Submission
No 42

INQUIRY INTO RURAL WIND FARMS

Name: Mr Ben van der Wijngaart

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The Director
General Purpose Standing Committee No 5
Legislative Council
Parliament House
Macquarie St
Sydney NSW 2000.

SUBMISSION INTO INQUIRY INTO RURAL WIND FARMS

Dear Sir/Madam

I enclose the following submission in response to the Inquiry into Rural Wind Farms.

I have recently concluded my appointment as head of a Working Group appointed by the Southern Councils Group earlier this year to conduct a high-level preliminary investigation of a community–based wind-power generation on the South Coast of NSW. This concept study involved interviewing a range of government, scientific, industry and community interests in the area of community based and, to a lesser extent, commercial wind power. The resultant 80 page report has been submitted to the Southern Councils Group and member councils for consideration.

As much of what was investigated may have a direct bearing on the Legislative Council inquiry, I have provided the attached submission based heavily on the information gathered in the concept study, but also sourced from other references. However, the Inquiry Committee might note that the opinions expressed in this submission are mine and should not be regarded as a submission by the Southern Councils Group or the Kiama Municipal Council of which I am a councillor.

Having said that, the submission points are entirely in accord with the Concept Study outcomes.

I may be contacted by email on g

Yours faithfully,

Ben van der Wijngaart

Enclosure:

1. Rural Wind Farm Inquiry Submission – B.H. van der Wijngaart

RURAL WIND FARM INQUIRY SUBMISSION
B.H. VAN DER WIJNGAART

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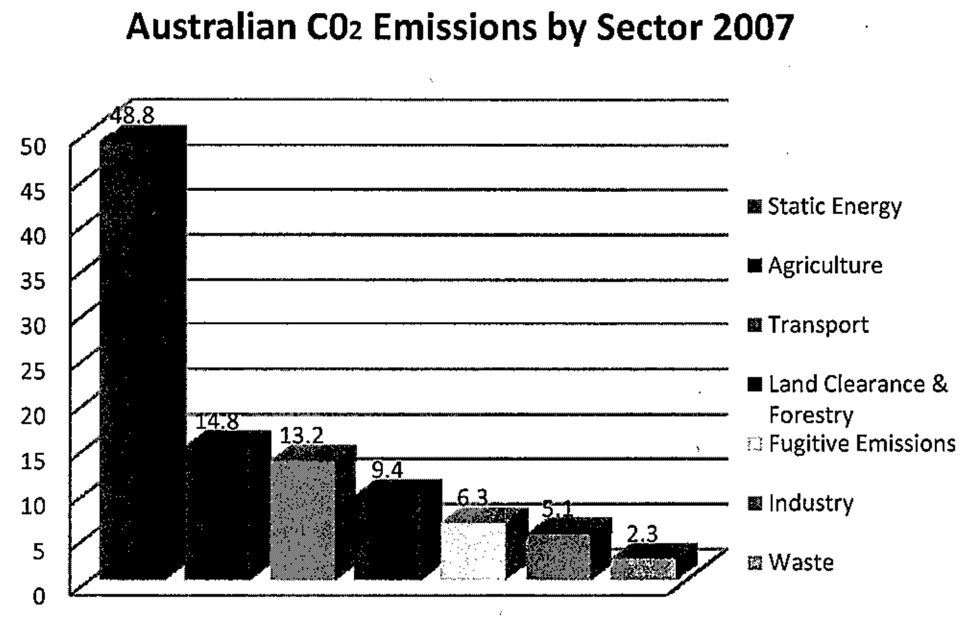
Role of Utility-scale Wind Generation

Green House Gas Reduction

1. The major contributor to CO_2 emissions in Australia is the generation of static power, because this is heavily based on coal power generation – some 48.8%[1] (See Figure 1). Even gas power generation is a high emitter, albeit about half that of coal.



Source: Australian Greenhouse Gas Office - National GHG Inventory 2009

Figure 1 - Percentage CO_2 Emissions by Sector - 2007

2. From a Climate Change perspective, therefore, tackling static power generation presents a constructive area of endeavour.

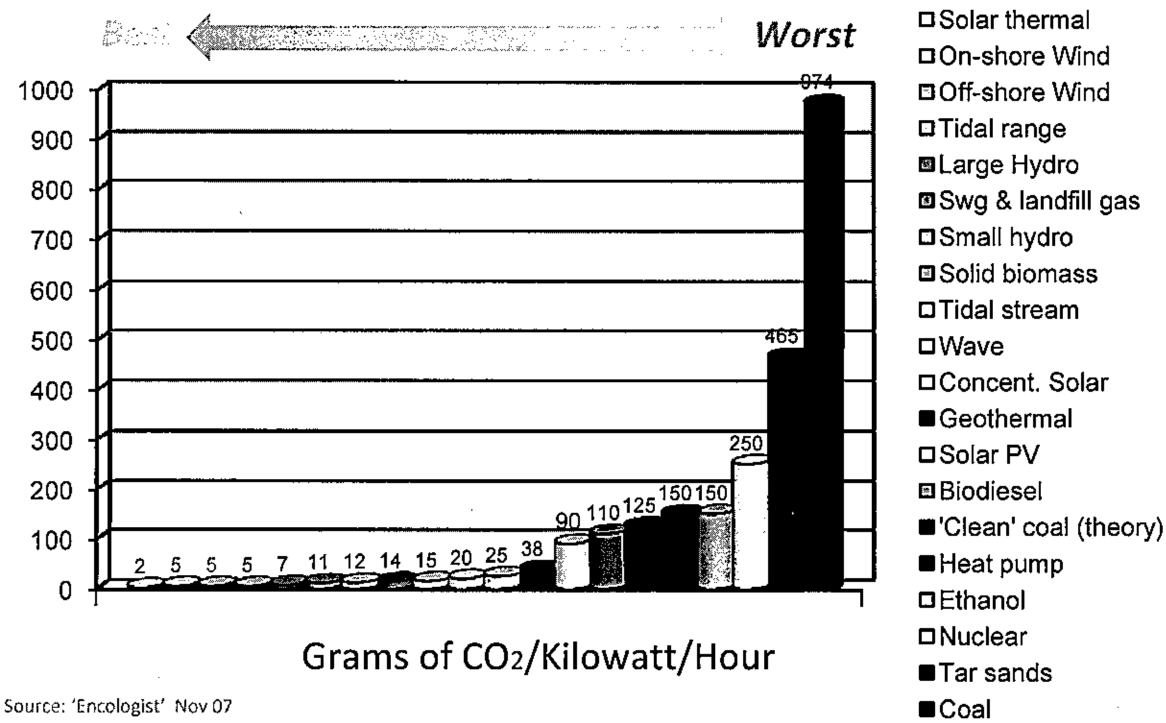
Energy Generation Carbon Footprint Comparisons

3. Renewable energy production is an urgent necessity and one where known and rapidly deployable technologies need to be afforded priority consideration – both for reasons of Climate Change but particularly for the immediacy of Peak Oil. Delays, globally and particularly in

[1] *Australian Greenhouse Gas Office - National GHG Inventory 2009*

Australia, in undertaking initiatives to address Climate Change also demand resorting to renewable technologies that get the best results quickest.

4. Lifecycle carbon emissions comparisons between various technologies are relevant. Figure 2 shows the relative efficiencies in terms of grams of CO_2 per kilowatt hour of various energy sources. Solar thermal, wind power and tidal power are clear winners in this field with between 2-5 grams per kilowatt hour compared with coal, the worst, at 974 grams per kilowatt hour (this may vary a little depending on the type of coal). Natural gas, although not shown, is about the same as tar sands. In any event this is a rapidly diminishing resource.



Source: 'Encologist' Nov 07

Figure 2 - Lifecycle Carbon Comparisons

5. A typical new 50Megawatt wind farm avoids between 65,000–115,000 tonnes of CO_2 emissions a year — equivalent to leaving thousands of tonnes of coal in the ground each year.

Energy Return on Energy Investment

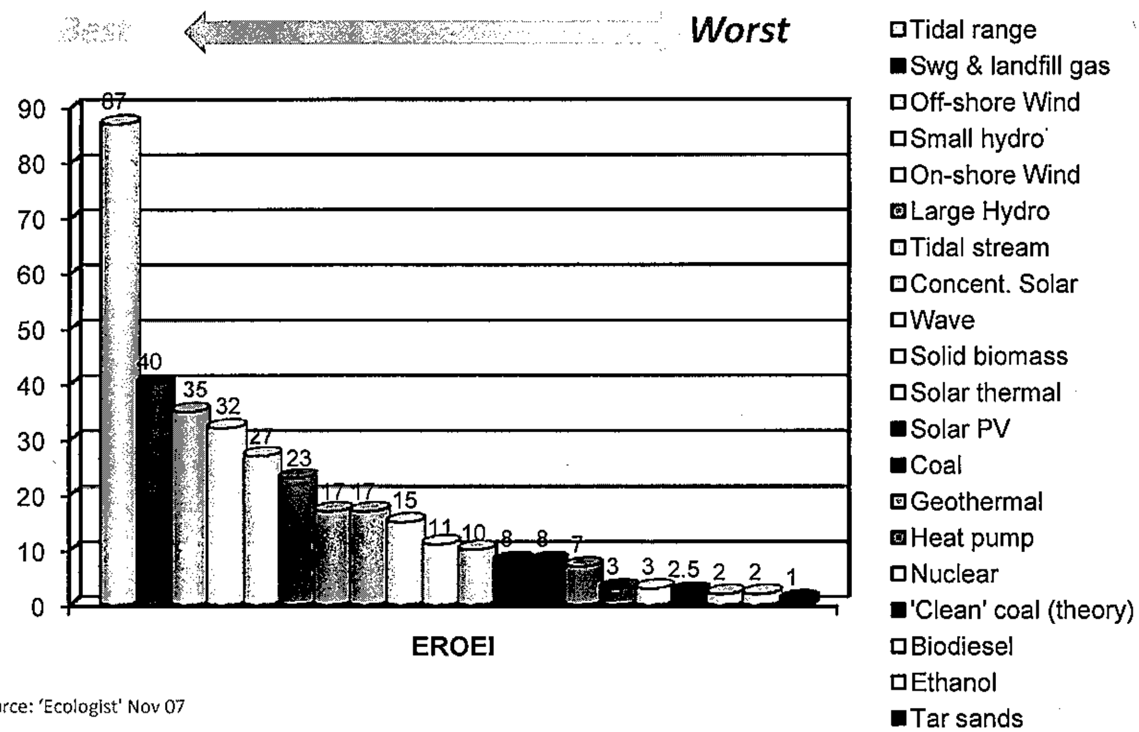
6. While some technologies may appear superficially attractive, their utility needs to be assessed on the basis of the energy needed for:

  a. the development and operation of their plant,

  b. the extraction, processing and transport of their fuel source, and

  c. the disposal of their waste.

7. Viewed on this basis, (see Figure 3) current fossil-based and nuclear technologies rate very poorly, with the worst, tar sands requiring as much energy (in the form of natural gas) for its extraction and refinement as it produces in terms of energy output. Tidal stream, biogas, wind and small hydro rate multiple factors of efficiency better. This is not surprising when considering these only demand energy in their construction and limited maintenance and require no 'fuel' to run.



Source: 'Ecologist' Nov 07

Figure 3 - Energy Efficiency Ratings

8. Another aspect of return on investment is the relative cost of getting small and large installations operating. These costs for smaller installations can be relatively lower per Megawatt of output, compared to larger installations that require much higher installation costs and economies of scale, which limit them to larger single operating sites.

Known Technology

9. While some renewable energy production technologies fare well under the preceding two criteria of carbon footprint and efficiency, they are still nascent development technologies and have not been proven on a wide commercial scale. This is the case with wave power.

10. Tidal power is better developed, but axial systems are essentially only at the pilot stage. The more developed barrage systems also have only very limited commercial sites yet operating (three known sites). While tidal energy is more reliable than wind it requires very specific sites. Tidal stream systems need to be located in areas with fast currents where natural flows are concentrated between obstructions; for example at the entrances to bays and rivers, around rocky points, headlands, or between islands or other land masses. Few of such sites exist on the South coast and the tidal ranges are also not optimal.

11. Other technologies that are better developed and very efficient, such as solar thermal and biomass/waste gas power, are relatively more expensive to deploy and require a substantially greater footprint, relative to wind power.

12. Only off-shore and on-shore wind power stand out as a known, proven technology that has operated commercially in a modern context for over 30 years and is both highly efficient and presents a low carbon footprint. These comparisons will change over time as other renewable

technologies develop; but for the immediate future wind power is the best bet to ensure rapid, low risk, quick return investment of available resources.

Producing Off-Peak and Base Load Power

13. The myth that wind power, or for that matter other renewable energy resources, being unable to produce base-load power or that it is intermittent, is often propagated by the coal and nuclear industries to foster their own interests. Also, while the term baseload power is often quoted, it is commonly misunderstood.

14. Professor John Quiggin, of QUT, a highly respected Australian economist, makes the following relevant observations on the concept of baseload power[2]:

> *'There is no relevant sense in which baseload power demand is a meaningful concept in our current electricity supply system. Any electricity supply system likely to exist in the next 40 years and capable of meeting peak power demand will have no problems meeting baseload demand.'*
>
> *'Our current electricity system is based primarily on coal-fired power stations, which cannot be turned on and off at short notice. So, generating power during times of peak demand (daytime) entails generating power during off-peak times, even if there is no demand for that power at a price that covers average costs. That is, we have a baseload supply, which easily exceeds the demand for off-peak power at average cost, and sometimes even at fuel cost. The result, as we observe, is that off-peak power must be heavily discounted, and even so, demand is barely enough to keep the turbines turning.'*

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2 *'The Myth Of Baseload Power Demand', Professor John Quiggin Blog 22 July 2009.*

'To consider any meaningful notion of baseload demand, we could do a bottom-up analysis, and consider how much of electricity demand corresponds to the notion of a continuous, stable 24/7 demand. In the average household, for example, this would include the fridge and those 'vampire' appliances that are left on standby all the time. In addition, of course, lots of households have off-peak hot water, but this is only because of the price incentives designed to get rid of the excess baseload supply. The same points apply to offices and a most industrial uses (including some that operate at night to take advantage of cheap power, even though other costs are higher). There are only a few continuous processes like aluminium smelting that really constitute baseload demand in the strict sense.'

'To get a quantitative handle, we can use the following analysis: currently off peak prices are about half of daytime prices, and offpeak demand is about half of daytime demand (illustrative numbers only...). If we didn't discount offpeak electricity, it seems likely that offpeak demand would be around a quarter of daytime demand.'

'So, as long as 25 per cent of supply is generated by baseload suppliers like geothermal.... our main problem will be one of excess baseload supply, as at present. We're unlikely to reach that point for some decades. But even then, the offpeak demand could be met by reliable sources that are independent of time of day, most obviously gas and hydro. In that case, standard principles of marginal cost pricing would suggest that there should be no off-peak discount. In such a system, the baseload sources would be used optimally, rather than generating excess low-value electricity as at present.

'I haven't dealt with the separate problem of supply variability from solar and wind. ...But, in our current circumstances, and as regards marginal increments to the system, the far bigger problem is that of supply invariability'

15. Dr Mark Diesendorf, of the Institute of Environmental Studies, UNSW, supports these concepts and further discusses the difference between variability in supply and demand and intermittency:

'Electricity grids are already designed to handle variability in both demand and supply. To do this, they have different types of power station (base-load, intermediate-load and peak-load) and reserve power stations. Wind power adds a third source of variability that can be integrated without major technical difficulties into such an already variable system.

'For several dispersed wind farms, total wind power generally varies smoothly and therefore cannot be described accurately as 'intermittent'. As the penetration of wind power increases substantially, so do the additional costs of reserve plant and fuel used for balancing wind-power variations. When wind power supplies up to 20 per cent of electricity generation, these additional costs are still relatively small.

'With the failure of the environmental arguments against wind power, a subtler piece of misinformation is being disseminated against this technology: to label renewable energy in general and wind power in particular as 'intermittent' and then claim that it can never replace existing base-load power stations, such as coal and nuclear, which are described as 'firm' or 'reliable' sources of power. For renewable energy to become a significant energy source, the assertion goes, it would need a new kind of inexpensive long-term storage

Superficially, this argument sounds plausible. Everyone knows that a single wind turbine may start and stop abruptly many times in a day and therefore can be described accurately as 'intermittent'. On the other hand, everyone knows that conventional electricity supply systems are highly reliable, at least in most developed countries. Nevertheless, further *thought exposes several false assumptions. The main steps in the refutation of this myth are:*

a. Conventional power stations are intermittent.

b. Electricity demand is variable.

c. Electricity grids are already designed to balance intermittent conventional supply against variable demand.

d. The variability of large-scale wind power is generally slow and manageable, in both theory and practice.

e. It cannot he described accurately as 'intermittent'. Wind power can substitute directly for coal power.' [3]

16. In fact conventional power stations are themselves 'intermittent'. 'There is no such thing as a totally reliable source of electricity. Every conventional power station breaks down unexpectedly from time to time, causing an immediate loss of all its power. That is true intermittency, a particular type of variability that switches between full power and no power. Once a conventional power station has broken down, it may be offline for weeks, much longer periods than calms in the wind (hours or days). Transmission lines also break down unexpectedly, either the result of overloading, or bushfires, or a tree falling, providing another source of intermittency in existing grids.[4]'

17. The key issue is the variability in demand. 'The demand for electricity varies on a daily and seasonal basis, as well as having unpredictable changes, both slow and sudden, resulting from a wide range of factors such as the weather or an advertising break in a popular television show.'[5]

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3 *'Greenhouse Solutions with Sustainable Energy' Dr Mark Deisendorf, (UNSW Press, 2007), p117*

4 *Op cit, p118*

5 *Op cit, p118*

18. The ability to respond to this demand and to store energy present problems for both conventional dirty power and renewable energies such as wind.

'Because it is very expensive to store electricity on a large scale, electricity grids are perpetually balancing intermittent supply against variable demand. They do this by providing a mix of base-load, intermediate-load and peak-load power stations to meet ranges in demand and by providing reserve base-and peak-load plant to cover breakdowns.

'Base-load power stations have high capital cost and (artificially) *low running cost. Therefore, they are operated 24 hours a day every day, except when they break down or undergo planned maintenance. In the absence of hydro-electricity, peak-load stations are gas turbines, which have low capital cost and high operating cost. Their fuel, usually natural gas, is much dearer than coal. Because peak-load stations can be turned on and off very quickly, they are valuable for 'balancing' sudden fluctuations in demand and for rapidly covering the unexpected failure of a base-load power station.*

'So, variability is nothing new to fossil-fuelled electricity generating systems. As a result of the variability of demand and supply, the reliability of the whole generating system can never be 100 per cent. To achieve this would require an infinite amount of backup and hence an infinite cost. In practice, reliability can be measured in terms of indicators such as the average number of hours per year that supply fails to meet demand.'[6]

19. Large scale wind power is certainly not intermittent because it does not start up or switch off instantaneously at unpredictable intervals. It does, however, introduce a third type of variability into the grid. Variations in wind generation capacity in different regions, particularly over such a

6 *Op cit, pp118-119*

large land mass as Australia's allows for this variability to be smoothed, particularly so with the introduction of smart grid technology based on the planned National Broadband Network. Dr Deisendorf presents the following evidence to support that contention:

'...recently ...Graham Sinden from Oxford University... analysed over 30 years of hourly wind speed data from 66 sites spread out over the United Kingdom. He found that the correlation coefficient of wind power fell from 0.6 at 200 km to 0.25 at 600 km separation (a perfect correlation would have a coefficient equal to 1.0). There were no hours in the data set where wind speed was below the cut-in wind speed of a modern wind turbine throughout the United Kingdom, and low wind speed events affecting more than 90 per cent of the United Kingdom had an average recurrent rate of only one hour per year.'[7]

20. Even on a smaller scale, and localised, wind power can effectively be stored in combination with other non-fossil resources. A combination of wind and mini-hydro is one such approach that would allow storage of wind power energy and its sale at peak sale demand.

21. The concept involves pumped storage using wind power (Figure 4). During low spot market prices/low demand during the day wind power is not wasted but used to pump water from a lower to a higher reservoir. This concept then allows the stored

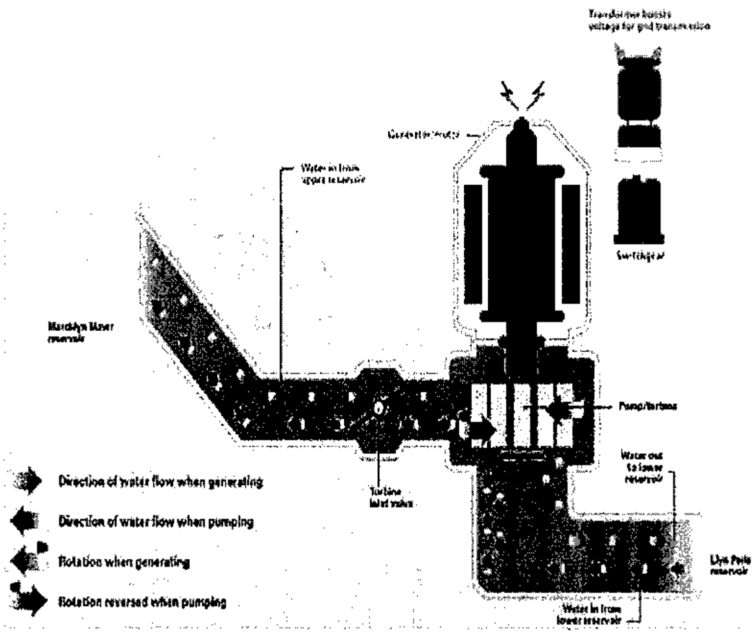


Figure 4 – Pumped storage Wind Power

[7] *'Greenhouse Solutions with Sustainable Energy' Dr M*
Characteristics of the UK wind resource: long-term patterns and relationship to electricity demand, Energy Policy, 35:pp 112-127.

water to be released at an optimum time to turn a turbine and generate mini-hydro power, if sufficient direct wind power is unavailable.

Wind Farm Location

Arguments Presented Against Wind Power

22. The case against wind power is most commonly lodged in terms of:

   a. noise,

   b. visual amenity,

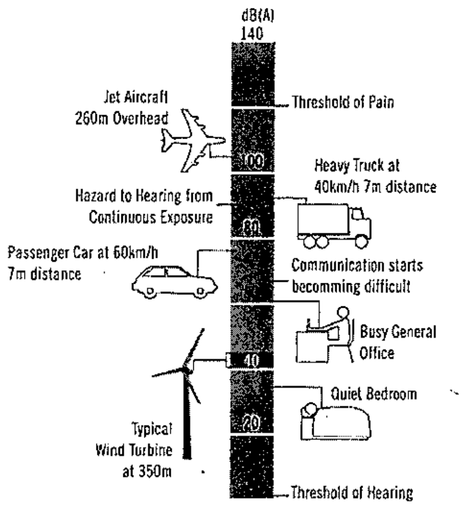
   c. danger to birds and bats, and

   d. land impacts.

Noise Impacts

23. Noise from modern wind turbines with advanced blade design has been greatly reduced since earlier designs. Their noise is generally rated at 350m to be 35db(A), the same as a quiet bedroom at night. By comparison, rural night-time noise is rated at 20-50db(A).

24. The noise created largely by blade tip turbulence is generally in the high end of the mid-range audible frequencies of sound, typically in the 1,000-1,500 Hz band. These frequencies attenuate fairly rapidly over distance and there are detailed guidelines that installers are required to observe for turbine siting.



Source: New Zealand Energy Efficiency and Conservation Authority Wind Energy Guidelines www.energywise.co.nz

Figure 5 - Wind Turbine Noise Comparisons

NSW State Government has no guidelines of its own issued, but relies on the South Australian Government guidelines.

These will eventually be replaced by a set national guidelines being developed by the Commonwealth, expected to be finalised in 2010.

25. My own discussions at a number of wind farm communities in Victoria indicated that the noise factor was not an issue and depended on good community education and involvement from the start of the project. For example, Hepburn Wind conducted regular free bus tour for residents to other wind farms so they could encounter the installations.

26. These experiences also allowed residents to test the quoted claim that 'normal conversations' can be carried out quite easily at the base of a tower, even at maximum rotation speed.

Visual Impacts

27. Unlike noise, the visual impact of wind turbines on a landscape is an entirely subjective issue – it cannot be measured. To a large extent it is a matter of taste how people perceive that wind turbines fit into the landscape.

28. However, numerous studies in Denmark, the UK, Germany, and the Netherlands have revealed that people who live near wind turbines are generally more favourable towards them than city dwellers. Independent polls[8] in Australia have consistently shown a favourable public disposition to wind power. In 2001, a poll in Victoria showed that 94% of respondents described wind generators as 'interesting' and 74% as 'graceful'. A subsequent survey showed that 36% of respondents were more likely to visit a coastal area if it had a wind farm, while 55% said it would make no difference. Only 8% said it would deter them from visiting.

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8 *AusPoll study - June 2001, AusPoll study - February 2002, Australian Research Group Study - September 2003, Tourist Attitudes Toward Wind Farms, MORI Summary Report, September 2002: http://www.bwea.com/pdf/MORI.pdf, and http://www.windpower.org/en/faqs.htm#. Source: Australian Wind Energy Association (AusWEA)*

29. The February 2002 survey also showed that 95% of respondents supported the construction of more wind farms. This result was again backed up in a national poll by AusWEA in 2003, which found that 95% support (27%) or strongly support (68%) building wind farms to meet Australia's rapidly increasing demand for electricity. Overseas surveys show consistently between 70% to 80% support.

30. Sensitivity to obvious 'iconic views' is clearly a consideration, but one person's view, is another's development site! Extensive community consultation is an accepted part of determining wind farm sites. Overseas and Australian evidence has shown that involving communities in the decision making process for siting and explaining to those concerned the inherent benefits of wind energy, economically and socially, are vital to establishing acceptance. Suggesting the need to consider the alternatives also presents a cogent argument, as does the consideration that, unlike housing development, wind turbine towers can always be removed and the land they covered, easily recovered and restored.

31. The author's own extensive experience at conducting community information briefings on wind power and community based wind power, have received a remarkably strong acceptance – once the facts are explained. However, it has also been profoundly clear from the responses to these briefings that the concept of cooperative/community based wind farms was a significant contributing factor to this level of acceptance and even enthusiasm for the idea.

Organised Resistance

32. Wind power projects within Australia and overseas have often encountered organised resistance on the basis of visual impact or the environment. One of the most notorious of these was the one based on the 'orange bellied parrot' in relation to Victorian Bald Hills wind power project in 2006. This is now recognised as having been organised was organised by the Victorian

chapter of the 'Landscape Guardians'[9]. Similar resistance was mounted by this group when the Hepburn Springs Wind consortium attempted to progress the first Australian community wind power project based on two turbines near Daylesford. The Landscape Guardians have also been involved in mounting objections to the commercial wind farm near Bungendore NSW.

33. The Landscape Guardians are a loose association of anti-wind farm groups that goes by the names of Landscape Guardians or Coastal Guardians and relies heavily for its information and campaign tactics on overseas groups that have been linked to the nuclear power industry.

34. The forerunner of this anti-wind farm pressure group was Britain's Country Guardians, established by Sir Bernard Ingham, a spin doctor for the former British Prime Minister Margaret Thatcher. He is a director of Supporters of Nuclear Energy. He was also a paid consultant to the British nuclear group BNFL.

35. Although the Hepburn scheme received 350 submissions of support and only 18 objectors, the Landscape Guardians succeeded in taking the Hepburn wind power proponents to the Victorian Civil and Administrative Tribunal (VCAT) – the rough equivalent of the NSW Land and Environment Court. The VCAT did not take long to dismiss the objection, but the tribunal appearance still cost the project.

36. While not all resistance to wind farms stems from the Landscape Guardians group, they are frequently behind community action. The point being that such objections, when they arise, should not be taken on face value and need to be carefully investigated to determine any hidden agenda. If there is one thing the wind industry has learned about community objections to installations, it is that the reasons presented against wind farms, are often not the real reasons.

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9 *See Envirowiki website - http://www.envirowiki.info/Anti-wind_power*

There are often commercial interests behind this resistance. This is not to say that there may well be valid environmental or other reasons that deserve serious consideration.

Wildlife Impacts

37. Some of the strongest opposition to wind farms has come from people concerned at the alleged capacity of wind turbines to kill birds and bats. This concern has possibly led to the most extensive study of this impact, both in Australia and overseas[10]

38. The conclusions from these studies indicate that birds generally have no difficulty with wind turbines. Earlier reports of bird kills by turbines were often related to poor siting. Early installations in the US were often made with little consideration for wildlife and resulted in turbines located in or near wetlands, adjacent to updrafts off cliffs, sites used by raptors, and on migratory paths.

39. Consideration of these factors in turbine placement greatly reduces wildlife impacts. It has also been determined that migratory or local birds take only a single season to learn the location of turbines and then stay well clear. There have been instances, cited in Victoria, where wedge-tailed eagles have actually sought out the turbines and used the tip turbulence for lift when soaring.

40. While an average of two birds per turbine per year are lost, many of these birds have also been found to be in poor health (that is, before impact!). This loss rate is little more than what can be expected for most domestic buildings with birds flying into windows.

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10 *AusWEA Fact Sheet 8, 'Wind Farms & Bird & Bat Issues, 2002.*

41. Worldwide research has also indicated that wind turbines account for between 1/5000th to 1/10,000th of annual bird deaths. Most of these occur as a result of impact with cars[11], powerlines and towers and glazed, particularly tall building. A 2001 US study into bird deaths is instructive. The proportion of bird deaths were found to be attributed as follows:

a. Vehicles — 60-80million

b. Buildings/windows—90-98million

c. Powerlines — up to 174 million

d. Towers — 40-50million

e. Wind turbines 0.01-0.04million.

Selecting Sites

42. The key technical factors for site selection are those discussed already – wind speed and grid proximity and capacity. Proximity to built environment, environmentally sensitive areas, accessibility for construction, topography, migratory bird and bat paths and visual amenity, are clearly other factors that require consideration. The national guidelines to be published in 2010 will undoubtedly provide clear guidance on many of these factors.

43. Willingness of landholders to have turbines on their property is also a factor, but invariably the leasing rates are sufficiently attractive and the loss of land utility insignificant so that this is rarely a problem. Empirical evidence indicates that most landholder complaints arise from those who have not been approached. The unique benefit of a community based cooperative is that such ownership provides an opportunity for financial benefit to all those impacted, and not just those on whose land turbines are located. This has proven to be a major advantage to overcoming community resistance.

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[11] *That the National Parks and Wildlife Service has reported that 7000 animals a day are killed by vehicle strike in Australia, helps put this into perspective.*

44. Site selection is, therefore, invariably a compromise based on all these factors. Many sub-optimal (albeit still good) wind speed sites have been selected where socio-environmental factors have been more accepting.

45. While most sites are typically on rural land holdings, there has been recent interest in wind farms by State Forests and Aboriginal Land Councils. Reportedly, State Forest managers see wind farming as a profitable use of land as it provides up to 8 times the return for the same area used for timber. Towers would need to be taller and therefore larger turbines capacities would be used (2-3 Megawatts), in order to clear turbulence from surrounding trees, but this would not generally be incompatible visually with such an environment.

Impact on property values

46. Occasionally, some concern is expressed that wind turbines might have a negative effect on land values. However, extensive research in Australia, Europe and the US has shown land value has not been affected by wind farms[12]. This is largely because wind farms have little impact on the agricultural capacity of rural land. Farming and grazing can still be undertaken with minimal disturbance. In fact, the existence of turbines on a property and the associated steady income they guarantee to the landowner would actually increase the property value as it would be more profitable as a commercial enterprise.

47. In the context of comparative land usage, the land footprint of wind farms is, in fact, a positive. They require 1.3 m^2 per Gigawatt hour, compared with 3.6m^2 for coal power.

48. The only possible impact could be that such rural structures may preclude aerial spraying. However this practice of broad-scale application of pesticides and herbicides is likely to be

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12 *AusWEA Fact Sheet 12,'Wind Farming and Land Values.'*

progressively phased out in the foreseeable future. This is likely to be driven the rising costs of petrochemicals, with diminishing oils supplies (the Peak Oil phenomenon) and the growing predominance of more intelligent and healthier farming practices based on soil management and permaculture. In any event, the siting of wind farms could easily avoid properties where aerial spraying is still being carried out.

49. In relation to wind farms affecting the value of residential properties by virtue of their impact on views, this has been refuted overseas where such installations have in fact become tourist attractions. While some people will undoubtedly continue to prefer their views without turbines, the Australian surveys referred to previously showed strongly in favour wind farms and their presence on the landscape.

Local Ownership and Control

Community-Based Wind Power?

50. It is generally agreed that cooperative wind farming started in Denmark in the late 1970s when three farming families in Middelgrunden sought bank finance to establish and operate their own small wind generators on their own land.

51. Community wind farms are now particularly prevalent in Denmark and Germany. In Denmark, a quarter of all wind farms are locally owned, mostly through cooperatives. 85% of wind generation capacity in Denmark is made up of small turbine clusters (typically three turbines) rather than large wind farms.

52. In Germany, 300,000 people are shareholders in wind farm projects, with around 80% of its wind farms owned by the community as early as 2001. Wind energy has gained very high social

acceptance in Germany and Denmark, with the development of community wind farms playing a major role.

Benefits of Community Ownership

53. The imperatives of Climate Change and Peak Oil are driving us towards establishing more resilient and self-sustaining local communities. So, this is something we not only should aspire to achieve, but will I believe, in due course, be forced to adopt.

54. From a more immediate perspective of benefits, European experience has proven that community wind farms (and other renewable energy cooperatives) allow local residents and landholders to own their own renewable energy source. Communities are involved in decisions from the outset and receive direct and indirect benefits from local development. Community ownership of wind farms has grown rapidly overseas and could play a big role in the future of energy generation in Australia.

55. Most existing wind farms have lease agreements with farmers, where the farmers typically receive 1-2% of the gross revenue. Community wind farms are typically, but not necessarily, co-operatives of local community members that enlist investors to purchase and operate wind farms. The revenues from selling the electricity are then divided amongst members.

56. Economic benefits do not only go to the leaseholder, but are spread throughout the community – and these benefits are likely to stay local.

57. Greater community involvement and control in decision making is a major determinant in community acceptance of wind turbines. Community owned wind farms also tend to be smaller (10 turbines or less.) and have less visual and noise impact than commercial farms, and this further encourages greater community acceptance.

Cooperative vs Corporation - the Essential Difference

58. The essential difference between cooperative and a traditional market economy corporation is in the voting rights of their shareholders. In a corporation, ignoring share classes that exist for some, the power of individual shareholders is determined by the total proportion of shares held. While this encourages large investors who may wish to have a say proportionate to their investment, it lends itself to undemocratic control. A true democracy is in fact a cooperative model. Here the voting power of every shareholder is equal. In a cooperative the essential rule is one vote per shareholder, regardless of their holding.

59. A cooperative system is clearly more suited to empowering communities, whereas a corporate system is not and favours cashed up investors. There is no guarantee that a corporate structure will not allow a takeover of the business by a buy-up of a majority of equity by a single shareholder, unless this is limited by a corporate rule. In such a situation the corporate model starts to lose its appeal to major investors as it removes or at least limits the essential advantage of a corporation in the minds of large investors.

60. By its nature, a cooperative model, on the other hand, is likely to have greater difficulty raising investments from larger shareholders. Although this is not necessarily the case, as it depends on the interests of the shareholder. This has to be weighed against the benefits of opposition to a development being reduced if all affected parties have an opportunity to gain from the project. Opposition has often come in the past from neighbours not receiving any return, while the site owner receives a rent.

Overseas Models

61. Cooperative models have been very successful overseas, but it must be conceded that in many of these countries and states there has existed enabling legislation for cooperatives. Denmark has its 'Cooperative Act', as do California and Canada – all very similar to the Danish legislation. It seems the Danes have got it right again!

62. Typically, in Denmark, cooperative wind farms are 50% owned by the community and 50% by power retailers.

Australian Application

63. The Bendigo Bank and Adelaide Bank model of cooperative development is probably the most well known in Australia and proves that cooperative can work despite a lack of legislation – although it is undeniably more difficult to raise funds in the absence of such legislation. Smaller cooperatives have also existed in Australia for a long time, some for many decades. Typically they have been in the form of primary producer cooperatives. However other non-agricultural cooperatives have worked well, such as those in existence for well over 50 years in the Barossa Valley to create community infrastructure, recreation facilities, community care and commercial enterprises – notably based on a traditional German model of resilient communities.

64. A cooperative structure is the most likely to achieve the greatest community benefit and acceptance on the way. Paramount of these benefits is that a cooperative model is most likely to achieve the important goal of community resilience.

Rural Wind Farms and the RET

Renewable Energy Targets

65. Potentially the greatest incentive to increasing the willingness for investors to fund renewable energy production, particularly a known, reliable technology such as wind power, is a Renewable Energy Target.

66. On 30 April 2009, Council of Australian Governments' (COAG) agreed to the design of the expanded national Mandatory Renewable Energy Target (MRET) scheme, to implement the Government's commitment that 20% cent of Australia's electricity supplies come from renewable energy sources by 2020. While the new scheme target is generally regarded by those concerned with the rapid onset of Climate Change as too low, it does expand on the existing MRET scheme and absorbs State and Territory renewable energy targets into a single national scheme. The MRET scheme includes a legislated target of 45 000 gigawatt/hours in 2020, which is more than four times larger than the current target.

67. It imposes a legal liability on electricity retailers and large wholesale purchasers ('liable parties' under the scheme), to support electricity generated from renewable resources. They must prove they have purchased the relevant proportion of renewable energy by surrendering Renewable Energy Certificates (RECs) or paying the shortfall charge – a penalty for non-compliance. Each REC represents 1 Megawatts/hour of electricity.

68. Previous State and Commonwealth RET schemes, some of which were allowed to lapse, had proven very effective incentives to investment in renewable energy, particularly wind energy as it had emerged as the most cost-effective way of generating renewable energy in Australia. Under the RET schemes wind farms grew at a very rapid rate and this is likely to be repeated under the new MRET scheme.

69. Discussion of any renewable energy incentives issue is incomplete with out discussion of two other factors:

a. feed-in tariffs, and

b. carbon pollution reductions schemes and the price of carbon.

Feed-in Tariffs

70. If there is a single factor that makes renewable energy a successful proposition, whether community based or commercial, it is the existence of meaningful feed-in tariffs. A feed-in tariff is a premium rate paid for electricity fed back into the electricity grid from a designated renewable electricity generation source such as wind or solar. Over 40 countries around the world at present have feed-in tariff regulations for renewable energy.

71. Possibly the most effective feed-in tariff laws would be those introduced in Germany over the past 15 years (Figure 6). In 1991 the German Government introduced the Electricity Feed Act, legally regulating the feed-in to the grid of electricity generated from renewable resources such as wind, solar and biomass power. This Act required utility companies to purchase electricity generated from renewable resources at set rates (feed-in tariffs).

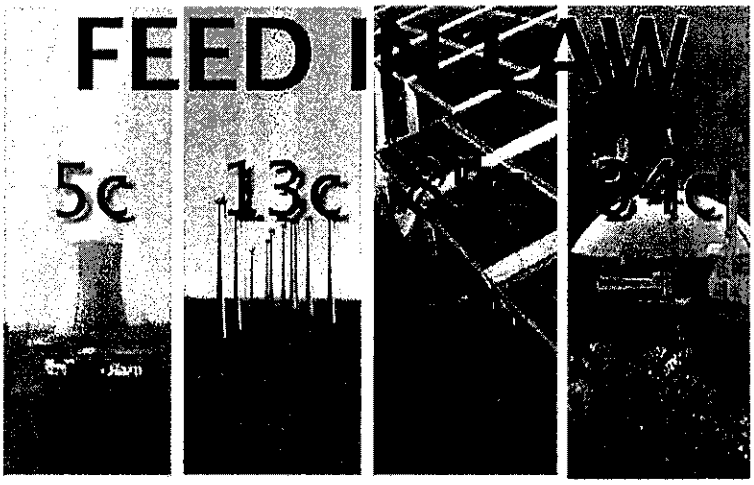

Figure 6 - German Feed-in Tariffs
(Picture courtesy Neil Barrett, Chairperson of the Mt Alexander Sustainability Group)

72. The scheme, originally introduced in 1991, was expanded and enhanced in 2000, and has been responsible for the dramatic growth in Germany's renewable energy market, particularly the solar photovoltaic industry. In the five years from 2000, the quantity of electricity fed into the grid from eligible sources has more than doubled, with a seven-fold increase in installed solar photovoltaic (PV) capacity to over 1,500 Megawatts by the end of 2005. By comparison, at the same time Australia had in the order of 7 Megawatts of grid-connected solar power, or less than 0.5% of Germany's capacity.

73. Australia currently has no nationalised program, only state run schemes. Most are net feed in tariffs with the exception of the ACT, which has a gross feed-in tariff

74. A net feed in tariff, also known as export metering, pays the power producer only for surplus energy they produce; whereas a gross feed in tariff pays for each kilowatt hour produced by a grid connected system. The difference is very important.

75. For example, under the (typical) new Victorian net tariff, residential grid connected system owners will be credited 60 cents for every unused kilowatt hour of power fed back into the state electricity grid. However, this will only be as a credit on their bills, rather than as a cash payment. If the system owner generates credit from the feed-in tariff exceeding the cost of their electricity consumption during the billing period, the additional credit is rolled over to the next billing period up to a maximum of 12 months from the generation date. Any accumulated credit is voided if the system owner changes electricity retailers or at the end of the scheme. This is more 'green-wash' than serious encouragement of renewable energy development.

76. By comparison, the ACT's gross feed in tariff will pay 50.05c/kWh for systems up to 10kw capacity and 40.04c/kWh for up to 30kW capacity, with a system capacity cap at this point of 30kW. The system cap may also be increased later in 2009. The program was rolled out on 1

March 2009. Installing a 1 kW solar power system in the ACT can earn the homeowner $15,000 over the life of the system.

77. On a national scale, to demonstrate how dramatic the relative effect and absence of a feed-in tariff have on renewable energy development, the graph at Figure 7 compares Australia's diminishing share of solar PV installations with countries that have gross feed-in tariffs that provide real financial incentives for the up-take of the technology. The values are based on exchange rates as of mid-February 2009 and show a drop from 6% to 1% of Australia's market share over the 10 years to 2007, while feed-in tariff countries show a responding increase in solar PV power output capacity.

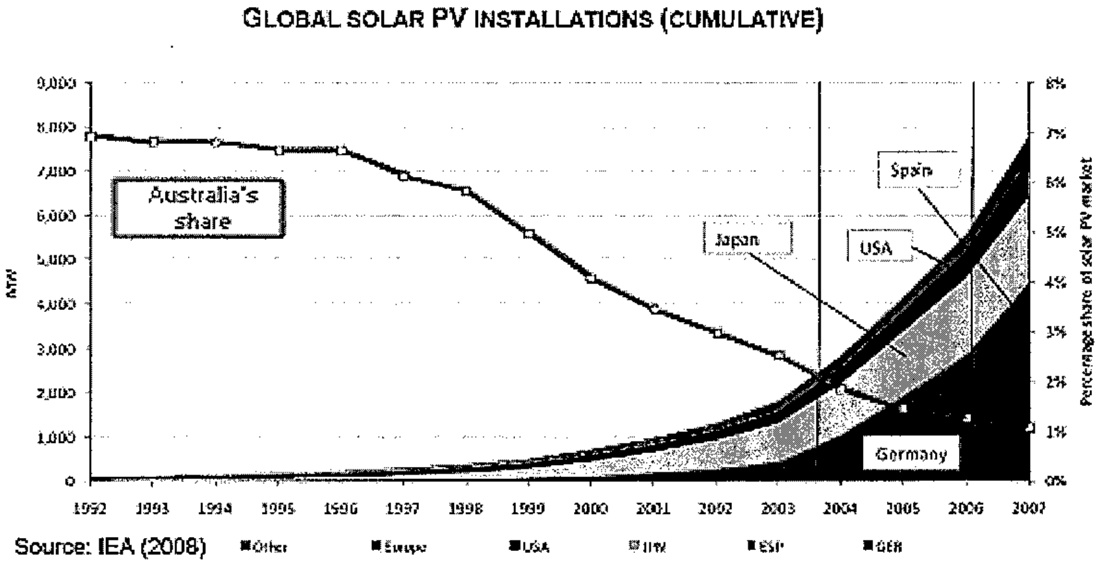

Figure 7 - International comparisons of the effect of gross feed-in tariffs
(Source: International Energy Agency, 2008)

78. Australia is lagging behind other countries such as Germany who, while having half the sunshine of Australia, have 200 times the solar production capacity of our country due to a generous feed in tariff program.

79. NSW is the only state or territory not to have a feed-in tariff. Although there are plans to introduce one in 2009, it is likely that any such tariff will only be related to domestic production

and will not embrace wind power. This is a major failing in encouraging community based wind power initiatives.

CPRS and the Price of Carbon

80. The Australian Government's controversial Carbon Pollution Reduction Scheme is presented as an initiative to put a price on carbon pollution making CO_2 emitters pay for their emissions and hopefully encouraging the reduction of emissions. In such a carbon constrained economic model, investment in renewable, not CO_2-emitting power production, should be increasingly attractive.

81. The would CPRS work by mandating that every organisation with a facility that emits 25 kilotonnes of CO_2-e or more per year must report and purchase a permit for every tonne of CO_2-e it releases. This should cover approximately 70% of Australia's emissions and should include most electricity generators, mining companies, large property trusts and other ASX 200 companies

82. Big developers believe large scale wind farmers will struggle to make a substantial profit at carbon prices below $25/tonne of CO_2. However, they regard an 8%-10% ROI as reasonable, whereas community based models can comfortably operate at a lower ROI as they are not aiming to be market competitive.

83. The current CPRS draft legislation is aiming to achieve a carbon price of $10/tonne of CO_2 for the first year, but this has now been delayed to start in 2011 – if it gets past the Senate. There are strong beliefs among sustainability groups and renewable energy projects that the present scheme will not assist, and may well be a disincentive for renewable energy investment. The effectiveness of the scheme is entirely reliant on the effectiveness of the carbon market. This in turn is affected by the number of concessions given to big polluters.

84. The concessions planned and the low cost of carbon (many in the renewable industry maintain any price less than $40/tonne of CO_2 would be ineffective) do not present an encouraging scenario for individual or many corporate investors to invest seriously in renewable energy. There are sound concerns that the proposed scheme will only raise the general cost of living. However, there is evidence that super funds are considered less prone to be put off from investing in renewable energy.

85. Advice received from the energy infrastructure sector on the effects of the price of carbon on a community-based wind project was reasonably consistent in that it was not considered helpful – largely owing to the timidity of the current CPRS legislation and the liberal concessions being proposed for major polluters.

Other Issues

The Peak Oil Imperative

86. Peak Oil refers to the globally accepted phenomenon that oil and gas as sources of energy are rapidly depleting and world oil production may have already peaked, with evidence that a gas production peak will follow shortly. This means essentially that the remainder of these fossil fuels will be increasingly more difficult and expensive to extract and refine.

87. There is already strong evidence that the oil peak has already occurred, based on geological experience with national reserves and the fact that production has in the eight years from 1998-2005 decreased from 1.2% to 5.3%. As of late 2007, world growth in demand for oil and gas has outstripped production by a ratio of 4:1.

88. This has severe implications for Western society in terms not only of transport costs associated with food and work, but also in the availability/affordability of over 30,000 totally oil

dependent, commonly used items, from clothing, cosmetics to plastics of all types. An overwhelming majority of the recognised experts in the field of peak oil suggest that this poses an imminent social and economic crisis that will need to be addressed by a variety of lifestyle changes. Pervasive among these changes is the reversion to more resilient, independent small communities who are reliant on local food, work, services and most importantly, energy production. Community-based sustainable energy production is seen as an essential feature of that future.

89. Wind power can provide electricity for plug-in hybrid and all electric vehicles, which will soon become the main alternatives (apart from improved public transport) to petrol and diesel.

Agricultural Benefits

90. With the progressive decline of the Murray-Darling Basin through extended drought and salinity, Australia stands to lose 40% of its food growing capacity. This decline has been reported only recently as being more advanced than previously calculated.[13] Alternative food growing areas proximate to major population centres (a factor driven by both Peak Oil 'food kilometres' and the need to reduce carbon emissions through transport) are becoming of critical importance. A number of these high value agricultural lands with good rainfall exist on the South Coast, particularly in the Kiama and Wingecarribee LGAs.

91. Diversification of current farming will become essential as will a greater reliance on organic agriculture and permaculture as the need to reduce petrochemical-based fertilisers, herbicides and pesticides is driven by the Peak Oil crisis. Protection of these lands for food and fibre

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13 *Research by Dr Paul Tregonning from the Australian National University, reported on ABC Am 19 May 2009 'New study shows drought has stripped the equivalent of 400 Sydney Harbours worth of water out of the Murray-Darling Basin.'*

production and diversification requires capital investment. Wind farming can provide at least part of that capital through leasing payments to farmers while leaving a minimum footprint on such land.

92. While a single small community project will not make a significant number of farmers affluent enough to recapitalise and diversify, the potential exists for not inconsiderable income supplementation for some. Subsequent development of wind farming will spread this benefit even further. This is no fanciful scenario. This practice has been well established in Germany and Denmark as well as other European nations. Many German farmers manage not only their crops and stock but also their wind energy production as another farm product - true 'wind farming' in the full sense of the term.[14]

Jobs

93. Europe in 2008 had 160,000 full time jobs directly involved in the wind industry. It is the fastest growing energy sector in the world and provides four times the number of (clean and safe) jobs as coal. This is largely due to coal mining becoming highly mechanised with long-wall mining techniques.

94. A salutary comparison can be made between Denmark's wind power industry which generated 16,000 new jobs between the mid 1980s and 2002. Over the same period the Australian coal industry lost 18,000 jobs. Australian wind farms in 2002 alone had 40-50%

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14 *Multiple examples of this exist and were recently reported in the documentary 'Solar, Wind and Biomass in Germany and Australia' produced by Neil Barrett, Chairperson of the Mount Alexander Sustainability Group, 2007*

Australian content and created 2-3 times as many jobs per kilowatt hour generated as coal power.[15]

95. Australia has the capacity, based on current, incomplete wind mapping, to increase at least tenfold the wind power it currently generates. 20% of Australia's current demand could be sourced from wind in two or three decades.[16]

96. There are currently over 6,000 megawatts of large-scale wind farms being investigated in Australia, or nearly 19,000 gigawatt hours per year. In 2004 Iain MacGill and Hugh Outhred from UNSW suggested that 8,000 megawatts could be installed in the National Electricity Market, and with further development in turbine technology this could be exceeded. This presents huge employment potential.

Community Consultation

97. This issue deserves its own paper. I have investigated this extensively from practical experiences during the Southern Councils Group Concept Study, but have also draw on 14 years professional experience in change management theory and practice.

98. The best way to explain briefly what is meant by appropriate 'community consultation' for a wind power project is to provide a brief outline of a couple of real-life examples. The first is from the Hepburn Springs Project where the community consultation was managed by a community group, the Hepburn Renewable Energy Association (HREA).

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15 *'Greenhouse Solutions with Sustainable Energy' Dr Mark Deisendorf, (UNSW Press, 2007), p106*

16 *'Greenhouse Solutions with Sustainable Energy' Dr Mark Deisendorf, (UNSW Press, 2007), p127*

99. As soon as the concept of the project was being mooted in the community, HREA staffed regular fortnightly street information stalls on the project and wind power in general. The stalls also offered opportunities for residents to join the HREA. This was considered a very important initiative as it allowed people to 'join the club' thereby creating a feeling of inclusiveness on the project.

100. They also organised regular bus tours, initially monthly, to the Ararat Challicum Hills wind farm – a 1½ hour drive – to allow residents to see and hear, and as it turned out 'experience' wind turbines close up (see box opposite). These were popular and highly successful at changing public attitudes and reservations over the project.

> 'People would sit in the bus hardly talking to each other on the trip to the wind farm. On arrival, we would walk right up to the base of one of the operating turbines so people could experience at close quarters this piece of engineering. There would be a distinct period of silent awe as people looked up at the moving blades above them. The conversations would start, rising rapidly to nervous laughter and animated enthusiasm for the sheer impressiveness of the thing. On the trip back home, you wouldn't believe they were the same group. The enthusiastic conversations would continue all the way back to Daylesford. It had clearly been a visceral experience and people had been allowed to form their own impressions. That is so important in such an enterprise.'
>
> *(Hepburn Renewable Energy Association members recounting the effects of bus tours in their community engagement process.)*

101. Importantly, both the stalls and bus tour initiative were continued until a point was reached when the public interest waned. HREA members indicated that there had arisen a general feeling of comfort with the idea and it was no longer an issue of debate in the public forum any more.

102. HREA also ran with a philosophy that it was important to have all aspects of the community not necessarily on board, but at least involved on advisory panels so their views were considered.

103. A second instructive example of the need to consider the human dimension of change was the approach taken with the Challicum Hills project in Ararat. In addition to undertaking similar

activities to HREA, the developers trucked in a 30m wind turbine blade to the local show and allowed people to touch it and climb over it. It was the talk of the show and later anecdotal feedback clearly indicated that the tactile experience left a strong and favourable impression on many.

104. Many contemporary infrastructure or large public projects fail to recognise this at their peril. Even the best motivated new projects raise almost predictable reactive resistance, sometimes, but not always, rational. The haste with which most modern projects proceed ignores the need for people to have a 'getting to know' the idea time-space. Instead there is a perfunctory 'public consultation' in the local hall to 'tell' people what a good idea it is. People want to know all the ins and outs and have time to think about it, talk about it, get personally acquainted with the concept (even if they appear not to want to).

105. If the approach to bringing the community on board were to be 'formulated', the expression could be **E^3+3B** (Educate, Educate, Educate plus Buses, Blades and Busking)

Conclusion

106. There is little debate in the renewable energy field that wind power currently presents the lowest risk, and most developed renewable energy technology. Its carbon footprint and energy efficiency is also high relative to other renewable sources and well above fossil-based and nuclear sources. This is particularly so if the full lifecycle of plant and fuel is taken into account.

107. Wind power is also, for reasons of its well-established technology and development and construction experience spanning more than 30 years in the modern context, one of the quickest to deploy and to start making a positive contribution to low/no carbon energy growth. The

capacity for development within Australia is also high. 20% of Australia's current demand could be sourced from wind in two or three decades.

108. Community resistance can be managed effectively if true transparency of process, due diligence and education is undertaken. The 'formula' E^3+3B, while trite, provides a sound basis for managing such infrastructure change. Community-based models, particularly cooperatives provide not only a sound basis for community acceptance, but also address future needs for community resilience and infrastructure security in an increasingly unstable World.

109. Experience in Germany in particular, and Europe in general, has shown that Government has a crucial role in the development of renewable energy industries – be they wind, solar, geothermal, biomass or others. In this regard, gross feed-in tariffs and serious, long-term commitments to renewable energy targets are paramount catalysts. They cannot be ignored. These provide the 'carrots', but the 'sticks' for polluters are also necessary in order that they pay the true price for their production – something they have escaped for over a century. A meaningful carbon emissions trading scheme therefore has merit. But one that does not penalise fossil fuel based energy production is valueless.

110. Cooperative renewable energy initiatives have great potential for community engagement in a promoting a sustainable and resilient future in Australia. This has been well established in other countries.

111. Wind power also has the potential for many more clean, green jobs than conventional dirty power production – 2-3 times as many per kilowatt hour generated as from coal fired power generation.

112. Why are we waiting? The reasons aren't technical, environmental, social, or financial….!

Recommendations

113. State Government should:

a. urgently either negotiate with the Federal Government for the implementation of a national gross feed-in tariff for small and large scale renewable energy providers, structured along the lines of the German feed-in tariff, or enact one for NSW;

b. investigate, draft and enact legislation, based on overseas experiences, that facilitates the development of renewable energy development in cooperatives;

c. encourage the Federal government to develop a meaningful carbon emission reduction scheme that does not protect large polluters;

d. recognise that wind farms currently present to Australia by far the best, least risk options to make rapid strides in moving towards a renewable energy future; and

e. ensure that with any new energy infrastructure development the best practice in community consultation is applied.

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17 August 2009