IN THE ENVIRONMENT COURT **ENV-2010-WLG-000145**

IN THE MATTER	of the Resource Management Act 1991 (the "Act")
A N D	
IN THE MATTER	of an appeal pursuant to clause 14 of the First Schedule to the Act
BETWEEN	**TRUSTPOWER LIMITED**
	Appellant
A N D	**OTHER PARTIES**
	Appellant
A N D	**HORIZONS REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE OF
CLAYTON DOUGLAS DELMARTER

17 February 2012

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1. INTRODUCTION

1.1 My name is Clayton Douglas Delmarter. I am employed by TrustPower Limited ("**TrustPower**" or "**the Company**") as Manager Major Projects (Acting).

1.2 This position sees me responsible for the construction of TrustPower's generation and infrastructure projects, including the development of its wind farm projects from feasibility through to execution. In this role I am a member of the Generation Portfolio Management Team, providing input to the strategy and management of the Generation Division's $2.5 billion asset base.

1.3 I have worked at TrustPower since 2002 (apart from a period where I worked overseas between 2006 and 2007). I have fulfilled a number of roles including project engineer and project manager prior to and since joining the Company.

1.4 I have been actively involved at some level in the operation, maintenance, development and construction of each stage of the Tararua Wind Farm. My responsibilities have included asset management, the full suite of site development including landowner liaison, wind monitoring, wind turbine selection and micro-siting, and assisting with the consenting and construction of both Stage II and III.

1.5 I have been working in the renewable energy sector in New Zealand and abroad for over 10 years. My overseas experience includes a role as Business Developer for BP within their Alternative Energy division based in Houston, Texas, United States of America. The primary focus of this role was focussed on developing wind farm projects in the USA, Europe and Asia. I was responsible for greenfield project identification, development activities and technical support for construction of a number of projects, including the repowering of the Edom Hills Wind Farm in Palm Springs, California.

1.6 I hold the qualifications of Bachelor of Science and Technology (Chemical Technology) from the University of Waikato.

2. SCOPE OF EVIDENCE

2.1 In this statement of evidence I will:

(a) Provide a brief overview of TrustPower and its generation portfolio;

(b) Outline the development of the Tararua Wind Farm, including in the context of surrounding wind farm development;

(c) Discuss the likely nature of the future repowering of the Tararua Wind Farm; and

(d) Address TrustPower's concern with Policy 7-7 in terms of implications on TrustPower's ability to upgrade or repower the Tararua Wind Farm.

2.2 My qualifications as an expert are set out above. I have read the Environment Court Code of Conduct for Expert Witnesses, and I agree to comply with it to the extent that I am qualified to give evidence as an expert. However, I also note that I am an employee of TrustPower and am authorised to present this evidence on behalf of TrustPower. I understand that in providing opinion evidence my duty is to the Court as decision maker and not to my employer.

3. OVERVIEW OF TRUSTPOWER AND ITS GENERATION PORTFOLIO

3.1 TrustPower is New Zealand's fifth largest electricity retailer and fifth largest electricity generator.

3.2 TrustPower is a listed company on the New Zealand Stock Exchange and remains predominantly New Zealand owned (more than 90% of its shares are NZ owned). TrustPower employs approximately 400 people nationwide, with a significant number of these employed at its head office in Tauranga. TrustPower generates electricity nationwide and retails electricity to approximately 220,000 customers.

3.3 Nationally, TrustPower's generation assets consist of two wind farms, 19 small to medium sized hydro-electric power schemes and one diesel peaking plant. These schemes are strategically located throughout New Zealand to ensure electricity is generated as close as possible to where it is consumed. A schematic map showing the location of TrustPower's generation assets in New Zealand is attached as **Appendix One** to this statement of evidence. TrustPower also owns and operates the Snowtown Wind Farm in South Australia.

3.4 The Company is committed to responsible and effective energy generation and to applying best industry practice to its activities. It acknowledges the importance of the environment to its continued operations and has a proven capacity to deliver sustainable environmental outcomes.

3.5 TrustPower constantly strives to enhance the performance of its existing schemes to increase environmental performance and demonstrate efficiency in the use of competing scarce resources. As part of this, the Company has an on-going programme of developing and implementing enhancements to its generation facilities.

3.6 TrustPower is mindful of the Government's target to generate 90% of electricity from renewable sources by 2025[1] and considers that its enhancement programme goes some way to helping achieve this target.

4. TARARUA WIND FARM

4.1 The Tararua Wind Farm is located 10 kilometres northeast of Palmerston North, and extends for 8km along the northernmost end of the Tararua Ranges. I refer to and adopt Ms Barton's description of the Tararua Wind Farm at paragraph 33 of her evidence-in-chief dated 31 January 2012 ("**Ms Barton's EIC**").

4.2 In December 1999 TrustPower purchased the newly commissioned Tararua Wind Farm, consisting of 48 660kW, three-bladed horizontal axis upwind turbines on lattice steel towers (Vestas V47), each being 63.5m in height (to the blade tip).

4.3 In May 2004, TrustPower completed construction of Stage II of Tararua Wind Farm, in which 55 additional turbines of the same model were erected, taking the installed wind farm capacity to 67.98MW.

4.4 TrustPower was granted resource consent for Stage III in 2005. This stage, which was completed in August 2007, involved the construction of a further 93MW of wind generation capacity comprising of 31 x 3.0MW turbines on cylindrical steel towers (Vestas V90), each being 110m in height (to the blade tip).

4.5 Attachment B to Ms Barton's EIC provides a summary of the wind farms in the Manawatu which includes the three stages of the Tararua Wind Farm, although I note that Stage III is not under construction as recorded but rather is built.

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[1] New Zealand Energy Strategy 2011-2021 and the New Zealand Energy Efficiency and Conservation Strategy, Developing Our Energy Potential, 2011, New Zealand Government. The Strategy retains the target set in the New Zealand Energy Strategy 2050 and referred to in the preamble to the National Policy Statement for Renewable Electricity Generation.

4.6 The selection of turbines at each stage of development is a judgment based on technology, availability, and economics. I expect the same factors will be relevant in the future.

4.7 Stage I of the Tararua Wind Farm was one of the first wind farms to be constructed on the Tararua Ranges, and within New Zealand. The three stages of the Tararua Wind Farm make it the largest operating wind farm in New Zealand at 161MW producing some 620GWh/yr, and approximately 1.5% of New Zealand's annual generation volume. This is enough energy to supply nearly 80,000 New Zealand households each year.

4.8 To maximise energy production, the turbines are sited along the main ridgeline, as well as on other lower spurs and ridges. A map showing the layout is attached to my evidence as **Appendix Two**.

4.9 I understand that in respect of the consenting of all three stages of the Tararua Wind Farm, the Tararua Ranges were identified in the Operative Regional Policy Statement as being an outstanding landscape.

The Tararua Wind Resource

4.10 The Tararua Ranges has received international recognition for its outstanding wind resource. The annual average wind speed observed at the site is 9-10m/s at hub height.

4.11 Stage I and II of the Tararua Wind Farm have a life to date capacity factor[2] of approximately 44%, and its production efficiency has been recognised by numerous national and international sources.[3] In November 2006, the Tararua Wind Farm achieved a 71% capacity factor, which is an exceptional performance measure. When compared with European and American typical annual capacity figures of 30 and 35% respectively, it is clear that the Tararua Wind Farm is a well sited and efficient wind generation facility.

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[2] The capacity factor is simply the wind turbine's actual energy output for the year divided by the energy output if the machine operated at its rated power output for the entire year.

[3] The 2003 issue of WindStats (a quarterly international wind energy publication with news, reviews on wind turbine production and operating data from over 12,000 wind turbines) stated that "*the Tararua wind farm in New Zealand looks to establish new records for annual capacity factor.*"

4.12 The climatic conditions observed on site (due to a combination of the nature of the wind resource and the site's topography) influence the design features and classification requirements for wind turbine selection.

4.13 International standard IEC 61400-1 (further discussed in paragraph 5.1), to which all wind turbines should be designed, defines a number of wind turbine classes. This classification system relates to the required wind turbine robustness and is clearly defined in terms of wind speed and turbulence parameters. The Tararua wind resource falls into class IA – the highest classification, and therefore any wind turbines utilised on the site must be inherently robust and able to withstand the climatic conditions observed. This characteristic of the site does limit the number of suitable wind turbine models available on the market, as many manufacturers focus production on models better suited to more benign conditions observed in other parts of the world.

Investment in the Tararua Wind Farm

4.14 The Tararua Wind Farm produces approximately 25% of TrustPower's current annual generation volume from its New Zealand assets. It is therefore a very significant asset for the company, and one upon which a number of consequential operational and investment decisions have been made.

4.15 The total capital investment in the Tararua Wind Farm (Stages I-III) to date is circa $NZ300M. In addition, there are significant ongoing operation and maintenance expenses, royalty payments to landowners, transmission charges and so on.

4.16 Should the repowering of Tararua Wind Farm not be enabled, and the asset eventually decommissioned, this would have a significant impact on the operation of the business. This generation output would need to be replaced in order to maintain energy supply to the Company's retail customers. Such a loss would have a flow on effect on the operation of our hydro assets, and the Company's overall risk profile. The inclusion of such a significant wind generation facility in the asset portfolio reduces TrustPower's exposure to dry year weather events, and helps mitigate the resultant reduction in generation volume due to the decreased hydro resource. In a wider context, there will be implications for New Zealand's renewable energy generation supply, as any losses will have to be replaced.

Surrounding Wind Farms

4.17 I refer to Attachments B and C of Ms Barton's EIC as providing a summary of the existing and consented (but un-built) wind farm development on the Tararua and Ruahine Ranges.

4.18 In relation to the surrounding wind farm development, TrustPower has never opposed new development or the expansion/intensification of existing (or consented) development on the Ranges on grounds that the proposal would absorb the resource capacity of the landscape to the extent that the further upgrading, repowering or enhancement of its own wind farm would be compromised.

5. REPOWERING OF TARARUA WIND FARM

5.1 Wind turbines are typically designed in accordance with international standard IEC 61400-1, which specifies design requirements that must be met to ensure the engineering integrity of wind turbines to achieve a design life of at least 20 years. Of course a number of other factors such as individual site conditions (for example, wind speed and turbulence), turbine quality and maintenance programs will impact the actual operational life achieved.

5.2 As the Stage I wind turbines were installed in 1999 and are therefore over half-way through their design life, it is very likely that a number of existing turbines will reach the end of their economic life within the next 10 years. The particularly testing environment within which they operate is also a contributing factor.

5.3 Within the industry, this process of replacing aging wind turbines is described as 'repowering'. Repowering is the process whereby wind turbines that have reached the end of their useful life are replaced with the latest turbine technology in order to continue to make the best use of the available wind resource, by maximising the efficiency and capacity of a given wind farm site.

This process would result in an increase in the quantity of renewable energy produced.

5.4 It is no longer possible to purchase the Vestas V47 turbines that were utilised in Tararua Wind Farm Stage I, as the manufacturer has ceased production of this turbine model. The reality is that the V47 turbines will have to be replaced with newer turbine technology. Newer wind turbine models utilised on sites like the Tararua Wind Farm are typically much larger, both in physical size and generation capacity than the current Vestas V47 wind turbines, yielding efficiency gains and a significantly lower cost of energy (as demonstrated by other more recent wind farm developments in the vicinity). New wind turbine models also make use of cylindrical steel towers rather than the older lattice style tower of the Vestas V47 turbine.

5.5 The wind turbine model selected for Tararua III provides a very clear example of the evolution of turbine technology over the five to six year period since the first V47 turbines were installed. The figure in **Appendix Three** is an example of the changes in scale of wind turbines in recent years. This figure also illustrates that while initial changes in technology were fast moving, the scale has somewhat stabilised of late.

5.6 There are many examples of repowering wind farm sites at locations in Europe and the USA where the wind power industry is more mature than in New Zealand, and older wind turbines have reached the end of their economic life. I am aware that a large number of wind turbines first installed in the 80's and 90's in the Tehachipi Pass and Palm Springs regions in California, USA have reached the end of their useful life and a number of repowering projects have been completed or are underway.

5.7 A number of potential benefits may be realised by repowering such as:

(a) Avian mortality reduction that may occur due to the installation of a smaller number of larger wind turbines, with improved micro-siting practices.

(b) Reduced aesthetic concerns to the extent that modern wind projects – even with higher tower heights – can be considered more visually appealing.

(c) Increased renewable energy production due to the higher average capacity factors typical of new wind facilities.

(d) Use of existing infrastructure (for example, roads, transmission and substations), resulting in lower installed costs relative to new "greenfield" wind power projects.

(e) Use of newer wind turbine technology that can better support the local distribution network or the national grid with better power quality.

5.8 It would not be prudent to speculate at this time as to what size wind turbine is likely to be utilised when the Tararua Wind Farm is repowered. The selection of the wind turbine model will be dependent on many factors, including environmental considerations, practical construction limitations (e.g. transport and craneage), energy yield, and of course the overall cost of energy.

5.9 It is very likely however that to make the most efficient and cost effective use of the wind resource at that point in time will require the installation of a turbine that is of a much larger scale, in terms of height and rotor diameter, than the current V47 model. However, my comments in paragraph 4.13 regarding the limitations in size due to the strength of the wind resource are a relevant consideration to this matter.

5.10 The result of this is that fewer turbines will be required to generate the same amount of energy currently produced.

5.11 The replacement turbines will be micro-sited in different locations to the existing turbines to maximise energy production and efficiency (and provide necessary separation of the larger structures). However, they will be fully contained within the site boundaries of the existing Tararua Wind Farm.

5.12 In time, TrustPower will also need to consider repowering Stage III of the Tararua Wind Farm when those turbines come to the end of their economic life. The issues that TrustPower will have to consider and the decisions it will have to make will be similar to those for Stages I and II. Repowering is therefore a consideration in the operating life of any wind farm, and is not unique to any particular project nor is it an isolated one-off matter. I expect that other electricity generators in the Region will face the same issues in time, albeit later than TrustPower, as their investment in the area is more recent. TrustPower's current situation is however somewhat unique in that it simply cannot replace like for like.

5.13 It is expected that any repowering will require assessment via a resource consent process. The Company will undertake a cost / benefit analysis of the proposal for its own purpose, and this will include taking into account direct consenting costs and the costs associated with any potential development restrictions that may be placed on the consent. These restrictions can include, for example, the deletion / re-siting of some or all of the turbines by the decision maker. TrustPower is aware of examples whereby the re-siting of turbines by decision makers has significantly altered the economics of a scheme.

5.14 If these costs are significant, the viability of the project could be undermined and may result in an outcome where the wind resource and a significant physical asset are not used as efficiently as they could be (for example decommissioning of existing turbines, or continuing to generate from older, less efficient turbines).

5.15 Any repowering application will be subject to the provisions of the Proposed One Plan, including Policy 7-7. I address the potential effect of this Policy on any repowering project below.

6. CONCERNS WITH POLICY 7-7

6.1 TrustPower's overall concern with Policy 7-7 is its potential to constrain repowering of the Tararua Wind Farm. In particular, against the background that the Ruahine/Tararua Skyline is visually 'saturated', clause (aa) sets a very low threshold for significant adverse cumulative effects. It is such that even minor effects could be determined to trigger this threshold, in which case future decision-makers could take a conservative approach in regard to the changes occurring as a result of a repowering proposal.

6.2 TrustPower accepts that the Regional Council has a responsibility to manage effects in outstanding landscapes, such as the Tararua Ranges. In the case of Tararua Wind Farm, this means the effects of the other subsequent wind farms on the Ranges may limit or prevent the repowering of what was New Zealand's first large-scale wind farm.

6.3 I am aware of the outcomes of various wind farm consenting decisions around the country over the past ten years. I have difficulty with the concept that while on one hand consents are being declined for proposals, on the other hand the outcome of this process may result in a lack of policy guidance for the repowering of existing wind turbines, where a number of other wind farms already exist and New Zealand's best wind resource is located. As a company we consider this guidance to be essential in order to plan strategic investment decisions in a robust manner.

6.4 TrustPower does not consider that it should be exempt from effects considerations in consenting processes, as that would not contribute to sustainable management. It however considers that greater guidance for applicants and decision makers should be provided in Policy 7-7 as to how applications for repowering of regionally significant infrastructure in outstanding landscapes or features are to be considered.

6.5 It is crucial that the Proposed One Plan makes provision for the consideration of the repowering of wind farms. Repowering is a necessary occurrence in the operational life of any wind farm, to ensure the ongoing viability of the physical resources.

Clayton Delmarter
17 February 2012

Appendix One

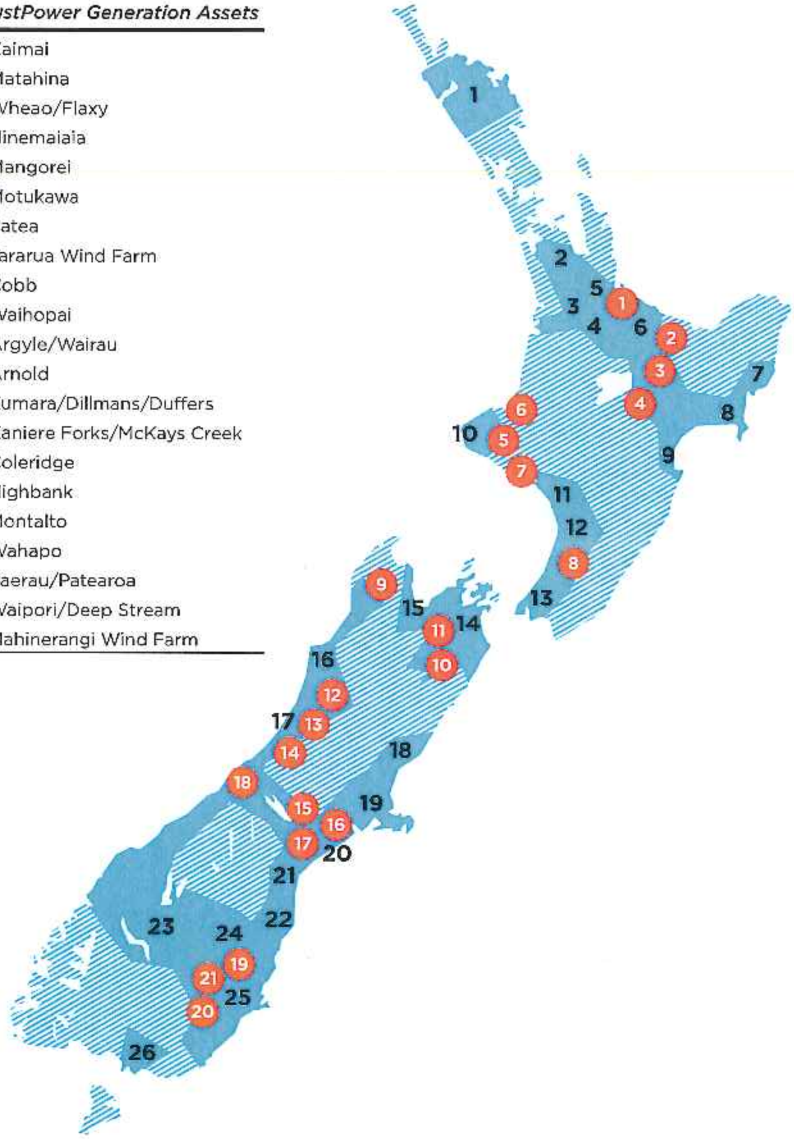
Schematic map showing the location of TrustPower's generation assets in New Zealand

Retail Customers

1 Far North
2 Counties
3 Waipa
4 Central Waikato
5 Southern Thames Valley
6 Tauranga/Rotorua/Taupo
7 Gisbourne
8 Wairoa
9 Hawkes Bay
10 New Plymouth
11 Wanganui/Taranaki
12 Manawatu
13 Wellington
14 Marlborough
15 Tasman/Nelson
16 Buller
17 West Coast
18 Rangiora
19 Christchurch
20 Ashburton
21 Timaru
22 Oamaru
23 Central Otago
24 Otago
25 Dunedin
26 Invercargill/Southland

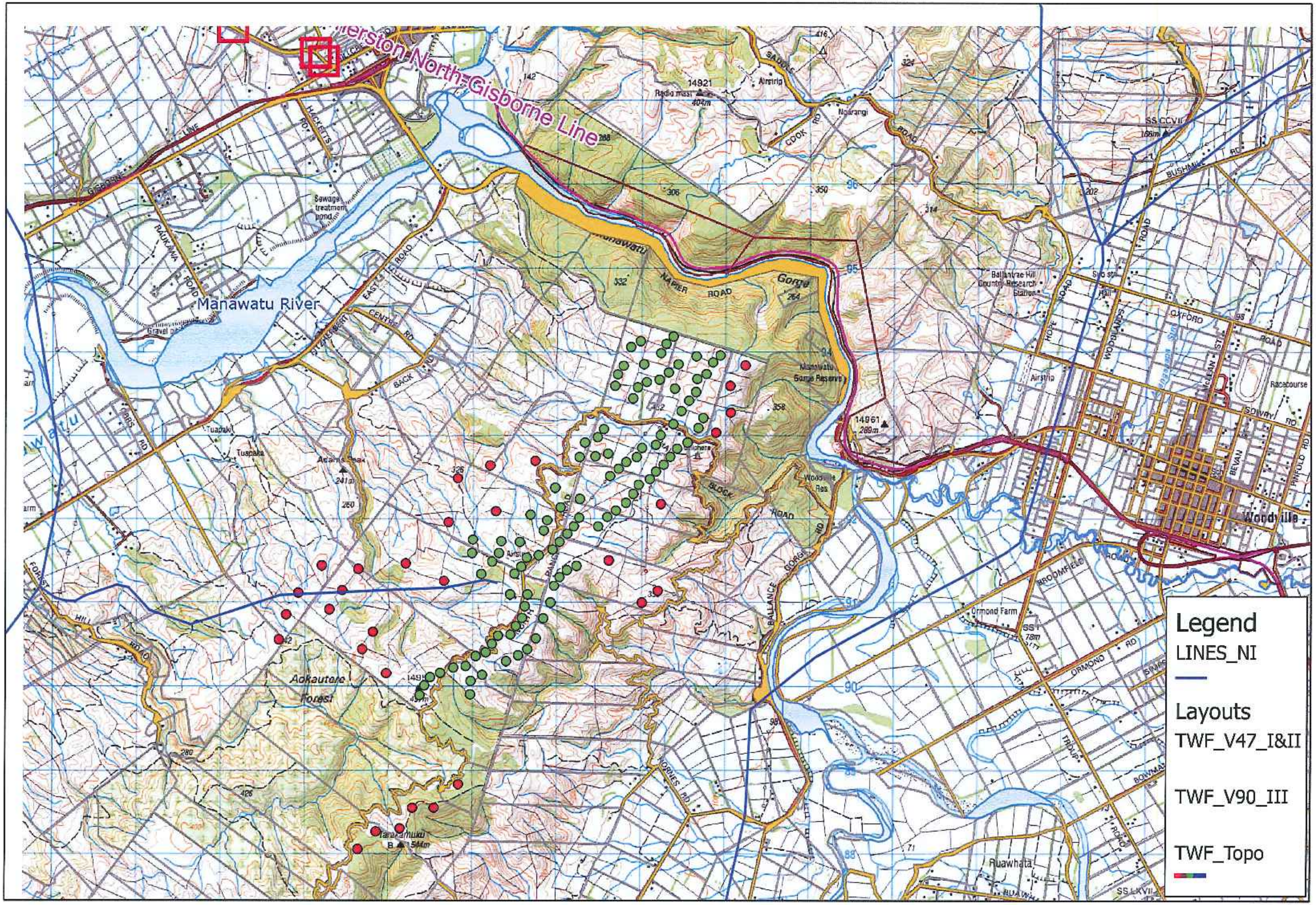
TrustPower Generation Assets

1 Kaimai
2 Matahina
3 Wheao/Flaxy
4 Hinemaiaia
5 Mangorei
6 Motukawa
7 Patea
8 Tararua Wind Farm
9 Cobb
10 Waihopai
11 Argyle/Wairau
12 Arnold
13 Kumara/Dillmans/Duffers
14 Kaniere Forks/McKays Creek
15 Coleridge
16 Highbank
17 Montalto
18 Wahapo
19 Paerau/Patearoa
20 Waipori/Deep Stream
21 Mahinerangi Wind Farm



Appendix Two

Map showing the layout of the Tararua Wind Farm


Legend
LINES_NI
Layouts
TWF_V47_I&II
TWF_V90_III
TWF_Topo
Palmerston North-Gisborne Line
Manawatu River
Manawatu Gorge
Woodville
Aokautere Forest

Appendix Three

Figure showing an example of the changes in the scale of wind turbines over recent years

PRODUCT/ROTOR DIAMETER (M)	V10	V15	V17	V19	V20	V25	V27	V39	V44	V47	V52	V66	V80	V82	V90	V90	V100	V112	V164
YEAR OF INSTALLATION	1979	1981	1984	1986	1987	1988	1989	1991	1995	1997	2000	1999	2000	2003	2004	2002	2009	2010	-
CAPACITY (KW)	30	55	75	90	100	200	225	500	600	660	850	1,750	1,800 2,000	1,650	1,800 2,000	3,000	1,800 2,600	3,075 (ONSHORE) 3,000 (OFFSHORE)	7,000