4 PROJECT JUSTIFICATION

4.1 Project benefits

Taurus Energy is committed to developing the Cullerin Range Wind Farm in a way which minimises the local impacts and maximises the benefits of the project. The project has been specifically designed as a small wind farm with only 15 turbines. The project offers:

- Up to 15 wind turbines, each with three blades up to 46m long mounted on a tubular steel tower up to 80m high;
- Production of up to 95,000 GWh of renewable electricity per annum, sufficient for the average consumption of up to 12,200 homes;
- Reduction in greenhouse gas emissions of up to 95,000 tonnes of carbon dioxide (equivalent) per annum, equivalent to taking up to 19,000 cars off our roads for 30 years;
- Savings in water consumption of 110 to 125 Million litres per annum of potable water used in coal fired power stations;
- Annual savings in pollution from coal fired power stations of up to 538,000 kilograms of sulfur dioxide, up to 233,000 kilograms of nitrogen oxides, and up to 2090 kilograms of particulates;
- Provision of a community fund of $25,000 per annum for local community and environmental projects;
- Provision of local jobs and injection of up to $10 Million into the local economy;
- Improved security of electricity supply through diversification.

4.2 The viability of wind power

4.2.1 International wind power development

Wind farms are an increasingly important source of electricity generation worldwide. Internationally, by the end of 2005, the total capacity of wind energy was more than 58,000 Megawatts which amounts to over three times the total capacity of power generation in New South Wales. Approximately 72% of this has been installed in the last 5 years (AWEA 2005).

Wind power technology has evolved rapidly through a research and development stage in the 1980's, rapid expansion and consolidation in the industry in the 1990's and is now a mature, advanced energy technology. As the technology has developed, the cost of wind power has been reduced. In some regions, wind farms are already competitive with alternate energy sources such as fossil fuels.

Current Worldwide and European wind capacity (MW) is shown in Table 4.1.

Table 4.1 Worldwide wind power capacity at end 2005 (WWEA 2006)

Region	Installed Capacity 2005 (MW)	Installed Capacity 2005 in %	Installed Capacity 2004 (MW)	Installed Capacity 2004 in %
Europe	40.932	69,4	34.758	72,9
Africa	252	0,4	240	0,5
Americas	10.036	17,0	7.367	15,5
Asia	7.022	11,9	4.759	10,0
Australia/Pacific	740	1,3	547	1,1
World	**58.982**	**100,0**	**47.671**	**100,0**

Top 20 Countries by Installed Capacity:

Country/region	Additional Capacity Installed in 2005 (MW)	Percentage Growth in 2005 (%)	Total Capacity Installed at end 2005 (MW)
1. Germany	1,798.8	10.8	**18,427.5**
2. Spain	1,764.0	21.3	**10,027.0**
3. USA	2,424.0	36.0	**9,149.0**
4. India	1,430.0	47.7	**4,430.0**
5. Denmark	4.0	0.1	**3,128.0**
6. Italy	452.4	35.8	**1,717.4**
7. United Kingdom	465.0	52.4	**1,353.0**
8. China	496.0	64.9	**1,260.0**
9. The Netherlands	141.0	13.1	**1,219.0**
10. Japan	143.8	16.0	**1,040.0**
11. Portugal	500.0	95.8	**1,022.0**
12. Austria	213.0	35.1	**819.0**
13. France	371.2	96.2	**757.2**
14. Canada	239.0	53.8	**683.0**
15. Greece	100.3	21.2	**573.3**
16. Australia	193.0	50.9	**572.0**
17. Sweden	57.9	12.8	**509.9**
18. Ireland	157.1	46.4	**496.0**
19. Norway	0.0	0.0	**270.0**
20. New Zealand	0.1	0.1	**168.2**

Source: World Wind Energy Association press release 7 March 2006

According to a media statement released 1 February 2006 by the European Wind Energy Association (EWEA), the EU cumulative wind power capacity increased by 18% to 40,504 MW by the end of 2005, up from 34,372 MW at the end of 2004. In total, 6,183 MW of wind power capacity were installed in 2005, representing a wind turbine manufacturing turnover of some €6 billion.

In this same media statement Prof. Arthouros Zervos, President of EWEA stated:

> "With the installation of a record 6,183MW in 2005, wind energy has achieved the European Commission's 40,000MW target for 2010, five years ahead of time. This underlines the technology's ability to deliver fast and vast amounts of clean energy."

This strong growth in recent years has led the European Union to review its projections for wind power capacity. Figure 4.1 shows that the EU projections to 2010 have recently been increased, from the original 40,000MW to a new expectation of over 72,000MW in Europe.

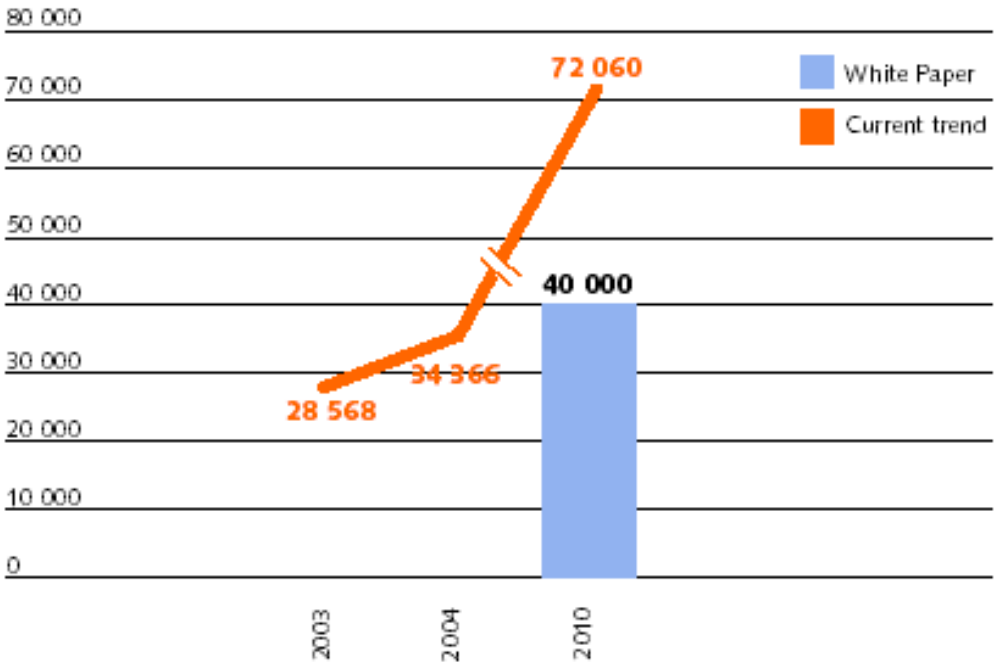

Figure 4.1 European Union wind power capacity projections (EC 2006)

Other markets are growing strongly in addition to this rapid growth in the European Union. China has the potential to be world's biggest wind energy market by 2020, doubling its current wind energy target for 2020 to 20,000MW (Hydro Tasmania 2006). In the USA, 2,500MW new capacity was installed in 2005 with over 3,000MW expected in 2006 and similar growth in 2007 (AWEA 2006b).

In many countries, even with already strong growth, governments are implementing policies to further accelerate the adoption of wind and other renewables for electricity generation. In a media statement in December 2005, the United Kingdom's Energy Minister, Malcolm Wicks stated:

> "As an island nation, we would be foolish not to exploit to the full all the natural resources that affords. Research from Oxford University recently confirmed that Britain has the best wind resource in Europe, providing most energy during peak daytime and winter periods. I am wedded to increasing the amount of energy we source from this and other forms of renewables. This year, there's been record growth in the industry and our drive to reach our 10 per cent target by 2010 is undiminished."

The European Wind Energy Association (EWEA) summarises many of the drivers for increased government support for wind as part of a balanced energy policy:

> "Wind energy is a significant resource; it is safe, clean, and abundant. Unlike conventional fuels, wind energy is an indigenous supply permanently available in virtually every nation in the world, delivering energy security benefits of eliminating fuel costs and long term fuel price risk, and avoiding the economic, political and supply risks of dependence on imports from other countries. Wind power has no resource constraints; the fuel is free and endless." (EWEA 2005)

4.2.2 Wind power in Australia

In Australia, the cost of wind energy is more than the cost of coal-fired electricity at the wholesale level. Wind farms are viable because of the Federal Government's Mandatory Renewable Energy Target (MRET). MRET requires electricity retail companies (such as Country Energy) to purchase a percentage of their power from renewable energy sources.

The proposed Cullerin Range wind farm will provide renewable energy which is eligible for Renewable Energy Certificates under the Federal Government's scheme. The full costs of MRET have already been taken into account by electricity retail companies in power prices set by them. Therefore, the wind farm will not increase prices for NSW residents or businesses. In fact, it will reduce the costs of production by reducing transmission losses to the region.

Many people in Australia do not acknowledge the government support that coal-fired generators have received over many years, and believe that schemes such as MRET are unwarranted. MRET was established in legislation to assist the development of this new industry in Australia, and to reduce greenhouse gas emissions from power generation. By doing so, MRET (and wind farms) will provide a base for cheaper and cleaner power into the future.

4.2.3 Viability of this project

The Cullerin Range wind farm would be developed by a private company. Accordingly, it is necessary for the project to provide an adequate financial return. The commercial viability is driven primarily by capital costs and the related cost of financing such projects. While the energy in the wind is free, the energy produced must make sufficient return to cover the high up-front costs of building the wind farm.

In the case of this project, the commercial viability is supported by relatively low cost transmission line connections (from using the existing line onsite) together with good wind speeds which have been measured on the site.

A number of elements included in this proposal, such as the installation of power lines underground, result in increased project costs to the proponents, and these higher costs have been accepted where they result in a project which is still commercially feasible.

4.3 Public attitudes towards wind farms

The proposal would promote renewable energy and thereby limit greenhouse gas emissions associated with energy production and is in line with Federal and State government promotion of renewable energy, including:

- The Commonwealth Government support for renewable energy provision through the National Greenhouse Strategy (NGS) and the Mandatory Renewable Energy Target (MRET);
- The NSW government supports renewable energies through programs of the Sustainable Energy Development Authority (SEDA) which has been incorporated into the Department of Energy, Utilities and Sustainability (DEUS), the NSW Greenhouse Gas Abatement Scheme and the NSW Greenhouse Office.
- Increased consumer demand for electricity generated from renewable sources is apparent in the national 'Green Power' accreditation program which sets environmental and reporting standards for renewable energy products offered by electricity suppliers.

State and Federal governments have been shown to support wind farms for their ability to produce renewable energy while reducing greenhouse gas emissions.

This support is in line with broader community attitudes towards power generation, greenhouse gas emissions, climate change, and renewable energy generation.

A telephone survey of 1027 participants was carried out in August 2003 by the Australian Research Group Pty Ltd on behalf of the Australian Wind Energy Association (ARC 2003).

This report found strong support for renewable energy, and wind farms in particular:

- 94% of respondents thought that a target to increase the contribution of clean energy from renewable sources was a good (32%) or very good (62%) idea. Furthermore, less than 3% considered the current target to be too high or much too high.
- 80% said they would be more likely (53%) or much more likely (27%) to think John Howard was doing a good job as Prime Minister if he increased the amount of electricity generated by non-polluting means such as solar or wind energy.
- The majority of respondents are prepared to pay more for cleaner energy
- A substantial majority of respondents (76%) said that they were prepared to pay 5% more on electricity bills for 10% more clean energy when faced with the option of having cheap electricity at any cost.
- The renewable energy sector has substantial community support. 88% of respondents want the Government to increase support to the renewable energy sector compared with only 26% wanting to see an increase in support to the fossil fuel sector.
- Very strong support exists for building wind farms. 95% support (27%) or strongly support (68%) building wind farms to meet Australia's rapidly increasing demand for electricity.
- 91% think it is more important to build wind farms for electricity than avoid building them in rural Australia.
- Greenhouse pollution is an issue of considerable concern. 59% would be more likely or much more likely to think that John Howard was doing a good job as Prime Minister if he signed the Kyoto Protocol.
- For 71% of respondents, reducing Greenhouse pollution outweighs protecting industries that rely on reserves of fossil fuel.

Interestingly, respondents residing in the city were as likely as those in regional/outer metro areas to support building wind farms however, city respondents were more likely than regional/outer metro respondents to strongly support this electricity option (72% and 64% respectively). The clear majority (91%) of respondents indicated that building pollution free wind farms for electricity is more important then avoiding building wind farms in rural Australia (4%) (Figure 4.2 and Figure 4.3).

The Cullerin Range Wind Farm proposal is fully self-funding, producing no drain on the public purse. The project maximises use of existing resources (wind, power line, road access) while being remote from high population centres, thereby minimising adverse social impacts.

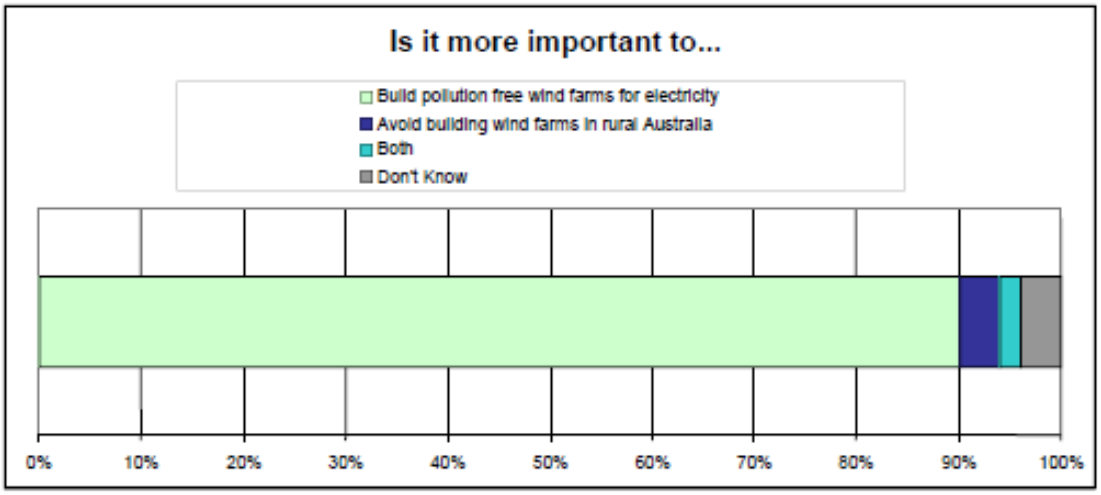

Figure 4.2 Community survey: importance of building wind farms

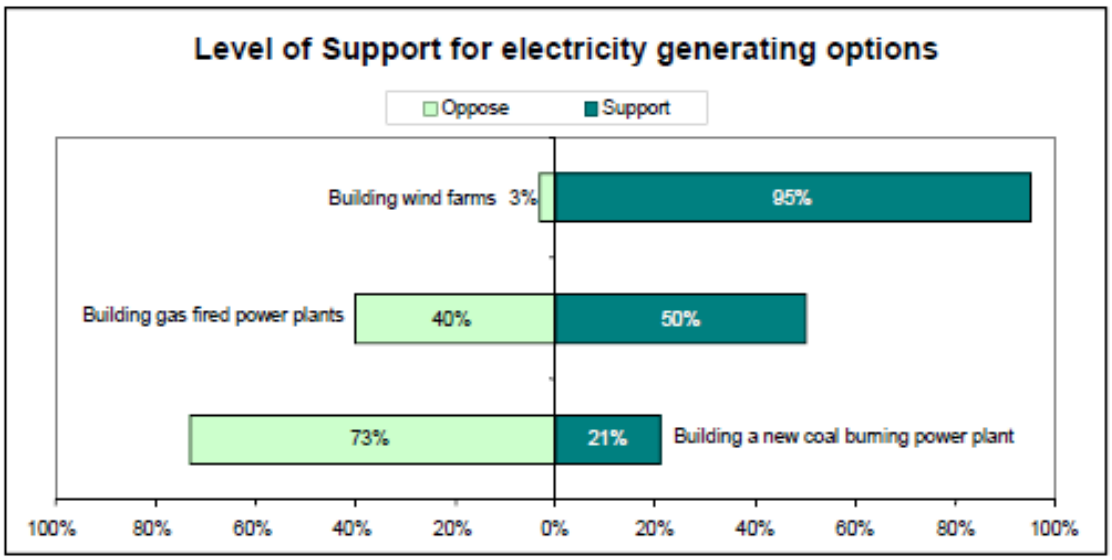

Figure 4.3 Community survey: support for electricity generating options

4.4 Broad scale benefits

4.4.1 Greenhouse gas emission reduction

Climate Change

There is increasing evidence that greenhouse gas emissions result in the warming of the earth's surface and have associated adverse impacts on weather patterns and natural ecosystems. According to the David Suzuki Foundation,

> *"Rising average temperatures do not simply mean balmier winters. Some regions will experience more extreme heat, while others may cool slightly. Flooding, drought, and intense summer heat could result. Violent storms and other extreme weather events could also result from the increased energy stored in our warming atmosphere."* (DSF 2006)

The foundation goes on to list the following general impacts of climate change:

- **Extreme Weather**: Climate change will increase the potency of storms, floods, droughts and other weather disasters.
- **Water Impacts**: Climate change will seriously affect water resources around the world, which will in turn affect food supply, health, industry, transportation, and ecosystem integrity.
- **Imperilled Ecosystems**: Ecosystems around the world will be damaged by climate change. (In Australia, particularly sensitive ecosystems include the Great Barrier Reef and the alpine areas including the Snowy Mountains)
- **Global Meltdown**: Alpine glaciers, arctic ecosystems and ice sheets are all at risk of succumbing to climate change, with global impacts.
- **Health**: Climate change threatens the health of future generations through increased disease (such as malaria), fresh water shortages, worsened smog, and more.
- **Economic Risks**: Rapid climate change poses incalculable economic risks for the future, which far outweigh the economic risks of taking action today.

In relation to this last point, the insurance industry is one of the first to notice these direct economic impacts. According to the David Suzuki Foundation, before 1988, the global insurance industry never had claims for more than US $1 billion in any single natural disaster. Yet between 1988 and 1996, 15 such events occurred, and a number of insurance companies closed down in the wake of these disasters.

According to the Munich Reinsurance Corporation of Canada*, "Economic losses caused by natural catastrophes are likely to bring home the effects of climate change more and more dramatically as time goes by."*

In addition, the cost to business of adapting to climate change will be significant, and the longer this adaptation is delayed the more significant and more severe will be the impact.

The regional impacts of climate change are discussed in Section 4.5.3.

Greenhouse gas reduction from this project

According to the Australian Greenhouse Office, stationary (i.e. non-transport) energy supply is the largest and fastest growing sector in terms of greenhouse gas emissions in Australia. The stationary energy sector accounted for 48 per cent of total emissions in 2002. Emissions from electricity generation make up nearly 70 per cent of stationary energy emissions. Between 1990 and 2002 emissions from electricity increased by 53 Mt CO2-e, an average of 2.9% per year (AGO 2005). Therefore in Australia, 33% of total greenhouse gas emissions are produced during the generation of electricity.

Within the electricity sector in NSW, approximately 90% of electricity is generated by fossil fuel power stations, primarily coal fired power stations. Greenhouse gas emissions from electricity generation in New South Wales grew by 44% between 1990 and 2002 (NSW Govt 2004).

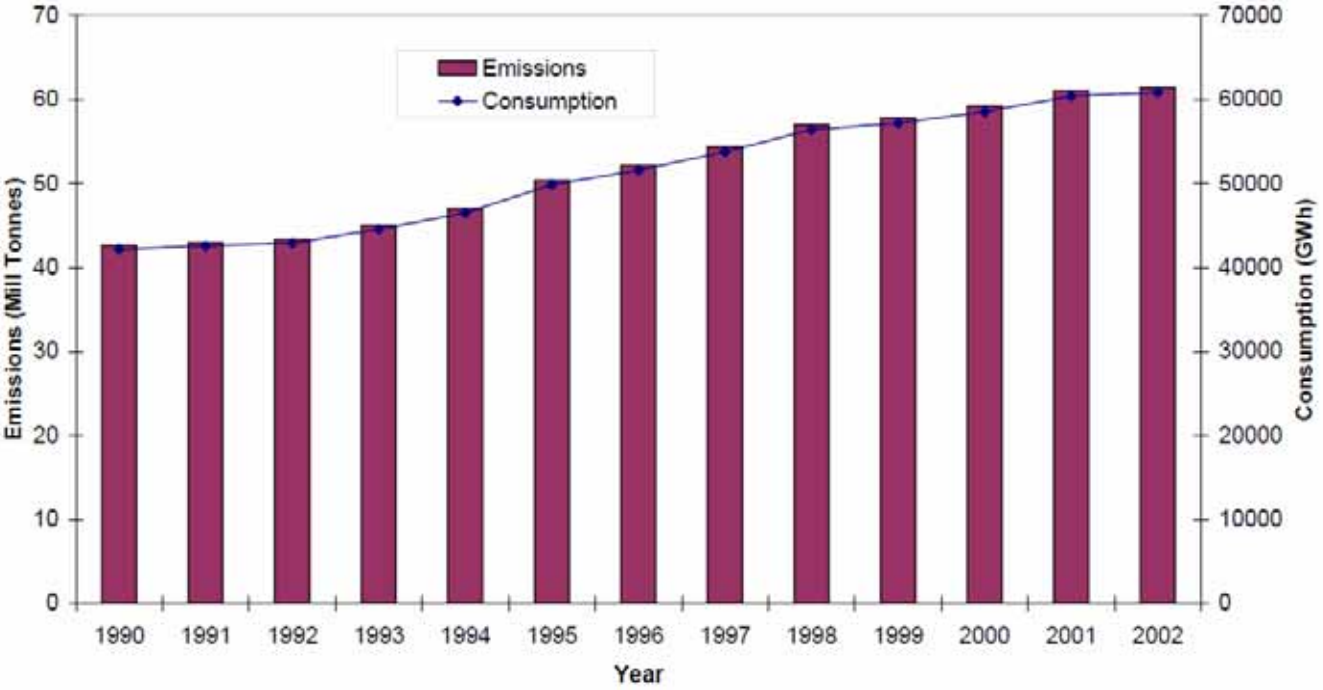

Figure 4.4 Greenhouse gas emissions from NSW power stations (NSW Govt 2004)

The nature of the NSW power system, and the dominance of coal as the fuel source means that Fossil fuel power stations are also the "marginal generator". The zero fuel cost of renewable energy (such as smaller hydro, biomass and wind power) means that these renewable energy sources are dispatched whenever generation is available, and coal fired power stations are reduced or increased in output to match the overall system generation with the required load. Although the Snowy Hydro is capable of supplying a very large amount of power, it can generally only do this for very short periods in order to maintain the water levels in its dams.

Accordingly, each Megawatt-hour of electricity generated by a renewable energy generator (e.g. the Cullerin Range Wind Farm) will reduce coal fired generation by approximately 1 Megawatt-hour. This may not mean that existing coal fired power stations are shut down, but it does mean that less coal is burnt in these power stations and therefore greenhouse gas emissions are reduced.

The most recent greenhouse gas emissions coefficient for the NSW electricity system is the NSW Annual Pool Value for 2004 of 0.981 Tonne CO2e/MWh (NSW Greenhouse Office 2005). This figure has been growing rapidly in recent years as shown in Table 4.2. A straight line progression of these figures would predict a value of 1.000 Tonne CO2e/MWh in 2006.

Table 4.2 NSW electricity system greenhouse gas coefficients

Year	Total NSW emissions (tCO2-e)	Total NSW Sent Out Generation (MWh)	Annual Pool Value tCO2- e/MWh
1999	N/A	N/A	0.901
2000	N/A	N/A	0.889
2001	N/A	N/A	0.905
2002	N/A	N/A	0.921
2003	63,431,793	66,800,866	0.950
2004	65,979,036	67,276,401	0.981
2005	TBA	TBA	TBA

(NSW Greenhouse Office 2005)

This means that for each Megawatt-hour of electricity consumed in the NSW electricity pool, approximately 1,000 kilograms of greenhouse gases are emitted, primarily from coal fired power stations.

The proposed wind farm would represent a renewable, non-greenhouse gas producing method of electricity generation to meet increasing demand. Every Megawatt-hour of electricity generated by the wind farm will prevent one Megawatt-hour of electricity being generated at a coal fired power station, as well as preventing losses within the electricity transmission system.

This means that for each Megawatt-hour of electricity generated by the proposed wind farm, the emission of at least 1,000 kilograms of greenhouse gases is avoided.

For comparison, a typical vehicle using 10 litres of petrol per 100 kilometres and driving 20,000 kilometres per annum would have a greenhouse gas emission of approximately 250g/km, or an annual emission of around 5 tonnes (Aust Govt 2006).

Section 4.5.1 outlines the energy production of the Cullerin Range Wind Farm, which is expected to be between 85,000 and 95,000 MWh per annum over its 30 year life.

The wind farm will reduce greenhouse gas emissions by 85,000 to 95,000 Tonnes of CO2e per annum, or a cumulative effect of 2.55 to 2.85 Million Tonnes of CO2e over the life of the project.

This is the equivalent reduction in greenhouse gas emissions of taking 17,000 to 19,000 typical cars off our roads for 30 years.

4.5 Regional benefits

4.5.1 Public electricity generation

Interaction with the electricity network

On a regional level, wind farms address the increasing demand for electricity in New South Wales, the loss of efficiency during transport (by generating electricity more locally) and provides renewable and clean source of electricity to the region.

Wind farms are an economically viable means to generate electricity and have many environmental benefits, when compared to currently available alternatives. In New South Wales a combination of hydro-power generators and coal-fired generators supply the population's power needs. Even with the considerable scale of the Snowy Mountains Hydro-Electric Scheme, coal-fired power generators supply around 90% of New South Wales electricity consumption.

Growth in electricity demand will soon exceed current electricity supply during peak times. According to Transgrid's Annual Planning Statement 2005; additional generation is likely to be required by 2008 to provide for New South Wales electricity supply needs. Accordingly, New South Wales requires additional electricity generators to be built to meet this demand, and to avoid power outages and blackouts.

Wind power provides a reliable and dependable electricity production. While on a day to day basis wind power output fluctuates with wind speed, on an annual basis output variation is small, and generally within 15-20% of the long term average. This is in contrast with hydro power, for example, where output of some power stations can drop to zero output during drought years.

The hourly fluctuations in wind speed, and therefore wind power output, are not significant in relation to the existing fluctuation of loads within the electricity system.

Figure 4.5 shows the daily NSW electricity demand for a 24 hour period in February 2006.

Figure 4.6 shows a similar effect on an annual scale. These figures show a daily variation of approximately 6,000 MW, or 200 times the maximum possible output available from the proposed 30 MW wind farm.

The existing electricity system in NSW is more than strong enough to cope with output fluctuations of the wind farm. At this scale of development, energy storage is not required for the wind farm.

In addition to their own electricity production, wind farms also reduce transmission line losses that arise from the long distances that power must be transmitted to supply regional locations. This reduces the overall cost of power supply in New South Wales, and further reduces greenhouse gas emissions.

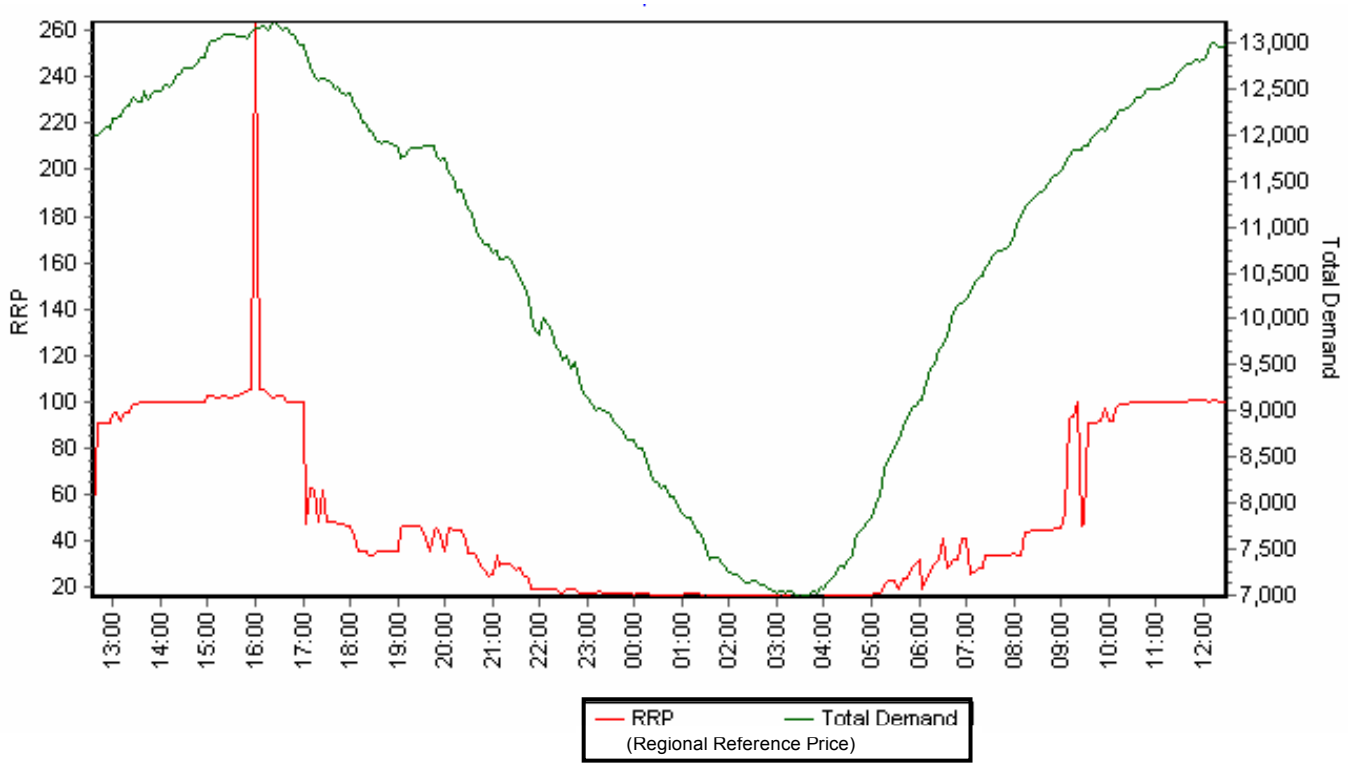

Figure 4.5 Typical daily variation in electricity demand (NEMMCO 2006)

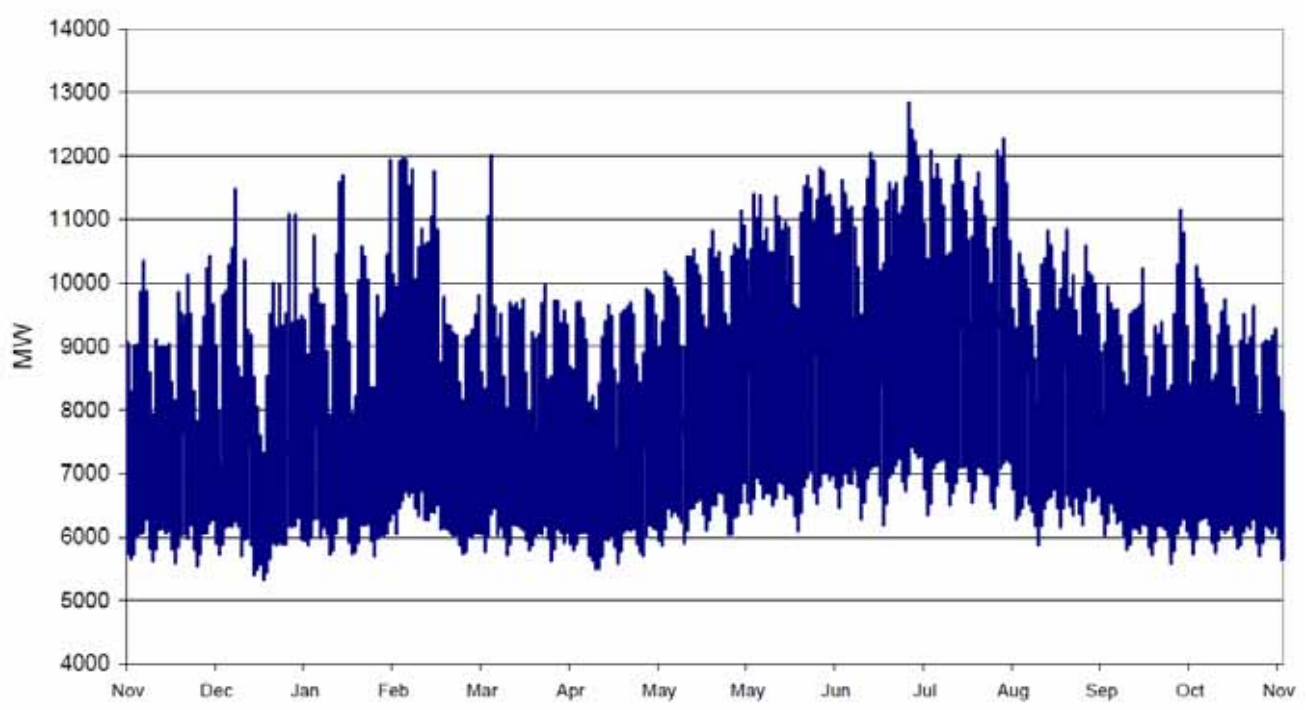

Figure 4.6 Variation in NSW electricity demand 2003/04 (NSW Govt 2004)

Energy production of Cullerin Range Wind Farm

Taurus Energy requested wind engineering consultants Garrad Hassan to prepare a wind energy assessment and electricity generation calculation based on the various turbine layouts proposed for the site. The assessment calculated likely energy generation in the typical annual wind regime, and then subtracted the various on-site losses (e.g. in cabling and the substation) to produce an estimate of the sent-out electricity generation for a typical year.

These studies show energy production (on a sent – out basis) for the Cullerin Range Wind Farm in the range of 85,000 MWh to 95,000 MWh per annum. It should be remembered, this calculation is based on a predicted typical year, with variations around this average of in the order of 15-20% likely for any single year.

Domestic electricity consumption in NSW was 7,399 kWh on average in 1999, growing from 6,983 kWh on average in 1990 (DEUS 2000). Continuing this growth rate, we can estimate a figure of approximately 7,800 kWh on average for 2006.

On this basis, production of electricity from the Cullerin Range Wind Farm of 85,000 to 95,000 MWh per annum would equate (on an annual average basis) to the annual electricity consumption of approximately 10,900 to 12,200 average NSW homes.

Given the relatively small scale of this project, it would not cause one of NSW's 2,640 Megawatt coal fired power stations to be permanently closed down. However, every Megawatt-hour of electricity produced from the proposed wind farm will mean a Megawatt-hour of electricity is not required from fossil fuel power stations. This in turn reduces fossil fuel required to provide power, which reduces greenhouse gas emissions.

Embodied Energy in Wind Farms

Wind power is a clean, renewable form of energy, which during operation produces no carbon dioxide (CO2) emissions. While some emissions of these gases will take place during the design, manufacture, transport and erection of wind turbines, enough electricity is generated from a wind farm within a few months to totally compensate for these emissions. When wind farms are dismantled (usually after 20-25 years of operation) they leave no legacy of pollution for future generation (AWEA 2006a).

The Danish Wind Turbine Manufacturers Association prepared a lifecycle analysis (LCA) of wind turbine manufacture which investigated the manufacturing, construction, installation, operation and decommissioning impacts of wind turbines. This particular study investigated a 600kW on-shore and 1.5NW off-shore wind turbine, and found in both cases an energy payback period of less than 4 months (when scrapping of the equipment is taken into account). Given the lifetime of a typical wind farm being 20-30 years, this means that the wind turbines generate approximately 60-90 times the energy used in their construction over their life (DWTMA 1997).

4.5.2 Energy security

In addition to broad environmental benefits, the development of wind energy in Australia has security implications as a stable and renewable energy source.

Wind farms offer a diversification of the existing electricity supply infrastructure which helps to mitigate risks of power station failures; of acts of terrorism; and of price risks from fossil fuels which are tied strongly to international energy prices.

A single coal fired power station in NSW can generate up to 2,640MW, or approximately 20% of the total NSW generation capacity. Any kind of outage or failure of such a power station, whether cause by fault or terrorism, would have a significant impact on the operations on the electricity system and thereby the economy as a whole.

In addition, fossil fuel prices are being pushed to record levels. For example, the price of oil has more than tripled since 2001, reaching an all-time high of almost US$70/barrel in this last summer. The prices of fossil fuel energy used for power generation, in particular gas, is strongly linked to international markets.

Gas is recognized as being likely to be the fuel of choice for future NSW power generation capacity. According to ABARE, there are currently proposals for 7 new power stations in NSW, with operational dates up to 2013, and a total capacity of 4,380MW. Six out of seven of these projects are gas-fired power stations, with the remaining power station coal fired and making up 34% of new capacity (ABARE 2005).

The supplemental use of wind power, with its free fuel cost, helps to decouple electricity prices from international oil and gas markets.

Corin Millais, CEO of the European Wind Energy Association, summarises the situation well:

> "Wind power has zero fuel price risk, zero fuel costs and extremely low operation and maintenance costs. In addition, wind provides total protection from carbon costs, and zero geo-political risk associated with supply and infrastructure constraints or political dependence on other countries. Wind power has no resource constraints; the fuel is free and endless. Unlike conventional fuels, wind is a massive indigenous power source permanently available. Wind power stations can be constructed and deliver power far quicker than conventional sources." (Millais 2006)

In addition, climate change is also likely to reduce security within the electricity network. Research carried out by CSIRO on behalf of the NSW Government notes four potential risks of climate change (NSW Govt 2004):

- Increased risks of storm, lightning and bushfire damage to electricity infrastructure
- Reduced water availability for cooling inland power stations
- Increased peak electricity demand for air conditioning due to the increased number of extremely hot days
- Reduced operational capacity of electricity networks at times of high temperatures, making more investment necessary to expand capacity to cater for a given level of demand

This wind farm will help to reduce climate change, and will provide a small local distributed power station to serve the regional community, it will provide a marginal but positive effect on energy security.

4.5.3 Reduced impacts of climate change

Section 4.2.3 outlines the greenhouse gas emission reductions available from this project. This section discusses the impacts of climate change if greenhouse gas emissions are allowed to continue on current projections and without mitigation available from this and similar projects.

Climate change, better known by its misnomer "global warming", is a scientifically proven result of human-induced greenhouse gas emissions, leading to an increased instability of climatic systems, significantly changed weather patterns worldwide, and a general warming of the globe.

Recent research by the CSIRO for the NSW Government shows the likely impacts to NSW of climate change may include (NSW Govt 2004):

- A 70% increase in drought frequency by 2030, leading to less rain and less water for farms, cities, power stations and rivers;
- Major costs to farmers of managing impacts such as reduced water availability, increased hail damage, and the spread of tropical pests;
- Increased risks to buildings and infrastructure from storms, bushfires, floods and lightning strikes;
- Higher insurance premiums, more restricted insurance coverage and the withdrawal of cover from the highest risk areas;
- An increase in the number of extremely hot days each year;
- Extinctions of threatened animals and plants; and
- Threats to human health from heat stress, mosquito born diseases and injuries from storms and floods.

Various scientists have assessed the likely impacts of climate change in Australia, captured in a report titled "Climate Change: An Australian Guide to the Science and Potential Impacts", prepared for the Australian Greenhouse Office 2003. (AGO 2003) This incorporated major contributions from CSIRO, Griffith University, Sydney University, Australian National University, Monash University and others.

The climate change report highlights current scientific expectation of the impacts of climate change in Australia. Vulnerabilities of New South Wales include floods, droughts and forest fires.

Projected adverse impacts on Australian agriculture, as a consequence of reduced local production capacity and increased production in positively affected northern hemisphere countries are particularly relevant to agricultural economies such as the Goulburn-Yass region.

Chapter 4.3 of this report outlines the largely negative impacts in Australia of climate change on pastoral activities; on cropping and agriculture; on fisheries; on forestry; on drought; and on pests, parasites and pathogens. It goes on to discuss the effects on sustainability of the industry in the presence of global markets (AGO 2003).

4.5.4 Additional environmental benefits

Water use in power stations

Fossil fuel fired power stations used significant levels of potable water in their operations, primarily for cooling water (in cooling towers) and for boiler make-up water.

Any reduction in the use of fossil fuel fired power stations will lead to a reduced demand on Australia's finite sources of potable water. This in turn will free up water for more productive uses, and is also likely to have longer term benefits to river quality and thereby water quality.

The major NSW coal fired power stations have the following potable water requirements per annum:

Table 4.3 Water consumption in NSW coal fired power stations

Company	Power Station	Potable Water Consumption
Macquarie Generation	Liddell (Hunter River / Lake Liddell)	25,000 ML/y
Macquarie Generation	Bayswater (Hunter River / Lake Liddell)	36,000 ML/y
Eraring Energy	Eraring	1,500 ML/y
Delta Electricity	Wallerawang and Mt Piper (Fish River & Cox's River)	22,000 ML/y
Delta Electricity	Munmorah & Vales Point	1,000 ML/y
TOTAL		*84,500 ML/y*

Source: company websites

This is equivalent to approximately 15% of Sydney's annual water consumption.

Based on an annual energy generation from these power stations 64,209 GWh (ABARE 2005), this equates to approximately 1.316 kilolitres per MWh generated.

Accordingly, the Cullerin Range Wind Farm is likely to reduce water consumption in NSW by 110 to 125 Million litres of potable water per annum.

Pollution from fossil-fuel fired power stations

The generation of electricity from fossil fuels also releases significant levels of contaminates and pollutants into the atmosphere, both through airborne and waterborne releases.

In his Overview of worldwide wind generation, Paul Gipe & Associates state:

> "The direct generation of a unit of electricity, whether from wind or water, offsets the combustion of three units of fossil fuel in a conventional power plant. Every Megawatt-hour produced by a wind turbine offsets the emission of 0.5 to 1 tonnes of carbon dioxide from conventional sources. Wind generation also offsets up to 7 kilograms per Megawatt-hour of sulfur oxides, nitrogen oxides and particulates from the fuel cycle for coal, including mining and transport, 0.1 kilogram per Megawatt-hour of trace metals, such as mercury, and more than 200 kilograms per Megawatt-hour of solid wastes from coal tailings and ash. The amount of pollutants offset depends upon the mix of fossil fuels, nuclear power, and hydro-electricity used in the existing fuel cycle. Wind

> generation offsets more air pollutants from utilities dependent on coal than those burning natural gas."(Gipe 1999)

In Australia, the National Pollutant Inventory identifies the emissions from electricity supply sector, primarily fossil fuel fired power generation. These are shown in Table 4.4, which highlights that the industry is a major emitter of heavy metal compounds, carbon monoxide, oxides of nitrogen, and sulfur dioxide.

These figures are total emissions over all power stations in Australia.

The emissions do not occur because a power station exists; they occur because of the use of fossil fuels while the power station is operating. Any reduction in fossil fuel use will also reduce the level of pollutants released each year into the environment.

By way of an example, in the financial year 2004-05 Macquarie Generation's Bayswater coal-fired power station consumed over 8 Million tones of coal and 4,000 tonnes of fuel oil to produce 16,867 GWh of electricity (Macquarie Generation 2005). The per-MWh emissions of sulfur dioxide, oxides of nitrogen, carbon dioxide and particulate matter are shown in Table 4.5.

Based on these figures, the proposal would prevent the atmospheric emission of:

- **480,000 to 538,000 kilograms of sulfur dioxide;**
- **209,000 to 233,000 kilograms of nitrogen oxides;**
- **1870 to 2090 kilograms of particulates.**

Table 4.4 National Pollutant Inventory 2004-05, electricity supply sector (NPI 2006)

Substance	Total Emissions (kg/year)	Emissions to Air (kg/year)	Emissions to Land (kg/year)	Emissions to Water (kg/year)
Acetaldehyde	13,000	13,000		
Ammonia (total)	250,000	200,000		54,000
Antimony & compounds	1.1	1.1		
Arsenic & compounds	2,800	2,300	1.2	530
Benzene	1,200	1,200		
Beryllium & compounds	3,000	3,000	0.30	16
Boron & compounds	850,000	830,000		16,000
1,3-Butadiene (vinyl ethylene)	21	21		
Cadmium & compounds	760	700	0.45	58
Carbon monoxide	65,000,000	65,000,000		
Chlorine	370	340		31
Chromium (III) compounds	5,200	4,700	0.40	500
Chromium (VI) compounds	860	710	0.0025	150
Cobalt & compounds	1,900	1,800	2.7	48
Copper & compounds	19,000	17,000	4.1	1,500
Cumene (1-methylethylbenzene)	1,100	1,100		
Cyanide (inorganic) compounds	7,100	7,100		0.47
Cyclohexane	20	20		
Ethylbenzene	1,800	1,800		
Fluoride compounds	3,200,000	3,100,000	12	39,000
Formaldehyde (methyl aldehyde)	170,000	170,000		
n-Hexane	23,000	23,000		
Hydrochloric acid	49,000,000	49,000,000		
Lead & compounds	7,700	7,500	0.34	200
Magnesium oxide fume	3.5	3.5		
Manganese & compounds	32,000	27,000	26	5,400
Mercury & compounds	1,100	1,100	0.069	11
Nickel & compounds	6,800	6,400	16	400
Oxides of Nitrogen	510,000,000	510,000,000		
Particulate Matter 10.0 um	45,000,000	45,000,000		
Polychlorinated dioxins and furans	0.048	0.048		
Polycyclic aromatic hydrocarbons	1,700	1,700		
Selenium & compounds	11,000	11,000		98
Sulfur dioxide	630,000,000	630,000,000		
Sulfuric acid	5,700,000	5,700,000		20,000
Toluene (methylbenzene)	3,100	3,100		
Total Nitrogen	24,000			24,000
Total Phosphorus	5,000			5,000
Total Volatile Organic Compounds	3,200,000	3,200,000		210
Xylenes (individual or mixed isomers)	1,100	1,100		
Zinc and compounds	12,000	10,000	3.6	1,700

These figures are total emissions over all power stations in Australia.

Table 4.5 Power station emissions per unit

Environmental Performance	
Regulatory Compliance	
NSW EPA Licences:	4
Other NSW Government Licences:	4
Breaches notified:	Nil
Coal consumed	
Bayswater	8,053,677 tonnes
Liddell	4,944,137 tonnes
Non-coal fuel consumption	
Biomass	
Liddell	70,237 tonnes
Coal replaced by biomass	40,607 tonnes
Coal replaced since August 1999	230,695 tones
Electricity produced from biomass since August 1999	449,350 MWh
Annual average production	74,892 MWh
Oils	
Liddell (Supplementary Fuels Program)	17,777 tonnes
Liddell (Boiler start-up)	10,376 tonnes
Bayswater (Boiler start-up)	4,004 tonnes
Air Emissions	
Sulfur dioxide	5.67 kg/MWh (Bayswater) 4.54 kg/MWh (Liddell)
Oxides of nitrogen (expressed as NO2)	2.46kg/MWh (Bayswater) 2.59 kg/MWh (Liddell)
Particulate matter	0.022 kg/MWh (Bayswater) 0.07 kg/MWh (Liddell)
Carbon dioxide	904.6 kg/MWh (Bayswater) 990 kg/MWh (Liddell)
Water Management	
Water diverted (Hunter River)	43,694 ML

Source: Macquarie Generation 2005.

4.6 Local benefits

4.6.1 General benefits to community

The local community would gain a marginal benefit from those regional benefits contained in Sections 4.3 and 4.5, in particular:

- Reduced greenhouse gas emissions
- Increased energy security
- Viable source of electricity to help meet growing demand
- Reduced impacts of climate change
- Improved environmental performance and sustainability of power generation

A significant part of the local economy is based on or around agricultural pursuits. The negative economic impacts of climate change are likely to be felt much more considerably in the local area than in urban areas of NSW, therefore the benefits of this project are also likely to be significantly weighted in favour of the local community.

4.6.2 Community fund

The proponent intends to set aside funds on an annual basis during the operation period to provide long terms benefits to the local community.

The Community Fund will be established to provide for local environmental benefits and local community facilities to the benefit of the local community. Worthy projects could include:

- Landcare
- Weed and pest management
- Local sporting facilities
- Local public services (e.g. libraries)
- Community parklands
- Academic scholarships
- Rural Fire Service support
- Event sponsorship
- Road improvements
- Local heritage management

The proponent will provide $25,000 per annum into the Community Fund during the period of operation of the wind farm.

The structure of the fund is to be determined, and could involve management by or joint management with the local Council and/or local community representatives. The proponent will seek local input into the structure of the fund.

4.6.3 Jobs, investment and economic benefit

Over the life of the wind farm, it will inject in excess of $10 Million into the local economy from the wind farm construction and operations. This economic injection will come from:

- Use of local contractors (where possible) in construction of the wind farm
- Use of local services (food and accommodation, fuel, general stores etc) during the construction period
- Ongoing use of these local services during the operation of the wind farm
- Lease payments to local landholders
- Provision of ongoing local jobs in operating and maintaining the wind farm

It is estimated that the project would provide approximately 50 jobs during construction and 5 jobs during the operational phase of the wind farm.

In addition to these direct benefits, the project provides an opportunity to increase tourism, if this is desired by the community. This also would increase use of local services on an ongoing basis. While initial interest in the wind farm is likely to be higher than ongoing interest, the close presence of the Hume Highway will bring new visitors to the region on a regular basis and the wind farm could be used as an additional attraction to secure visitors to the local townships.

The project will also bring economic benefits through the Community Fund. The services provided through this fund will largely be met from within the local community, who will also be well served by the outcomes of the fund.

The general benefits to the community identified in Section 4.6.1 will also have direct and substantial economic implications, due to the heavy reliance within the area on agricultural pursuits.

4.6.4 Locally produced power

Section 4.5.1 confirmed that production of electricity from the Cullerin Range Wind Farm of 85,000 to 95,000 MWh per annum would equate (on an annual average basis) to the annual electricity requirement of approximately 10,900 to 12,200 average NSW homes.

There is true equity in the people of the local area hosting a power station that more or less balances their electricity consumption, and does this using local renewable energy resources.

4.7 Consideration of alternatives

Proposal options considered include altering the size and location of the wind farm, as well as the size and locations of individual wind turbines onsite.

4.7.1 Comparison with other forms of electricity generation

Wind is one of the cheapest forms of renewable energy available in Australia, which can be demonstrated by its dominant share of the MRET target.

Wind farms offer significant environmental benefits over fossil fuel power stations. During the operating life of a windfarm, it will produce:

- No greenhouse gas emissions
- No air or water born pollutants such as nitrous oxides, sulfur oxides, heavy metals or particulates
- No water use
- No waste products (nuclear or otherwise) which require long term disposal

Wind power is also a relatively safe technology. In over 20 years of electricity generation with more than 100,000 machines installed worldwide, no member of the public has ever been injured in the operation of a wind farm. Since the early 1970's the wind energy industry has experienced 14 worker fatalities worldwide, directly or indirectly during wind farm construction or related accidents. All of these deaths could have been prevented if today's safe work practices had been adopted (AusWEA 2004).

According to the construction, forestry, mining and energy union (CFMEU), mining is the most dangerous occupation in Australia. Coal miners for example have a 1 in 28 chance of being killed over their 40-year working life. Figures obtained from the International Labour Organization (ILO) show that miners account for 1 per cent of the global work force yet at the same time contribute to seven per cent of global work fatalities (Westwick-Farrow Pty Ltd. 2006).

4.7.2 Selection of wind farm location

Background to Site Selection

Appropriate sites for wind farms are very rare in New South Wales. Appropriate locations for wind farms are found where:

- Wind speeds are not only high but consistent;
- Vegetation cover is low and not sensitive;
- Housing in the immediate vicinity is relatively sparse;
- High voltage transmission lines are available nearby;
- Reasonable road access is available to site;
- Relevant landowners are interested in allowing wind turbines on their land.

While many believe that coastal winds in NSW are stronger, in New South Wales the most suitable sites occur at various locations along the Great Dividing Range which helps to accelerate the more consistent westerly winds at levels close to the ground.

Taurus Energy has investigated various regions around NSW for their wind farm potential.

Taurus Energy commenced these investigations by identifying windy regions using the SEDA Wind Atlas (SEDA 2006). After identifying wind farm potential in the Bombala, Eucumbene, Yass, Goulburn and Guyra regions, Taurus prepared high resolution broad scale wind maps (approx 50km by 50km) for each region. This map was prepared using the software tool WindScape™ developed by CSIRO, which estimates wind speeds every 100m over large areas based on topographic, vegetation and weather data.

These wind maps were then analysed using MapInfo™ GIS with extensive overlays covering national parks and state forests; vegetation cover; road access; and transmission line access.

Once specific sites were identified, more detailed investigation of local house locations and property ownership was carried out, and landowners contacted to gauge their interest in a possible wind farm.

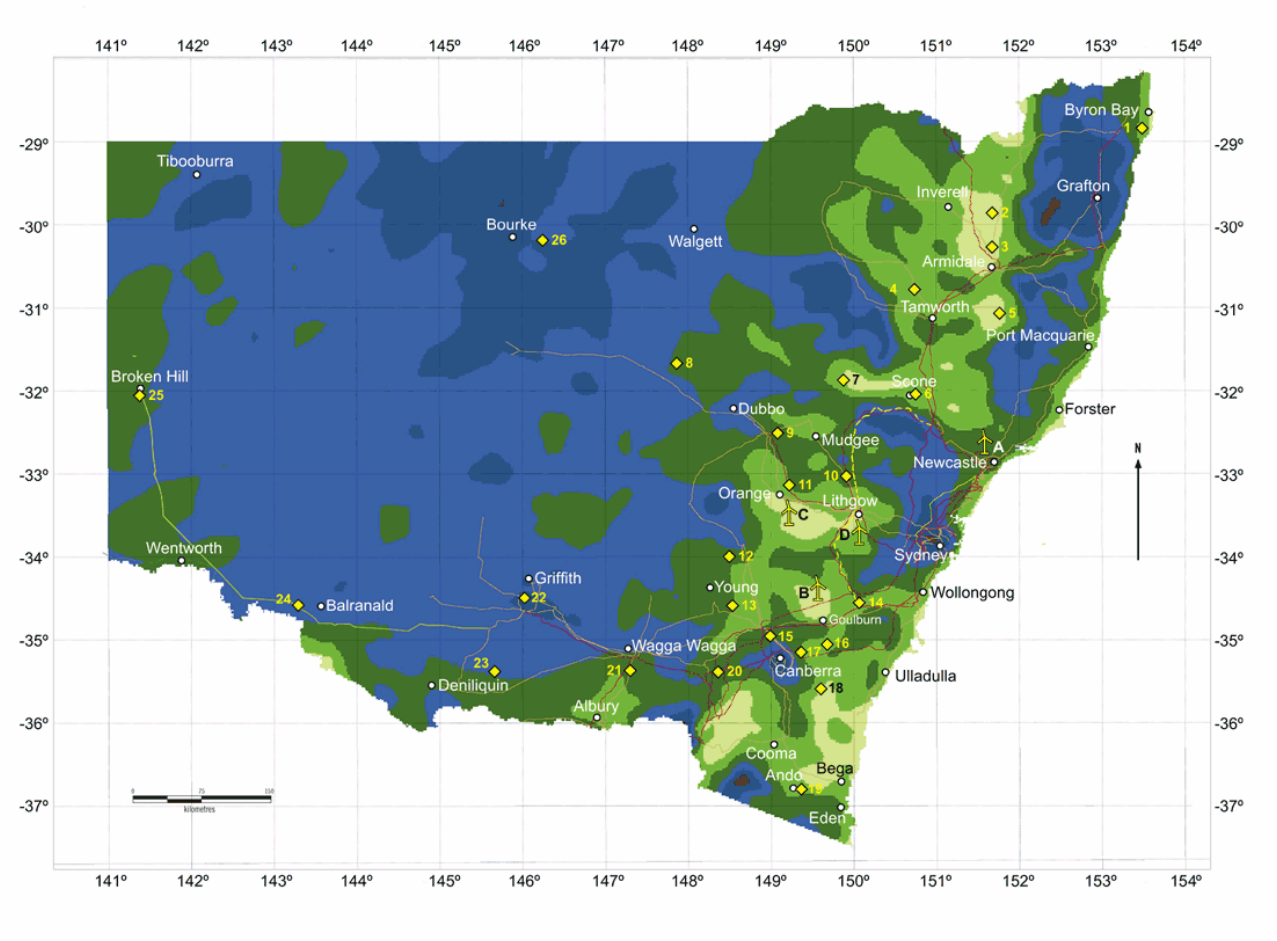

Figure 4.7 SEDA Wind Energy Atlas (SEDA 2006)

The Cullerin Range site

The Cullerin Range site was initially assessed by an unrelated wind farm prospecting company (New Energy Partners P/L) which had entered into agreements with the relevant landowners.

After a review against the site selection approach above, this site was acquired by Taurus since it represents a limited number of locations which met the required criteria. The site has:

- High wind speeds, among the highest in New South Wales;
- Sparse vegetation and largely modified vegetation communities;
- Low population density (one person per 88.59 hectares in the Upper Lachlan Shire area);
- Good road access to site (located between the Hume Highway and Cullerin Rd);
- Existing electricity transmission line on site (132kV Goulburn – Yass transmission line);
- Interested property owners for the relevant properties.

Taurus Energy commenced development of the site in June 2005, purchasing the existing interests of New Energy Partners P/L. New Energy Partners P/L is no longer involved in the project.

The site has a 65m tall wind monitoring mast that was installed in 2005, to confirm expected wind speeds onsite. The data from this mast is downloaded weekly by CSIRO Land and Water and forwarded to Taurus Energy. Wind data has been correlated against existing long term monitoring towers in the area (i.e. Goulburn Airport AWS, operated by the Bureau of Meteorology) to predict a long term wind speed and wind direction profile for the site.

The wind monitoring has demonstrated that there is sufficient wind resource to develop a medium scale wind farm at the proposed site.

4.7.3 Scale of the proposed wind farm

Wind farms are comprised of multiple wind turbine generators. The more wind turbines located in a wind farm, the higher its energy production.

Most wind farms currently proposed in New South Wales are greater than 50 Megawatts, with more than 25 wind turbines each.

These large scale wind farms (greater than 30 MW output) can have much larger visual and noise impacts on the surrounding landscape. Large wind farms require greater transmission line capacities, often meaning that new transmission lines need to be built over many kilometres. They also require greater amounts of excavation and machinery access to install, maintain and decommission, leading to increased truck movements and local disturbance.

Given the increased level of impacts that result, Taurus Energy does not believe that a large wind farm is appropriate for the Cullerin Range site. Accordingly, it has proposed a wind farm design with a maximum of 30 Megawatts output, and with a maximum of 15 wind turbines. Table 4.6 places the proposed development along-side other proposals for New South Wales.

Table 4.6: Wind Farm Proposals – Goulburn / Yass Region, NSW

Project, Project Location	Proponent (Status)	Project Capacity	No. of Turbines	New Powerlines to connect to grid
Crookwell 1 WF, near Crookwell	Delta Electricity (Operational)	4.8MW Built 1997	8	Substation on site
Gunning WF, near Gunning	Delta Electricity (DA Approved)	64MW	32	14km, 132kV, aerial
Crookwell 2 WF, near Crookwell	Gamesa Energia (DA Approved)	100MW	50	330kV substation, on site
Woodlawn WF, near Tarago	Wind Energy JV (DA Approved)	50MW	25	Not specified
Taralga WF, near Taralga	RES Southern Cross (DA Approved)	100MW	50	Not specified, >30km high voltage
Cullerin Range WF, near Gunning	Taurus Energy (Proposed)	<30MW	15	Substation on site
Evandale WF, near Goulburn	Taurus Energy (Proposed)	<30MW	15	<10km aerial
Conroy's Gap WF, near Yass	Taurus Energy (Proposed)	<30MW	15	<4km aerial
Spring Range WF, near Murrumbateman	ACTEW Corporation (Proposed)	unknown	10 - 15	unknown
Molonglo Range WF, near Queanbeyan	EHN (Oceania) (Proposed)	Up to 120MW	Up to 60	3-10km, aerial

Sources: Company websites, media releases and published Environmental Impact Statements.

4.7.4 Size of the proposed wind turbines

Wind turbines come in various sizes, from small 10 kilowatt wind turbines used for individual houses, to 5 Megawatt wind turbines used offshore in Europe, with potential to supply up to two thousand houses from each wind turbine. These large turbines can have blade diameters and hub heights of well over 100 metres each, with tip heights exceeding 150 metres.

There is a trade-off between the number of wind turbines and the size of wind turbines to provide commercial volumes of electricity from a site. The smaller the wind turbine, the larger the number of wind turbines would be required for a viable project.

Increasing the size and reducing the number of wind turbines has a number of benefits:

- Reduced visual impact (see discussion in the *Cullerin Range Wind Farm: Visual Impact Assessment* specialist study)
- Reduced environmental impacts of construction through less footings, hardstands, road areas etc
- Reduced cost of wind power per unit of output

Taurus Energy proposes to use mid-sized wind turbines, with each wind turbine having a hub height of up to 80m and blade diameter of up to 92m. This reduces the number of wind turbines onsite to a maximum of 15 for a viable project, and significantly reduces the environmental impacts from construction and visual impacts in operation.

4.7.5 Electricity transmission connection options

Various options for connection to the electricity transmission system have been considered.

Connection to the local 11kV powerlines was ruled out immediately, as these powerlines do not have the capacity to connect more than one or two wind turbines.

Connection to the 330kV lines to the south of site was considered. Such a connection would involved a major substation in a key transmission line link to the Yass substation, as well as the construction of new powerlines crossing the Hume Highway. This option was ruled out primarily on cost, but would also be ruled out due to the increased visual impacts and increased area of disturbance from a biodiversity perspective.

Connection to the 132kV powerline onsite is the preferred option. It minimizes the visual impacts of the substation and connecting powerlines, reduces potential biodiversity impacts cause by construction of an albeit short length of powerline, and reduces the cost of the overall project.

4.8 Modifications to the Cullerin Range Wind Farm proposal

The location of individual wind turbines onsite and elements of the construction, operation and decommissioning phase are being informed by a range of specialist studies. These include wind speed parameters, noise and visual assessment (from residences and nearby recreational areas), Aboriginal archaeology, flora (including threatened species and communities as well as total amount of vegetation cover) and fauna (including threatened species, migratory species and habitat values of the site).

The final proposal has been designed to reduce adverse impacts upon social and environmental parameters while taking advantage of the landscape features that could most effectively contribute to the supply of greenhouse gas emission-free sustainable energy generation.

In particular, the following improvements have been made since the initial concept was developed and presented at the first Open House in November 2005:

- Three turbines have been removed from northern end of the site and relocated to the southern end of the site. While this incurs a significant loss in energy production from these turbines, it offers a significant reduction in visual and possible noise impacts to houses in the proximity of the northern end of the site.

- Use of the southern access route (to the existing telecommunications tower) has been minimised to reduce erosion in the vicinity due to steep slopes of this route.

- Access to site via the Cullerin Rd and Breadalbane has been relocated to access site via Lerida Rd North. This will have a significant reduction in traffic movements and noise through Breadalbane and Cullerin and to houses bordering on Cullerin Rd.

- The concrete batch plant location has been relocated to make use of a previously used batch plant site which was used for construction of the Hume Highway.

- A new substation location has been identified and is now preferred over the previously proposed substation location to the north of Cullerin Rd. In the event that the Gunning Wind Farm does not proceed, this location will offer a reduction in biodiversity and visual impacts.

- The concept of a Community Fund has now been incorporated into this proposal to broaden the benefit of this proposal within the local community.

- A commitment to offer visual screening to affected landowners in the vicinity of the wind farm has been incorporated into the final proposal.

4.9 Reversibility of the proposal

The proposal would not substantially alter the vegetation, soil or water quality on the site. In the short-term, mitigation measures will be required during construction to ensure that the spread of weeds, soil erosion and water quality decline are not exacerbated by the proposal. Impacts on fauna contain a greater degree of uncertainty, requiring rigorous monitoring to characterise the impacts of the operational wind farm and an adaptive management program. Impacts on the visual landscape would be ongoing during the operational phase of the wind farm. The Environmental Assessment outlines the measures that would be implemented to protect the environment and minimise both environmental and social impacts of the proposal.

The reversibility of the proposal is also an advantage in mitigating potential impacts of the operational wind farm. If bird or bat strike or shadow flicker are found to be greater than anticipated by this assessment, there is scope to shut down individual turbines temporarily in order to reduce the impact during sensitive periods (for example, migration times). Temporarily shutting down turbines is a strategy that may be recommended by post construction fauna and / or shadow flicker monitoring. Implementation of this strategy will depend on the specifics of the identified impacts and cannot be committed to in advance. Taurus commit to implementing this strategy, should post construction monitoring deem it necessary.

At the end of the proposal's life (25-30 years if not recommissioned) the infrastructure would be removed from the site. The concrete footings and access trails would remain however, all other soil disturbance would be rehabilitated and revegetated where appropriate. The landforms, land use and visual character of the site would them be returned to its pre-existing state.

As there is no significant tree clearing or cut and fill operations involved in the project, the site could be substantially returned to its current state.

5 PLANNING CONTEXT

5.1 Local Government instruments and policies

5.1.1 Gunning Local Environmental Plan 1997

The Cullerin site is located in the Upper Lachlan local government area on land that is subject to the Gunning Local Environmental Plan (LEP) 1997. The LEP establishes the framework for development within the local government area. It contains a planning scheme establishing specific land use zones which guide Council planning. Each zone carries specific planning objectives. Figure 5.1 shows the land use zoning that affects the proposal site.

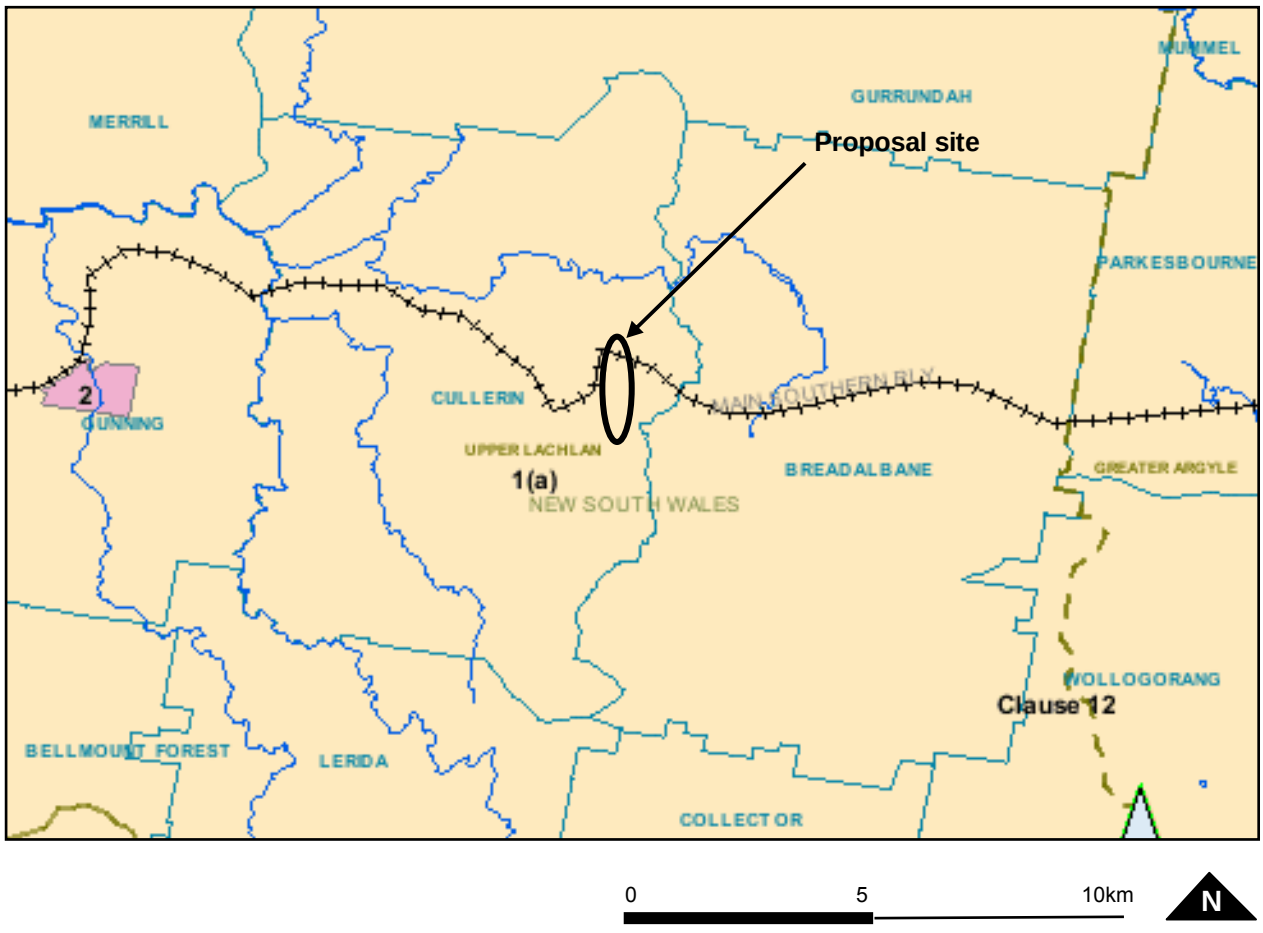

Figure 5.1 LEP zoning in the study area (DIPNR PlanConnect portal)

The proposal site is located in zone 1(a) Rural Zone. Under the LEP, the objectives of this zone are:

a) To maintain the rural character of the area of Gunning

b) To encourage the use of rural land for agriculture and other forms of development which are associated with rural activity or which require an isolated or rural location

c) To ensure that the location, type and intensity of development is appropriate, having regard to the characteristics of the land, the rural environment and the need to protect significant natural resources including prime crop and pasture land

d) To minimize the cost to the community of:

   i) Fragmented and isolated development of rural land, and

   ii) Providing, extending and maintaining public amenities and services,

e) To ensure that the soils within this zone are protected and maintained in good condition, and that the water quality is maintained above a minimum standard determined by the Council.

General principles that the Council consider for developments proposed within Zone 1 (a) include:

a) Any impact the development will have on the future or current agricultural use of the land and of adjoining land, Whether an adequate water supply is available, and

b) What services are or may be required,

c) Any natural hazards likely to affect the development on the land or other land as a result of the development,

d) What effect the development might have on water quality and on land with environmental or conservation values,

e) The effect the development will have on aquatic fauna or habitat and the natural flow of any watercourse or stream,

f) The effect the development will have on riparian vegetation and habitat, and

g) Whether the development will contribute to ribbon development or substantially change the appearance or character of the amenity of the locality.

The proposal is not prohibited under any local environmental planning instrument. This document has considered the Upper Lachlan Shire Council Development Control Plan for Wind farms, as indicated in Section 5.1.2 below.

5.1.2 Wind Power Generation Development Control Plan

The Upper Lachlan Shire Council Wind Power Generation Development Control Plan (DCP) was adopted on 22nd September 2005. Although the scale of the development (in excess of $30 million capital investment) has determined that the proposal would be assessed by the Minister for Planning, during the consultation process, Upper Lachlan Shire Council expressed interest in seeing how the proposal fits within the recommendations of the DCP. A summary of the DCP criteria is outlined below and the means by which the development would address these are provided in the right hand column.

Table 5.1 Items required by the Upper Lachlan Shire Council, as indicated in the DCP for Wind Power Generation

Item	Addressed in:
The EIS, as a minimum, should contain:	
1:25,000 maps showing proposed development, property boundaries, transmission lines, gradient, service roads, significant features (housing, heritage items, aircraft facilities).	Section 3
The location of wind turbine and associated infrastructure, native vegetation, access points.	Section 3
Description of wind turbines.	Section 3
Land use description of adjoining land including future use.	Section 5.1
Noise impact assessment and compliance to NSW DEC licences, reference to SA EPA wind farm environmental noise guidelines, monitoring to validate predicted noise levels.	Section 7.3
Visual assessment, including shadow flicker.	Section 7.2
Electromagnetic radiation and interference from the proposed infrastructure (health as well as TV reception issues).	Section 7.8 and 8.3
Construction program environmental management plan incorporating the staging of works, erosion and sedimentation controls, heavy vehicle movements, site access, weed controls, farm impacts and all other works.	Section 9
Evaluation of flora and fauna impacts.	Section 7.6
Decommissioning and site restoration plan.	Section 7.11 and 9
Relevant issues in the NSW EIA Guidelines and NSW Wind Energy Handbook.	Throughout document
Demonstration that all relevant agencies' issue have been addressed.	Section 6.2.2
Heritage significance of the site and surrounds (making reference to the LEP, Heritage Council, DEC, National Trust of Australia, Australian Heritage Council and draft Heritage Council of NSW wind farm policy.	Section 7.5 and 8.4
Assessment of the development regarding relevant legislation and policies.	Section 5

Item	Addressed in:
The development application should consider the following guidelines in design criteria and assessment of the wind farm:	
Sited and carried out to minimise impacts on normal grazing, farming, forestry.	Section 7.7
Carried out to minimise adverse impact on land degradation, drainage patterns, pollution of ground water, spread of noxious plants and animals and bushfire hazard.	Sections 7.6, 7.9 and 8.1
Assess and consult with council and community on the visual impacts.	Section 6
Assess the cumulative impact of the development in regard to existing and proposed wind farms (avoid large expanses of ridges covered with turbines).	Section 7.10
Comply with SA EPA noise criteria guidelines.	Section 7.3
Locate the development more than 15 times the blade tip height *(1.89km for this proposal)* or 2km (whichever is greater) from any lot that has been created for the purpose of a dwelling (or greater where the turbines will be significantly higher than such properties and will dominate the view).	Four non-involved premises are located within 2km of a turbine (refer to Table 5.2, below). Sections 7.2 and 7.3 assess visual and noise impact from nearby properties.
Locate the development more than 2 times the height of the turbine *(252m for this proposal)* from a formed public road (greater if required by the road authority).	Section 7.8.1
Locate the development more than 2 times the height of the turbine *(252m for this proposal)* from a non-related property boundary.	Figure 3.3
Turbine locations shall be sensitive to non-related dwellings surrounding the development. Existing and proposed screenings could be used to minimise visual impacts to existing and potential building lots.	Section 7.2
Turbine locations should not surround a non-related property.	Figure 3.4
Communications study should assess current conditions and potential impacts. If necessary the developer may be required to install additional services to maintain such services.	Section 7.8.3
The construction phase shall only occur on approved routes/roads which will be identified in the development application.	Section 7.8.1
Substantial investigations into the roads chosen should be undertaken (ARRB and gypsy camera).	A preliminary investigation has been completed (Section 7.8.1). Additional investigations would occur as required by RTA and DoP (refer to 9.1).

Item	Addressed in:
Bonds required for any potential damage to roads during the construction phase, road works required for the development will be at the developers cost.	A preliminary investigation has been completed (Section 7.8.1). Additional investigations would occur as required by RTA and DoP.
Internal roads shall be the responsibility of the developer, with proof supplied to council that they have been adequately designed.	Access tracks onsite would be the responsibility of the developer. Design details can be forwarded to council, upon request.
All infrastructure required for the wind farm should be included in the development application and located in low visual impact locations.	Section 3 and 7.2
Reference to relevant council and state acts, assessment guidelines and policies should be made (including the SA EPA noise guidelines)	Section 5 and throughout document
Council prefers to have a viewing area where safe vehicle and pedestrian movements can view the wind farm in a safe manner; the developer should liaise with council and RTA.	A viewing area is not currently part of the proposal.
Within six months of the wind turbine generators becoming redundant, any rights of carriageways that were constructed for maintenance should be extinguished by the developer, unless otherwise agreed to by the landowner.	Not applicable
Within six months of the wind turbine generators becoming redundant, they are to be fully dismantled and removed from the site by the developer.	Within 12 months of wind turbines becoming redundant, they would be removed and the site restored, Section 7.11

The proposal does not meet several items in the Upper Lachlan Development Control Plan for Wind Farms, September 2005. The most serious is considered to be the proposed location of turbines within 2km of premises (specifically, Illawambra and Faybri, refer to Table 5.2). The visual and noise assessments have provided mitigation measures that aim to reduce the level of impact at these premises to an acceptable level however, additionally, the proponent would commit to working with the owners of these premises to ensure that the mitigation of impacts is acceptable to them (refer to Section 9.1).

Table 5.2 Distances of closest turbine to nearby residences

Property name	Distance to nearest turbine (km):	
	Layout A	**Layout B**
C04 Illawambra	1.51	1.51
C37 Faybri	1.18	1.19

5.2 State Government legislation and policy

5.2.1 Part 3A approval process

The proposal is a Major Project which would be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). The approval process applying to Major Projects under Part 3A and the Major Projects State Environmental Planning Policy is described in Section 2.2.

Part 3A integrates the assessment and approval regime for all Major Projects that need the approval of the Minister for Planning, previously dealt with by Parts 4 and 5 of the Act. Projects approved under Part 3A of the *EP&A Act* do not require authorisations under the:

- *Fisheries Management Act 1994* (sections 201, 205 or 219, stop work orders);
- *Heritage Act 1977* (Part 4 or section 139);
- *National Parks and Wildlife Act 1974* (section 87, consent under section 90, interim protection and stop work orders);
- *Native Vegetation Act 2003* (section 12);
- *Rivers and Foreshores Improvement Act 1948* (Part 3A);
- *Rural Fires Act 1997* (section 100B);
- *Water Management Act 2000* (sections 89, 91);
- *Threatened Species Conservation Act 1995* (interim protection and stop work orders);
- *Protection of the Environment Operations Act 1997* (environment protection notices);
- *Local Government Act 1993* (orders under section 124).

5.2.2 Director General's Requirements

Under the *EP&A Act*, Determining Authorities are to consider 'to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity'. The Director General's Requirements that outline the form and content of the Environmental Assessment are attached to this document (Attachment 1.1). The following table summarises the requirements and where they are addressed in this report.

Table 5.3 Director General's Requirements: General and key issues and where each item is addressed in this Environmental Assessment (EA).

Director-General Requirement's: Key issues	Addressed:
Project Justification The Environmental Assessment must include a clear demonstration of quantified and substantiated greenhouse benefits, taking into account the proposal's capacity factor and identification of sources of electricity that could be realistically replaced and the extent of the replacement.	Section 4
Visual Impacts Comprehensive assessment of the landscape character/values of the affected areas and the visual impact of the proposal on this landscape and on the existing and approved residences, particularly within 2 km of the turbines. Consideration should be given to the Australian Wind Energy Association and Australian Council of National Trust's draft issues paper Wind Farms and Landscape Values. The assessment must also discuss/provide impact of blade "flicker" and blade "glint" on existing and approved residences and road users (including road safety matters) within 2 km of the turbines; "flicker vertigo" issues; proposed mitigation measures, including screening, turbine layout and location; photomontages of the proposal taken from strategic vantage points.	Section 7.2 and attached specialist study, Attachment 3.1.
Flora and Fauna The Environmental Assessment must address impact on critical habitats, threatened species, populations, ecological communities, and their habitats listed under the *Threatened Species Conservation Act 1995* and the *Fisheries Management Act 1997*; impact on birds and bats from strikes and alteration to movement patterns from the turbines and transmission lines. Assessment should consider the Australian Wind Energy Association's publication *Assessing the Impacts on Birds – Protocols and Data Set Standards*. An outline of an adaptive management program should be provided; vegetation clearing during construction and maintenance. The threatened species assessment must generally be in accordance with the DEC's Guidelines for Threatened Species Assessment. Where ecological offsets or compensation is proposed (eg compensatory habitat or rehabilitated areas), appropriate details of each offset option must be included in the Environmental Assessment, including implementation measures for each offset option.	Section 7.6 and attached specialist study, Attachment 3.4.
Archaeology/Cultural Heritage The Environmental Assessment must address the potential impact on Aboriginal heritage values and items and must generally be in accordance with the DEC's Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation.	Section 7.5 and attached specialist study, Attachment 3.3.
Operational Noise Comprehensive assessment of the noise impacts associated with the proposal (including 'infrasound') to be undertaken in accordance with the DEC's Industrial Noise Policy and Wind Farms – Environmental Noise Guidelines, South Australian Environment Protection Authority (February 2003). If any Noise Agreements with residents are proposed for areas where noise criteria cannot be met, sufficient information should be provided to enable a clear understanding of what has been agreed, and what criteria have been used to frame any Agreements.	Section 7.3 and attached specialist study, Attachment 3.2.

Director-General Requirement's: Key issues	**Addressed:**
Bushfire Risk The Environmental Assessment must address the potential for wind turbines to start/influence the pattern of bushfires, and include bushfire management strategies and measures in consultation with the Rural Fire Service and the local council.	Section 7.9
Traffic and Transport The Environmental Assessment must: identify transport routes to and from the project site, including details of any proposed upgrading or construction of road/access to the site; assess the construction traffic impact of the project in terms of capacity and safety of these routes and potential damage.	Section 7.8.1 and attached specialist study, Attachment 3.7.
Land Values/Development Potential Assessment of the potential impact of the wind farm on surrounding land values, including a prediction of expected land value changes as a result of the development in the short and long term. Any consequences for development of surrounding land.	Section 7.4.3 and attached specialist study, Attachment 3.6.
Community consultation Strategy for community consultation to keep affected landowners and communities involved and informed about the project, including proposed measures to address community concerns.	Sections 6.1, 6.3
Services and Infrastructure Assessment of potential impact on aircraft and telecommunications, roads, bridges, rail crossings and electricity infrastructure, in liaison with relevant authorities. In reference to aircraft, the assessment should consider the Civil Aviation Safety Authority Guidelines Draft Advisory Circular AC 139-18(0), December 2005, Obstacle Marking and Lighting of Wind Farms.	Section 7.8
Proposed substation and grid connection Discussion of connection agreements/approvals by Country Energy, including ownership and management of the connecting transmission line following construction. The implications (statutory and technical) of any shared arrangement of the site substation between the proposal and Gunning Wind Farm must be addressed.	Section 3.2.4
Cumulative impact Assessment of the cumulative effects of the proposal having regards to existing or other proposed wind energy facilities in the area.	Section 7.10
Decommissioning Discussion of the envisaged lifespan of the project and the Proponent's commitment, arrangements and necessary approvals for removal of the wind turbines and associated infrastructure at the end of the project's life.	Section 7.11

5.2.3 Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands

The Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (Fallding 2002) provides regional principles and planning settings to be considered in planning and development control decision-making. The Framework identifies key planning issues and conservation values relevant for 18 landscape units within the Southern Tablelands region. The Framework also provides recommended actions and impact assessment guidelines for threatened species and communities occurring in the region. The Framework has no statutory force, but is to be considered by decision-makers in development planning and approval processes.

The site occurs in the Goulburn landscape unit. Key features of the area include outstanding wetlands, box-gum woodlands and several threatened species listings (refer to Biodiversity Assessment attached to this report and summarised in Section 7.6, for a more thorough description of biodiversity values of the site and region and potential impacts to these values). Key planning issues include the growth of peri-urban and rural subdivision pressures around Goulburn.

The development is appropriate to harness the natural resources of the site (high wind speeds) without compromising the existing extensive agricultural land use (cattle and sheep grazing). Infrastructure would be sited such that it requires only minimal tree clearing and would not impact wetlands. The development is located on one ridge, close to existing transport corridors (Hume Highway and Old Hume Highway) and electricity easements and therefore is not incongruous with the existing infrastructure in the landscape. The potential impact of the proposal on future subdivisions has been considered. No subdivisions are proposed at this time (pers. comm. K. Reedy, Upper Lachlan Shire Council, March 1 2006). The visual and noise impacts on nearby residences have been considered within specialist reports (Visual Assessment, Section 7.2; Land Value Assessment, Section 7.4.3). While some impacts are anticipated, the level of impact was not considered to be unacceptable, with the implementation of mitigation measures.

5.2.4 Ecologically Sustainable Development (ESD)

Ecologically sustainable development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all state and territory governments endorsed the *National Strategy for Ecologically Sustainable Development*. In NSW, the concept has been incorporated in legislation such as the *EP&A Act* and Regulation.

For the purposes of the *EP&A Act* and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the *Protection of the Environment Administration Act 1991* outline the following principles which can be used to achieve ESD.

(a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

Table 5.4 Goulburn landscape unit planning and management issues

Description	**Land uses**
Largely defined by extensive, flat plains and rimmed and bisected by low to medium ranges, this unit also contains two ephemeral lakes. Low hills are dominated by Dry Forests. Several areas support Box-Gum Woodlands. Grasslands or Grassland-Woodland Mosaic occupies the major part of the region.	A major city, several small villages, rural sub-divisions, a major transport link, grazing, one small Crown reserve (Alison Hone Reserve).
Vegetation status	**Endemic features**
Dry forests on the ranges are partly cleared and fragmented. The Box-Gum Woodlands and Grassland-Woodland Mosaic have been severely cleared or modified. The Grasslands are highly cleared, modified and fragmented. There are: • Several samples of Box-Gum Woodland and Grassland of exceptional diversity and integrity, including the outstanding Gundary TSR and Woodland at Kenmore Dam; • Other excellent examples of Box-Gum Woodland, Grassland and Grassland Woodland are at Collector and Lerida TSRs, Rose Lagoon and Tarago Cemetery; and • Wetlands of outstanding quality at Rose Lagoon, Breadalbane, Lake Bathurst and the Morass.	This unit contains: • Two ephemeral lakes of considerable significance for wildlife • The northernmost regional population of Striped Legless Lizard • One of the largest, and the northernmost known population of Button Wrinklewort • The northern-most and quite isolated population of Creeping Hopbush • Along with Marulan, one of the two regional populations of Dwarf Kerrawang • Along with Bungendore, one of the two regional populations of *Wilsonia rotundifolia* (a wetland forb)
Known threatened and important species and endangered ecological communities	**Planning and management issues**
Plants: Button Wrinklewort, Buttercup Doubletails, Creeping Hopbush *Wilsonia rotundifolia*, Dwarf Kerrawang, Golden Moths Orchid, Hoary Sunray (white form), Australian Anchor-plant **Mammals:** Koala, Eastern Quoll (old records), Bilby (a dubious old record) **Birds:** Blue-billed Duck, Freckled Duck, Magpie Goose, Australasian, Plains-wanderer (an old record), Latham's Snipe, Australasian Bittern, Glossy Black-cockatoo, Superb Parrot, Powerful Owl, Speckled Warbler, Hooded Robin, Brown Treecreeper, Regent Honeyeater, Diamond Firetail **Reptiles and frogs:** Rosenberg's Monitor, Striped Legless Lizard, Green and Golden Bell Frog (old records) **Vegetation communities:** Natural Temperate Grassland, White Box - Yellow Box - Blakely's Red Gum Woodland	In this unit there are • considerable peri-urban and rural sub-division pressures surrounding the city of Goulburn Consists primarily of planning settings D and B (See Part 5 of report).

(c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The aims, structure and content of this EA have incorporated these principles.

The precautionary principle has been adopted in the assessment of impact; all potential impacts have been considered and mitigated where a risk is present. Where uncertainty exists, measures have been suggested to address it. The majority of potential impacts of the proposal are likely to be localized and would not diminish the options regarding land and resource uses and nature conservation available to future generations. The reversibility of the proposal has been specifically addressed in Section 7.11. The impacts of the proposal on local populations of threatened species, threatened communities or their habitats have been assessed in detail in the attached Biodiversity Assessment (summarised in Section 7.6). Due to the lack of certainty about bird and bat strike, monitoring has been incorporated into the Statement of commitments. Parameters such as the site's soil, hydrology and native vegetation have been valued in terms of their broader contribution to the catchment and catchment processes.

The Draft Statement of commitments in Section 9.2 provides an auditable environmental management commitment to these parameters.

Based on the social and environmental benefits accruing from the proposal at a local and broader level, and the assessed impacts on the environment, it is considered that the development would be ecologically sustainable within the context of the above ESD principles.

5.3 Commonwealth legislation

5.3.1 Environment Protection and Biodiversity Conservation Act 1999

This Act provides for a Commonwealth assessment and approvals system for:

a) Actions that have a significant impact on 'matters of national environmental significance';
b) Actions that (indirectly or directly) have a significant environmental impact on Commonwealth land; and
c) Actions carried out by the Commonwealth Government.

A proposal requires the approval of the Environment Minister if an action is likely to have a significant impact on a matter of national environmental significance or listed as a matter of national significance which includes:

i) World Heritage Properties,
ii) Wetlands of International Importance (Ramsar wetlands),
iii) Commonwealth Listed Threatened Species and Ecological Communities,
iv) Commonwealth Listed Migratory Species,
v) Nuclear action,
vi) Commonwealth marine areas, or
vii) Commonwealth land.

The Act aims to ensure the conservation and recovery of flora and fauna species and communities at a state and national level. Schedules 1 and 2 list species and communities that are endangered, vulnerable or presumed extinct. Schedule 3 outlines key threatening processes.

A search for Matters of National Environmental Significance based on the study area and a 30 kilometre buffer was undertaken using the Commonwealth Government's Protected Matters Search Tool. This tool covers World Heritage properties, National Heritage places, significant wetlands, migratory species, nationally listed threatened species and communities and other matters protected by the EPBC Act. The report generated by the Matters Commonwealth Government's Protected Matters Search Tool is provided in full in Attachment 3.5. A summary table of the findings is presented below.

Table 5.5 Protected Matters Search (30km buffer around the site)

Item	Number
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas	0
Threatened Ecological Communities	2
Threatened Species	16
Migratory Species	6

The wetlands of international significance that are listed do not occur within 30km of the study site. These are Fivebough And Tuckerbil Swamps which occur in the Riverina district and would not be impacted by the proposal. Two Threatened Ecological Communities (EECs) occur, these being Grassy White Box Woodlands and Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory. The former community occurs onsite. Sixteen threatened species are listed as either occurring or having potential habitat in the area. Nine migratory bird species are listed as either occurring or having potential habitat in the area. The impact of the proposal on EECs, threatened species and migratory was considered in the Biodiversity Assessment, attached in full in Attachment 3.4 and summarised in terms of impact assessment in Section 7.6 of this document. The likelihood of significant adverse impact on these features is considered to be low, if mitigation measures outlined in this report are implemented.

The proposed development is not considered by this assessment to impact on World Heritage Properties, Wetlands of International Importance (Ramsar wetlands), Commonwealth Listed Threatened Species and Ecological Communities, Commonwealth Listed Migratory Species, Nuclear action, Commonwealth marine areas, or Commonwealth land. Due to the expressed interest of the Department of Environment and Heritage in wind farm projects (A. Rankin, DEH, letter to Taurus Energy, 23 Jan 2006), utilising the precautionary approach, a referral was made to DEH on the basis of potential impact to Commonwealth listed threatened species, communities and migratory species (referred 3 March 2006). On May 4 2006, the Federal Minister for the Environment, Ian Campbell, determined that the proposed action (development of a wind farm at Cullerin) is not a controlled action pursuant to Section 75 of the *EPBC Act 1999* and therefore, that significant impact on matters of national significance is not expected as a consequence of the proposal.

5.3.2 Protection of the Environment Operations Act 1997

Electricity generating works over 30MW require a license under this Act. The wind farm would not exceed 30MW.

Concrete batch plants exceeding production of 150 tonnes per day or 30,000 tonnes per year require a license under this Act. The concrete batch plant would produce up to 250m^3 of concrete per day. The maximum operational period would be 6 months. In total, the plant would produce approximately 8,750 m^3 of concrete. These volumes equate to 575 tonnes per day and 20,125 tonnes per year. The batch plant would therefore require a license to be issued by DEC, given the amount exceeds the license threshold of 150 tonnes per day (but not 30,000 tonnes per year). License conditions specified by DEC are likely to include operational protocols and monitoring (pers. comm. M. Rizzuto, DEC April 27, 2006).

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6 CONSULTATION

6.1 Consultation plan

Wind farm developments and approvals in Australia have elicited polarised responses from the community, highlighting the need to appropriately identify and consult with all stakeholders early in the development process. Taurus Energy has informed and consulted with the local community and government stakeholders during the planning and development of the Cullerin Range wind farm proposal. A consultation plan was developed and implemented (Table 6.1). Methods of consultation have included release of media statements, newspaper advertisements and in-person meetings (including onsite meetings, teleconferences and open house sessions*).

Table 6.1 Consultation plan

Stakeholder	Method of Consultation	Timing
Involved land owners / occupiers All land holders / occupiers that may have wind turbines or infrastructure occurring on their land.	• Contact landholders and occupiers by phone or in person • Discuss details of the proposed work • Discuss environmental assessments and onsite meetings that will occur • Provide with means to communicate concerns / issues (Taurus and ngh phone number, address, website) • Send formal consultation letter containing the details of the proposed work, plan for environmental assessments and onsite meetings, copy of the consultation process plan • Invite to all open house* sessions	August 2005 November 2005 February 2006
Nearby land owners and occupiers All landowners / occupiers within an 8km radius of the site for which addresses could be found. (Approximately 38 properties, details obtained from Upper Lachlan Council).	• Send formal consultation letter containing the details of the proposed work, plan for environmental assessments and onsite meetings, copy of the consultation process plan and means to communicate concerns / issues (Taurus, ngh, Council contact name, phone number, address, website) • Invite to all open house* sessions	August 2005 November 2005 February 2006
Aboriginal community Local Aboriginal Land Councils contacted Liaison with DEC	• Notification via local newspapers, advertising the details of the proposed work • Inclusion of interested parties in the field assessment	October 2005 November 2005

Stakeholder	Method of Consultation	Timing
Wider community General community	• Notification via local media (newspapers, local newsletters), advertising the details of the proposed work, environmental assessments and onsite meetings that will occur, means to communicate concerns / issues (Taurus and ngh phone number, address, website), dates and purpose of open house* sessions	September 2005
	• Open house* session 1 to introduce the proposal and invite community feedback	November 2005
	• Open house* session 2 to relate the findings of the specialist studies and the final proposal details	February 2006
Local Council Upper Lachlan Council Richard Davies (Environmental Services), Ken Reedy (Director of Works), John Bell (General Manager).	• Initial Meeting to introduce the proposal, and obtain comments relevant to the proposal	August 2005
	• Invite to onsite Planning Focus meeting	November 2005
	• Provide with a summary of comments from community open house* sessions	March 2006
	• Liaison to keep abreast of proposal changes and findings of assessments	
Consent authority Department of Planning, Sydney	• Initial Meeting to discuss the proposal, and obtain comments relevant to the proposal	September 2005
	• Planning Focus meeting held onsite to discuss the proposal with government stakeholders	November 2005
	• Lodgement of Project Application, outlining the proposal and key impact areas and requesting the Director General's Requirements for the Environmental Assessment	December 2005
	• Lodgement of the Environmental Assessment	March 2006
Government Agencies Department of Natural Resources, Department of Agriculture, Department of Environment and Conservation, Local Council, Lachlan Catchment Management Authority, Rural Fire Service, Roads and Traffic Authority (RTA) and the Civil Aviation Safety Authority (CASA).	• Invited to attend the onsite Planning Focus meeting to discuss issues relevant to each agency	November 2005 – February 2006
	• nghenvironmental liaise with representatives from relevant agencies as necessary during the specialist studies and preparation of the Environmental Assessment	

**refer to 6.2 discussion of the open house format, below.*

6.2 Government consultation

6.2.1 Initial meetings

Taurus Energy and **ngh**environmental consulted with Upper Lachlan Shire Council in person (R. Davies, K. Reedy, J. Bell; 10 August, 2005) in order to better appreciate the local issues associated with development of wind farms in the locality. The council were also invited to attend an onsite Planning Focus Meeting with other agencies.

Taurus Energy met with the consent authority, the Department of Planning, formally on September 8, 2005, introducing the Cullerin proposal and seeking advice on the assessment process. The department participated in the onsite Planning Focus Meeting with other agencies, described below.

6.2.2 Planning Focus Meeting (PFM)

The Planning Focus Meeting (PFM) was held onsite at Cullerin on November 10, 2005. Comments from the representatives of the agencies who participated were sought in order that impacts relevant to each agency be addressed by the proposal. Participants at the meeting included:

- Neville Osborne, Department of Planning
- John Bell, Ken Reedy and Richard Davies, Upper Lachlan Council
- Mathew Rizzuto, Department of Environment and Conservation
- Col Hackney, Country Energy
- Nick Graham-Higgs and Brooke Marshall, **ngh**environmental
- Andrew Durran, Martin Poole and Anthony Micallef, Taurus Energy

Meredith McIntyre from the Department of Planning, Queanbeyan was unable to attend the meeting. Representatives from the Catchment Management Authority (CMA), Roads and Traffic Authority (RTA) and the Civil Aviation Safety Authority (CASA) were invited to attend but declined. These organisations advised that they would liaise directly with the Department of Planning.

Comments from agencies participating in the PFM are summarised in Table 6.2.

Table 6.2. Key comments by agencies at the Planning Focus Meeting

Agency	Key issues
Department of Planning	• Introduced the Project Application (preliminary assessment) and Environmental Assessment (more intensive environmental assessment) process under the new Part 3A of the Environmental Planning and Assessment Act 1979 legislation • Invited the agencies to respond formally with their comments
Upper Lachlan Council	• Proximity to uninvolved residences (less than 2km) • How the proposal stacks up against the Council's LEP and wind farm DCP (evidence that the issues in the DCP have been addressed) • What are the benefits to the community (Delta provided road upgrades and community services) • Access arrangements and the potential damage to roads (traffic study required) • The potential for ongoing jobs and employment opportunities, role during construction for local manufacturers • Visual and noise impacts • Community consultation (5km radius mail out to residents required) • Viewing platform advised (liaise with RTA and council for a safe location) • Heritage issues (bridge near Old Hume Highway that will be used – liaise with Australian Railway and Track Corporation) • TV coverage impacts (patchy already).
Rural Fire Service (did not attend Cullerin site)	• Access to the site in the event of a fire • Potential for containment lines • Potential for the substation to start a fire (if the power station caught on fire, it would be a NSW fire brigade issue, due to the hazardous materials, with RFS involved in a support role) • Hot welding in fire danger periods – fire suppression required • Commented that the development was not substantially different to other infrastructure risks in the area so no large issues as far as the RFS was concerned • The ability to address these issues in the Statement of commitments was discussed
Country Energy	• Connection agreements and approvals • Private ownership of powerlines would be an issue • Usual arrangement is that the proponent creates assets and then vests them with CE to manage.

Agency	Key issues
Department of Environment and Conservation	• No statutory role if the development remains below 30MW – no scheduled activities • Concrete batch plant may require license, determined by volume • Noise (need to assess in a manner consistent with other developments of this type) • Heritage • Biodiversity – DEC will liaise directly with DoP • Recommends that the following technical guidelines be adopted: o *Wind farms – environmental noise guidelines* (South Australia EPA, 2003) o *Industrial noise policy* (NSW EPA, 2000) o *Draft guidelines for Aboriginal cultural heritage impact assessment and community consultation* (DEC July 2005) o *Draft guidelines for threatened species assessment* (DEC and DPI July 2005)

6.2.3 Further correspondence

Road and Traffic Authority (RTA)

In a letter received on 19th December 2005, the RTA requested the completion of a traffic impact study (see letter, Attachment 2.1) for the Cullerin Range wind farm proposal. The applicant was advised to particularly address:

- Access arrangements to and from the wind farm,
- Construction traffic impacts, and
- An assessment of the road safety impacts associated with locating wind turbines adjacent to the road reserve, including the impact of light flickering through the blades.

These issues were addressed via a preliminary traffic assessment, summarised in Section 7.8.1 and attached in full in Attachment 3.7).

6.3 Community consultation

6.3.1 Open house format

The Cullerin community consultation process was based on in-person contact between the community, Taurus Energy and consultants contracted to investigate the environmental impacts of the proposal. The local community was invited to participate in two open house sessions. The first session introduced the proposal in its initial form, and invited community feedback by way of feed back forms. The second session presented the results of the specialist studies (separate reports detailing visual, noise, archaeological, biodiversity, traffic and land value assessments). This information was used to shape the final details of the proposal.

The open house format aims for a two way dialogue between the proponents and the community. It runs for several hours to allow people to drop in as is convenient to them. It focuses on one-on-one discussions in preference to presentations, where possible.

An open house format can be helpful in avoiding the stress and heat of a public meeting for contentious issues, allowing a flow of stakeholder dialogue throughout the event rather than a more constrained discussion that can be hijacked by the most vocal individuals. While there remains a potential for this to occur with an open house, it is easier to manage given the more diffuse flow of traffic. This allows for a larger proportion of stakeholders to voice their individual concerns with the relevant representatives in a less confrontational situation, allowing interested parties to find out about issues at their own pace without the pressure of speaking before a large group of people. It also allows the presentation of issues and information to be tailored to individual queries.

6.3.2 Open house session 1

The first community consultation session was held at the Gunning Function Hall, 18 Warrataw Street, Gunning, on the 17th November, 2005; from 2-7pm. A media release was sent to the Goulburn Post (14, 16 November) and Yass Tribune (9, 16 November). In addition, invitation letters were mailed to 38 residents within 8km of the site.

The community consultation received a high level of community attention. Approximately 10-15 people demonstrated at the site proposed for the wind farm during the agency Planning Focus Meeting on November 10, 2005 and spoke to staff from Taurus Energy, nghenvironmental, and local and state government representatives after the meeting. Members of the community also put up posters in Gunning advertising the first open house to encourage people to attend the event and set up a table to discuss adverse impacts of wind farms outside the venue on the day.

On hand to answer questions were Andrew Durran and Martin Poole (Taurus Energy – issues specific to the proposal), Nick Graham-Higgs and Brooke Marshall (nghenvironmental – issues specific to environmental impacts and the assessment process) and Philip Hutchinson (Scenic Landscape Architecture – issues specific to the visual impact assessment). Three lap tops and one overhead projector presented rolling displays of the proposal. Several maps of the area and of the proposal were wall-mounted so that participants could determine their proximity to the proposal and be talked through the proposal. Wind farm fact sheets and an example of a wind farm environmental assessment document were also available. Tea, coffee and seating were provided and participants were encouraged to stay and discuss their concerns.

The recording of public input from an open house can be difficult due to its loose structure. It is also staff intensive. These issues were addressed by using an array of recording tools; blank paper for community members to write on, structured feedback forms for them to fill in, and by discussing comments directly.

Results

Thirty-eight members of the local community registered at the open house; the majority were drawn from Gunning, Cullerin, Breadalbane and Collector. The flow of traffic over the day was diffuse and it is highly likely that all 38 participants were able to discuss the proposal either individually or in a small group. The most frequently raised issues were visual impacts, noise impacts, land value impacts, impacts to stock (including horses) and wildlife (including eagles and water-fowl) and impacts on the community. A diverse range of views were present, from liking the look of the turbines, liking the sustainability of wind energy production, to not agreeing that wind farms were a valid contribution to energy demand, viewing the look of the turbines as an unacceptable industrialisation of the landscape, and being neutral in opinion.

One respondent commented that community disruption could be addressed better if affected landowners were able to share in the profits. Concerns were raised that the shadow flicker may affect traffic on the highway. Liability for decreasing land values was raised. It was commented that the spiritual connection with the area would be affected and also that in an historical area, the development would be an inappropriate industrialisation of the landscape.

Fifteen community feed back forms had been returned by December 31, 2005. Five additional submissions were received by post / email; hence, around half of the open house participants lodged some form of written feedback. The collated results of the feed back forms and issues raised in the submissions are summarised below (all questions on the feed back form have been included in the summary). While surveys can be biased, over representing those individuals who feel strongly for or against or are more articulate about their concerns, the survey was effective in identifying the broad range of issues of concern to the community.

1. Where would you take some one to show them a good view of your local area (list as many places as you can think of).

This question was intended to identify scenic areas in the locality and therefore the appropriateness of the site for establishing a wind farm that may affect this quality. Many respondents entered their own property, highlighting that their views are a valued characteristic of the area. Results were spread out with no area attracting more than two nominations. The undulating landscape may lend itself to valued viewpoints from many locations.

	Tally
'Wodonga', Gunning	2
The ridge/range above Collector, looking down on Lake George	2
Wet lagoon on Collector Road	2
The Cullerin Range	2
Gun Range, Enniskellen, Cullerin	2
Collector- Breadalbane Rd	2
Breadalbane-Gurrundah Rd	2
Old South Rd, Breadalbane	2
Bannister Lane	1
Grabben Cullen Road	1
Gundaroo Road	1
Biala	1
Crookwell Road	1
Old Hume Hwy to Goulburn	1
'Big Hill', Gunning	1

	Tally
Old Hume Highway	1
Parkesbourne	1
Local river	1
Wind farms in the area	1
'The Towers' property	1
3 years in the future	1

2. What do you value the most about the local area:

Respondents favoured views and the cultural landscape of the area, foremost.

	Tally
Views	11
Cultural landscape	11
Work	7
Recreation opportunities	6
Natural environment	2
Community / people	2
Country lifestyle / quality of life	2
Unpopulated and minimal tourism	1

3. What is your interest in the local area:

Most respondents were involved in commercial agriculture and lived and worked nearby. Nonetheless, their primary values (Question 2) related to views and the cultural landscape over the work and residential opportunities in the area.

	Tally
Agriculture	
commercial or	11
hobby farm	1
Recreation / tourism	3
Live nearby	6
Work nearby	5
Somewhere to retire	1

4. Which statements describe you (tick all those that apply)

Most respondents anticipated that they would be able to see the wind farm from their property.

	Tally
I am a landowner on whose property the wind farm may be located	0
I would see the wind farm from my house	5
I would see the wind farm from my property	11
I am a resident of the area in which the wind farm may be located	8
I would see the wind farm from a place of recreation.	5

5. If you have concerns about this wind farm, what aspect would have the biggest impact on you?

Most respondents were concerned about the visual impact of the proposal. Land values, electrical interference and noise were also cited.

	Tally
Visual	7
Decrease on land values	4
Electrical interference	3
No concerns	3
Noise	3
Community benefits / impacts	2
Shadow-flicker	1
Bushfire potential	1

6. What do you <u>like</u> about wind farms, in general?

Most respondents nominated little or nothing was liked about wind farms. Others liked the look of the turbines and environmental benefits.

	Tally
Very little or nothing	4
The look of the turbines	3
Environmental benefits	2
Using natural resources	2
Engineering	1
No fossil fuel consumption	1
Community good	1
Ability for each household to have a small one for their own needs	1

7. What do you dislike about wind farms, in general?

Visual impact was of most concern with several people also questioning the efficiency and reliability of the energy produced.

	Tally
Visual impact on rural landscape	10
Inefficient / unreliable source of electricity	7
Depreciation of land values	4
Noise	4
Community disruption	3
Shadows	2
No concerns	2
Electrical interference	2
Questionable methods by which they are promoted	2
Decommissioning issues	1
Affect on historic landscape	1
Moving structure is eye-catching	1
Flora or fauna impact	1
Impact on environment	1

8. Do the following issues concern you?

Asked to nominate issues of concern under broad headings, the following results were obtained.

		Tally
Environmental		
	Flora and fauna (including stock)	5
	Lack of short and long-term research on effects	2
	Peace and tranquillity of the range changed	2
	Lightning impacts (Cullerin range lightening prone)	1
	Easements for power lines pollute landscape	1
	Infrastructure footprint	1
Visual		
	Change of visual landscape	7
	Movement catches attention	1
	Not concerned, they are majestic	1
	Size	1
Heritage		
	Historic landscape affected	4
	Sense of place and belong affected	2
Noise		
	Concerned about impact on residents within 2km	3
	Start-up and shut-down noise (continuous noise would be better)	1
	Background noise amplified by hearing impediment	1
	Impact on quiet country life style	1
	Don't have enough information	1

		Tally
Recreation		
	Hills will be ruined	1
	Horse riding, bird watching, bushwalking and photography would be spoilt	1
Health		
	Noise impact on sleep	3
	Lack of short and long-term research on effects	3
	Shadow flicker	2
	Visual	1
	Mental health due to community division	1
Other		
	Telecommunication interference	3
	Misinformation from proponents, secretive way the proposal is being put forward	3
	Devaluation of the land	2
	Removal / repair of turbines, who is liable	2
	Power lines	1
	Area being bombarded with proposals with no coordinated community approach	1
	Profit would go overseas	1
	Emphasis should be to conserve not put up outdated wind turbines	1
	Night lighting would mean no relief from visual impact	1
	Flawed environmental assessment process	1
	Open house was aimed at construction impacts	1

Additional submissions

Five additional submissions were made (three by post, two by email). All five were strongly against the wind farm proposed for Cullerin although four stated sympathy with green energy alternatives. The issues raised by the submissions were incorporated into the summary above.

The issues raised in the community consultation process assisted the identification and investigation of issues in this EA. This included contracting a land value impact study on land surrounding the existing Crookwell wind farm and investigating potential impacts of the proposal on horses kept near the site, historic features in the area and contacting a local authority on fauna issues. The open house session was particularly useful for identifying viewpoints from which to construct photomontages of the proposal when investigating the visual impact on residences in the area.

6.3.3 Open house session 2

The second community consultation open house session was held at the Shire Hall, Copeland Street, Gunning, on the 28th February 2006. A media release was sent to the Goulburn Post (15, 22, 24 and 27 February 2006) and Lions Newsletter (by 17 February 2006). In addition, invitation letters were mailed to 57 nearby residents (56 by post, one by email), including all those who registered their addresses at the first open house. This invitation included an update of the project, assessment process and invited feedback (refer to Attachment 2.2).

The open house was held over 4 hours, from 3-7pm. On hand to answer questions and discuss the proposal were Andrew Durran, Martin Poole and Anthony Micallef (Taurus Energy – issues specific to the proposal), Nick Graham-Higgs and Brooke Marshall (nghenvironmental – issues specific to biodiversity, general environmental impacts and the assessment process), Philip Hutchinson (Scenic Landscape Architecture – issues specific to the visual impacts) and Gustaf Reutersward (Heggies Australia– issues specific to the noise modelling).

The objective of the second open house session was to make available and discuss the completed specialist studies with the community. Changes to the proposal based on the specialist studies were also discussed. Stand-alone specialist reports were available online one week prior to the event (visual, noise, biodiversity, archaeology, land value, traffic and transport - their availability was advertised in invitation letters). Hard copies of each report were available to view at the open house and CDs containing these reports were disseminated on the day. A Specialist Study Summary leaflet was handed out. Thirteen photomontages showing how the turbines would appear from locations between 1 and 10km from the wind farm were wall-mounted. Refreshments and seating were provided and participants were encouraged to stay and discuss their concerns. Several hard copies of specialist reports were mailed out on request.

Results

Thirty participants registered at the second open house session. Most were from the local area: Gunning, Cullerin, Breadalbane and Collector. The flow of traffic over the day was concentrated in the last 1-1/2 hours, making registration and discussion of issues on a one to one basis difficult during this time. Hence, not all those who attended registered; it was estimated that 40-50 people attended.

Representatives of Taurus Energy and consultants spoke to at least six people each about the proposal; discussing the results of the specialist reports, the proposal, and answering questions to the best of their ability. While several people voiced support or no concerns over the proposal during discussions, the majority of those attending the latter half of the event had strong concerns. A demonstration was organised to coincide with the open house and a petition was signed.

Formal feed back was not specifically invited at the open house, as the purpose was to explain and discuss the impacts of the proposal. Paper was made available for comments however, and participants were advised that written submissions and petitions could also be sent to the Department of Planning. One person submitted a comment to nghenvironmental on the day; this was in support of the proposal.