

Submission to Inquiry into Social and Economic Impacts of Rural Wind Farms, addressing the Terms of Reference concerning **noise** and **other relevant matters**.

The Community for Community Affairs

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PROVISO

This submission supports windpower provided its methods are altered and provided it operates with altered economic incentives and social purpose, described below. This submission may not be used to support arguments against a future wind industry because the problems discussed here are presented as problems that can be addressed. Transition to renewables such as wind, though not sufficient on its own, is considered essential for the continuation (or achievement) of civilisation.

BACKGROUND

I make this submission as co-instigator of 52.5 MW wind farm in south central Victoria, having invited a wind company to investigate the possibility of setting up a wind farm on my family's farm in 1999. I write as someone who closely observed the installation of the towers on our farm, and as someone who lives and farms on the finished wind farm. I have scientific training. References supporting the claims and proposals made in this submission can be provided.

SUMMARY

Windpower could be a good thing. Windpower should be improved and supported as part of a plan to avoid the climatic chaos for which we are almost certainly heading. Improvement would require formal social and financial recognition of wind power's physical impacts, a change in social aspirations to give greater priority to earth-friendly ones, acceptance of publicly agreed limits on environmental effects of all economic activity and a more thorough switch in the units of trade from throughput of resources to services.

Wind has the advantage of relatively low dollar investment per kilowatt of generating capacity, and relatively low energy investment for manufacture. But if all human activities were powered from renewable sources like wind, the activities for which we presently want the energy would still continue to impoverish the biosphere and diminish its capacity to support us. Secondly, wind farm construction, although by all accessible environmental measures far better than coal per kilowatt hour (kWh), itself impoverishes the biosphere: wind farms

are currently built with substantial roads connecting the turbines. If climate change ceased to be a problem, the proliferation of roads and vehicles would remain an environmentally damaging process. Roads are potent in facilitating nearly all other types of expansion of damaging human impact. Fragmentation and loss of habitat by wind farm roads is a significant unpriced cost. The windiest inland places are often on hills whose steepness has protected them from the most intense aspects of agriculture, so that these sites are often important patches of remnant flora and fauna.

There is capacity to reduce the impact of wind farms. Pricing unpriced costs will create a commercial incentive for development of new installation methods requiring much less earthworks. Existing regulation and law recognises some damages to a landowner from wind farm installation, and a commercial rent considered to compensate for these, is the result. But they provide insufficient incentive to reduce the environmental effects just described. New mechanisms are needed to financially represent the costs to society of environmental degradation. If the long-term environmental costs of installation were recognised in the relative pricing of labour versus resources, i.e. if we demonstrate a long-term interest in our surroundings, then the design of infrastructure would be to suit the landscape instead of vice versa.

Tower sections, for example, are only cheaper in the existing large pieces because the less obvious costs of a reshaped landscape to suit these large pieces are not recognised or not paid to (a section of or a representative of) society. Shorter tower sections can be transported through sharper dips and over sharper crests in the road. Less earthwork is then required. If we want the price signals in our economy to lead us to a habitable future, then the fuller cost of earthworks to our national and global wellbeing should be priced such that the least environmentally damaging plan - probably retooling of tower manufacturing plants to make shorter tower sections- is the best option financially.

Despite potential improvements to wind farm construction methods, completely pollution- and damage-free energy is not possible. Since any rate of damage, multiplied sufficiently by economic growth, will undermine the habitability of the planet in the foreseeable future, we must also agree on limits for total human environmental impact on our landscape. Pricing reduces pollution to an "economically efficient" level, set depending on society's sensitivity to environmental damage. But it does not eliminate it. Money changing hands to purchase "offsets" or in compensation for the loss or damage when the environmental goods are very scarce does not leave society equally well off. Therefore wind power development must be part of a national plan that accepts a limit on environmental impact from human activity. There is capacity for reducing the "required" generating capacity by at least 50% through efficiency and conservation (without population increase). Demand for electricity should be queried just as much as unpriced costs.

Noise pollution from wind turbines should be taken seriously. Authorities already accept noise in general as a significant irritant. Whether or not a sound is annoying depends on what it represents to the hearer. Those who unwillingly

hear noise from towers are more likely to be irritated by the noise. Wind farm noise is often favourably compared with highway noise or CBD noise. A more relevant benchmark might be to compare it with a sound environment we would like, not some of the less preferred “noisescapes”. Incremental deterioration of the “soundscape” must also be taken seriously. Noise pollution from wind turbines can be tolerated if towers are sited far enough away from dwellings. There may be scope to further reduce the noise from turbines by altering the design of turbines. Quiet, bladeless towers could be used where necessary if developers viewed the problem seriously enough to restrict electricity use to that available from these (currently) smaller towers.

Strict standards for light pollution from towers should be set before lower standards gain precedence.

To create monetised markets for damage requires a change in social priorities and a higher level of understanding of the consequences of current habits and expectations. Without this understanding, wind farms are wrongly interpreted by most as evidence that we are addressing environmental problems, and that addressing environmental damage is primarily a technological task. Thus they have a pacifying or disguising effect, while our system of economic growth continues untouched. Environment damage is barely accounted for in this system. Environmental services, although essential for life, have almost no economic value because, as far as consumers can tell, they are not scarce. The price we currently pay for goods represents “catch effort” or labour, not the level of environmental stocks. The role of government should therefore be to address this gap between mass opinion (the market) about environment and scientific assessment of our situation through:

- Working towards setting national limits on the environmental effects of economic activity;
- higher environmental standards (less ground disturbance) for installation of wind turbines, thus starting to create a market in better installation methods;
- dismantling current incentives that promote the expansive exploitation of natural resources (almost free resources, and reward per volume of bulk commodity sold) and to replace them with incentives for increasingly efficient use of resources within a materially stable framework;
- promoting the social aspirations and educations needed for an economy maturing from quantitative to qualitative growth.

The reduced profitability of wind developers due to greater commercial recognition of environmental costs such as earthworks, landscape fragmentation and noise will be outweighed by their greater profitability when CO₂ emissions are priced.

INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC) has drawn on a vast international body of independently funded research, and has restricted its

conclusions to well within its area of expertise. It represents probably the most rigorous and extensive work done so far by humans into any particular subject. It has warned that if current trends of fossil fuel use continue, we are on track within the next 50 years for climate change severe enough to disrupt much of civilisation, with tipping points passed in the next decade or two. Wind power could be an important part of solution. Compared with the weight of air pollution per kilowatt hour of coal-fired electricity, wind farms are an environmentally excellent type of energy infrastructure.

But their vastly superior credentials compared with coal should not obscure the damage they cause. Like every other expansion of infrastructure, wind farms consume more of the remaining land that needs to be allowed to conduct natural activities free from human influence and infrastructure. Wind power currently supplies 1.5% of Australia's electricity consumption, so that replacement of coal entirely by wind, for the sake of argument, would require roughly a sixty-fold increase in the number of turbines, at the current average nominal capacity per tower. The social and environmental costs of this, while far less than those for coal-fired electricity, would still be significant and the social cost obvious as well. Therefore we should compare wind farms with an idealised completely sustainable system, which would not reduce natural capital at all. The environmental costs of wind farms could be reduced, partly by a requirement to price them.

Since completely pollution- and damage-free energy is not possible, and since any rate of damage, multiplied sufficiently by economic growth, will undermine the habitability of the planet within the lifetime of people alive today, we must also agree on limits for total human environmental impact on our landscape including a percentage of electricity from wind turbines. If the Wind industry conforms to higher standards and to caps, government action should promote a certain number of wind farms as an essential part of purchasing a future with less conflict and misery than the future warned about by IPCC reports.

OVERALL PLAN FOR WINDPOWER

This submission does not support the push toward ever greater electrical generating capacity. Wind power development must be part of a national plan that accepts a limit on environmental impact from human activity. Such a limit implies a certain population level unless we can achieve ever decreasing levels of resource consumption per head. This is unlikely considering our current inability or unwillingness to even stabilise consumption per head. Renewable energy infrastructure is not built without damage to environment. Some of the environmental costs are described below under Installation Costs. These costs are discounted because as a society we do not recognise that they are part of a set of priorities - narrow and short term definition of profit and self interest, personal status from throughput of resources, and from material wealth far beyond the point where it increases happiness - that is causing problems we do belatedly recognise, like greenhouse gas emissions.

But if all human activities were powered from renewable sources like wind, the activities for which we want the energy would, without a change of course, continue to impoverish the biosphere and diminish its capacity to support us. In

a physically expanding economy it is not enough to say that the damage, per unit of energy consumed, is less with renewables, though this is true. Firstly, less environmental deterioration per unit of energy consumed from renewables is more than counteracted by an increase in the overall rate of consumption. Secondly, environmental impact even from “desirable” sources should not only be considered per unit of production. We should also consider how close our total impact (of any particular sort) is to critical natural thresholds. Any addition may take us over the threshold. With far less than the impact from fossil fuel power sources of equal capacity, expansion of the wind industry still does and will contribute to more environmental deterioration, already at critical levels.

Without a cap, the wind industry is currently following the same path of commercial expansion as other industries. This applies to every renewable energy industry, but especially to wind which is expanding rapidly. The laws, the training, the infrastructure and the social expectations that currently promote the expansion of industrial activity need to be reshaped to show recognition of physical limits.

Low greenhouse emissions are critical, but not sufficient to mark a technology as sustainable. Expansion of all things human over the last half century has already resulted in serious loss and simplification of the living web that supports us. In fact *Environmental Science and Technology* reports this year (Zalasiewicz, J., M. Williams, W. Steffen, P. Crutzen, 2010, 44 (7) (Feb), pp 2228–2231) that collectively humans are such a force in the biosphere and have wrought such vast, lasting impacts on the planet that we have entered a new geological period, the (proposed) Anthropocene’. Even without lifestyle change, there is much capacity to reduce the impact of wind farms and capacity for reducing the “required” generating capacity by at least 50% (notwithstanding population increase). Demand for electricity should be queried just as much as unpriced costs.

As well as a cap on the total generating capacity, expansion of wind power should be tied to winding back of coal-fired generation of electricity. Coal is only “cheap” because it is not paying for future climate damage or the thousands of deaths and illnesses each year from mine work and from airborne particulates.

ADVANTAGES OF WINDPOWER

After a wind tower has been made, the fossil fuel used in manufacture has been burnt, the energy has been mostly dissipated as heat, and the greenhouse gases have been released into the atmosphere, of course. The functioning of the wind turbines reverses none of this. So wind power cannot “pay back” the energy- or CO₂-cost of manufacturing a turbine after a period of running.

But the “pay-back period” figures compare various technologies in terms of how much energy must be invested in each technology, usually from fossil fuels, before a certain rate of energy capture can be achieved. Wind power compares very well with other technologies in this regard. It is estimated that it takes 6-12 months for a turbine to capture as much renewable energy as was used in its manufacture. This is the main ecological advantage of wind power. In the short term, until prices reflect a more comprehensive range of costs including environmental costs, wind also has the advantage of relatively low dollar investment per kilowatt of generating capacity.

INSTALLATION COSTS

With current turbine technology, and current installation methods, wind power's environmental installation costs are not as low as some other renewable technologies. The roads built on wind farms often involve considerable earthworks, with the width of disturbed ground being between 8 and 12 metres in the case of the Chalicum Hills Wind farm. This is a disruption to the land. The earthwork itself is very energy intensive and disturbs the topsoil, releasing CO₂. The roads cut into the surface of the land on hillsides, crests of hills are cut away and saddles are filled to allow the passage of large trucks designed for highway use. The land thus becomes more "suburban", and traffic is promoted. Road infrastructure is so familiar to us that it seems a normal part of the landscape, and is left out of most lists of concerns about wind farms. But road building is a significant contributor to scientists' estimate that each year humans move more rock, sediment and soil than natural processes (Zalasiewicz et al., op. cit.). Further, roads are critical infrastructure that brings with it or facilitates nearly all other damaging activities. It cannot be considered sustainable to put roads where there were none. If climate change ceased to be a problem, the proliferation of roads and vehicles would remain an environmentally damaging process. Gravel is imported in some wind farm constructions, further raising the total environmental project cost in terms of resources, energy and environmental mixing.

The windiest places are often on hills whose steepness has protected them from the most intense aspects of agriculture, so that these sites are often important patches of remnant flora and fauna. Fragmentation of this habitat by wind farm roads is a significant unpriced cost.

Market recognition of the cost of greenhouse gases would give wind power an advantage. But we must price the full range of wind power's environmental costs, as far as we can detect them, including loss of road-free areas and fragmentation of habitat. We should price them at a level that allows us to take only nature's interest and not her capital, difficult as these are to define and measure. Wind would still have a huge advantage over coal, but the wind industry would then need to invest in new methods and equipment. Installing towers with methods involving much less earthworks is technically possible, but it is not currently a high enough priority for the investment that would make it commercially viable. Commercially influential pricing of land fragmentation and of roadmaking as a threatening process amounts to raising the price of resources relative to labour, whose price has risen largely at the expense of environment.

NOISE

Whether or not a sound is stressful depends on what it represents to the hearer. So people who want wind farms will probably enjoy or accept the sound, especially if it is part of what they expected from a wind farm. Those who unwillingly hear noise from towers are more likely to be irritated by the same noise. I was told that there would be no noise at my house. I felt tricked when I discovered that this was not so. The noise of the turbines represented developers' dismissal of noise as a serious issue, or disdain towards wind farm residents.

Wind turbines' noise varies depending on many factors including blade size and shape, on funnelling or blocking of noise by local topography, on the clustering of turbines and on wind direction and speed at the time of hearing. This range of factors may account for divergent claims from wind farm neighbours about the degree of noise from turbines. With southeasterly winds, I hear a low-pitched hum or beat from the combined sound of about 30 towers some 3 kilometres away. Based on experience of the variability of noise at the Challicum Hills wind farm, it seems houses closer than 500metres could have more annoying noise.

Incremental deterioration is a major characteristic of environmental problems. Considering the spread of industrial noise over the last century, sound readings on wind farms are likely to be part of a trajectory of increasing noise from a variety of sources unless we express our valuing of quietness. The step-increase in background noise created by a new wind farm is perhaps a benefit in creating a market for noise, because humans adapt too well to incremental change. Quiet outdoor places, like the non-human environment generally, are probably undervalued by society if we also value having good prospects for wellbeing. For example, we might view littering in a litter-strewn place as less serious than in a pristine environment. However the reverse logic seems to be used for wind farm noise in quiet countryside. Places where no industrial noise is audible are becoming scarce in America, and Australia is following a similar path of development to America.

Wind farm noise is often favourably compared with highway noise or CBD noise. A more relevant benchmark might be to compare it with a sound environment we would like, not some of the less preferred "noisescapes". Comparison of wind farm noise with a beach is not relevant because the noise at a beach is not something imposed by on group of people on another, and it is not new. Secondly, the beach sounds have very different connotations to wind farm sounds.

Noise from wind turbines is tolerable if towers are sited far enough away from dwellings. Wind tower noise has been reduced from newer towers. There may be scope to further reduce the noise from turbines by altering the design of turbines. However it is a problem that should be taken seriously. In fact noise is accepted by authorities as a significant irritant. Vertical axis turbines, which so far have a lower generating capacity than horizontal axis turbines, produce less noise, as they have no blades spinning past the tower. They also kill many fewer birds and bats. If society wanted to accommodate concerns about noise rather than force a minority to tolerate it, these towers could be introduced, especially near dwellings, despite their currently lower capacity.

Whether or not there is any physical explanation for the illness claimed, by some people who live near wind towers, to be due to the noise or vibration from the turbines, wind towers are clearly very stressful for some. The stress alone is a significant health risk. This should be addressed, perhaps by further limiting the proximity with which towers may be sited to houses, by having a schedule of height limits related to the distance to the nearest dwelling and by banning lights on towers.

Light pollution from towers should be recognised as a serious issue. The red lights on the Waubra wind farm are a form of aesthetic degradation to the landscape. The light at the Challicum wind farm is on for no good reason (no people present) more than 90% of the time.

EFFECT ON EXPECTATIONS

The immediate physical costs of wind farm construction are not the only ones. The tendencies promoted by wind technology must be recognised and shaped responsibly. At present, wind farms, like many other technological responses to energy supply issues, promote the idea that addressing environmental damage is primarily a technological task. This ensures that the same societal aspiration for growth will be expressed through different technologies. Physical growth will still be the outcome. If a culture of growth and speed is maintained while wind farms spread, then wind farms may promote less concern about electricity use, which may then rise faster than it otherwise would.

Wind farms could demonstrate recognition of the need to accept physical limits on human activities, but currently they stand for the idea that we simply need to switch technologies with no substantial change to our expectations, lifestyles and economic groundrules. They also support the assumption that the earth can cope with whatever we want to do to it especially if the intention is “green”. The construction of substantial roads in hilly farmland and coastal areas physically facilitates the spread into what were relatively undisturbed parts of the landscape of the expectations we have about driving on public roads. Environmentally problematic expectations are given physical support in the rural landscape this way. This shoring up of environmentally problematic interpretations of the environmental problem is a social cost of wind farms.

For wind farms to have a positive effect on levels of sustainability in Australia, all aspects of their manufacture, installation, and maintenance, what they represent in the minds of the majority, and the uses to which their output is given need to be moving strongly towards sustainable practice. For example, a community grants scheme initiated by the local wind farm company has only modest benefit to environment, having been used to fund some local clubs with no particular interest in environment and the upgrade of computers at a local primary school. The funding could be spent on developing less invasive turbine installation methods or on “green” training for tradespeople, construction of more bikeways in the town, increasing the amount of shade in the town to prepare for the forecasted increasingly severe summers, water conservation infrastructure, public education about energy and environment, retrofitting public buildings to reduce their energy consumption, setting up walking buses to the local primary schools, setting up a green home information centre, increasing the sophistication of the recycling efforts at the transfer station, supporting existing environmental groups whose efforts reduce resource use, and so on.

GROUND RULES FOR BETTER WIND FARMS

For wind farms to be more sustainable, they would need to operate in an economy that recognises environment financially through prices and socially through altered aspirations. Government can accelerate the development of this situation through setting standards, by setting an example in its own operation and publicising its efforts, and by financial incentive or penalty through taxation. The following changes should be promoted and where possible implemented so that wind farms actually improve environmental health, rather than marginally slowing the rate of damage:

Beyond Physical Growth

Our society must mature beyond one that considers physical expansion of human numbers and infrastructure to be successful, impressive and beneficial. This is essential if we are to live within physical limits and the changes below are to be introduced. Government could begin this change by adopting economic statistics more revealing than GDP. Government should further efforts to establish a national system of environmental accounting: a budget for environmental disturbance and loss of land from primary production and reserves.

Resource Pricing.

The price of resources and environmental disturbance must be high enough to motivate more environmentally careful construction. Government can influence this by setting standards of non-disturbance of land during the installation of turbines. For example, the road through the Chalicum Hills wind farm was cut into the landscape as wide and flat as it was, we were told, primarily to allow access by the 300t crane needed to lift the nacelles and blades into place. The crane could have been dismantled and reassembled at each turbine site, allowing a smaller road to be sufficient. But this would have cost several weeks' labour for several people, compared with the much smaller price attached to road building.

If the diesel fuel that presently allows us to substitute for manual road making labour were priced highly enough, or if our society valued its quiet open spaces the way some societies value old buildings, then the human work of dismantling and reassembling could be substituted for environmental deterioration (earthworks and diesel combustion). Resource prices represent the labour required to produce them, but if a market for damage of resource extraction and use develops far enough, then the extra labour needed to avoid the damage becomes the cheaper option.

Likewise, if environmental disturbance were considered serious enough, and priced accordingly, it would become financially worthwhile to invest in remaking the factories manufacturing the tower sections so that they made the sections shorter. Shorter tower sections can be transported through sharper dips and over sharper crests in the road. Less earthwork is then required. This way the machinery would be designed to suit the landscape instead of vice versa, because the long-term environmental costs of installation would be recognised in the relative pricing of labour versus resources. Investment in redesign of the manufacturing wind turbines in smaller dust-proof components would remove the need for a very large crane and its large road to lift the nacelle into position. So-called "self-erecting" towers appear to offer another method of reducing the landscape impact of installation.

Limits

Permission for much of the environmental costs of installation must be wound back. There are plans to build a wind farm in the middle of a

significant brolga breeding site near Warrnambool in Victoria. Brolgas are very rare birds in southern Australia. At present, the low price of electricity as well as the underpriced loss and degradation of remnant vegetation give wind developers incentive to exploit the windiest sites regardless of conservation value. Remnant vegetation, sometimes on the most profitable sites, needs extra protection from development through penalties for damage and/or rewards for maintenance.

It is not that the loss of trees (cleared on our farm for the road), the further fragmentation of the natural landscape and urbanisation of the landscape (with roads, concrete culverts, plastic guide posts, gravel paths, rubbish, bluemetal parking area, and uniforms) simply need to be priced. Pricing them can help pay for rehabilitation. But a monetary price for environmental deterioration, to allow purchase of an “offset”, is not a substitute for environmental health, abundance and diversity when these are very scarce, as is the case with remnant vegetation. The price of a good or service is thought to allow the purchase of something equally desirable or useful. When environmental goods are very scarce, however, substitutability fails and money changing hands in compensation for the loss or damage of very scarce environmental goods does not leave society equally well off. Therefore even a high price on rare remnant environmental goods fails to ensure that natural capital is not further eroded.

Economic Incentives for a Finite Planet

We need government to create an economic structure that limits the physical size of a market while promoting efficiency and development within this limit. Government interference in markets is criticised as distorting markets from their most efficient form. However it is market forces that have played a major role in expressing the popular understanding and aspirations behind the last half century’s resource depletion and the diminished future prospects for living standards. Public measures of current living standards are “snap shots” and do not include this depletion or those critical aspects of future prospects diminished by excessive human dominance over nature. This suggests that the current definition of economic efficiency, with its consideration of (perceived) scarcity, (socially created and organised) demand and price at various levels of production is problematic. It acts on our short term concerns without recognising how these reach detrimentally into the future. It seems deficient as a social tool in not placing enough value even on 30 year prospects. Government influence can be criticised where it has been used to support the strongest parts of this short term system. But its influence should be used so that it eventually becomes socially unacceptable to buy or sell unsustainably.

To be fundamentally different from the existing power market, and not to simply make adjustments to the basic system of growth, we must dismantle the incentives we have created for selling more electricity. A rent or royalty applied to raw energy resources would not alter the basic

incentive for physical growth. It would simply mean that to achieve the same absolute profit level from lower profitability per kWh a company would need to sell more kilowatt hours. A cap and trade system for energy units would fundamentally alter economic incentives. In combination with a shift to services, as described below, a cap and trade system for energy, not just CO₂, will create economic incentive for more efficient use of the resource by the wind company in selling its product (or service). This would shift the thrust of economic prospecting and investment from development of new wind sites and larger towers to development of new efficiencies within their organisation. It would shift the incentive from size to efficiency.

SELLING SERVICES

If we wanted to design an economy that automatically grew, we would create incentives for throughput. This is what we have at present, by selling electricity per kWh. Wind companies currently become more profitable the more electricity that passes through their infrastructure.

An environmentally better scheme would be for energy companies to sell energy services, not electricity. This would make the change to a post-industrial service economy more thoroughgoing. Wind companies would sell the service for which we want the energy, such as refrigeration, or methods of keeping warm. This would remove another incentive for power companies to sell more electricity. Energy companies could improve their profitability by getting more saleable “product” or service to sell from the same amount of electricity. Dismantling of incentives for physical growth also requires replacing the pride and satisfaction at making a company grow, with pride and satisfaction at doing more with less: a task of changing social priorities. Pride in working with such large pieces of equipment also needs to be tempered with understanding of the drawbacks of machinery beyond human scale.

Valuing Road-free areas and Remnant Vegetation

Landowners need to request contracts entailing more earth-friendly installation methods. This would show a higher level of environmental sensitivity and understanding in society and would create financial incentive for wind companies to develop machinery and techniques requiring less disturbance to the land during installation. Demand has to be created for environmental protection, and landholder education can play a big part in this. Landholders without towers are paid for the imposition of having part of a wind farm road with its traffic through their property. Extending this basis for payment, if roads’ bare ground were considered a liability because of its erosibility by water and its lack of living vegetation, then landowners might charge wind companies per square metre of bare or per cubic metres of disturbed ground. This would provide an incentive for the wind developer not to make such wide roads, not cut roads in to the land so deeply or not to leave a permanent wide road. Temporary road making techniques would then be incentivised.

Without changes such as these to the rules and incentives driving wind farm development, we will only moderate existing trends; we will not substantially change them for the better.