

Submission to Senate Inquiry on the Social and Economic Impact of Rural Wind Farms

Submission

It is my submission that in respect to rural wind farms that:-

- (i) They do cause adverse health effects to a percentage of the population living up to 5 km (or more) from wind turbines.
- (ii) That noise and vibration information presented to us by Origin – as potential adjoining landowners, has been underestimated.
- (iii) That wind turbines have an effect on property values and whilst some jobs may be created, many others will be lost.
- (iv) That information presented to the Stockyard Hill Wind Farm Panel hearing was biased and expert witnesses presentations by the proponent have now been proven to be inaccurate after recent rainfall events.
- (v) Potential Stakeholders have been given preferential treatment in the design of the Power line route, and given other incentives to host turbines.
- (vi) There has been inadequate community consultation.
- (vii) Other issues.

Introduction

I live at “Slaters Lake” which is at the southern end of the proposed Stockyard Hill Wind Farm.

I am 51 years old, I have an honours degree in Agricultural Economics . I have worked for 10 years with the multinational company – ICI ,and then for the past 20 years on the land as a farmer (and grew up on the land) My wife Janet and I have actively sought to assist the flourishing of native fauna and flora on our property over our time here.

I am married to Janet and have three children 14, 10 and 9.

The consultation process – along with the errors and omissions in Origins application are surprising and give us little faith in the quality of lots of the predictions.

Furthermore, it disappoints me that the State & Federal Governments have not set more stringent guidelines for the development of Windfarms. The connection to the electricity grid could also be planned in a more structured manner– rather that working it out on an ad hoc basis- windfarm by windfarm.

(i) They do cause adverse health effects to a percentage of the population living up to 5 km (or more) from wind turbines.

We live 35 km from the Waubra wind farm which has now been operating for over a year.

We personally know a number of different families that live close to the windfarm. One family lives over 3.5 km from a wind turbine – and is constantly woken up at night due to their noise. Many other families have described to us the adverse impacts the Waubra turbines have on their lives

This makes our future very uncertain as we will have turbines situated as close as 2.5 km from our house.

Quite a few households within the Waubra Wind Farm have been bought out by Asciano because their houses have been unliveable. They have had to sign a gag clause in their sale contract – prohibiting them to speak out about why they have sold. One lady in this situation was subpoenaed to court to give evidence – and she revealed the reason she sold was because it affected her health and the house was too noisy to live in.

It is apparent that the noise will not affect everyone – just as car sickness does not affect everyone.

We have a disabled daughter who has sleep issues – and this was certainly not explored by Origin – and they made light of the fact stating that anyone can get a doctors certificate.

(ii) That wind turbines have an effect on property values and whilst some jobs may be created, many others will be lost.

Our family has owned this property for 4 generations. We have actively sought to develop and conserve the natural features of the farm. We have a lake – over 100 ha in size – which we have fenced to protect the old red gums that surround it. We have made a large investment in this property – and do not wish to see this investment eroded.

[...] says that close proximity to turbines definitely has an adverse affect on property values and sales.

John Jess – Property Valuer in Gippsland has also publically stated how wind farms can reduce lifestyle properties by 25% to 40% , and farming properties may be in the order of 10% to 15% - but this can vary either way depending on proximity and affect on view.

JOHN JESS	
Valuer	CJA Lee Property Pty Ltd
	50 Bland Street
http://www.cjalee.com.au/	Yarram Victoria 3971
	DX 32356, Yarram
	Telephone 03 5182 5251
	Facsimile 03 5182 6251
	Mobile 0427 825 251

Wind companies are always promoting the jobs that will be created by the wind farm. In the case of Waubra – as many people have been driven out of the district because of the adverse affects – as have been brought into the district to work.

In our situation we believe the ability to gain extra income through farm tourism will be eroded.

We regularly host Japanese school students. The last group of 4 boys stayed with us in September 2010. They come to experience the wide-open spaces and at night to view an unpolluted night sky. The company (Downunder Recreational Tours, Mt. Eliza, Melbourne, Tel: 03 97875232)who organises these visitors specifically requests that the Japanese students are shown the night sky to see the stars, as it is hoped there is no light pollution here.

We also host International Agricultural Exchange students, who come to our property to work on our farm and live with our family.

The noise and lights will affect the quality of their stay – and ultimately affect our ability to host these students in the future.

This wind farm will also severely affect the quality of stay of friends and family who often visit us.

Second Residence

We have a second four bedroom residence on our property which we are currently renovating to host families with children with disabilities (Prader-Willi Syndrome in particular) and also as a farm stay operation.

People typically use farm stays for a holiday if they have young children and want a restful and peaceful environment.

The close proximity of the wind farm will prevent farm stays being successful on our farm.

At no point have Origin ever considered the impact that the windfarm will have on this residence. It has never been shown on any maps.

Our ability to earn extra income from this operation will be affected.

(iii) That noise and vibration information presented to us by Origin – as potential adjoining landowners, has been underestimated.

Wind farm Modelling

What turbine is being used ?

“All modelling undertaken for the proposed wind farm has been based on the REpowerMM92 (2MW) machines”¹

However –during the application – and all the information provided states a rotor diameter of 104meters – which means they would be considering the REpower3.4M104 machine – which is 3.37MW and 104 meter rotor diameter².

Why do they do modelling on a 2Mega Watt machine when it appears they are intending to use a 3.37 Mega Watt machine!!!

Origin thoughtfully state in their application that:-

“In the event a different wind turbine model is used for the proposed wind farm, this may result in minor differences in the turbine dimensions. Should the dimensions alter, SYHWF will assess the impact of the new turbine model to ensure that the proposed wind farm continues to comply with the applicable standards in terms of noise, shadow flicker, and visual impact”

- Can we trust SYHWF to assess the impact of the new turbine model ?
- Has all their sound modelling been done on a 2MV machine?
- Visual photomontages in the original application were of a much smaller turbine - this was highlighted to the panel that Origin had to redo their photomontages with the larger turbine. I feel this error was intentional.
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- Turbine spacing was not done on the larger machine – In fact it doesn't even comply with the smaller machine.

I have attempted to get information from REpower on the specifications of the turbines they produce. After my initial contact with REpower – Germany – I was referred to REpower Australia. They told me I would have to go to Origin for more details because Origin are not using REpower machines.

This raises the question “What machines are Origin planning to use – and how can any modelling or Wind farm design be done without a clear idea on the size of machine that will be used?

It is submitted that as Origin must have known the modelling basis and the plans they have in mind, the failure to put before the Panel, the correct and actual specifications must have been intentional. The failure to explain and demonstrate any reason for such a failure must

¹ Page 47 – Planning Application Permit Report.

² <http://www.repower.de/index.php?id=12&L=1> See appendix 1

result, it is submitted, in a very serious doubt as to what true reliance even Origin put on the modelling provided.

It is trite but true that Origin have chosen to put only what they have selected before this panel, they chose not to explain the modelling and specifications disparity.

I submit that the way the modelling has been provided and the intentional failure by Origin to explain its adoption of modelling presented in this application means that they have no real confidence that results of the correct modelling (using the specifications of intended turbines), would support their application. I submit that when the fact of incorrect modelling being used is added to the obvious conclusion that Origin knowingly intended to use of incorrect modelling, the Panel can not and should not place any reliance on modelling as relied upon to support the application.

Turbine Spacing

If turbines are placed too close together then one will create a wake for the second one. This reduces efficiency – but also it affects the sound characteristics of the turbines. The recommended spacing of turbines is a minimum of 5 times the rotor diameter – which is $5 \times 104\text{m} = 520$ meters minimum. If the turbines are in line with the most common prevailing wind then the distance has to be 8 times the rotor diameter or 840 meters.

Many turbines though out the project are closer than the recommended distance.

This causes different noise levels to what has been predicted, as well as reducing the efficiency of the turbine due to the effect of the wake.

It is clear that a wind farm based on 2MW machines would be designed in a different manner to a wind farm based on 3.37MW.

Also, Repower turbines are known to be the quietest ones on the market. If different turbines end up being used, as is expected, then sound levels will be greater.

Impact on our house

The impacts of the Wind farm on our house will be significant.

In particular we are concerned with:-

- Noise (what we will hear)
- Infrasound (what we will feel)

- Ground Vibration
- Health
- Visual
- Shadow & Flicker
- Flashing Red Lights
- Effect on visitors

There should be no turbines within 5km of ANY residence

Noise – What we will hear

The Noise Standard used for turbine placement in the Stockyard Hill Wind Farm was NZ6808 1998.

This standard has been updated to keep in touch with appropriate levels and NZ6808 2010 should be the standard used for the Stockyard Hill Wind Farm.(The new standard was considered in rejecting The Sisters wind farm).

We know people who live 1 to 1.5 km from the Waubra, Challicum Hills and Toora wind farms and they say that the wind farm noise is very noticeable and can be very annoying.

Origins Expert Witness – Delaire said in response to this comment

*“The aim of NZS6808:1998 is to minimise the impact of the wind farm, not to make it inaudible to surrounding residents”.*³

Also, due to our close proximity to Mount Monmot there is the issue of the increased noise emissions due to higher level of air turbulence.

Origins Expert Witness – Delaire said in response to this comment

“Guidance on suitable siting of the wind turbines is provided by the turbine manufacturer. I understand that the turbines will be sited in accordance with this guidance.

*Turbulence levels are not taken into account when assessing wind farm noise emissions in accordance with NZS6808:1998.”*⁴

It is clear that the turbines have not been sited in accordance with the turbine manufacturer specifications, and also as turbulence levels are not considered in the sound report then how can we have any faith in predicted noise levels.

Ground topography was not considered when doing the noise study and this too will have an effect on how sound travels.

Atmospheric conditions have not been considered and this too will have an effect on how sound travels. In the winter when the air is dense the sound won't travel as far as in the summer when it is thinner. Sometimes on still days we can hear dogs barking and cows mooing over 3 km away.

In the late summer and autumn when paddocks are bare then the sound will travel much further. It will be like the acoustic in a room with bare floorboards vs a carpeted room

I'd also like to make an analogy between two large machines. A tractor and a turbine.

When you go to buy a tractor the specifications say how it rates in the manufacturer's tests. It will then go on to talk about power output, fuel consumption and many other features. You only hear the good information. When you get the tractor out in the paddock its real performance is evident. But also over time as the tractor ages it wears and it becomes noisier and does not perform as well as when it was new.

Turbines will be similar. A few years after they have operated then parts will wear and they will become noisier. One example of this is a noisy turbine at Waubra. We witnessed this on a trip to Waubra earlier this year. There was one turbine that obviously had a dry bearing and it was squealing. That squealing noise travelled a long way. I have been told subsequently that it is due to a dry bearing – which is unable to be lubricated or replaced without a huge crane which would be too expensive to hire.

Infrasound (what we will feel)

It is hard for people to grasp the concept on how something you can't hear can affect you.

Infrasound occurs when the turbine blades chop up the wind – and so it comes through in pulses. In a similar way to the propeller of a boat chops up the water.

This can be felt indoors as it will come through glass and can reverberate around a room.

Suggested mitigation such as double glazing of windows can make the noise worse. (Dr Bob Thorne).

Ground Vibration

We live on a stony barrier – part of the original larva flow from the Mt Monmot Volcano.

The sub surface between us and the turbines on Mt Monmot is solid stone. It is like a solid conductor. This means any vibration from the tower will be felt at our house. As these turbines are in a location where there will be uplift and turbulence then there will be considerable pressure on the blades and the tower. This will create more vibration than a turbine on flat ground.

According to Dr Robert Thorne⁵ this can be felt for up to 3.5km where there is a solid substrate. Suitable mitigation at 3.5km would entail building a house on a solid slab.

Health

The impact of the SYHWF on our family, and in particular our daughter, will be significant. Our daughter has Prader-Willi Syndrome and sleep issues just one of many issues associated with this syndrome

The Victorian Health Officer has said that he cannot find a link between turbines and health(based on a literature review – much of which has been written by the Wind Industry)

. However there is little doubt that they affect sleep patterns – and in the longer term this affects health.

I play the bagpipes and it could be argued that they don't affect your health. However I'm sure that if I woke you up every night by playing the bagpipes at 3 in the morning then over time your health, patience and sense of humour would deteriorate.

The issues of Wind Turbine Syndrome at Waubra , Toora and many other places cannot be ignored. There have been many doctors reports on health issues with Turbines⁶

The size of turbines used in the last few years are bigger than ever. There are very few in the world that are like the ones planned for Stockyard Hill . In fact there is are only 8 Repower3.4M104 turbines installed world wide (See Appendix 2)

Windpower designed Waubra – and the issues there have not been resolved.

Windpower (taken over by Origin)has designed Stockyard Hill Wind Farm – and have made the same mistakes – except on a bigger scale. There are more turbines here and they are more than twice as big (1.5MW Vs 3.4MW).

⁵ Information presented to Panel Hearing.

⁶ <http://www.savewesternny.org/health.html>

Health is my greatest fear with the proposed windfarm.

Answers need to come from the questions being asked at Waubra –and many other locations in the world before any further wind farms be developed.

A cautionary approach is the only approach that should be made.

Visual

In the Landscape and visual assessment (page 132) our house M18 is classified as having a high visual impact⁷.

It then goes on to say that because of existing screening the visual impact will be low.

Furthermore it states that the other proposed turbines close by will be behind Mount Monmot.

Well the assessor maybe didn't realise that the turbines behind Mt. Monmot will be 80 & 90 meters higher than Mt. Monmot – in which case we will see them from our house. Also they are all earmarked for red lights – and because of their height we will see them over the tree tops. We have a number of deciduous trees in our garden and in the winter time they wont block out any noise or lights.

We live where we live for many reasons:-

One reason is because we run our farming operation from here. But we don't have to live here to run the farm. I manage another farm 60 km away.

Other reasons are that we enjoy the view of the countryside. We like the quiet surrounds. We like the friendly & caring community. We like the night views.

The impact of this wind farm on houses has been acknowledged by Origin when they have offered put options on quite a few houses on small acreage. This sends a clear message that the windfarm will have an effect on the lifestyle of these people.

We have four bedrooms facing the east and we entertain on the east side of our house. The turbines, noise and lights will all have a substantial effect on our bedrooms and entertaining areas.

The fact that we live on a farm seems to discount the fact that we live here for lifestyle reasons. During the report Origin seem to assume we spend our entire life in our house –

⁷ Page 132 Planning Application Report – Landscape and Visual Assessment.

because it only ever refers to the impact from our house. We work all over the farm and the visual impact will be significant from most locations on the farm.

There was no viewing point taken from our house. If it had been done it would have shown that the vegetation around our house is too low to block out the turbines to the east.

Shadow & Flicker

We are on the edge of the Shadow flicker map – indicating that we will experience less than 30 hrs per year. The size turbine used to calculate these shadow maps have not been specified but we assume they were done on the smaller turbines.

We could get 20 minutes each morning for two months and that would still be less than 30 hours per year. Those 20 minutes could disrupt our sleep – and would have adverse effects our family.

The planning application also states that they may move the turbines up to 100m (micro-siting!). This could put the turbines even closer to our house which will create more shadow and flicker.

The effect of Shadow Flicker on roads – and intersections – was stated by Origin to be no different to trees on the sides of roads. I believe the shadow and especially the flicker and blade glint to be far worse – and a potential traffic hazard that needs to be considered.

Flashing Red Lights

The flashing red lights are of great concern to us. Origin has stated that they don't want to put red lights on the SYHWF turbines. However, Waubra residents were told there would be no red lights. They were subsequently turned on with no community consultation.

Origin is confusing the issue by saying that CASA may not require them to put on red lights. However they go on to say:-

- *“A wind farm proponent may have a duty of care to the aviation industry or local operators in terms of ensuring obstacles are made conspicuous...”⁸*

If we as farmers dig a fence hole on our property – and a trespasser comes on to our property and falls down the hole and hurts himself – then we are continually told by our insurance companies that we are liable.

⁸ Page 148 - Planning Permit Application Report

I am sure that Origin has a duty of care to protect the aviation industry.

Red lights won't be able to be turned off if they cause concern for residents. They will be flashing on and off – for the next 25 years – or longer.

Effect on visitors

Ross Richards from Origin said living next to turbines was like living next to a railway line. I used to live next to a railway line - trains did disturb my sleep. When we had friends and relatives, they would always be woken up by the trains.

Also, the noise from the turbines is different to that of a train – the type of noise is different – and while a train will come and go – the turbine noise is there all the time.

(iv) That information presented to the Stockyard Hill Wind Farm Panel hearing was biased and expert witnesses presentations by the proponent have now been proven to be inaccurate after recent rainfall events.

Brolga's

Brett Lane & Associates- Survey

During the survey period I had two contacts with BL & A staff.

BL & A only looked at usable breeding sites – and quickly dismisses sites that may impede on the number of turbines.

Wetland number 39 on the corner of the Skipton –Beaufort Rd and Mt Emu Settlement Rd is one example.

BL & A says it has been drained – cropped and no chance of it ever being suitable for Brolga nesting in the future.

This information is clearly wrong. It will hold water It has never been cropped from what I can determine – If it has it has certainly resorted back to its natural state. It has native grass surrounding it – And has been known to have had many nests during the wetter year in the 1980's.

In August this year-just 4 months after the expert advice of Brett Lane- this wetland filled – and remains full – and will be a valuable area for native fauna. Already, since the big rains we have seen Japanese Snipe (endangered) and also Australian Tern.

During the panel hearing, more evidence emerged of Brolga nesting site which had been left out of BL & A submission. On several occasions the panel requested that BL&A provide a complete list of nesting sites. This was not presented to the panel until the last day of the hearing – too late for any objectors to cross examine.

Brolga Movement Corridor

The movement corridor at the southern end of the wind farm includes Slaters Lake and its overflow swamp and Listons swamp. This covers an area of > 200ha. In winter it provides a habitat for a vast array of species – and in big numbers. I have seen Japanese Snipe, Australian Tern, Pelicans , Cape Baron Geese, Swans, ducks and Brolgas to name a few.

These habitats are still in close to their original condition and there should not be a power line running down through this corridor Over the past 6 years we have gradually fenced off 75% of Slaters Lake to try to enhance the habitat of flora & fauna.

(v) Potential Stakeholders have been given preferential treatment in the design of the Power line route, and given other incentives to host turbines.

Power line route

I have already made reference to the power line in relation to its effect on Brolgas – and going through a wildlife corridor.

Other issues of concern to us are that they will be going directly past our front gate – and along our property boundary from 3 km.

The power line outside our front gate is next to where our children catch the school bus. The radiation is of concern to us. This section was not in the original submission – and only tabled at the Directions Hearing. We were advised on the day of the Directions Hearing that the power line had been altered.

Also, as a result of the movement in power line route – it means there will be two powerlines converging at the intersection of the Skipton-Beaufort Rd and the Stockyard Hill Rd. This will cause further distraction to an intersection that is already a bad intersection.

The power lines along our Eastern Boundary will also impede aerial spraying on our property. Wind direction determines how a paddock is sprayed and the powerlines will reduce and in some cases eliminate the option of aerial spaying. This will greatly affect our crop yields and income.

Stakeholder Preferential Treatment

It appears that Origin have done what they can to appease stakeholders

Our neighbour (potential stakeholder – at time) had the power line running past the front of his property and house. This was the most direct route for the power line. He objected to Origin – and on the basis of this objection the power line route was changed to come past the front of our property.

I note with amusement that Brett Lane said the power line was moved because of vegetation issues! The vegetation issue was that some pine trees had to be removed. That hasn't worried Origin in other sections of the power line route.

Also, on the revised route a number of Pine Trees will have to be removed and that will increase the number of turbines we see from our house!

The revised powerline route was never discussed with us – and we were only notified during the panel hearing

I also believe Origin have offered to put down a bore for a stakeholder to pump up water to enhance wetland areas.

Other stakeholders have had offers of work on their dams – as a sweetener to host turbines.

(vi) There has been inadequate community consultation.

Community Consultation

To my knowledge there has never been a map put up in Skipton for public viewing. I believe the application has been available for viewing at the Post Office. Many people are unaware of the scale of the project and the size of the turbines. They are quite surprised when we tell them that the sweep of the blades will cover nearly one hectare. The photomontages at the Post Office would also have been incorrect.

We have had a few visits from Windpower/Origin. We have continually requested maps of their proposed layout. They never gave us a copy saying it hadn't been finalised.

When we expressed concern about the power line route they told us they we need not worry about it because it was only one of three proposed routes. Now do we start to worry?

The Geology, Geomorphology and Geosciences report dated September 2008 (Annex J) doesn't include the total project as it is presented in the Planning Permit Application Report.

It doesn't include the area near us – as well as many other parts of the project area.

This highlights how Origin have continually been adding on turbines here and there.

This gives us little faith in the staff of Origin.

Origin have been busy selling the wind farm to the community visiting the schools and progress associations etc. The story they are selling is the money they will give to the community and the money that will be bought into the town. They have not discussed the health issues, the loss of visual amenity, the lights, the empty farm houses and so on. Just the positives.

Stakeholders of Stockyard Hill Wind Farm

Have the stakeholders been told all the facts?

The appeal of financial compensation has convinced them and some of the members of the community that the project is good.

The Submission states that 23 out of 25 properties exceed standard NZS6808 .However they comply with ETSU-R-97. This standard cannot be used as it was designed for far smaller

turbines⁹ – read articles below to see that ETSU-R-97 was developed for medium turbines (hub height 32m – and not large ones – isn't this a big deficiency! The remaining 2 properties will be occupied by SHWF for life of project.

Have these stakeholders been told that noise at their houses will exceed the old standard (NZ6808 1998). I don't think so! We have friends who will be in one of the two noisiest houses in the wind farm – I don't think they have been told that.

The theory is that stakeholders have a higher tolerance to noise because they are getting paid BUT do their children and grandchildren have a higher tolerance.

It seems like a double standard to me and I know with work care there are not different rules for different people.

Have stakeholders been told that they will not be able to aerial spray paddocks near turbines? Pesticide spraying has to be done when there is wind. When there is wind the turbines will be turning – causing turbulence. Aerial operators will not operate in these conditions.

Have stakeholders been told in bad fires that firebombing aircraft will not be able to operate over their property!

Have stakeholders been told that the double glazing that some have been offered as mitigation for having turbines close to their house will actually make the noise worse?

Transparency

At one stage there were 5 turbines proposed around the base of Mt Monmot. We mentioned to Ross Richards (Origin) our concerns with these turbines. Later he said he took into account our concerns and removed 2 turbines. Were we expected to think he was thinking of us?

⁹ <http://www.wind-watch.org/documents/wp-content/uploads/mas-noise-assessment.pdf>

good article on the deficiencies of ETSU-R-97

Then at the panel hearing we discover they were removed for morphological concerns!

Origin has offered mitigation to some stakeholders in the form of double glazing of windows. Have all stakeholders with noise issues been offered this?

How many houses have been offered put options?

These type of secret deals erode our community cohesion.

(vii) Other issues

Secondary Consent

One concern of great importance to us – and many objectors, is the option of any condition of the permit which grants “secondary consent”. If secondary consent is not allowed under the permit, any later change has to comply with the statutory regime of public consideration under the Act. That is particularly important to this project given the modelling does not relate to the machines actually proposed by the Applicant.

Our argument against secondary consent being permitted under the permit is that the Act has been set up to allow public participation, there is no good reason for that to be circumvented by a secondary consent permission, even more so where the modelling is not using the intended turbines.

Radio Reception

The Panel for the Lal Lal wind farm acknowledged that the Radio Controlled Model club would have to be relocated.

There is little doubt that interference with the control and operation radio controlled model aircraft at the Ballarat Radio Model Flying Club’s field could be expected.

...We note that the Proponent has offered to assist the club with such any such relocation.¹⁰

Does this mean our boys won’t be able to use their radio controlled cars and aeroplanes?

Television, Radio, UHF Radio, CFA Radio, GPS units on tractors and headers all rely on good radio reception. Wind turbines can have an affect up to 50 km – depending on where towers, transmitters and receptors are.

¹⁰ Page 103 Lal Lal Wind Farm Panel Report

GPS in Agriculture is rapidly expanding with automatic steering on tractors. Transmitters are often put on high points to ensure good coverage of a big area. 132m towers would have to have an effect on these.

Conclusion

The Victorian Labour Government – in their final days approved the construction of over 1400 Wind Turbines. This is despite the growing body of evidence proving a link between adverse human health and proximity to Wind Turbines.

There needs to be more independent analysis of these health affects- before it is too late. There is no doubt that we need to reduce the use of coal fired electricity generators. However – to adopt wind power on this scale – with known health affects is wrong.

The turbines being proposed are far bigger than the majority of turbines used in Europe. Turbines with a height of 132m – and 3MW – have only been used over the past 8 to 10 years in Europe – and nowhere near the scale that is being proposed at Stockyard Hill.

We enjoy where we live – and the SYHW will impact on our lives substantially.

It is extremely annoying that the Victoria and or Federal Governments have not set up stronger guidelines. The process we – as individuals has been costly, very time consuming and stressful and has affected other areas of our life. This could have been avoided – or reduced – with better guidelines in place.

We don't want the mistakes of Waubra and other wind farms made at Stockyard Hill.

David Jackson

2466 Stockyard Hill Rd

Skipton


Vic 3361


Appendix 1

<http://www.repower.de/index.php?id=12&L=1>

The REpower product range

The REpower product range comprises wind turbines with an output from **2.05 megawatts up to 5 megawatts** and **rotor diameters from 70 up to 126 meters**. Regardless of whether your site offers strong or weak winds, flat land or mountains, or is onshore or offshore, REpower offers the right solution for all locations and conditions combining: **high yields, reliability, and cost-effectiveness**.

Our  **sales team** will gladly advise you on choosing the optimal wind turbine for your site.

All product lines are based on proven  **REpower technology** and offer intelligent, efficient turbine design and maximum quality down to the smallest detail. This enables REpower turbines to achieve peak performance in terms of energy, reliability, and network compatibility. This high-quality power plant technology translates into **particularly economical operation** over the turbine's **entire lifespan**.

Technical Data *

Typ	Rated power	Rotor diameter	Power control	Speed	Range of application
<i>5M</i>	5.0 MW	126.0 m	Pitch (electrical)	Variable	Onshore/ Offshore
<i>3.2M114</i>	3.17 MW (MV-side)	114.0 m	Pitch (electrical)	Variable	Onshore
<i>3.3M104</i>	3.37 MW (MV-side)	104.0 m	Pitch (electrical)	Variable	Onshore
<i>MM92</i>	2.05 MW	92.5 m	Pitch (electrical)	Variable	Onshore
<i>MM82</i>	2.05 MW	82.0 m	Pitch (electrical)	Variable	Onshore

* technical modifications reserved

Environment:

No leakage of lubricants at hub or nacelle, due to

- - labyrinth packing in spinner
- - grease and oil collecting pans integrated in nacelle
- - coaming edges in nacelle panelling and
- - grease pan below azimuth gearing

Closed central lubrication system of blade bearings

Shielding of all relevant cables and use of power rails to protect workers and machine