greater WELLINGTON
THE REGIONAL COUNCIL

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Renewable Energy Initiative

1. Purpose

To advise the Council of recent developments in the need for renewable energy with particular reference to the Wellington Region.

To seek the Council's approval to complete a feasibility study for a wind farm development at the Belmont Regional Park.

2. Introduction

This report considers renewable energy initiatives in the Wellington Region and developments with which Greater Wellington - The Regional Council could be involved.

In September 2002, the Ministry of Economic Development (MED) estimated that electricity demand in New Zealand will continue to increase at about 2 percent a year. This is in spite of a number of conservation initiatives being promoted by various agencies including the Energy Efficiency and Conservation Authority (EECA).

3. Background

During the mid 1990s, there was an abundant supply of gas and electricity in New Zealand. Now electricity supply and demand are becoming more in balance, particularly in a dry year, and the effective life of the Maui gas field is about two years shorter than expected. This means the country is going to need new electricity generation and the development of various gas resources. In the order of 150 MW of new electricity generation is needed each year to meet increased demand. Such developments take time. A report by the MED in February 2000 shows a rising wholesale electricity price from 2000 onwards. Updated projections are expected in March or April 2003 and are likely to

indicate more aggressive price rises than the report of two years ago. One of the reasons for this is the early depletion of the Maui gas field.

An issue for New Zealand is the future sources of energy. For electricity generation, this is likely to mean coal, gas, oil or renewables. Greater Wellington – The Regional Council can play a role in shaping the outcomes. The choice is stark. At one end of the scale is coal and greenhouse gas emissions, at the other end renewables and virtually zero emissions. (Some emissions may result from maintenance work on renewable sources even though there may be zero emissions in the actual generation process.)

4. Policy Issues

In September 2001, the Government released the National Energy Efficiency and Conservation Strategy. It included two high level targets to be achieved by 2012:

- An economy wide energy efficiency improvement of at least 20%
- 25-55 Petajoules (PJ)[1] of additional consumer energy to be obtained from renewable energy sources – with further work required to refine the range.

Then in October 2002, the Government announced the refined energy target of an additional 30 PJ from renewable sources by 2012. This is equivalent to 8340 GWh a year – an ambitious target to achieve within 10 years.

A number of policies were mentioned in the Government's announcement as to how the renewables target may be achieved. Three of these are of particular relevance to this report, they are:

- Improved processes under the Resource Management Act (RMA) in order to remove unreasonable barriers to renewables development.
- Developing a renewable energy action agenda.
- Renewable energy resource studies.

The Energy Efficiency and Conservation Authority is responsible for implementing some of the policies.

In February 2003, the Government announced pending changes to the Resource Management Act effectively delivering on one of its strategies. Greater weight is to be given to the national benefits from renewable energy when considering this type of resource consent.

[1] A Petajoule (PJ) is equivalent to 278 GWh. This is slightly less than the quantity of electrical energy the city the size of Porirua would consume in a year. A GWh is one million kilowatt hours (kWh). An average household consumes about 8,600 kWh a year.

In making the February announcement, Environment Minister Marion Hobbs said, "This change will smooth the path for renewable energy while retaining the necessary environmental safeguards. The RMA will still require consideration and management of the environmental effects of renewable energy production". In the same statement, Energy Minister Pete Hodgson added, "The Government is well aware of growing pressure on New Zealand's electricity generation capacity. Renewable energy is one of the most effective and sustainable ways of meeting this demand".

In March 2003, the Government issued "carbon credits" to ensure the extension of the Tararua Wind farm is viable and assist Meridian Energy with a new wind farm development.

Some countries have strong incentives for renewable resources and wind generation in particular. A paper presented on behalf of TrustPower at the 2002 New Zealand Wind Energy Association conference mentioned the following incentives that are used to promote wind generation.

"Incentive Options:

- Investment support
  - Capital investment subsidies up to 30-40%
  - Soft loans, deductible capital investment
  - Tax exemptions

- Production support
  - Premium rates, renewables certificates
  - Production subsidies
  - Tax incentives

- Demand creation
  - Mandated renewables quotas for retailers with penalties for non compliance
  - Green schemes

New Zealand has none of these incentives – just a lot of wind!"

Since this conference, the Government has started to move on addressing the issues.

New Zealand's heritage in hydro and geothermal power development is well documented, these are still the mainstay of the electricity industry. But with the abundant supplies of natural gas that became available in the 1980s, this fuel has been burned in power stations like there is no tomorrow. Unfortunately, the "no tomorrow" is about to arrive, gas is going to increase in price and become much more limited.

Globally, the wind energy industry is on a roll with a continuous growth rate of 30 percent a year since 1994 and annual investment expenditure of the equivalent of NZ$11b. Worldwide, the installed capacity exceeds 27,000 MW or about four times the total electricity generating capacity in New Zealand

from all sources. New Zealand's wind energy contribution so far of just 36 MW from this form of sustainable energy has been disappointing. Much more could have been done to plan for the post Maui gas era.

New Zealand's ratification of the Kyoto Protocol on 10 December 2002 and the associated enactment of the Climate Change Response Act 2002 also point to a growing need to seriously address sustainable energy production and energy management generally.

Greater Wellington's objective of sustainable energy use is in line with the Government's policies. As part of the annual long-term planning process, one of the work streams under the "Take '10' Quality for Life" is to investigate the potential for greater use of renewable energy in the Region. This report is part of that process. For its part, Greater Wellington Water is currently negotiating an energy supply contract to assist in underpinning the expansion of a wind farm in the Wellington Region. Greater Wellington has already demonstrated its commitment to responding to energy shortages and energy efficiency initiatives. For example, in the power shortage in 2001, the wholesale water supply system was operated in a mode to minimise electricity usage, as opposed to the usual mode of minimising production and distribution costs.

In recognition of its energy efficiency work, Greater Wellington Water received an EECA Innovation Award in 2002. Fostering potential sustainable energy developments builds on the earlier work of the Council.

The Regional Policy Statement for the Wellington Region also supports investigation and use of the Region's renewable energy resources. For example, Objective 2 of the Energy Chapter aims for "an increasing proportion of energy (to be) provided by sources that are renewable", and Policy 6 seeks to "promote efficient energy production from the Region's renewable energy assets, where the effects of the development are environmentally acceptable". Wind power, in particular, is identified as offering potential.

There are a number of positive linkages between greater use of renewable energy sources, reduced greenhouse gas emissions and improved air quality. In addition, there is also the opportunity of strengthening local energy security.

5. Types of Renewable Energy – Wellington Region

There are several types of renewable energy that may be practical in the Wellington Region, either now or at a later date.

- **Solar**
  - Currently only economic for limited commercial purposes. Very suitable for powering remote facilities where there is no reticulated electricity, such as data recording devices.

- **Bio-mass**
  - As an energy form, this was more in favour during the fuel shortages in the 1970s. Not seen as viable for the Wellington Region with current energy prices.

- **Wave/Tidal**
  - Tidal ranges are not great in the Wellington area and to some extent, wave energy is still experimental. To avoid corrosion from seawater, expensive metals must be used in wave generators.

- **Hydro**
  - Small catchment areas in the Wellington Region, relative to some of the river systems in New Zealand, and environmental considerations mean that any hydro developments are likely to be rare and on a small scale.
  - A few years ago, Wairarapa Electricity was considering a new hydro power station and purchased a number of land holdings. A subsequent owner of the company abandoned the project because of an inadequate return on the potential investment.

- **Wind Generation**
  - Of all the renewable energy sources for power generation in the Wellington area, wind is probably the most promising in the short to medium term. Not only is it a sustainable resource but it is environmentally very friendly. There are no emissions in the generation process and at the end of the economic life of the turbines, they can be removed and the land quickly restored. There is no potential for contaminated land or silted rivers as there could be with thermal or hydro generation respectively.

The first modern commercial wind turbine in New Zealand was erected by the Electricity Corporation of New Zealand in Brooklyn in 1992. Subsequently, a wind farm of 3.5 MW was completed in 1996 in the Wairarapa[2], and is now owned by Genesis Power. In 1998, a 32 MW wind farm near Palmerston North was completed, this was the first stage of a two-stage development. Although this is outside the Wellington Region, some of the characteristics that made it viable also exist in the Wellington area.

6. Wind Farms

6.1 Potential Wind Farms in the Wellington Region and nearby

EECA published a report titled "Review of New Zealand's Wind Energy Potential to 2015" in May 2001. Attachment 1 is a map from the report showing the good New Zealand wind resource areas and areas with more localised wind resources. The first category includes the West Coast of the North Island from the south coast to about the Otaki area and up to a few

[2] The Hau Nui wind farm near Martinborough consists of 7 turbines each of 500 kW capacity. Towers are 42m high and the swept blade diameter is 40 metres.

kilometres inland. The second category includes the Wairarapa Hills out to the east coast north of Masterton. EECA has estimated the full potential of the west coast area as 250 MW and the east coast as 300 MW, based on a generating price of 10c/kWh. This figure is well above the average current wholesale electricity price. EECA acknowledges a high degree of uncertainty in its projections.

Unfortunately, the output from a wind turbine is very sensitive to wind speed – the relationship is cubic. For example, an increase of wind speed from 9m/sec to 10m/sec (11.1% increase) results in an increase of available power from the wind of 37 percent. For this reason, accurate information is required about wind speeds for a particular site before considering a development. Currently, wind speeds in the order of 10 metres per second are required for a new development in New Zealand to be economic. Such sites are rare. In Europe, developments are proceeding with average wind speed in the 6-8 metres/second range.

Genesis Power has committed to extending its Wairarapa wind farm – the issue at present is the timing of such a move.

TrustPower, who own the wind farm near Palmerston North, had postponed the second stage of its development until electricity prices are more favourable, but with the issue of "carbon credits" this project is now expected to proceed. TrustPower holds a resource consent for the second stage but much of the power would be injected into the national electricity grid rather than used in Palmerston North.

Generally, the annual variation in wind patterns is about 10 percent and is more favourable than the 20 percent variation in water available for hydro generation. However, hydro schemes usually have the ability to store water for varying periods to enhance the revenue potential.

6.2 Potential Wind Farm Sites Near Urban Wellington

The breakeven point for proceeding with a wind farm development may be reduced if the power can be sold within a local area, because a network company may enjoy the benefits of avoiding some of Transpower's national grid charges.

For a wind farm to be economic in the Wellington area at present, it is likely to need at least the following characteristics:

- An average wind speed close to or greater than 10 metres/second (36 kilometres/hour) at the turbine hub height.
- Road access for the construction materials including the long turbine blades, substantial tower sections and the large construction crane.
- Reasonable proximity to one or more network load points.
- The ability to mitigate any adverse effects at a reasonable cost.

Public statements have been made about various wind farm investigations in the southern part of the Wellington Region. Some may not be under current investigation. The sites include:

- Baring Head (Energy Direct - mid 1990s)
- Makara (Meridian Energy - current)
- Belmont (Energy Direct - mid 1990s)
- South Coast to the Ohariu Valley (private land owners - current)
- Wainuiomata near the coast (private land owners/developer - current)

6.3 Role of Greater Wellington – The Regional Council

Greater Wellington can play a role in the development of renewable energy resources in the Wellington area including wind farms. Its role could take several forms, and range from a no or low risk position to one of high risk. Strategies could include:

6.3.1 *Facilitating development*. Setting policy frameworks that are supportive of renewable resource use and wind farm developments in particular, subject of course to the Resource Management Act. This is a no or very low risk strategy.

Facilitating developments is in line with Greater Wellington's Take 10 Quality for Life aspirations.

6.3.2 *Passive Investment as well as facilitation.* For example, making Greater Wellington controlled land available for renewable energy development.

With passive investment, through making land available, there is minimal financial outlay. Financial benefits to Greater Wellington and other land owners come through royalties or fixed charges for the use of the land. Some of the initial expenses by Greater Wellington could be recovered prior to start up of the energy development. This is a low risk strategy.

6.3.3 *Active Investment*. Taking a normal commercial investment risk and owning or part-owning a renewable energy development.

Active investment involves taking a normal commercial risk. At present, there are several substantial electricity generating companies in New Zealand. Three of them are already involved in wind generation and one overseas power company has expressed interest in Greater Wellington land for wind generation. Most electricity generators in New Zealand are already involved in renewable energy generation. It is therefore evident that there is no market failure in wind generation or from generation from other renewable sources.

6.3.4 *Project Developer Role.* Another option could be for Greater Wellington to become the initial project developer and then on-sell the development prior to construction. This would involve obtaining the wind information, designing the layout of the turbines and other facilities and obtaining the required

resource consents. While such a development could be sold at a profit, it would be only after the outlay of potentially several hundred thousand dollars. There are also some risks. For example, there are a number of choices to be made in the development phase and different generators will have different points of view. The proposal when it is sold could be sub-optimal to some generators so any additional financial advantages may not outweigh the extra risks. Hence, this option is not recommended.

6.3.5 Summary

At this point in time, there is no requirement for Greater Wellington to actively invest in wind generation, given that there are a number of experienced companies in the electricity generation market. If a wind farm development does not proceed following a favourable consent process, it is likely to be because the project does not offer an appropriate rate of return to the investor after all the risks are considered.

Greater Wellington's immediate focus should be in the areas of facilitating developments and passive investment.

6.4 Greater Wellington Land

While Greater Wellington is a significant landowner, much of the land is covered in prime forest and on many of the ridges where there is some open space that may be suitable for wind farming, there are accessibility problems.

One site that shows promise is the elevated open space in the Belmont Regional Park. Mainly the land above the 300m contour that is currently farmed. Although the open space in the park is controlled by Greater Wellington for recreational purposes, the land includes ownership by several additional parties, see Attachment 2.

The highest point in the park is 456m above sea level. The total area of the park is 3,551 ha and of this, the land higher than 300m above sea level is 833 ha. Existing transmission lines and other features reduce the area available for placing wind turbines. Turbines could be widely spaced and positioned in less than 20 percent of the park. Foundations for each turbine are buried so essentially public access to the land would be little different from the present situation.

Part of the park seems to satisfy the criteria for a wind farm outlined in section 5.1. There has already been some preliminary discussion with the landowners and more formal discussions could take place if the Council decides to investigate the feasibility of a wind farm project.

It is possible there are some elevated sites in the Council's exotic forest areas that may be suitable for wind farms, and these will be investigated in due course. There are economies of scale aspects with wind farms because of the fixed costs such as resource consents and access. These costs tend to discourage one-off isolated commercial wind turbines.

6.5 Greater Wellington Regional Parks Management Plan

The Local Government Act 1974 requires Greater Wellington – the Regional Council to prepare and comply with a management plan for each of its regional parks and provides for specific factors to be addressed in those management plans.

In short, the park management plans set out the aim, objectives and policies for managing and administering each park. All proposals for land use must currently be assessed against criteria specified in the management plans and must be compatible with the aim, objectives and policies of the relevant plan.

When the Local Government Act 2002 comes into effect in July 2003, the current provisions relating to regional parks in the Wellington Region will remain in force for five years. At that time those provisions will be repealed and the general regional parks provisions in the 2002 Act will become applicable. Under the 2002 Act, management plans are not specifically required.

Interpretation of Belmont Regional Park Management Plan

In respect of wind generation opportunities at Belmont Regional Park, the current Management Plan for that Park, prepared in 1996, is inconclusive. This Plan does not appear to give clear direction on the suitability of wind generation proposals in the Park.

The Plan (Policy 2.11) provides for considering the construction of network utilities in conjunction with recognised environmental effects assessment requirements and relevant district plans under the Resource Management Act 1991.

The Plan also specifies that support for proposed works may be given:

- Where there is not other alternative site or method;
- Where the works are of direct benefit to the region or nation; ***and***
- Where their presence and location would not adversely affect the natural and cultural features of the park.

However, it appears that all three criteria above must be met for support to be given to a proposal. Furthermore, the Plan notes that practical opportunities will be taken to construct utilities that are as unobtrusive as possible and that where appropriate, network utilities should be sited underground.

The overall aim of the current plan is to provide for *the development and management* of the Park *for outdoor recreational use, while protecting and enhancing its natural character, intrinsic values and cultural heritage.*

The management plan is intended to be read in a holistic way. Many policies in the Plan relate to protection of the environment and landscape in the Park, cultural heritage, recreational opportunities, quality of experience for park users, educational opportunities, and protection of current non-recreational uses

(e.g. farming). A proposal for wind generation activities would need to be balanced with these needs and be compatible with the associated policies. While wind generation may be compatible with some of the policies in the Management Plan, its compatibility is less clear in other instances.

In particular, the current plan states that the Council will seek to conserve landscapes and features which are significant to the landscape character and recreational experience of the park. These specifically include the grassed open hill tops (generally above the 250-metre contour) – refer Policy 3.1(1). Forestry is also discouraged from the land above the 250-metre contour in recognition of Policy 3.1(1) mentioned above. Key heritage objectives provide for protecting the grassed open hill tops of the Park.

The policies in the Belmont Regional Park Management Plan are binding on the six landowners in the Park.

Under the current plan, significant new works of this type will be subject to the Council's *Procedures for Approval of Works in Wellington Regional Council forest lands, water collection areas, regional parks and recreation areas 1994*, which describes procedures and principles to guide consideration of proposed works and procedures for public review.

Approval of the owner or owners of the land where it is proposed to locate a wind farm will be needed before any proposal can proceed.

Several network utilities currently cross Belmont Regional Park including natural gas pipelines, electricity transmission lines and water mains. (It should be noted, however, that the electricity transmission lines are protected under the Electricity Act 1992. Section 22 of that Act – "Protection of existing works" gives the *existing* electricity transmission lines continued right to be fixed or installed where they are – refer page 60, Part 2, Belmont Regional Park Management Plan.)

Regional Parks Network Plan

A draft Regional Parks Network Plan, which covers policies common to all the regional parks and sets the management direction for the parks network as a whole, has recently been released for public consultation.

The Regional Parks Network Plan has been written in an "enabling way" - to provide for assessing the effects of a range of different proposals. In other words, assessing the *effects* of activities is emphasised, rather than precluding particular *activities* per se.

The draft plan acknowledges that regional parks provide for a wide range of uses including recreational, community, educational, commercial, and Tangata Whenua customary uses and that the challenge for park management is to balance use with the protection of natural and cultural heritage values.

The focus of the plan is on sustainable management – providing for activities and uses *that are sustainable and contribute to a sustainable region* and

discouraging those *that are unsustainable and detract from a sustainable region.*

Factors to be taken into account when assessing particular activities include the positive and negative effects of the proposed activities on water, air, energy, land and waste in addition to various societal, park management and economic factors.

This plan provides for commercial activities to take place in the Parks as appropriate. In particular, it is noted in the draft Network Plan that commercial activities not only provide direct returns to the Council to help run the parks, they also contribute to the broader regional economy and that sustainable energy production may be considered in this context.

With respect to preserving landscapes, the policies in the draft plan provide for assessing development and management proposals for their likely effects on landscape values *with a view to maintaining a diverse range of distinctive landscapes and settings, including dominant landscape features of particular significance.*

Review of the Belmont Regional Park Management Plan

As noted, the current management plan does not give clear direction regarding wind generation activities in the Park. Given this lack of direction, coupled with the recent interest in Belmont Regional Park as a potential area for wind generation, a development of this type will need to be contemplated as part of the next management plan review.

The current management plan is due for review at the beginning of the 2003/04 financial year. It is anticipated that a Draft Belmont Regional Park Management Plan (which must be compatible with the overall objectives of the Parks Network Plan) will be completed by the end of the current calendar year and released for public consultation early in 2004.

There will be a series of meetings involving interest groups and members of the public throughout the review period. The public consultation involved in this review will provide opportunities not only for open public debate on the use of the Park for wind generation but also for informing the public about the processes involved in wind generation and the benefits to be gained from renewable energy sources.

Provision for allowing wind generation in the revised management plan would not eliminate the need for resource consents under the Resource Management Act.

6.6 Wellington Region Wind Generation Economics

A report by East Harbour Management Services in September 2002 for the Ministry of Economic Development provides more detailed information than the EECA report on costs. At present, the estimated electricity selling price needs to be 5.5 cents/kWh for a 9-10 m/sec wind speed site to provide a 5

percent return on the investment. At a 10 percent return requirement, the figure rises to 7.75 cents/kWh. Prices of about 6 to 6.5 cents per kWh are often quoted by various potential generators as being the energy price required to make a development economic on a high wind speed site. East Harbour Management Services are also predicting a reduction in the cost of wind turbines over time, prices have already dropped in real terms over the last 20 years or so.

The following are the average wholesale spot market electricity prices (unweighted by volume) at Transpower's Haywards grid exit point. Haywards is the prime price reference point in the Wellington area.

Year	Price cents/kWh
1997	4.50
1998	3.48
1999	3.33
2000	3.25
2001	7.99
2002	4.01

Wind generators take the going spot electricity price when the wind blows, unlike hydro generation which usually has some water storage, even if only to ensure a generation bias towards higher daytime prices.

At present then, there is a gap of about 2 cents a kWh between the average wholesale spot price and the price required for wind generation to be economic in the Wellington area if the output was sold on the spot market.

Embedding generation within a local network creates a situation where the network operator may be able to avoid some of Transpower's charges and thus offer the generator credits for the energy generated. A report published by Windflow technology Ltd in May 2002 reviewed the embedded situation for six network companies. Three companies offer credits for connection, of up to 1.6 cents/kWh while the other three would charge the generator up to 3.04 cents for connecting to the local area. Vector, the new owner of UnitedNetworks (the Wellington network owner) commented on the report indicating it did not think the conclusions were accurate. Notwithstanding the comments by Vector, a range of about 4.6 cents between the benefit and disbenefit from connecting to a local network is incredible particularly when Transpower has relatively consistent national grid pricing for network companies.

In the Windflow report, it is mentioned that UnitedNetworks would issue credits of 0.59 cents/kWh for embedded generation. While specific details for the wind generation have to be worked out, it is expected that UnitedNetworks will be able to offer credits for some of the generation on the Belmont site. At times, demand in the embedded area may be less than the wind generation output. During such times, power is exported into Transpower's national grid but the financial impact of this is not known at this stage. See section 6.7 for further details.

A possible revenue scenario for a wind farm in the Wellington area is:

	Cents/kWh
• 2002 spot market wholesale electricity price at Haywards	4.0
• Embedding credit from UnitedNetworks	0.6
• Contracting the output – margin over the spot price	0.5
• Power price increases over the next three years, say	1.0
	6.1

On the basis of the current average wholesale price at Haywards, expected increases in this price, a margin for a contracted price and the embedding network credits, then the Belmont site and similar sites in the Wellington area are possibly economic for wind generation. Particularly when it is remembered that the planning, investigations, resource consent and construction process will take place during a time of rising electricity prices. As a note of caution, sometimes adverse impacts can be remedied by spending on mitigation measures. This then reduces the economic viability of the project and in the ultimate case makes a project unviable.

For sites that are not currently economic, then the "carbon credits" programme that the Government is expected to announce later this year could assist.

6.7 Belmont Park Wind Farm - Issues

A number of issues require investigation before a development could proceed. Many of these would form part of the resource consent application. It is possible though to make some general comments on a number of issues at this stage.

Benefits

There are a number of potential benefits from developing a wind farm on the Belmont Regional Park land. These include:

· Diversified use of the park. Wind generation can co-exist with farming (see Attachment 3) and park visitors. It may encourage more tourism opportunities such as horse trekking.

· Promotion of renewable energy.

· Encouraging greater visitor numbers to the park. The wind turbine at Brooklyn has proved to be a popular visitor attraction. Views from the higher parts of the Belmont Regional Park are very expansive. For example, the Hutt Valley, the entrance to Wellington Harbour, the Porirua basin and the northern parts of the South Island are visible from the centre of the park whereas different aspects are visible from the northern and southern ends of the park.

· Education purposes. The Tararua wind farm near Palmerston North has incorporated a visitor centre. A similar centre could be created at Belmont,

which may be able to link with Council's environmental education programmes.

- Improved power security for the Wellington area.

- Reduced transmission losses. Most of the power used in the Wellington area comes from the central area of the North Island or the South Island, resulting in transmission losses.

- Employment opportunities as full time maintenance staff would be required.

- During the construction phase, many of the resources required could be sourced from the local area including concrete for the foundations, structural steelwork, tower erection, laying of power cables and construction of electrical equipment. Engineering and scientific consultants are required during the development.

Adverse Effects

Two of the often quoted adverse effects from wind farms are noise and the visual impact. With regard to noise, a New Zealand Standard has been published to assess site suitability. With careful placement of turbines, noise is not expected to be an issue outside the park boundary. There will be minor effects on park users close to the turbines. Visual aspects are subjective and are best dealt with under the RMA process, but a guide to the potential visual impact is obtained from the towers associated with the two high voltage transmission lines that already run through the Belmont Regional Park. The transmission towers are visible from the various parts of the cities in metropolitan Wellington, though only a few towers are visible from any built-up area. With a wind farm, the impact would be similar – only a few towers being visible from any built-up area. Although the towers in the Tararua wind farm are of a lattice construction, tubular towers are more frequently used, the towers in the Wairarapa being tubular. It is usual for power cables connecting the wind turbines to one or two central points to be placed underground. All adverse effects would be included in the environmental impact report for the development.

During the construction of a wind farm, parts of the park would have to be isolated for health and safety reasons.

Other Issues

With any project of this type, there are a number of issues to be discussed with key stakeholders in order to produce a quality feasibility report. The investigation work is now at a point where it is appropriate to enter into some of these discussions, which means it is preferable that the project is in the public domain. Discussions of this type though should not be confused with formal consultation. Should the Council decide that the project is worth pursuing, then formal consultation would be carried out, probably by the Council and the project developer as part of the Resource Management Act process.

6.8 Potential Size of a Belmont Park Wind Farm and the Resource Quality

To estimate the wind speeds at Belmont, 10 years of wind data from Mt Kau Kau was obtained and adjusted for various factors. Mt Kau Kau is 10 kilometres south west from the centre of the park.

On the basis of the information, it is possible to conclude that the more exposed parts above the 300m contour line within the Belmont Regional Park, where wind turbines would be placed, will have an average wind speed in the range of 10.5 to 11 metres/second. The remaining areas above the 300m contour are expected to be in the 10 to 10.5 metres/second wind range. As a comparison the Tararua wind farm site has an average wind speed of just under 10 metres per second. There is no doubt that the Belmont site represents a world class wind farm opportunity. There are many windier sites around the world but few are as close to significant built up areas and also accessible by existing roads.

In order to refine the quality of the wind speed information, additional data is required. Energy Direct obtained some wind speed information at Belmont in 1993. It is proposed to install a mast to support an anemometer on the same site used by Energy Direct. This is near the park entrance off Hill Road. Secondary masts are then placed at different locations in the park for short periods and the information correlated with the data from the main mast.

Positioning of wind turbines requires detailed investigations but because of the strong wind direction bias, see Attachment 4, it is possible to provide some initial information. In the north south direction, towers would be spaced about 320m to 350m apart – as a comparison the distance from the Wellington Railway Station building southern face to the Westpac stadium footbridge across Waterloo Quay is 370m or for those associated with the game of golf, the north-south spacing it equivalent to a relatively long hole. In the east west direction, spacing of the towers is expected to be about 200m.

Average wind turbine sizes from the various manufacturers have increased over the years so while each turbine may be more visual than say 15 years ago, the spacing between turbines has increased significantly to compensate for greater wind shadows. Although wind turbines of several megawatts capacity are available, there are practical considerations of transportation and construction. It seems likely that possible turbines for a Belmont development would range between 850 and 1000 kW based on those currently available. During the investigation stage over the next two years or so, turbines could increase slightly in output but utilise the same or similar blade swept areas as the current turbines. Alternatively, turbines of 1.5 MW capacity may be suitable if the logistics problems can be solved in an economic way. Preliminary work suggests the site could support 81 turbines. On this basis, the installed generating capacity would range from 69 MW to 81 MW. Attachment 5 shows the park boundaries and the possible area for wind turbines. Two properties adjoining the park have land that is higher than the 300m contour. Should the property owners also wish to foster sustainable energy development, then the total installed generating capacity will increase slightly. This, combined with slightly larger turbines than currently suggested

could result in an installed generating capacity of about 100 MW. Power output quantities noted in the next paragraph though do not include this potential additional capacity.

Just as important is the annual power output. A capacity factor of 50%[3] gives an output of 302 GWh/year for 69 MW and 370 GWh/year for 81 MW. This is equivalent to about the amount of energy consumed in Porirua City in a year.

Of interest is the fact that any power generated at the site would firstly meet or go towards meeting the power demand in the Hutt Valley and/or Porirua and northern parts of Wellington City.

The minimum amount of power fed into the Hutt Valley and/or Porirua/north Wellington City areas from the Melling and Takapu Road Transpower substations in 2001 was 10 MW and 17 MW respectively. Equivalent mean figures were 32 MW and 38 MW. Hence, given the potential size of the wind farm, a significant amount of power will flow into the national grid each year. Power flows are governed by the laws of physics, but it is highly likely that power injected into the grid at Melling and/or Takapu Road Transpower substations will exit the national grid at a point in the Wellington area. The Haywards substation is also reasonably close to where wind turbines would be situated so it is also a possible connection point.

6.9 Development Costs

Costs for the Tararua Wind Farm, namely $50M for 32 MW (48 turbines of 660 kW capacity) or $1.6M a MW, provide an indication of the costs for a development at the Belmont Regional Park. Average turbine sizes though have increased since the Tararua development, leading to economies of size, but there has also been some cost inflation. For the purposes of this report, a cost of $1.7M a MW has been assumed giving a project cost range of $117M to $138M.

Turbine blades, the generator and associated equipment that sit in the nacelle on top of each tower account for 70 percent of the project cost and are likely to be imported. This leaves about 30 percent ($35M to $41M) as the New Zealand content. There is no reason why this expenditure should not accrue to local manufacturers and service providers.

Turbine blades for all the wind turbines currently in service in New Zealand have been imported. New Zealand though has been very successful in the manufacturing of a number of fibreglass products, particularly in the boat building industry. Manufacturing the turbine blades in New Zealand would increase the New Zealand content by about another 5 to 10 percent.

[3] Wind generators usually start producing power when the wind speed exceeds 3 to 4 metres/second with maximum output reached at about 14 metres per second. A 50% capacity factor is equivalent to producing the full power for half the year or conversely half the rated capacity for a full year.

7. Conclusions

New Zealand requires new electricity generating sources in order to avoid brown outs. Maui gas is running out sooner than was earlier predicted and the development of the Pohokura gas field, which is substantially smaller than the Maui gas field, has been delayed. Shortages of electricity lead to higher average prices, loss of productivity and the loss of international competitiveness. Even increased electricity prices have an impact, an increase of 1 cent a kWh represents an annual cost to the nation of $350M based on a consumption of 35,000 GWh.

It is apparent from statements by various ministers that the Government is concerned about a possible electricity shortage. Likewise, the Council, on behalf of Wellington Region, has every right to be concerned about any economic down turn and difficulties in households if electricity is in short supply. Greater Wellington – The Regional Council has shown its ability to respond in the past to energy issues and an electricity shortage in particular. Potentially, the pending shortage problem is far more significant than the shortage problem in 2001 if solutions are not found.

At issue then is where new power generation will come from. Solid Energy is promoting the use of coal and is investigating coal fired generation on the West Coast of the South Island and in Southland. Some natural gas may be available but it is more likely to be used in existing power stations. Liquid natural gas and fuel oil are available on the world market – at a cost. All these energy forms produce greenhouse gases as part of the generation process. Some new hydro generation is possible, Meridian Energy's Project Aqua on the Waitaki River is under active investigation.

Wind generation is promising but needs a push because of the economics and resource issues. Greater Wellington is one of the parties that is able to assist with that "push". Central Government also has to play its part.

EECA has estimated that 550 MW of wind power could be developed in the Wellington Region, but at the top end it is only economic if electricity prices rise to 10 cents/kWh. EECA also qualified the uncertainty in its projections. Analysis of the Belmont area's potential, which is only one of a number of quality wind sites in the Wellington Region, suggests EECA's figure of 550 MW may well be realistic but possibly at an economic cost lower than 10 cents/kWh.

Promoting renewable energy sources is one of the policies of Greater Wellington and Central Government. Greater Wellington can promote its objectives by fostering wind farm development on land under its control. The open spaces in the Belmont Regional Park appear to be suitable for a wind farm. It would be a very sustainable development on what is a world class site. Generating capacity of up to 100 MW is possible if a small amount of adjoining land is incorporated in any development. The rewards include improved power security for the local area and delivery of one of the 30 petajoules from renewable energy sources Central government is seeking by 2012. Completion of the feasibility study will allow the expression of a more definitive view on the suitability of the site.

Other Council land may also be suitable for wind generation and will be investigated.

There are points for and against wind farm developments and other renewable resources. These are best dealt with through the rational RMA process and the review of Greater Wellington's various Plans.

The objectives of the Council can be achieved through facilitation and a passive investment in wind farms that represent a form of a public private partnership. To assist with this, some changes are needed to various Council plans to make the Council's views clear with regard to sustainable wind generation.

8. Communication

Given the importance of the issues raised in this report, a media statement following consideration by the Committee would be appropriate.

9. Next Steps

Subject to the Council accepting the concepts outlined in the report, then the next steps are as follows:

- Review various Council Management Plans to provide a clearer vision for sustainable energy development.
- Enter into discussions with key stakeholders in regard to a possible wind farm development at Belmont so that their ideas and any concerns can be incorporated in the feasibility study.
- Continue the process of obtaining Belmont site data to incorporate in the feasibility study.
- Complete the feasibility report and prepare a report for Council.

Some of the steps will run concurrently.

10. Recommendations

It is recommended that the Committee:

(1) ***receives*** *the paper and notes its contents.*

(2) ***strongly supports*** *sustainable energy development in the Wellington Region subject to the frame work required by the Resource Management Act and Council Plans and Policies.*

(3) ***notes*** *the potential for wind farm development in part of the Belmont Regional Park.*

(4) ***notes*** *the Parks Management Plans are under review.*

(5) ***approves*** *officers completing a feasibility study for a wind farm development at the Belmont Regional Park.*

(6) ***directs*** *officers to report back to the Committee on the feasibility investigations in (5) in due course.*

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(A) Acknowledgements

This report has been prepared with the assistance of several Greater Wellington staff and persons in other organisations. Their assistance is appreciated and acknowledged.

(B) Disclosure

Several major companies in the energy industry potentially stand to gain from renewable energy initiatives that Greater Wellington – The Regional Council may promote. Some of these companies are listed on the New Zealand Stock Exchange or have issued financial instruments. Stocks and/or shares are held by persons associated with the renewables project from the Council perspective. Disclosures will be made to the Council Secretary as appropriate.

Attachments

Attachment 1: Map of NZ showing locations most suitable for wind energy development
Attachment 2: Belmont Regional Park Land Ownership
Attachment 3: Photos of Tararua Wind Farm and Belmont Regional Park
Attachment 4: Wind data graphs and photo taken at Belmont Regional Park
Attachment 5: Belmont Regional Park Potential Wind Farm Area