

2015/13: Should Australia reduce its commitment to wind turbines as an energy source?

What they said...

'When I've been up close to these wind farms, there's no doubt, not only are they visually awful, they make a lot of noise'
Australian Prime Minister, Tony Abbott

'If we're going to use the criterion of "Does Tony like the look of it?" when making important decisions for our country, we could be in a spot of bother'
Perth radio broadcaster, Nat Locke

The issue at a glance

On June 24, 2015 a new renewable energy target (RET) was set at 33,000 gigawatt-hours of renewable energy sources by 2020. This is around 20 per cent lower than the original 41,000 gigawatt-hours target.

On June 18, 2015, the Abbott government announced its intention to appoint a national wind farm commissioner to investigate complaints about wind turbines. A similar commissioner has not been appointed to investigate complaints about any other form of power generation.

On June 10, 2015, the Prime Minister, Tony Abbott, gave a radio interview to Sydney talkback host Alan Jones, during which Mr Abbott stated that he regretted Australia had ever committed itself to a RET and that his intention was to reduce the growth of wind farms which he criticised as 'ugly' and potentially harmful to human health.

Critics of these decisions and comments have argued that they represent an anti-wind farm bias on the part of the government. It has further been argued that a responsible clean energy policy requires Australia to increase its use of renewable energy sources such as wind turbines.

Background

Much of the information given below has been taken from a Wikipedia entry titled 'Wind power in Australia'. The full text can be accessed at https://en.wikipedia.org/wiki/Wind_power_in_Australia

Wind power is a rapidly expanding mode of renewable energy production in Australia with an average annual rate of growth in installed capacity of 35% over the five years up to 2011. As of 2011, there is 2224 megawatts (MW) of installed capacity, with another 15284 MW either being planned or under construction. In the year to October 2011, wind power generated 6432 gigawatt hours (GWh) of electricity accounting for 2.4% of Australia's total electricity demand and 21.9% of total renewable energy supply. As of October 2010, there were 52 wind farms in Australia, most of which had turbines of from 1.5 to 3 MW.

South Australia has close to half of the nation's wind power capacity, accounting for almost twenty percent of that state's electricity needs of as October 2010. By the end of 2011 wind power in South Australia reached 26% of the State's electricity generation, edging out coal-fired power for the first time. At this stage South Australia, with only 7.2% of Australia's population, had 54% of the nation's installed wind compactly. Victoria also had a substantial system, with about a quarter of the nation's capacity, and projects under construction forecast to more than double that capacity by the end of 2013.

Australia has excellent wind resources by world standards. The southern coastline lies in the roaring forties and hundreds of sites have average wind speeds above 8 or even 9 m/s at 50 m above ground (the hub height of a modern wind generator). The southwest of Western Australia, southern South Australia, western Victoria, northern Tasmania and elevated areas of New South Wales and Queensland have good wind resources. Several states engaged in systematic wind speed monitoring in the 1980s and 1990s, the results of which are publicly available. Australian wind farms produce on average capacity factors of 30-35%, making wind an attractive option.

Australian government policy changes regarding wind power

From 2001 to early 2006, the main driving force for the establishment of wind farms in Australia was the Government's Mandatory Renewable Energy Target (MRET). However, by mid-2006, sufficient renewable energy had been installed or was under construction to meet the small MRET target for 2010. Also, in 2006, several Federal Government Ministers spoke out against a number of wind farm proposals.

Some critics have suggested that the Howard Government had tried to stop the development of wind power, the lowest-cost, new, renewable electricity source, until such time as coal-fired power stations with CO2 capture and sequestration and possibly nuclear power stations are available. However, 'clean coal' technologies may not be commercially available for at least 20 years. Furthermore, to bring down the high cost of nuclear power to a level where it could compete with wind power would require a new generation of nuclear power stations that is still on the drawing board, which could take at least 15 years.

In November 2007 the Rudd (Labor) government was elected in Australia on a platform of reducing Australia's greenhouse gas emissions. The new government ratified Australia's commitment to the Kyoto Protocol, promised a target of 20% renewable power by 2020 and to introduce an emissions trading scheme intended to reduce greenhouse gas emissions. As a result, several new wind power projects were proposed or developed in anticipation of an expanded

MRET.

The Abbott (Liberal/National Coalition) government elected in 2013 has been critical of the RET.

In October 2014, while opening a 3.9 billion coal mine in central Queensland, the Prime Minister, Tony Abbott, stated, 'Coal is good for humanity, coal is good for prosperity, coal is an essential part of our economic future, here in Australia, and right around the world.'

The Prime Minister went on to claim, 'Energy is what sustains our prosperity, and coal is the world's principal energy source and it will be for many decades to come.'

On 18 May, 2015, a bipartisan deal was reached between the Federal Government and the Labor Opposition regarding what Australia's renewable energy target would be for the next five years.

The legislation for the new target was finally passed in the Senate on June 24, 2015. The new target is 33,000 gigawatt-hours of renewable energy sources by 2020. This is around 20 per cent lower than the original 41,000 gigawatt-hours target. This was based on a compromise brokered by the Clean Energy Council (CEC).

On June 10, 2015, the Prime Minister gave a radio interview to Sydney talkback host Alan Jones, during which he stated that he regretted Australia had ever committed itself to a RET and that his intention was to reduce the growth of wind farms which he criticised as 'ugly' and harmful to human health.

On June 18, 2015, the Abbott government announced its intention to appoint a national wind farm commissioner to investigate complaints about wind turbines. A similar commissioner has not been appointed to investigate complaints about any other form of power generation.

On July 12, 2015, the Abbott government announced the federal that it will instruct the Clean Energy Finance Corporation (CEFC) not to invest in existing wind technology or small-scale solar power projects. Instead, the CEFC is to focus its energies on 'emerging technologies', including large-scale industrial solar generation.

Internet information

On July 13, 2015, The New Daily published an analysis and comment by Paul Bongiorno titled 'Abbott's deep well of hostility to renewable energy'

The article examines the attitudes and policy positions of Tony Abbott and his government regarding renewable energy and suggests an entrenched opposition to these energy sources.

The full text can be accessed at <http://thenewdaily.com.au/news/2015/07/13/abbotts-deep-deep-well-hostility-renewable-energy/>

On July 13, 2015, In Daily published a news report titled 'Feds favour large-scale solar over wind'

The report looks at a directive from the Federal Government to the Clean Energy Finance Corporation' advising the Corporation to fund large-scale solar develops and not wind farms.

The full report can be accessed at <http://indaily.com.au/business/2015/07/13/feds-favours-large-scale-solar-over-wind/>

On June 26, 2015, Perth Now published a comment by Nat Locke titled "'Ugly" Rottnest turbine claims just hot air'.

The comment suggests the Prime Minister, Tony Abbott's comments on wind forms are ill-informed and prejudiced and not the basis on which to develop a national policy.

The full text can be accessed at <http://www.perthnow.com.au/news/opinion/nat-locke-ugly-rotnnest-turbine-claims-just-hot-air/story-fnhocuug-1227406323231?sv=d4fc25a7f339973a31e1913d69382112>

On June 26, 2015, The Guardian published a feature article and commentary titled, '

Minimal sound and almost no fury: life in the shadow of Australia's windfarm "hell".'

Written by Calla Wahlquist, the piece examines the situation of those living near the Collgar wind farm near Merredin in Western Australia, one of the largest wind farms in the southern hemisphere. The views expressed by those interviewed are supportive of wind farms.

The full text of the article can be accessed at <http://www.theguardian.com/environment/2015/jun/26/minimal-sound-and-almost-no-fury-life-in-the-shadow-of-australias-windfarm-hell>

On June 12, 2015, ABC News posted a report titled 'Tony Abbott wants fewer 'visually awful' wind farms, wishes Howard government never implemented Renewable Energy Target'

The report details the comments the Prime Minister made to Sydney talkback radio host Alan Jones, indicating Abbott's opposition to wind farms.

The full text can be found at <http://www.abc.net.au/news/2015-06-11/abbott-wants-to-reduce-wind-farms-wishes-ret-never-implemented/6539164>

In 2015 the anti-wind power lobby group, Wind Power Problems Org, updated its Internet site treating the negative consequences it claims are associated with wind power production.

The site details environmental, economic, technical and health problems.

These claims can be accessed at <http://wind-power-problems.org/wind-power-problems.html>

On March 31, 2015, the Australian Petroleum Production & Exploration Association (APPEA) published a media release titled 'RET must not undermine Australian LNG competitiveness'

The statement stresses the importance of Australia's renewable energy targets not undermining the competitiveness of

Australia's natural gas exports.

APPEA is the peak national body representing Australia's oil and gas exploration and production industry.

The full text can be accessed at http://www.appea.com.au/media_release/ret-must-not-undermine-australian-ling-competitiveness/

On May 6, 2013, ABC Radio National's science program Ockham's Razor presented a broadcast from Sue Taylor, a birdwatcher and author of John Gould's Extinct and Endangered Birds of Australia.

The broadcast was titled 'Thousands of birds paying a high price for green energy'

Ms Taylor is concerned about the threat wind farms pose to Australia's bird populations.

The full text of the broadcast can be found at <http://www.abc.net.au/radionational/programs/ockhamsrazor/bird-strikes-at-wind-farms/4668750>

On July 25, 2011, the ABC's current affairs program, Four Corners, telecast 'Against the Wind' examining the claims made by those opposed to wind farms and the responses of those who dispute these claims.

The telecast can be accessed at http://www.abc.net.au/4corners/special_edds/20110725/wind/

One the same page of the ABC site are links to six other sources of significant information on this issue.

In June 2011, the Clean Energy Council of Australia produced a fact sheet titled 'There's power in wind'

The information sheet presents the various advantages of wind turbines as a source of clean energy.

The full text can be accessed at <http://webcache.googleusercontent.com/search?q=cache:ChlC0aymZ94J:https://www.cleanenergycouncil.org.au/dam/cec/technologies/wind/fact-sheets/Wind-Energy-Fact-Sheet-Theres-Power-in-Wind.pdf+&cd=2&hl=en&ct=clnk&gl=au>

Conserve Energy Future is a site promoting energy conservation. A section of this site outlines the advantages and disadvantages of wind turbines as an energy source.

The information can be accessed at <http://www.conserve-energy-future.com/pros-and-cons-of-wind-energy.php>

Arguments in favour of reducing Australia's commitment to wind turbines

1. Wind turbines pose a potential human health risk

Some individuals living in the vicinity of wind turbines report experiencing adverse health effects including annoyance and/or sleep disturbance and/or stress related health impacts and/or reduced quality of life. In some cases the adverse effects have been severe enough that families have elected to abandon their homes.

In the United States a 2012 board of health resolution made a formal request for '...temporary emergency financial relocation assistance from the State of Wisconsin for those Brown County families that are suffering adverse health effects and undue hardships caused by the irresponsible placement of industrial wind turbines around their homes and property.'

Those who believe that wind turbines can adversely affect human health claim that the turbines do not have to cause a disease state directly, such as the noise from turbines contributing to hearing loss. Rather they claim that other more subtle impacts can indirectly cause reduced health.

A report produced by Inter.Noise 2012 stated, 'Wind turbines produce sound which can become a risk to human health when it is perceived to be noise. Noise of a moderate level acts via an indirect pathway and can have health outcomes similar to those caused by high noise exposures on the direct pathway. Specific health effects in the indirect pathway include: interference with communication; sleep disturbance effects; cardiovascular and psycho-physiological effects; performance reduction effects; effects on social behaviour and annoyance.'

The same report further concluded, 'Wind turbines produce sound which can become a risk to human health when it is perceived to be noise. Noise of a moderate level acts via an indirect pathway and can have health outcomes similar to those caused by high noise exposures on the direct pathway.'

Specific health effects in the indirect pathway include: interference with communication; sleep disturbance effects; cardiovascular and psycho-physiological effects; performance reduction effects; effects on social behaviour and annoyance.'

2. Wind turbines cause environmental damage

It has been claimed that wind turbines pose a risk to a range of wildlife, especially to birds and bats.

In September, 2005, the United States Government Accountability Office stated, 'Once thought to have practically no adverse environmental effects, it is now recognized that wind power facilities can have adverse impacts-particularly on wildlife, and most significantly on birds and bats.'

Again in September, 2005, the same body concluded, 'At wind power-generating facilities in Appalachia and California, wind turbines have killed large numbers of migratory birds and bats. Wind power facilities may also have other impacts on wildlife through alterations of habitat. Habitat destruction and modification is a leading threat to the continued survival of wildlife species in the United States.'

On May 6, 2013, Robin Williams, on ABC's Radio National's Ockham's Razor, broadcast the views of Twitcher (birdwatcher) Sue Taylor. Taylor claimed, 'The Altamont Pass wind farm in northern California was established in 1982 and has 5,400 wind turbines. Sadly, it was constructed in a major raptor migration corridor with the highest concentration of Golden Eagles in North America. Consequently, the turbines killed from 880 to 1,300 raptors each year, mainly

Burrowing Owls and Red-tailed Hawks, but also up to 116 Golden Eagles.'

Referring to the Australian situation, Ms Taylor stated, 'In Australia, I believe that the birds most affected by wind turbines are raptors-birds of prey-and these birds often require an enormous range. In some locations a pair of Wedge-tailed Eagles needs a hunting range of 100 square kilometres. That makes finding an appropriate place for a wind farm difficult, to say the least. The Tasmanian subspecies of Wedge-tailed Eagle is classified as vulnerable, and is of concern at every Tasmanian wind farm.'

Location of turbines has been revealed to be a key factor in influencing the impact they have on bird populations. This has been found to be equally crucial in determining the impact wind turbines have on bat numbers.

In February, 2015, the European Journal of Wildlife Research published findings regarding the large number of bat deaths caused by wind turbines in Germany. Some of the turbines concerned are in bat migration routes. According to the research each wind turbine causes the death of approximately 10 to 12 bats per year if no mitigation measures are put in place...

This led the researchers to conclude that if all the wind turbines in Germany were put into operation without any mitigation measures, nearly 250,000 bats would die per year. Of these numbers, approximately 70% can be attributed to bats migrating between summer and winter habitat.'

3. Wind turbines are aesthetically unappealing

It has been claimed by critics of wind turbines that they are aesthetically unappealing and represent a form of visual pollution. There are also those who claim that the noise they make is offensive.

In an interview given to Sydney radio host, Alan Jones, in June 2015, the Prime Minister, Tony Abbott, stated, 'When I've been up close to these wind farms, there's no doubt, not only are they visually awful, they make a lot of noise.'

The year before, in May 2014, the federal treasurer, Joe Hockey, stated in an interview given on Macquarie Radio, 'If I can be a little indulgent please, I drive to Canberra to go to Parliament, I drive myself, and I must say I find those wind turbines around Lake George to be utterly offensive. I think they're just a blight on the landscape.'

Opposition to the visual impact of wind turbines appears to have grown as the size of the structures has increased.

On November 30, 2006, Dr Andrew Lothian, Principal, Scenic Solutions, Adelaide, South Australia, released a report titled, 'Visual Impact Assessment of Wind Farms in South Australia'.

In the report Dr Lothian stated, '[There has been] a massive increase in the size of turbines, and hence the visual impact they have on the landscape. Typical turbines in 1990 stood 65 m high (hub height and rotor) but ten years later in 2000 were over twice that height - 135 m high. A 135 m turbine with a rated power of 1.5 MW has fifty times the output of a 1980 turbine of 45 m height. With the greater scale, their visual impact has grown accordingly.'

Dr Lothian also noted the aesthetic sensitivity to wind farms increased when they were located in areas that were popularly regarded as having a high level of visual appeal. Dr Lothian explained, 'Wind farms had greatest negative effect on landscapes perceived as highly scenic and progressively less effect on landscapes rated as lower in scenic quality.'

In addition to those in Australia, there have been numerous commentators in Europe who have criticised wind farms for their damaging visual impact.

In 1994, an article published in The Economist described wind farms in Britain as a 'new way to rape the countryside' and Sir Bernard Ingham described a wind farm in Yorkshire as 'lavatory brushes in the air' in 2001. In 2004, Ann West, vice Chair of Country Guardian, described them as 'industrial-size blots on the landscape'.

In 2002 landscape publications in Germany described the destruction of scenic beauty by wind farms as a 'catastrophe' and warned 'the beauty of our landscape is in danger'. The German Association for Landscape Protection (BLS) is generally opposed wind farms.

4. Australia renewable energy targets have been set too high

The Coalition federal government considers that renewable energy targets increasing the proportion of Australia's energy derived from wind or solar have been set too high and may be undesirable.

The Prime Minister, Tony Abbott, has stated that he regrets Australia having made any commitments toward achieving particular renewable energy targets (RET) and that those we have set are too high.

In an interview with Sydney Radio talkback host, Alan Jones, Mr Abbott explained that the target was initially created in 2001 by John Howard and subsequently strengthened by Labor to 'at least 20 per cent by 2020', calculated at the time as being 41,000 gigawatt hours of electricity.

Mr Abbott further explained that that target of 41,000 gigawatts hours per year to be derived from renewable energy sources can now be reached without setting a target of 20 per cent for the percentage of the country's energy production that comes from wind or solar power.

In addition to reducing the percentage of power production to come from renewable energy sources, on June 24, 2015, the Australia Parliament passed legislation amending the targets so that they are now set at 33,000 gigawatt hours rather than 41,000 to reflect lower overall energy demand.

In the Alan Jones interview given two weeks before the Parliament amended these targets Mr Abbott indicated that changes before the Federal Parliament to reduce the RET were designed to prevent wind farms from further spreading across the Australian landscape.

Mr Abbott stated, 'I would frankly have liked to reduce the number a lot more but we got the best deal we could out of the Senate.

And if we hadn't had a deal, Alan, we would have been stuck with even more of these things [wind turbines].'

The Government appears to consider renewable energy targets an inflexible tool which does not readily allow for either increased efficiencies in energy production or reductions in demand which may render a particular target outdated. The Government and the non-renewable energy sector also appear concerned that too high a RET may damage the international competitiveness of some Australian industries, especially coal and petroleum industries or those industries reliant on these power sources.

The Australian Petroleum Production and Exploration Association (APPEA) has stated, 'Australia's LNG (liquefied natural gas) exporters are among the most trade-exposed of all Australian exporters. They cannot pass increased costs on to consumers and any loss of competitiveness would benefit Australia's international LNG competitors or suppliers of alternative energy sources that emit higher levels of greenhouse gases.'

APPEA has further stated, 'The ongoing negotiations to secure political support for Renewable Energy Target (RET) reforms must deliver sensible outcomes for Australia's oil and gas industry.'

5. There are other means of producing clean energy

Opponents of wind farms claim that there are other ways of producing clean energy than via wind turbines.

One of the key alternative renewable energy sources is solar power. The cost of solar photovoltaic modules has fallen 80 per cent over the past decade and one in six Australian households now uses them to generate their own electricity (up from one in 100 households in 2009).

The current federal government has taken the view that Australia's renewable energy focus should be on large-scale industrial production of solar power rather than wind power or home-based solar generation.

In June 2015, the federal environment minister, Greg Hunt, stated, 'What we're doing there is very significant and we're increasing the focus on large-scale solar. There should be a support for large-scale solar, which I think many Australians, if not all, if not the vast majority, would strongly support.'

Australia is also exploring ways of capturing the carbon dioxide emitted during coal-fired power generation. CSIRO researchers are investigating carbon capture and storage, and intense gasification technologies.

The CSIRO is also developing DICE (direct injection carbon engine) as a way of producing energy from coal more cleanly. DICE is essentially a diesel engine which uses a liquid slurry of water and brown or black coal (and bio-char if available) to create energy.

The CSIRO's head of the Advanced Carbon Power division, and principal scientist working on DICE, Louis Wibberley, has claimed that it would be 'absolutely possible' for DICE to cut carbon dioxide emissions by 30 per cent.

In addition there are those who claim Australia should investigate nuclear power as a means of producing clean energy.

Arguments in favour of increasing Australia's commitment to wind turbines

1. There is no reliable evidence to demonstrate that wind turbines pose a risk to human health

The worldwide consensus of opinion appears to be that to this point there is no clear evidence to indicate that wind farms have an deleterious effect on human health.

The most recent research is Australia is consistent with this view. On February 11, 2015, The National Health and Medical Research Council issues a report on 'Wind farms and human health'. The report concluded 'After careful consideration and deliberation, NHMRC concludes that there is currently no consistent evidence that wind farms cause adverse health effects in humans.'

The Council investigated the health effects of wind farms in 2009 and came to a similar conclusion. 'This review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines.'

The Clean Energy Council of Australia has stated, 'There are nearly 250,000 wind turbines across sites all over the world - many of them close to people's houses.'

Reviews conducted by leading health and research organisations from all over the world, including Health Canada, the Australian Medical Association and Australia's National Health and Medical Research Council, have found no direct link between wind farms and health effects.'

The Clean Energy Council went on to note, 'Opponents of wind farms have claimed that "infrasound", or sound that is too low-frequency for humans to hear, can cause negative health effects. However, there have been multiple scientific, thorough, peer-reviewed studies on wind farm noise that have found that infrasound from wind farms is not a problem.' The Clean Energy Council has also given a detailed overview of the findings made in Canada regarding the impact on human health of wind farms.

The Council states, 'Health Canada, Canada's national health organisation, released preliminary results of a study into the effect of wind farms on human health in 2014. The study was initiated in 2012 specifically to gather new data on wind farms and health. The study considered physical health measures that assessed stress levels using hair cortisol, blood pressure and resting heart rate, as well as measures of sleep quality. More than 4000 hours of wind turbine noise measurements were collected and a total of 1238 households participated.'

The Health Canada study findings were summarised as follows. 'No evidence was found to support a link between exposure to wind turbine noise and any of the self-reported illnesses. Additionally, the study's results did not support a link between wind turbine noise and stress, or sleep quality (self-reported or measured).'

2. Traditional forms of energy production pose a significant and proven risk to human health

Supporters of wind turbines note that their favoured technology has never been demonstrated to harm human health

while coal, gas and oil have demonstrable ill effects.

The Australian Climate Council has produced a briefing paper titled 'Health Effects of Coal'.

The briefing paper states, 'Every aspect of coal's lifecycle - mining, transportation, combustion and the disposal of waste - produces pollutants that affect human health.'

The paper claims that the closer populations live to coal-generated power stations the greater the likelihood of ill health. 'Health impacts from coal emissions on miners, workers and local communities can be severe. For example, the risk of premature death for people living within 50 kilometres of coal burning power plants can be as much as three to four times that of people living at a greater distance.'

The paper lists some of the diseases which can be attributed to pollution caused by coal-based power generation.

'Health risks from coal include lung cancer, bronchitis, heart disease and other health conditions.'

Overseas studies have supported these conclusions. In the United States, 50,000 deaths each year have been attributed to air pollution from coal-fired power generation. There are 18,200 premature deaths, about 8,500 new cases of chronic bronchitis, and over four million lost working days each year due mainly to respiratory and cardiac disease in Europe. In Australia, coal-emission related health impacts cost \$2.6 billion each year.

Leigh Ewbank, Friends of the Earth's renewable energy spokesperson has stated, 'It's astonishing that the minister responsible for our national response to climate change is complicit in efforts to demonise wind farms. The NHMRC, Victorian Department of Health, and Australian Medical Association have already given wind energy a clean bill of health. The public health impacts of coal are well-documented, yet the Abbott government is proposing to regulate clean and safe wind energy on health grounds. It's the stuff of satire.'

In Victoria, brown coal production occurs in the Latrobe Valley at the Hazelwood, Loy Yang and Yallourn power plants. In 2014, when embers from a nearby forest fire took hold in the Hazelwood mine, the public health costs associated with coalmining became apparent for many Australians. The fire burned for 45 days, releasing toxic smoke, carbon monoxide and ash across surrounding towns. Thousands of residents were affected and complained of blood noses, headaches and sore eyes. Others with existing health conditions experienced a worsening of symptoms.

3. Any environmental hazards posed by wind turbines are relatively minor and can be mitigated

Supporters of wind farms note that wind energy has far less environmental impact than the fossil fuel powered generation that it replaces. They also claim that any negative environmental impacts wind farms may have can largely be overcome if the turbines are located or sited carefully.

A wind farm, when installed on agricultural land, has one of the lowest environmental impacts of all energy sources. It occupies less land area per kilowatt-hour (kWh) of electricity generated than any other energy conversion system, apart from rooftop solar energy, and is compatible with grazing and crops.

An indication of the small impact wind farms can have on bird populations is found in a 2013 Canadian journal article.

The Canadian journal, Avian Conservation & Ecology, published a research paper titled 'Canadian Estimate of Bird Mortality Due to Collisions and Direct Habitat Loss Associated with Wind Turbine Developments'. The authors used data from carcass searches from 43 wind farms and concluded that on average about 8 birds were killed per turbine per year. It has also been claimed that the environmental damage caused by wind farms is far less than other energy sources.

Benjamin Sovocool, wrote a paper titled The Avian and Wildlife Costs of Fossil Fuels and Nuclear Power for the peer-reviewed Journal of Integrative Environmental Sciences. Sovocool compared bird deaths from nuclear and fossil fuel power stations with bird deaths caused by wind turbines. His paper was a synthesis of findings from many studies and was dated June 30, 2012. He provided figures of 0.27 avian fatalities from wind power per gigawatt-hour of electricity generated, 0.6/GWh for nuclear power and 9.4/GWh for fossil-fuelled power stations. This data suggests that fossil-fuelled power stations are 30 times more hazardous to birds than wind farms.

It has further been noted that the environmental damage caused by climate change which burning fossil-fuels has helped to cause is a far, far greater threat to the environment than wind farms. For example, the June 2011 issue of Scientific American included a study about fire hazard linked to climate change. It stated that the area burned by wild fires in the United States in the average year, given a one degree rise in temperatures, is expected to be up to six times as large as at present. Similar results can be expected in Australia.

Supporters of wind farms also note that whatever adverse environmental impacts they have can be largely controlled.

The United States Office of Energy Efficiency and Renewable Energy has stated, 'As with all energy supply options, wind energy development can have adverse environmental impacts, including the potential to reduce, fragment, or degrade habitat for wildlife, fish, and plants.'

Furthermore, spinning turbine blades can pose a threat to flying wildlife like birds and bats. Due to the potential impact that wind power can have on wildlife, and the potential for these issues to delay or hinder wind development in high-quality wind resource areas, addressing siting and permitting issues are among the wind industry's highest priorities.'

A similar set of procedures is employed within the European Union. The intention is not to place wind farms in locations where they are likely to cause significant environmental damage.

To reduce bird fatalities, several strategies are employed. Restricting construction activities to non-breeding periods can help reduce the negative effects of bird disturbance. Structural design improvements are also effective in reducing bird mortality. For example, enlarging the blades and slowing the rotational speed of wind turbines can lower the bird fatality rate.

4. Conventional power sources, such as coal-fired power stations, are generally far less visually appealing than wind

farms

Supporters of wind farms have claimed that even for those who find them unattractive, wind turbines are far less visually unappealing than fossil-fuelled power generators.

In an opinion piece published in Perth Now on June 26, 2015, West Australian radio and newspaper commentator Nat Locke stated, '

Referring to Prime Minister Abbott's complaint that wind turbines are 'ugly', Locke stated, 'With all due respect, is he mental? Has he ever been to a coal-fired power station? Has he ever hung around a diesel-fuelled generator? If it was a beauty pageant, they'd be no Megan Gale, put it that way.'

Locke went on to claim, 'I've gazed at rows of them along European ridges and have honestly found them considerably more visually appealing than, say, a nuclear power station.'

Locke further noted that it should not be the aesthetic judgement of one or more individuals which determines whether Australia proceeds with a potentially important power source such as wind turbines. Locke stated, 'And if we're going to use the criterion of "Does Tony like the look of it?" when making important decisions for our country, we could be in a spot of bother. I would have hoped that some slightly more valid criteria could be considered. Like, does it make economic sense? Is it sustainable? Will it create jobs?'

An article published in The Guardian on June 26, 2015, examined the reactions to residents living near the Collgar wind farm near Merredin in Western Australia, one of the largest wind farms in the southern hemisphere. The article's author, Calla Wahlquist, states, 'There is no objective measure for visual awfulness but it's hard to find anyone in Merredin who thinks they're ugly. People certainly think they are less ugly than Muja power station, the coal-fired generator that sits at the Collie end of the industrial power corridor.'

Some commentators have suggested that those who condemn wind farms as ugly are privileged and out of touch with the visual pollution which is for most people the price of living in an industrialised society. Most people, it is claimed, have had to endure far greater visual disturbance than that caused by wind farms.

In an article published in The Age on June 13, 2015, economics editor Peter Martin stated, 'Everything about the electricity industry is ugly, and dangerous; from the mega stations that spew out smoke and ash in the Hunter and La Trobe Valleys to the high voltage cables and substations that spark fires and ominously hum, to the poles and wires that interfere with trees on their way to our homes. But windmills, near farms?'

Martin concluded, 'It takes a special kind of hysteria to get worked up over windmills. Or a special sense of entitlement...'

5. Wind turbines are one of the most efficient and non-polluting sources of energy

The efficiency and non-polluting nature of wind turbines are among the factors that make them such an attractive alternative energy source.

A wind farm generates the energy used in its construction in just 3 months of operation, yet its operational lifetime is 20-25 years. Greenhouse gas emissions and air pollution produced by its construction are small and declining. There is very little emission or pollution produced by its operation. In substituting for base-load (mostly coal power) in mainland Australia, wind power produces a net decrease in greenhouse gas emissions and air pollution.

A fact sheet produced by Australia's Clean Energy Council in June 20011 states, 'Wind energy is currently the most cost-effective renewable energy resource in Australia.'

It involves the generation of electricity from the naturally occurring power of the wind. Wind turbines capture wind energy within the area their blades pass through. The blades in turn drive an electrical generator to produce power for export to the electricity grid.

Unlike conventional sources of electricity generation, like coal, no water is required for wind farm operation and no greenhouse gases are produced.'

The fact sheet further states, 'A single wind turbine can produce enough energy to supply up to 2,000 average households each year and save around 1 tonne of greenhouse gas for every megawatt produced...'

Wind farms are efficient because they do not produce wasted heat. Coal power stations can only extract 25 per cent of the energy in their fuel compared to 50 per cent in wind. Wind turbines also do not use any water to generate electricity, whereas a large coal-fired power station such as Hazelwood in Victoria uses at least 11 billion litres of fresh drinking water each year...

Wind energy is currently the most cost-effective source of renewable energy in Australia and it continues to reduce in price - it has already dropped by 80 per cent in 25 years'

Further implications

(The following 'Further implications' is an excerpt from a comment published in The Brisbane Times on July 24, 2015 and written by James Rydge and Fergus Green. It details the changing international economic and environmental circumstances which the authors argue make it imperative for Australian governments to facilitate this country's shift to clean, renewable energy production.

The full text of this comment can be found at <http://www.brisbanetimes.com.au/comment/australia-needs-to-accept-the-move-to-clean-energy-20150723-gjiipe2.html>)

Australia is at a historic economic turning point. The mining boom is over. The price of Australia's two largest exports, iron ore and coal, has collapsed for structural reasons. The extraordinary transformation of China's economy, which has taken root over the past 18 months, is central among these. China, our largest trading partner, is shifting rapidly away from the old model of breakneck growth based on investment in resource-intensive heavy industries such as steel and

cement production, and towards household consumption and investment in services and higher-value manufacturing. China is also transforming its energy system. The government has imposed restrictions on coal use in key economic regions and is supporting a rapid shift to cleaner energy sources. In 2014, \$US83 billion was invested in renewable energy generation capacity (excluding hydroelectricity) in China - about a third of the global total. This shift is motivated partly by acute public concern about air pollution, which kills more than a million Chinese people every year and burdens tens of millions more with ill health and toxic living conditions.

The remarkable outcome is that in 2014 China's coal use fell (after growing at more than 8 per cent a year between 2000 and 2013), and has fallen even more strongly in the first six months of 2015. Coal imports fell by about 38 per cent year-on-year in the first half of 2015.

This is China's "new normal". China's next five-year plan, scheduled to start in 2016, will accelerate these economic shifts: China's central bank estimates the country will spend at least \$US320 billion in each of the next five years to meet the new plan's targets for cleaning up China's environment and expanding non-fossil-fuel energy.

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The result of all this for Australia? Constantly rising Chinese demand for our resources has become a thing of the past, just as mining companies have invested heavily in expanding Australia's supply. And demand for low-carbon, energy-efficient, and environmentally friendly goods and services will grow, just as Australia's current government is systematically dismantling the policies and institutions designed to foster Australian growth industries in these areas. Dramatic changes in energy systems are evident in many other countries too, and they are affecting technological possibilities and relative prices everywhere.

Denmark already gets more than 40 per cent of its electricity from renewable sources, and is aiming for 100 per cent by 2035. On one windy July day this year, Denmark produced well over 100 per cent of its electricity needs from renewables, selling the surplus to other countries. Germany, the world's fourth-largest economy, gets a quarter of its electricity from renewable sources already and is aiming for up to 60 per cent by 2035. The United States just announced the retirement of its 200th coal-fired power station in five years, and California alone is proposing a 50 per cent renewable energy target by 2030.

These countries are acting to capture the economic benefits and are positioning themselves for a future of cheap and clean energy. As the costs of key zero-carbon technologies plummet, the transition is now accelerating at a rate few thought possible even three years ago.

Australia, with its world-class renewable resources, is among the best-placed countries to capitalise. Wind energy is competitive with new-build coal and gas. And the cost of solar photovoltaic modules has fallen 80 per cent over the past decade - a key reason, no doubt, why one in six Australian households now uses them to generate their own electricity (up from one in 100 households in 2009), and why Australians overwhelmingly support efforts to expand renewables. It is now beyond reasonable doubt that a more decentralised, renewables-based system will provide much cheaper power over the medium and long term, especially with ongoing innovation, and with the increasing uptake of smart electricity grid infrastructure and energy storage technologies, the costs of which are also falling rapidly. Energy planning, operation, and pricing arrangements designed to optimise such a system will make energy prices in the new system even more competitive compared with the alternative of propping up our creaking, centralised, fossil fuel-based system. Further improvements in energy efficiency - eminently possible with the right policies - will bring the cost of energy services down further still and can offset any short-term electricity price increases.

Amid this surging tide of technological innovation, ever-more attractive economics, and growing popular support for a renewables-based energy system, what should the Australian government do?

A comprehensive package of complementary government policies is essential to steer private investment in energy efficiency, clean energy innovation and climate-smart infrastructure - these are fundamental drivers of both economic growth and the transition to a zero-carbon energy system...'

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<http://www.smh.com.au/federal-politics/political-opinion/prime-minister-tony-abbott-blows-hot-air-over-wind-farms-20150611-ghlhqx.html>

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<http://www.theage.com.au/comment/the-age-editorial/abbotts-wonky-meddling-in-cefc-20150713-giavh4.html>

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<http://www.theage.com.au/comment/australia-needs-to-accept-the-move-to-clean-energy-20150723-giipe2.html>

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<http://www.theage.com.au/comment/renewable-energy-debate-in-australia-needs-to-focus-on-emissions-20150722-gihv9u.html>

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