spelt out some of the statistics in an essay which looked at the death and extinction of fauna due to wind turbines<sup>f</sup>:

*“Species extinction is a serious issue: around the world we’re losing up to 40 a day. Yet environmentalists are urging us to adopt technologies that are hastening this process.*

*“Among the most destructive of these is wind power.*

*“Every year in Spain alone — according to research by the conservation group SEO/Birdlife — between 6 and 18 million birds and bats are killed by wind farms. They kill roughly twice as many bats as birds. This breaks down as approximately 110–330 birds per turbine per year and 200–670 bats per year. And these figures may be conservative if you compare them to statistics published in December 2002 by the California Energy Commission: ‘In a summary of avian impacts at wind turbines by Benner et al (1993) bird deaths per turbine per year were as high as 309 in Germany and 895 in Sweden.’”*

In Australia, although little formal research has been published, there is every reason to accept that the situation is similar.

Risk factors for birds, particularly those prone to fly at great heights such as the **raptors** are significant and include:

- **Collision** with moving turbine blades, with the turbine tower and associated infrastructure such as overhead power lines, or in the wake behind the rotors causing injury, leading to direct mortality;
- **Disturbance displacement** from around the turbines or exclusion from the whole wind farm;
- **Reduced breeding;**
- **Reduced survival** may result if birds are displaced from preferred habitat and are unable to find suitable alternatives;
- **Barriers to movement** disrupting ecological links between feeding, wintering, breeding and moulting areas and extended flights around wind clusters, leading to increased energy demand potentially reducing fitness;
- **Loss of habitat or change** due to wind turbines and associated infrastructure.

Thus wind energy facilities can have detrimental impacts on birds (and indeed bats and other fauna) in four fundamental ways:

- Collision mortality
- Loss or degradation of habitat
- Disturbance and subsequent displacement from habitat
- Disruption of ecological links

Raptors and other large birds of prey often soar where wind turbines are best sited and may be attracted to their deaths by vegetation and prey around the turbines. These birds cannot sustain big losses because they breed so slowly. International experience has shown that important raptor populations can be wiped out or significantly reduced<sup>7</sup>.

A recent review by Sprague et al<sup>8</sup> raises concerns that bird kills in Canada and the USA are greater than previously reported, and the potential for collision fatalities increases with increasing height and increasing rotor-swept area of the greater size of modern industrial wind turbines. Wind turbulence is also increased with turbine size and represents further danger for bird and bat flight.

In Australia the **wedge tailed eagle** (*Aquila audax*) – a climax avifauna species – is often singled out as being vulnerable to wind turbines. The wedge-tailed eagle is identifiable, powerful and omnipresent, and it is hardly surprising that it has a strong presence in Aboriginal custom and mythology<sup>h</sup>. As such any pressure on wedge-tailed eagle habitat, breeding or range can risk the threat of local extinction thereby affecting indigenous customs and beliefs. Other large avifauna are also considered at risk, for example the brolga.

**Micro bats** are also extremely vulnerable. These are largely insectivorous, consume enormous numbers of insects and have a vital role in pollination. Studies in the USA for instance have shown that a colony of just 100 small bats can consume a quarter of a million mosquitoes and other small insects per night which has significant consequences for insect control in Agriculture<sup>i</sup>. Savings to Agriculture can run to the 10's of millions of dollars. But with the advent of wind turbines the death of significant numbers of small bats has meant that costly insect control by chemical insecticides has been required. In 2010 in Pennsylvania it has been estimated that 420 wind turbines killed more than 10,000 small bats.

A recent study at the University of Colorado<sup>j</sup> used published bat fatality information to derive estimates of the number of bats killed at wind energy facilities in the contiguous United States in 2012 and concluded that over 600,000 bats may have died as a result of interactions with wind turbines.

The study also felt this was a conservative estimate with a figure of 900,000 being possible.

The development and expansion of wind energy facilities is a key threat to bat populations in North America. Dead bats are being found underneath wind turbines across North America, and bat fatalities have been documented at almost all of the wind facilities at which thorough bat surveys have been conducted.

Micro bats are nocturnal and therefore feed at night. Their vulnerability to wind turbines is exacerbated by aircraft navigational warning lights which are often required to be sited on wind turbines. The insects that are attracted to the lights in turn attract the bats. Rather than blade strike it has recently been found that the bats are affected by **barotrauma** due to the moving blades of the wind turbines causing a drop in pressure<sup>k</sup>. Bats have proportionally larger lungs and hearts than most other mammals, and have blood-gas barriers that suddenly expand and are also much thinner. This makes them much more susceptible to barotrauma resulting in pulmonary haemorrhage and ultimately death.

Monitoring is often a condition to project approvals, at least for the first few years of operation. Monitoring the impact of active turbines on birds typically involves regular searches for corpses beneath the turbines. Problems with monitoring are important as they may affect the result of carcase surveys. Most wind energy producers do not publish the studies and methodologies used to arrive at their mortality estimates.

**We have yet to see one Environmental Assessment that describes any methodology for monitoring bird and bat collisions and further, there is usually no indication that results will be publicly available.**

## CONCLUSION:

Birds (particularly iconic climax species such as raptors) and micro bats are especially vulnerable to wind turbine kill. Overseas studies indicate large numbers of avifauna are killed annually with implications for local and national extinctions.

Fauna monitoring is important but wind energy producers are not forthcoming with either monitoring methodology or verifiable results.

Although monitoring is often one of the Conditions of Consent to operate wind turbines this is usually a haphazard affair with little or no follow-up or audit by licencing authorities.

This situation must be rectified and poses the question whether wind turbines should be operated at all if there is no net reduction in greenhouse gases but the threat to wildlife (particularly avifauna) is so significant.

## REFERENCES:

- f. Hambler, C .(2013). *Wind farms vs wildlife.The shocking environmental cost of renewable energy.* The Spectator Jan 5, 2013.  
<http://www.spectator.co.uk/features/8807761/wind-farms-vs-wildlife/>
- g. Sprague, T., Harrington, M.E. and Krogh, C.M.E. (2011). *Birds and Bird Habitat: What are the Risks from Industrial Wind Turbine Exposure?* Bulletin of Science, Technology & Society. Reprinted by SAGE Publications 2011.

- h. Olsen, P. (2005). *Wedge-tailed Eagle*. 120pp. CSIRO Publishing, Australia.
- i. Brahic, C. (2008). *Wind turbines make bat lungs explode*. New Scientist 25<sup>th</sup> August 2008.
- j. Hayes, M.A. (2013). *Bats Killed in Large Numbers at United States Wind Energy Facilities*. BioScience 63 (12) 975-979.  
<http://bioscience.oxfordjournals.org/content/63/12/975.full.pdf+html>
- k. Baerwald, E.F., D'Amours, G.H., Klug, B.J. and Barclay, R.M.R. (2008) *Barotrauma is a Significant Cause of Bat Fatalities at Wind Turbines*. Current Biology 18 (16): R695-696.

## 6. THE ENERGY AND EMISSION INPUT AND OUTPUT EQUATIONS FROM WHOLE-OF-LIFE OPERATION OF WIND TURBINES

The **ONLY** reason for construction and operation of wind turbines to produce electricity is based on the premise is that this will reduce carbon dioxide (CO<sub>2</sub>) emissions. Assuming that this is a desirable goal the question to be answered is whether there are any savings or reduction in carbon dioxide at all.

The further question is whether **increasing** the number and capacity of wind turbines in Australia results in a concomitant **decrease** in CO<sub>2</sub> emissions.

Given that there are in excess of 40 wind farms approved for construction in Australia at the moment is *there a case for approvals to be withdrawn if wind turbines do not result in a reduction of Australia's CO<sub>2</sub> footprint?*

The Renewable Energy (Electricity) Act 2000 calls for renewable energy to “reduce emissions of greenhouse gases in the electricity sector”. For this the renewable energy operators receive **substantial economic benefits** principally via the renewable energy certificates issued by the Clean Energy Regulator and purchased by the electricity retailers (passed onto the energy consumers – business and individual).

If there is no reduction in CO<sub>2</sub> then the purpose of electricity generation by wind is negated and the effective subsidies that the wind industry enjoys are received **illegally**.

**At no time has the wind industry in Australia been asked (by Government) to justify or prove the claim that its operation reduces CO<sub>2</sub> emissions.**

There have been several studies looking at the energy life cycle of wind turbines and their ability to reduce CO<sub>2</sub>. A substantial and exhaustive list of references can be obtained on the website:

<https://www.wind-watch.org/documents/category/emissions/page/2/?titles=on>

Le Pair and colleagues (2010)<sup>1</sup> in the Netherlands studied the effectiveness of CO<sub>2</sub> reduction by wind turbines and stated:

*“Wind turbines produce electricity which is delivered to the grid. Variations in wind velocity cause yield variations. Conventional power stations are forced to compensate these variations by adjusting their output. This has a negative effect on the efficiency of the latter stations. Using data provided by CBS, the Dutch Institute for Statistics, an estimate is made of the so called “turning point”. This is the point where the efficiency reduction of conventional power stations balances out the fuel saving of the wind turbines, and where the CO2 emission reduction turns negative as well. In the Netherlands the data for the year 2007 show this to be the case at an efficiency reduction of all power stations of about 2 %. The Dutch government uses an incorrect formula for calculating the fuel and emission saving from wind energy. On this subject parliament has been incorrectly advised by government.*

***In addition, fuel costs required for initial installation of wind turbines are substantial.***

***Application of wind energy without adequate buffer and storage facilities serves no green purpose.”***

Udo (2011)<sup>m</sup> undertook a similar examination of the operation and effectiveness of wind turbines in Ireland and reached the conclusion:

*“Currently the combination of wind energy with gas turbines is seen as the ideal configuration to deal with the problem of the fluctuations of wind energy.*

*“The April data of the Irish electricity system shows clearly, that the combination of wind energy with gas turbines does not achieve the goal of CO2 emission reduction, if no storage of energy is present.*

*“In general it is shown that the CO2 saving decreases with increasing wind contribution to the electricity supply.*

*“The consequence is that an investment of billions of Euros in wind turbines produces not more than a few per cent reduction in CO2 output.*

*“This analysis does not take into account the energy necessary to ramp the conventional generators up and down nor the energy to build wind turbines nor the extra transmission lines with their additional losses.*

*“It is highly probable, that taking all these effects into account will show, that the few per cent gain in CO2 will revert to a loss (i.e. an increase in CO2).*

*“The Irish system performs slightly better in other months probably due to the greater contribution of hydropower, but it never comes near to the promises made by wind energy advocates.*

*“This study shows, that building wind turbines without constructing adequate storage of energy is futile. It only leads to high extra costs and hardly any fuel or emission saving. Therefore, the introduction of wind energy without buffer storage leads to increased fossil fuel use and CO2 emissions and is a non-sustainable practice.”*

A forensic examination of the whole-of-life operation of wind turbines shows that there are substantial energy and materials used in their construction and operation. In a recent dissertation Professor Ian Plimer<sup>n</sup> makes the point:

*“The amount of energy embedded in steel pylons, concrete footings, blades, wiring, magnets, land clearing and roads is more than a wind pylon would ever generate in its working life.”* In particular substantial emissions of CO<sub>2</sub> result from the manufacture and delivery of concrete for footings (concrete manufacture is one of the most intensive CO<sub>2</sub> emitting industries).

The magnets in modern wind turbines require up to one tonne (and increasing) of the rare earth, **Neodymium**, historically exported from China which has a monopoly on supply. The mining and processing of this rare earth is **environmentally toxic** and has significant **health sequelae**. The prospect of recycling Neodymium also has **intractable problems**<sup>o</sup>. This is an important factor when making a whole-of-life assessment of wind turbines. The fact that much of the impact is delivered outside Australia (and could be happily ignored?) becomes irrelevant when issues of **decommissioning** of wind turbines are considered.

Flyers Creek Wind Turbine Awareness Group commissioned a report by J. Schneider in its submission to the NSW Department of Planning and Infrastructure in 2011<sup>p</sup> concerning the proposed (now approved) Flyers Creek Wind Farm (Infigen).

The report amply demonstrates that there are issues with decommissioning, and the fate of the materials to be recovered and disposed. Ultimately these issues have ramifications for the calculation of the whole-of-life cycle of wind turbines; they will further reduce any capacity to reduce CO<sub>2</sub> emissions and must be included. (Of course Australia could follow the USA experience – particularly California and Hawaii – where obsolete and disused wind turbines are left to litter the landscape; around 15,000 - 19,000 to date according to some estimates).

The whole-of-life cycle also needs to include the age at which wind turbines can be decommissioned. Currently wind power developers, and government agencies, quote the life of a wind turbine to be 20 to 25 years. Recent work by G. Hughes<sup>a</sup> studying wind turbines in the UK and Denmark reports that the life expectancy of wind turbines is actually **12 to 15 years** which has important implications for government policy and for the whole-of-life cycle calculations; it clearly indicates that the reduction of CO<sub>2</sub> over the life of a wind turbine would be significantly reduced.

## **CONCLUSION:**

**Embarrassingly, Australia has done little or nothing to calculate the energy and emission input and output equations for the whole-of-life operation of wind turbines.** Overseas experience indicates that the net energy and greenhouse emissions from wind turbines is neutral to negative, with many problems of:

1. Spinning reserve.
2. Intermittent power generation.
3. Grid stability.
4. Maintenance.
5. Operation and,
6. Decommissioning.

NONE of these are addressed by the wind power operators in Australia. All of these result in the inability of wind turbines to produce economic, meaningful and reliable renewable energy.

**WIND TURBINES ARE NOT FIT FOR PURPOSE.**

**WIND POWER TECHNOLOGY SHOULD BE ABANDONED AS A FAILURE.**

## REFERENCES:

- l. le Pair, C. and de Groot, K. (2010). *The impact of wind generated electricity on fossil fuel consumption*. <http://www.clepair.net/winefficiency.html>
- m. Udo, F. (2011). *Wind Energy in the Irish Power System*.  
<http://www.windawareireland.com/economic-issues/#economic-issues-top-nav>
- n. Plimer, I. (2014). *Greens' silence on folly of wind and solar power*. News Weekly, October 25, 2014. <http://www.newsweekly.com.au/article.php?id=56747>
- o. Lee, C. (2014). *Rare earth recycling: Is it worth it? Mining neodymium is dirty, but recycling may not be a panacea*. <http://arstechnica.com/science/2014/03/rare-earth-recycling-is-it-worth-it/>. March 26, 2014
- p. Flyers Creek Wind Turbine Awareness Group (2011) *Submission to Department of Planning & Infrastructure: Proposed Flyers Creek Wind Farm, Blayney Local Government Area MP08-0252*.  
[http://majorprojects.planning.nsw.gov.au/index.pl?action=list\\_submissions&job\\_id=2644](http://majorprojects.planning.nsw.gov.au/index.pl?action=list_submissions&job_id=2644) (labelled Awareness Group of Millthorp, NSW 25042-25052)
- q. Hughes, G. (2012). *Performance of wind turbines in the United Kingdom and Denmark*. <http://www.ref.org.uk/attachments/article/280/ref.hughes.19.12.12.pdf>