

**IN THE ENVIRONMENT COURT
AT AUCKLAND**

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Appeals under s120 of the Act

BETWEEN

GENESIS POWER LIMITED

(ENV A376 / 04)

**THE ENERGY EFFICIENCY AND
CONSERVATION AUTHORITY**

(ENV A392 / 04)

Appellants

AND

FRANKLIN DISTRICT COUNCIL

Respondent

STATEMENT OF AGREED FACTS

(22 FEBRUARY 2005)

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MAY IT PLEASE THE COURT:

This Statement records the facts as agreed between the parties in these appeals. While evidence does not need to be adduced by any party on the matters set out in this Statement, this does not preclude any party from calling evidence on such matters.

I. THE ENERGY SECTOR IN NEW ZEALAND

A. ELECTRICITY

1. A reliable, robust and sustainable electricity system is of paramount importance for the New Zealand economy. Electricity is a vital input for businesses and consumers and, therefore, the efficient and cost-effective provision of electricity services over the long-term is of national importance.

2. In regard to electricity use, a report prepared by the Parliamentary Commissioner for the Environment entitled *Electricity, Energy and the Environment Part A: Making the Connections*¹ noted:²

“Electricity is a major form of energy in the industrial, commercial and residential sectors of New Zealand ... the industrial sector [which includes the primary production sector] is currently the biggest user of electricity (using over 40 per cent of all electricity produced). The residential sector uses approximately a third of electricity, while the commercial sector uses just under a quarter.”

3. The report goes on to note the increase in electricity usage:³

“... total usage of electricity has more than doubled over the last three decades...”

Electricity is the most significant form of energy in the residential sector (providing 72 per cent of energy used in 2001).

Electricity is also the most significant form of energy for the commercial sector ... (providing 58 per cent of energy in 2001).

Between 1974 and 2000, total use of electricity in the industrial sector increased by approximately 142 per cent ... Approximately 30 per cent of the energy used by industry (excluding primary production) in 2001 was provided by electricity.”

4. The report also looks at where New Zealand’s electricity comes from and notes that electricity generation has doubled over the last two decades, and comes from a variety of different sources, including hydro (55% of the total electricity generated in 2001), geothermal, oil, coal and gas.⁴

5. In terms of environmental impacts, the report notes:⁵

“... the most significant impacts are associated with the generation of electricity and its transportation to the point of use (as well as during the transportation of fuel used for generation). Both tables [summarising key adverse impacts] highlight the fact that environmental impacts reverberate over long distances (as well as over time). Cumulatively, this means that initiatives at a local or regional level can have downstream

¹ Parliamentary Commissioner for the Environment: *Electricity, Energy and the Environment Part A: Making the Connections*. June 2003.

² *Ibid*, page 22.

³ *Ibid*, page 22-25.

⁴ *Ibid*, page 26-27.

⁵ *Ibid*, page 29.

consequences for the national environment and, in some cases, on the global environment. The fact that global environmental trends such as climate change can contribute to local impacts in New Zealand reinforces the need to neutralize any 'footprint' that the electricity sector may be having on the atmosphere...

The environmental impacts from using fossil fuels for electricity generation are (as a general rule) much more significant than those of using renewable resources."

6. The report considers a sustainable electricity sector in New Zealand and, without identifying any particular technologies, provides core sustainability criteria applicable to the electricity sector:⁶

Criteria	Example
Regeneration	Using electricity generated from renewable resources ... efficiently ... Ensuring that the use of renewable resources ... does not exceed their long-term rates of natural regeneration.
Substitutability	Using non-renewable resources ... efficiently ... Facilitating the use of new, more efficient electricity technologies and renewables, and distributed generation.
Assimilation	Minimising emissions of: <ul style="list-style-type: none"> • greenhouse gases • other contaminants to air... • contaminants to water ...
Avoiding Irreversibility	Avoiding irreversible impacts on <ul style="list-style-type: none"> • ecosystems and the loss of biodiversity • significant cultural and historic landscapes or areas with wild and scenic attributes

7. Electricity demand is growing at about 1.2 to 1.8% per annum. This growth is driven principally by population growth, growth in Gross Domestic Product ("**GDP**"), large industrial developments and energy intensity (energy consumption relative to production).
8. To meet New Zealand's electricity growth rate, the Ministry of Economic Development has estimated that between 100 and 150 megawatts (MW) of new electricity generation is required per annum. As such, there is a pressing need to build new generation capacity, while also implementing energy efficiency and conservation measures, to meet growth in demand.
9. New Zealand's reliance on hydro-generated electricity means that it can be vulnerable to the effects of dry years. This, in combination with uncertainty over New Zealand's future gas supply and its international climate change commitments means that renewable sources of energy for electricity generation, such as wind energy, need to be found.

B. RENEWABLE ENERGY

10. "Renewable energy" is defined in the Resource Management Act 1991 ("**RMA**") as:

⁶ Ibid, page 39.

“... energy produced from solar, wind, hydro, geothermal, biomass, tidal, wave, and ocean current sources.”

11. The National Energy Efficiency and Conservation Strategy⁷ echoes this definition in identifying the sources / technologies of renewable energy as including the following – hydro, geothermal (with certain controls), wind, solar, biomass and wave current.
12. Renewable energy in New Zealand as at year 2003 comprised the following:⁸

Renewable Energy Source	Net Consumer Energy (Taking electrical transmission & distribution losses of 9.4% into account) PJ*
Hydro	80.60
Geothermal – electricity	8.64
Geothermal – direct use	13.20
Wind	0.51
Bio-energy (total)	35.81
Solar (total)	0.19
Sea energy (total)	0
TOTAL	139.0

*One PJ (petajoule) equals 278 GWh. (As a general rule of thumb, 1PJ is the annual amount of energy *consumed* by a city the size of Nelson.) To put this in the context of energy use overall in New Zealand, as at March 2002 the total energy production in New Zealand was 487.07 PJ, of which electricity accounted for 118.98 PJ, fossil fuel for 315.72 PJ (for non-transport purposes 119.51 PJ, and for transport purposes 196.21 PJ), biomass for 46.35 PJ and geothermal for 6.02 PJ.⁹

C. WIND ENERGY

13. New Zealand has significant wind energy resources. EECA notes:¹⁰

"New Zealand is well suited to wind energy development since it lies across the prevailing north-westerly winds. It also has a long coastline, where sea breezes and lack of topographic interference result in consistent and relatively strong winds throughout much of the year. Most regions of New Zealand have a wind resource that could be practically developed.

...

The EECA/CAE Report identified twelve general areas for land based wind farm developments throughout New Zealand, on the basis of available wind resource .. An additional region, North Island East Coast Hills and Coast has been added, bringing the number of general areas where wind energy development by wind farms of various sizes is likely to be feasible, to thirteen...

Figure 1 shows the thirteen areas considered suitable for wind farms.

The possibility of installing wind farms close to load centres, and thus reducing electrical losses incurred in the transportation of the energy through the national grid, is an important consideration in the uptake of wind energy development.

...

⁷ The National Energy Efficiency and Conservation Strategy (prepared by EECA in conjunction with the Ministry for the Environment, August 2001) is **attached** to this statement.

⁸ Renewable Energy Industry Status Report 30 June 2004, page 3 – refer EECA website www.eeca.govt.nz .

⁹ Energy Database – refer EECA website www.eeca.govt.nz .

¹⁰ Review of New Zealand's Wind Energy Potential to 2015, EECA, May 2001, pages 8-9. See www.eeca.govt.nz. Figure 1 is **attached** to this statement.

The large majority of load centres are ... near the coast. Since coastal winds are generally of higher speed and more consistent throughout the year than inland winds, wind farm sites most likely to be developed in the foreseeable future are mostly in the coastal environment. The main exception is the area around the Manawatu Gorge, close to Palmerston North. While the major wind farm development to date has been in this area, there is a limit to its capacity, and the majority of any significant developments in the future are more likely to be in the coastal areas."

14. The present use of wind resources in New Zealand is relatively confined, with commercial wind farm developments as follows:

YEAR	SITE DESCRIPTION	TURBINE SIZE	NO OF TURBINES	SITE OUTPUT
1993	Brooklyn	225 kW	1	0.225 MW
1997	Hau Nui (Stage 1)	550 kW	7	3.85 MW
1999	Tararua	660 kW	48 (Stage I)	31.7 MW
2003	Gebbies Pass	500 kW	1	0.5 MW
2004	Tararua	660 kW	55 (Stage II)	36.3 MW
2004	Te Apiti	1.65 MW	55	90 MW
2004	Hau Nui (Stage 2)	660 kW	8	4.8 MW

15. With the exception of the Gebbies Pass wind turbine, these existing wind farm developments are all located in the lower North Island, where wind speeds and reasonable proximity to electricity load centres make wind energy developments favourable. Wind energy currently generates approximately 1 percent of New Zealand's total electricity consumption.
16. The critical factors to wind energy development have been identified by EECA as including equipment and installation costs, the amount of wind resource available close to load centres, operation and maintenance costs and wind turbine life.
17. In the *New and Emerging Renewable Energy Opportunities in New Zealand* report, EECA and the Centre for Advanced Engineering identify:¹¹
- "The energy available in the wind varies according to the wind speed raised to the third power. Small increments in wind speed can therefore significantly alter the resource potential".
18. Therefore, the average wind speed will determine the electricity produced and viability of the wind farm site.
19. EECA notes in its *Review of New Zealand's Wind Energy Potential to 2015*:¹²
- "There is also an upper limit set by the maximum wind speed that the wind turbines must survive, which is somewhat associated with the average site wind speed. In general terms, it can be said that the annual average wind speed should not be higher than 12 m/s."
20. Below this upper limit, viable wind farm sites utilize a wide range of average wind speeds, including the Genesis Energy Awhitu project.

¹¹ *New and Emerging Renewable Energy Opportunities in New Zealand*, Energy Efficiency and Conservation Authority and Centre for Advanced Engineering, University of Canterbury, July 1996, page 211.

¹² *Review of New Zealand's Wind Energy Potential to 2015*, EECA, May 2001, page 20.

21. Renewable energy advantages include security of energy supply, avoiding future high prices of oil and other fossil fuels, reducing reliance on imported fossil fuels and benefits for the New Zealand renewable energy industry. Renewable energy will also help New Zealand meet its international objectives under the Kyoto Protocol. In addition, trade barriers to products with high levels of embedded fossil fuels used in their production and transport may occur in the future. New Zealand can address this by showing that an increasing share of energy comes from renewable energy, but this would require more wind farms and other forms of renewable energy to be constructed.

II. CLIMATE CHANGE

22. "Climate change" is defined in the RMA as follows:

"... a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods."

A. EFFECTS OF CLIMATE CHANGE

23. A large and increasing body of evidence indicates that due to climate change, the world is likely to experience a rise in temperature, resulting in increasing sea levels, more frequent extreme weather events and a change in rainfall patterns. These climatic changes will potentially impact on New Zealand native ecosystems, industries, infrastructure, health, biosecurity and economy. In the long term, if unchecked, climate change increases the risk of major and irreversible changes to the Earth. For example, even for relatively moderate warming, the Greenland ice sheet is expected to melt completely over the next several thousand years, which would lead to a sea-level rise of as much as 6-7 metres. The cost of doing nothing about climate change could be severe and the impacts on our environment, economy and society are likely to get steadily worse if greenhouse gas emissions are not reduced significantly over the coming decades. In 2001, the IPCC completed the Third Assessment Report - Climate Change 2001 which set out in four volumes its assessment of the effects of climate change.
24. The Third Assessment Report is evidence of the effects of climate change. The IPCC is currently undertaking a Fourth Assessment Report which is not yet completed. Some of the global effects of climate change that can be expected include:¹³
- an increase in global average surface temperature of about 0.5°C in the 20th century due to anthropogenic forcing (ie, human activity) alone;
 - decrease of snow cover and sea ice extent and the retreat of mountain glaciers in the latter half of the 20th century;
 - a rise in global average sea level and the increase in ocean water temperatures;
 - likely increase in average precipitation over the middle and high latitudes of the Northern hemisphere, and over tropical land areas and an increase in the frequency of extreme precipitation events in some regions of the world;
 - shrinkage of glaciers;

¹³ Working Group I, Intergovernmental Panel On Climate Change (IPCC), *Climate Change 2001: The Scientific Basis, Summary for Policymakers* (2001) and Working Group I, Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2001: Impacts, Adaptation and Vulnerability: Summary for Policymakers*(2001).

- loss of land and salinisation of water supplies in low lying Pacific Islands, flood plains and river deltas because of rising sea levels, and many major cities built along coasts or waterways could be affected;
- warmer temperatures are likely to cause lower crop yields in tropical and subtropical countries;
- more frequent extreme climate events such as droughts, heavy rainfall and storms in many areas;
- threats to human health could also include increasing prevalence of diseases such as dengue fever, malaria and cholera;
- thawing of permafrost;
- lengthening of the growing season in middle and high latitudes;
- poleward and altitudinal (upward) shift of plant and animal ranges;
- the decline of some plant and animal species; and
- earlier flowering of trees, earlier emergence of insects and earlier egg-laying in birds.

25. Some of the climate change effects New Zealand is likely to experience are as follows:¹⁴

- higher temperatures, more in the North Island than the South;
- increasing sea levels (research has shown that sea levels globally are expected to rise between 9 and 88 cm by 2100, compared with an average rise of 10 to 20 cm in the 20th century) and greater susceptibility of coastlines;
- more frequent and intense extreme weather events such as storms, droughts (especially in the east of New Zealand) and floods; and
- a change in rainfall patterns - higher rainfall in the west and less in the east, possibly adversely affecting Otago hydro schemes.

26. These changes will result in both positive and negative effects For example:¹⁵

- agricultural productivity is expected to increase in some areas but there is the risk of drought and spreading pests and diseases which would likely have a negative impact. It is likely that there would be costs associated with changing land-use activities to suit a new climate. There will also likely be changes in distribution of other species affecting horticulture, pastoral farming and cereal production in Canterbury; and the appearance of new pests and diseases;
- some people are likely to enjoy the benefits of warmer winters with fewer frosts, but hotter summers will bring increased risks of heat stress and subtropical diseases;
- forests and vegetation may grow faster, but native ecosystems could be invaded by exotic species, the distribution of trees may change, and species may be driven to extinction;

¹⁴ New Zealand Climate Change Office, Climate change impacts in New Zealand, www.climatechange.govt.nz.

¹⁵ Ibid.

- drier conditions in some areas are likely to be coupled with the risk of more frequent extreme events such as floods, droughts and storms;
- rising sea levels will increase the risk of erosion and saltwater intrusion, increasing the need for coastal protection;
- snowlines and glaciers are expected to retreat and change water flows in major South Island rivers; and
- costs to the country and to insurers from extreme weather events such as storms, floods and droughts are likely to increase.

B. INTERNATIONAL CONVENTIONS

27. The United Nations Framework Convention on Climate Change ("**UNFCCC**") is the overarching Convention addressing climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other heat-trapping gases.
28. Under the Convention, governments gather and share information on greenhouse gas emissions, national policies and best practices, launch national strategies for addressing greenhouse emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries, and cooperate in preparing for adaptation to the impacts of climate change. New Zealand is a party to the Framework Convention.

Kyoto Protocol

29. The 1997 Kyoto Protocol to the Convention shares the Convention's objective, principles and institutions, but significantly strengthens the Convention by committing Annex I Parties¹⁶ to individual, legally-binding targets to limit or reduce their greenhouse gas emissions.
30. New Zealand has ratified the Kyoto Protocol, which will enter into force on February 16, 2005. Individual targets for Annex I Parties, which include New Zealand, are listed in the Kyoto Protocol's Annex B. New Zealand's target is 100%, which means that New Zealand is required under the Protocol to reduce its greenhouse gas emissions back to 1990 levels on average during the first commitment period of 2008-2012. Meeting this target will require reductions in CO₂ emissions, but more drastic reductions will need to be negotiated for future commitment periods.
31. Renewable energy, such as wind energy, will significantly assist New Zealand to meet its obligations under the Kyoto Protocol whilst helping to meet New Zealand's growing electricity demand without increasing the use of thermal generation, a major contributor of greenhouse gases to climate change.

C. RATIFICATION INTO DOMESTIC LAW

Climate Change Response Act 2002

32. The purpose of the Climate Change Response Act 2002 is to enable New Zealand to meet its international obligations under the United Nations Framework Convention on Climate Change ("**FCCC**") and the Protocol to the FCCC, including its obligation to "retire units equal to the number of metric tonnes of carbon dioxide equivalent of human-induced greenhouse gases emitted from the sources listed in Annex A of the

¹⁶ A list of the Annex 1 Parties can be accessed via www.climatechange.govt.nz.

Protocol in New Zealand in the commitment period" and its obligation to report back to parties to the Convention.

33. One of the key means of achieving New Zealand's obligations under the FCCC is to encourage sources of energy which do not contribute to or reduce the level of greenhouse gas emissions, including the use of renewable energy, such as wind energy.

Resource Management Act Amendments

34. New Zealand's obligations under the FCCC and the Protocol to the FCCC are also reflected in recent amendments to the Resource Management Act pursuant to the Resource Management (Energy and Climate Change) Amendment Act 2004
35. These amendments seek greater alignment between local government plans and national energy objectives, outlined in the NEECS and climate change policies, and aim to ensure that Councils consider the contribution their regions can make to meeting New Zealand's commitments under the Kyoto Protocol.
36. Specifically, the Act has amended section 7 to require decision makers to have particular regard to the efficient use of energy, the effects of climate change and the benefits associated with the use and development of renewable sources of energy (such as wind energy):

"(ba) the efficiency of the end use of energy."

"(i) the effects of climate change;

(j) the benefits to be derived from the use and development of renewable energy."

III. GOVERNMENT POLICY

37. The Government's commitment to a sustainable energy future and greater uptake of renewable energy resources, such as wind energy, is set out in the following energy policies and strategies:

A. CLIMATE CHANGE POLICY PACKAGE

38. The Government confirmed its climate change policy package in October 2002. The policy package consists of the following policies and measures:
- **Non-price measures** – Measures include the development of business opportunities associated with climate change, public awareness campaigns research and voluntary commitments;
 - **Price-based measures** – Measures include a planned emission charge ("**carbon tax**"), Negotiated Greenhouse Agreements ("**NGAs**") and the Projects to Reduce Emissions programme; and
 - **Foundation policies** – The following documents are considered to be the policy package's foundation policies:
 - National Energy Efficiency and Conservation Strategy;
 - New Zealand Waste Strategy;
 - New Zealand Transport Strategy;
 - Growth and Innovation Framework; and
 - Sustainable Development Programme of Action.

B. ENERGY POLICY FRAMEWORK

39. The Government's approach to energy policy is outlined in its Energy Policy Framework, which commits the Government to a sustainable and efficient energy future. Two of the outcomes sought by that Framework are "environmental sustainability, including continuing improvement in our energy efficiency and a progressive transition to renewable sources of energy", as well as bringing about a "reliable and secure supply of essential energy services".

C. SUSTAINABLE DEVELOPMENT FOR NEW ZEALAND PROGRAMME OF ACTION

40. The Sustainable Development Programme of Action outlines policies and objectives to guide government policy and decision making.
41. Energy has been identified as one of the four priority areas for sustainable development in New Zealand due to the importance of energy to our economy and its necessity in our lives and commercial interests.
42. The Sustainable Development Programme of Action for energy states that the Government is committed to a sustainable and efficient energy future for New Zealand. Within this commitment, the overarching goal for energy is to ensure the delivery of energy services to all classes of consumer in an efficient, fair, reliable, and sustainable manner. In support of this overarching goal, the Programme of Action seeks to achieve the following outcomes:
- energy use in New Zealand becomes progressively more efficient and less wasteful;
 - our renewable sources of energy are developed and maximised; and
 - New Zealand consumers have a secure supply of energy.
43. More recently, in October 2004, the government released a discussion document entitled '*Sustainable Energy: Creating a Sustainable Energy System for New Zealand*'. It represents the results of a workstream initiated by the Sustainable Development Programme of Action. This document discusses the energy challenges and opportunities facing New Zealand, the government's thinking on sustainable energy, its policy response so far and some possible further steps towards a more sustainable energy system. One possible view of New Zealand's future energy mix presented in the document includes 'much more use of renewable energy for electricity generation, particularly from wind, geothermal, small or micro-hydro, biomass and waste'.

D. NATIONAL ENERGY EFFICIENCY & CONSERVATION STRATEGY

44. The National Energy Efficiency and Conservation Strategy ("**NEECS**") is the Government's primary means of achieving the outcomes sought in the Sustainable Development Programme of Action for Energy.
45. The purpose of the NEECS is to facilitate the move towards a sustainable energy future for New Zealand by promoting energy efficiency, conservation, and a transition to the use of renewable energy sources.
46. The NEECS identifies two key policy directions that support New Zealand's movement towards a sustainable energy economy:

- Ongoing improvement in our energy efficiency; and
 - Progressive transition to renewable sources of energy.
47. Accordingly, the NEECS has two high-level targets:
- Economy-wide energy efficiency improvement of at least 20%; and
 - An additional 30 petajoules (PJ) per annum (pa) of consumer energy from renewable resources by 2012.

Renewable Energy Target

48. The mechanisms to achieve the target of 30 PJ of additional consumer energy from renewable sources by the year 2012 (include implementing policies such as those which are part of the Climate Change Policy Package) are set out in New Zealand's Renewable Energy Target, which is a component of the NEECS.

49. As noted in the NEECS:¹⁷

“... there is a close synergy between climate change and renewable energy policies. The NEECS ... is one of the foundations policies of the Climate Change Policy Package, and renewable energy development is heavily dependent on the incentives provided by some climate change policies.”

50. In terms of the NEECS:¹⁸

“The renewable energy programme is designed to support renewable energy development by engaging with stakeholders and working to minimise the barriers that inhibit the realisation of the full potential of renewable energy. These barriers include: lack of knowledge and information among key parties and decision-makers, lack of economies of scale for some technologies, and institutional regulatory / planning approaches that might discriminate against some renewable energy opportunities.”

51. A summary of the NEECS renewable energy mechanisms is set out in Appendix 1 to this statement.

52. The NEECS, and in particular, the renewable energy target is a vital instrument in striving to provide a sustainable energy environment which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety. Wind energy development is expected to make a significant contribution to the Renewable Energy Target.

E. GOVERNMENT POLICY STATEMENT ON ELECTRICITY GOVERNANCE

53. The Government Policy Statement on Electricity Governance states that the Government's overall objective for the electricity industry is to ensure that electricity is delivered in an efficient, fair, reliable and environmentally sustainable manner to all classes of consumer. To meet this objective, the Government favours industry solutions that satisfy consumers' electricity requirements in a manner which is least-cost to the economy and in accordance with the principle of sustainable development.

54. The government has identified a number of desired outcomes consistent with the above objective and wind energy developments, such as:

¹⁷ NEECS New Zealand's Renewable Energy Target, page 5.

¹⁸ NEECS New Zealand's Renewable Energy Target, page 5.

- (a) the electricity sector contributes to achieving the government's climate change objectives by minimising hydro spill, efficiently managing transmission losses and constraints, promoting demand-side participation and energy efficiency and removing barriers to investment in new generation technologies, renewables and distributed generation; and
- (b) risks relating to security of supply are properly managed.

IV. NATIONAL BENEFITS AND POSITIVE EFFECTS OF WIND ENERGY AND THE AWITHU WIND FARM

Security of Supply

- 55. Wind energy assists with long-term electricity supply security by adding to, and diversifying, New Zealand's generating base. In many respects, wind energy complements New Zealand's existing renewable generation sources, allowing hydro resources to be stored during dry periods.
- 56. Diversity in energy supply through the development of renewable energy, such as wind energy, reduces wholesale electricity costs, as wind energy resources have limited exposure to energy supply disruptions or price shocks. In contrast, thermal generation costs can rise sharply as a result of fuel supply interruptions and changing fuel prices.
- 57. A wind farm of the size of that proposed at Awhitu (19 turbines) with a capacity of 19 MW will generate 66,500 megawatt hours annually, which is enough electricity to supply approximately 8,000 households per annum. That is equivalent to approximately 40% of the homes in the Franklin district. It will also contribute up to 0.18% towards New Zealand's annual electricity consumption.

Reduction in greenhouse gas emissions

- 58. Wind energy assists in meeting New Zealand's growing electricity demand without emitting any greenhouse gases (other than the very small amount emitted during construction) that could have otherwise been created by generating electricity via gas or coal resources. Such an activity directly assists to meet New Zealand's climate change obligations under the Kyoto Protocol.
- 59. A wind farm of the size of that proposed at Awhitu will avoid approximately 40,000 tonnes of CO₂ per annum that would have otherwise been produced by a coal fire power plant. To put this into context, approximately 59,000 trees would need to be planted to displace 40,000 tonnes of CO₂ or approximately 9200 petrol cars would have to be taken off the road for one year.

Reduction in dependence on the national grid

- 60. A significant benefit of wind energy farms is that they may be installed relatively close to the source of electricity demand, thereby minimising load on the national grid and delaying the need for transmission upgrades. The location of the Awhitu wind farm makes this benefit particularly relevant, being located close to New Zealand's major load centre, Auckland.

Reduction of transmission losses

- 61. When electricity flows through wires, some of it is dissipated as losses (effectively heat). The further the distance the greater the losses. Losses also rise

disproportionately with the amount of electricity being carried in a particular cable or power line. If a transmission line is operating near maximum capacity and another unit of electricity is sent down the line, a much larger portion will be lost in transit than at low transmission rates. This means that while on average around 5% of all electricity supply injected into the national grid is lost in transmission, incremental losses for the next MW of demand to be met can be considerably higher. For example, at very high transmission rates through the Cook Strait cables, over 15% of each extra MW transmitted is lost.

62. The proposed Awhitu wind farm will reduce supply requirements from more distant resources thereby materially reducing transmission losses which are effectively wasted supply.

Reliability

63. Wind is a relatively reliable natural resource. The annual wind energy variation is typically 10%, compared to rainfall variation which is 20%.
64. Wind is also a relatively reliable economic resource. While all primary fuels for thermal-powered electricity generation (oil, coal, LNG and natural gas) have been subject to significant price increases and volatility over the last few years, there is no cost for the primary fuel of a wind turbine (wind). Therefore, once a wind farm is built, it has no ongoing fuel price issues, and the cost of producing electricity from the wind depends primarily on the average annual wind speed which, as noted in paragraph 63, is relatively constant from year to year. The only economic volatility that wind power faces is the electricity sale price.

Development Benefits

65. Wind energy initiatives result in industry development, profitable business opportunities and regional development.
66. The promotion and development of wind energy technologies create new employment opportunities. Direct employment arises in areas of research, manufacturing, installation and distribution, and maintenance of renewable energy technologies, in addition to indirect employment opportunities.

Contribution to the Renewable Energy Target

67. It is estimated that the Awhitu Wind Farm will contribute about 0.24 PJ per year or 0.8% of the New Zealand Renewable Energy Target.