TO: THE BOARD OF INQUIRY
HAUAURU MA RAKI WIND FARM PROPOSAL

IN THE MATTER OF the Resource Management Act
AND
IN THE MATTER OF resource consent applications by Contact Wind Limited in respect of the Hauauru Ma Raki Wind Farm Proposal
AND
IN THE MATTER OF Notices of Requirement and a Resource Consent application by Contact Energy Ltd for transmission infrastructure related to the Wind Farm Proposal

EVIDENCE OF Sean Barrington Cox

My Name is Sean Barrington Cox.

My primary occupation at present is managing the environmental reconstruction my family's land on the Aotea Harbour edge. Previously and currently I am consulted as a mathematical analyst primarily in fluid and structural dynamics.

My qualifications and experience relevant to this evidence are that:
I hold the degree of Bachelor of science from the engineering faculty of Southampton university in 'Ship Science'.
I have designed structural and aerodynamic elements of wind turbines for over 35 yrs. I have been involved with solving power transmission problems for wind turbines for over thirty years.
I have studied the wind of the west waikato and have detailed records for over 10 years.
I have carried out intensive tree growing for carbon sequestration trials in the west Waikato and have detailed records covering 15 years.

Is Wind power with it's high environmental impact really necessary?

During the Te Uku turbine hearing WEL successfully argued that they did not have to consider alternative power generation methods. The commissioners at that hearing held that WEL could choose the renewable generation technology with the highest cost and severe environmental impact and did not have to justify this choice at the turbine consent stage.

For this combined application 168A (3) b and c of the RMA 1991 imposes a duty on requiring authority to consider alternative sites, routes, or methods of undertaking the work. As well as whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the consent and designation is sought.

The duty under 168A must be applied to the project as a whole.

Wind power is a poor choice both for the West Waikato and for NZ in general. This was argued at the Te Uku turbine consent hearing and subsequently proved by operational experience in the last year with New Zealand's current industrial scale wind power generators.

One specific disadvantage of wind power that has great bearing on this application is its cyclic nature and dependence on weather patterns. Its placement in an area of relatively light wind means the actual average power output of the Te Akau wind turbines will be below 120MW. Market effects that were proved over the last four months may even drop the long term average below 100MW.
All the four practical and superior alternative renewable power generation methods have high peak to mean ratios and can provide this level of average power down much smaller and less intrusive lines..

It is worth noting that one of the alternative reliable renewable generators in the Te Akau-Huntly area would improve the reliability and quality of Aucklands supply. Something that the proposed wind project does not do.

Alternatives to Wind turbines and pylons.

I include a description of alternatives to wind written two years ago for the Te Uku turbine hearing. This is still relevant as background as all the wood power and solar options scale to the size of this project.. With two additions.

1. Actual wood power power plant design near Te Uku substation.
A project to generate electricity from intensively grown wood actually reached detail design and land acquisition stage near Te Uku last year. This project was discontinued last August because of business reasons. (the impossibility of competing with a cartel that has access to hydro power generated at a cost of $10/ MWH without government guarantees).
Data from this project shows that a combined Gasifier - internal combustion - ORC (Organic Rankine Cycle) power station with similar annual output to the TE Uku wind project can be built for less than 45 Million NZ$. With running costs including fuel less than those of the Te Uku wind turbines. This station could supply it's full output down simple concrete HT lines.
This project scaled well to 50MW per site output so two of these small and inconspicuous plants (about the size of a large cowshed) would be a superior replacement for the massively intrusive and destructive wind power project.
At less than 200 million NZ$ for capital 10 year cycle costs this option would generate a more useful type of power at a much lower cost than the wind project.

There are more than twenty ideal sites for this type of plant between the wind power site and SH1. To clarify there is potential to generate more than 1000 MW (continuous!) from this area with no impact on agriculture or tourism.

2. New technology solar generation is available for delivery about 2013 that prices a 20MW unit at around 50 million NZ$ including control gear. This has a lower annual output than the Te Uku wind project but is much more reliable and is very much ‘power for dummies’. This station could supply it’s full output down smaller lines.

I also include for information the paper ‘Wind farms provide negligible useful electricity’ written in 2006 but the issues raised have still not been solved in the case of windpower in NZ.

Contact’s north west wind wind power and transmission line project is a pointless and unnecessary development. It has been overtaken by newer technologies and is as obsolete as the horse buggy.

Effects of 600MW transmission line.

The pylons of the 600MW line required for the inefficient wind turbines line will be one more blot on the landscape.
Do not discount this, everything that makes NZ’s landscapes look less natural has a real effect on tourism income. The effect of this line could easily be millions of lost dollars over a fifty year period.

The value of houses within 750M of the line will be badly hurt. The health risks associated with high tension lines may not be incontrovertible but they are likely enough to make most people avoid living near them. I would not personally ever live within 1000M of a this type of line.

The line will kill and maim a significant number of birds. This will be an obstacle to recovering populations in the future but of course will be insignificant compared to the larges numbers killed by the turbines themselves.

Relative Carbon Emissions, last year. March 2008-March 2009

At the Te Uku wind power turbine hearing 18 months ago several opposing submitters raised doubts about the usefulness of much more than the current 600MW of installed wind power in New Zealand. 600 MW being about 7% of NZ's generating capacity, an amount which is around the limit for easy grid integration.

Specifically, I pointed out that the linkage between dry periods and light winds made wind power particularly unsuitable to back up NZ's hydro dominated generation and that the wild claims of saving carbon emissions were not backed up by any examples.

The last year has settled these points beyond any rational dispute.

The last year had a dry late 2008 summer but an average amount of rain overall.
7 out of 8 dry summers also have light wind and this was true of last year.
There were poor inflows to the hydro lakes in the early part of last year. This resulted in Huntly running flat out for months just to keep the lake levels up.

Currently NZ needs 80% of hydro power available to meet peak demand. Wind power cannot be counted on to meet peak demand. Records show that peak daily demand times happen at times of low diurnal wind, even if the average wind is good.
Over 10% of the time no wind power is available at the time of peak daily demand. This will not change no matter how much wind power is installed on the main islands.
At present hydro lakes must be managed to ensure that there is always enough water to run storage lake driven hydro turbines at times of peak demand.
This is inherently wasteful and will not be changed by any amount of wind power installed on the main islands of New Zealand.

It is illuminating to the usefulness of wind power to note the results of a study of the effects of different generation types for the last years actual weather.

These results assumed un upgraded high voltage grid for the 2000MW additional wind power. Note that the government's recently announced 2 billion dollar plus upgrade is less than 2/3 of that required to support an additional 2000Mw of installed wind power.
I have added a wood fired alternative to this chart assuming the same operational constraints as the first three.

The results of this study seem odd at first glance.
Building 666 3 MW wind turbines results in a saving of a paltry 35,000 tonnes of CO2 equivelent (1.3%) but requires 1,900,000 tonnes of CO2 equivelent emissions to build them. A 54 year payback period.

Building five 400 MW gas stations reduced emissions by 620,0000 tonnes of CO2 equivelent (23%) but only required 80,000 tonnes to build. A payback time of two months.

Building 100 20MW wood stations reduced emissions by 1,602,0000 tonnes of CO2 equivelent (60%) but only required 160,000 tonnes to build. A payback time of just over a month.

Main reason for these odd results are that in options 1 and 2 most of the power from the wind turbines was used to keep lake levels high 'just in case' there was no rain latter. The coal fired stations had to run at full capacity for six months for the same reason. All this power was wasted when rain arrived latter in the year, much of which had to be spilled.
In options 3 and 4 there is enough generation capacity even if the main storage lakes are empty so all the water in these can be used. This increases hydro utilisation and greatly reduces the need for coal generation. especially so in the cheaper option 4.

Option 4 gets to 82% renewable generation. Rather better than the 62% of option 2.

Relative carbon emissions	in kt CO2-e	Power figure is annual amount able to be utilized by grid in GWH									
	Option 1 power generated	actual	carbon emission-construction	Option 2 power generated	2000Mw new wind carbon emission-fuel	carbon emission-construction	Option 3 power generated	2000mw new gas. carbon emission-fuel	carbon emission-construction	Option 4 power generated	2000mw new wood. carbon emission-fuel	carbon emission-construction
Hydro	21800	fixed		20000	fixed		23200	fixed		23800	fixed	
geothermal	3800	460		3800	460		3800	460		3800	460	
wind	980	0	108	3000	0	1920	980	0	108	980	0	108
wood	360	0		360	0		360	0		7000	-200	40
gas	11200	1000		11000	982		12920	1154	20	6680	596	
coal	4900	1100		4900	1100		1900	427		900	202	
oil	120	100		100	83		0	0		0	0	
total	43160	2660	108	43160	2625	1920	43160	2040	128	43160	1058	148
Total emissions		2768			4545			2168			1206	

A note on the monetary cost of these options may be helpful.
666 3Mw wind turbines spread over both islands together with the grid upgrade necessary cost about 8.2 billion NZ dollars.

Five 400Mw gas stations need some grid upgrade and so cost around 4 billion NZ dollars.

100 20MW wood stations need no grid upgrade and cost between 3 and 4.5 billion NZ dollars depending on whether a labour saving type is required.

Running cost of 100 20MW wood stations is about the same as 666 3MW Wind turbines in NZ conditions. 5 400 MW gas stations cost a lot more to run if gas prices continue current trends.

There are two significant effects that none of the alternative generation methods will produce.

Large amplitude very low frequency air pressure variations. (including subsonics).
An issue of which the only common source is large industrial scale wind turbines.
My analysis of the output from Contact's turbine array suggests that Aotea harbour will be shielded by topography. Hence I have made no personal submission about this project. I reserve the right to oblige Contact to alter operational methods if my analysis is in error and significant emissions do reach my home.
Raglan however is exactly on the array axis and in some common wind directions may well suffer significant reinforcement of this problem as well as annoying and disturbing beat effects in the audible pressure wave range.

The destruction of the natural view of the coast north of Raglan and the subsequent removal of a valuable price support feature of the houses at the base of Karioi.
This project taken together with the Te Uku wind power plant will remove much of Raglan's current natural views. This will certainly have a fundamental effect in detriment to Raglan's appeal as an international tourist destination.

Sean Cox B.Sc.(Eng)
RD2 Moerangi. Raglan. O7 8256829
sbcox@orcon.net.nz