IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications to the **WAIKATO DISTRICT COUNCIL** and **WAIKATO REGIONAL COUNCIL** by **WEL NETWORKS LTD** for resource consents to authorise the establishment, operation and maintenance of 28 wind turbines for the generation of electricity and associated activities on the Wharauroa Plateau near Te Uku

FURTHER STATEMENT OF EVIDENCE OF JIM TRUESDALE

1. INTRODUCTION

Qualifications and experience

1.1 My name is Jim Truesdale. I am a director of Concept Consulting Group, a Wellington based consultancy specialising in the energy sector. My qualifications and experience are set out in my original statement of evidence. I also confirmed my commitment to comply with the Expert Witness Code of Conduct in that statement.

Purpose and scope of my evidence

1.2 Mr Gallagher submitted evidence on 13 February 2008 which raised issues in relation to my original evidence. The purpose of this statement is to comment briefly on specific issues raised by Mr Gallagher in his statement of evidence. In that regard, my evidence will address the following matters:

(a) Carbon footprint of the project (section 2);

(b) Emissions avoided (section 3); and

(c) Penetration of wind generation (section 4).

2. CARBON FOOTPRINT

2.1 Mr Gallagher states (para 7.7 of his statement of evidence) that a recent Auckland University study estimated the carbon footprint of Meridian Energy's Te Apiti wind farm to be 93,800 tonnes of carbon dioxide, and that this is equivalent to 1,705 tonnes per wind turbine. He then goes on to state that:

> *"This is almost double the 865 tonnes calculated by Jim Truesdale and even greater than Mr Cox's conservative estimate of 1,400 tonnes per turbine. As the turbines planned for Te Uku are 3 MW, compared to 1.65 MW at Te Apiti, the carbon footprint for each Te Uku turbine will be considerably greater than 1705 tonnes".*

2.2 In my original statement, I noted a number of studies which estimated the carbon footprint of wind turbine generators. I concluded (para 5.5) that, based on the highest estimate from the studies reviewed, a conservative estimate for the carbon footprint of the Te Uku wind farm would be 104,000 tonnes of carbon dioxide. This is equivalent to approximately 3,700 tonnes per wind turbine generator.

2.3 The figure of 865 tonnes [per turbine] to which Mr Gallagher refers (para 7.7) is an estimate of the carbon dioxide emissions embodied in constructing the foundation for each turbine and mounting it, excluding wind turbine manufacture, etc. Further, the estimate of 1,400 tonnes by Mr Cox, to which Mr Gallagher refers in the same paragraph (para. 7.7), was also only for mounting and construction (i.e. excluding equipment manufacture, transport to New Zealand). My upper estimate of the total carbon footprint for each turbine, to which he should have referred, is approximately 3,700 tonnes.

2.4 Linearly scaling the Auckland University study estimate of 1,705 tonnes per 1.65 MW turbine to which Mr Gallagher refers (para 7.7) yields a figure of 3,100 tonnes for a 3 MW wind turbine. This is 600 tonnes lower than my upper estimate of 3,700 tonnes.

2.5 Applying the Auckland University figure so-scaled to each of the 28 Te Uku wind turbines would yield a carbon footprint of approximately 87,000 tonnes of carbon dioxide for the project. That figure is significantly lower than the upper estimate of 104,000 tonnes which I derived, but higher than most of the estimates derived from the international studies noted in my statement.

3. EMISSIONS AVOIDED

3.1 I stand by my original statement, in which I estimated that the Te Uku project could avoid up to 168,000 tonnes of carbon dioxide emissions annually (assuming an

average contribution of 259 GWh to annual energy supply requirements) and that therefore the project would achieve carbon credit status within its first year of operation.

4. PENETRATION OF WIND GENERATION

4.1 Mr Gallagher states (para 7.1) that:

> *"A large part of Jim Truesdale's subsequent evidence is taken pointing out that NZ generates most of its electricity from hydro resources and then comparing that to countries who generate electricity by other means. It seems strange that he did not explore electricity markets with substantial hydro resources and the issues they have encountered integrating hydro into their networks".*

4.2 My original statement simply notes that other countries with proportionately less hydro than New Zealand have been able to accommodate significant levels of wind generation. There may be some associated system costs which wind investors in New Zealand will bear (as acknowledged in my statement, e.g. para 3.24 and following). The key point I was making is that, from a technical perspective, significant levels of wind have been integrated into systems with less hydro than our own.

4.3 It is unclear which other countries Mr Gallagher believes I should have looked at. Elsewhere he states, with respect to the California Public Utilities Commission study concerning North American control areas, that (para 5.2) "*many of these power control areas are mainly hydro based*" but gives no details as to which power control areas he is referring to.

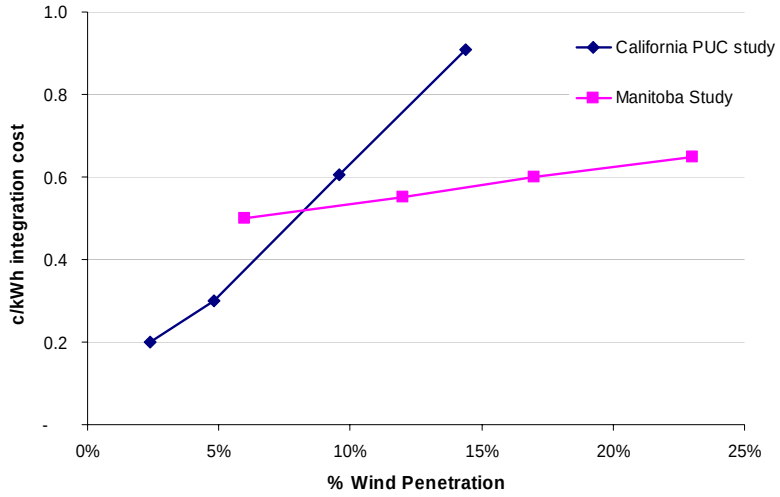
4.4 He separately mentions Manitoba (para 5.5). Manitoba Hydro is a provincial government owned utility in Canada with interconnections to other provinces and particularly the US. It has approximately 5,500 MW of installed generating capacity, of which just under 10% is thermal. It has facilitated the development of a 300 MW of wind farm (purchasing its production) and is seeking to facilitate more similar developments.

4.5 The table below para 5.5 of Mr Gallagher's evidence provides estimates of wind integration costs for different levels of wind penetration in Manitoba. It is interesting to observe from the table that as wind generation penetration increases from 250 MW (6% penetration) to 1,000 MW (23% penetration), system integration costs are expected to increase by Cdn0.15 cents/kWh. In contrast to Mr Gallagher's assertion (para 5.5) about integration costs escalating disproportionately, that is a relatively small increase.

4.6 Further, the Manitoba Hydro study estimates to which he refers appear to be inconsistent with his earlier assertion (para 5.4), based on his analysis of the California Public Utilities Commission study, that "*As the amount of wind generated doubles, the* total *integration cost quadruples"*.

4.7 The following chart, derived from the data presented by Mr Gallagher from the two studies he refers to, shows how the estimated integration cost estimates vary on a per kWh basis for different wind generation penetration levels.

Figure 1: Comparison of integration cost data on per kWh basis



4.8 This highlights the risks inherent in attempting to interpret and apply the results of cost estimate studies undertaken elsewhere to the New Zealand market.

4.9 Figure 1 of Mr Gallagher's statement (following para 5.2) further confirms this point. For example, the MNPUC (Minnesota Public Utilities Commission) study results shown within Mr Gallagher's Figure 1 suggest that with 25% penetration, system costs would increase wind generation costs by a comparatively low figure of 0.4c/kWh. Electricity supply in the MNPUC region is dominated by thermal and nuclear generation with hydro supply accounting for less than 2% of total generation. In contrast, the corresponding estimate for Manitoba Hydro, which is interconnected to Minnesota, and dominated by hydro supply, is roughly double this figure at over 0.8c/kWh.

4.10 In any event, I note that the level of costs referenced by Mr Gallagher are generally less, on a per kWh basis, than the impact of carbon costs on thermal power station operating costs.

5. CONCLUSION

5.1 To conclude, I consider that the reasoning underpinning Mr Gallagher's criticism of my evidence as regards the matters I have addressed above is flawed and there is nothing in his statement which would lead me to alter the conclusions which I reached in my original statement.

Jim Truesdale
February 2008