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Committee **Policy, Finance and Strategy Committee**
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Renewable Energy Initiative Update

1. Purpose

To update the Council on the renewable energy developments over the last year, in particular, the wind energy feasibility studies on Council and adjacent lands.

2. Introduction

In March 2003, the Council approved investigating the possibility of a wind farm development at the Belmont Regional Park (report 03.11). Then in May 2003, Council approved the finance for investigating four sites (report 03.312). One of the requirements in report 03.11 is to report back to the Council in due course. While Councillors have been regularly informally appraised of the feasibility study work, this report is the first comprehensive update. It covers the investigation work over the last 12 months.

3. Background

One of the key elements of “Towards a Sustainable Region” is sustainable energy. Attachment 1 is an extract of report 03.11, which sets out some background to the renewable energy project.

Greater Wellington is in a unique position to assist in the development of renewable energy resources. As a substantial landowner and land manager in the region, the Council may be able to influence sustainable wind energy development through making some of its land available for wind generation. At some of the sites, the adjacent landowners have indicated they may also offer their land for wind generation purposes.

The need for new electricity generation has intensified over the last year, particularly with the recent cancellation of Meridian Energy’s Project Aqua which would have yielded over 500MW. While an electricity shortage was averted last winter due to the late filling of the hydro storage lakes, the pressure remains to find new energy sources. As the Institute of Professional Engineers of New Zealand noted in its March/April 2004 magazine, “with New Zealand’s

energy usage doubling every 22 years for the last century, it is imperative that the extent of existing energy resources is known and steps taken to find new ones". Over the last year, work started in New Zealand on several new generating plants including two to be powered by wind energy. The need though for around about 150MW of new generation each year remains.

In October 2003, the Ministry of Economic Development (MED) published its New Zealand Energy Outlook to 2025. It predicts that wholesale electricity prices in real terms will climb from 6.3 cents per kilowatt hour in 2005 to 7.2 cents per kilowatt hour in 2020, and then 8.4 cents per kilowatt hour in 2025. The MED also notes that there could be price volatility of approximately $\pm \frac{1}{2}$ cent per kWh in any one year.

In report 03.11, provision was made for carrying out feasibility studies on up to four sites for wind generation. Initial investigations identified three potentially very good sites. As a result we decided to focus on these three sites and not attempt to investigate a fourth (lesser) site.

4. Progress with wind energy feasibility studies

While it is stating the obvious, it is clear that if the wind resource is inadequate then it is not worth taking investigations further. Hence in the initial phase of the study we concentrated heavily on getting the equipment in place to quantify the wind resource. More recently we began looking at the other components which feed into a feasibility study (e.g. landscape issues, required infrastructure, effects on other users, ecology etc). To assist me in preparing a feasibility study we have set up a cross-divisional team of officers. The role of this team is to provide advice and expertise to the project.

In this report we have considered the wind resource first followed by the other key issues. In order to provide you with a rough comparison between the capabilities of the various sites, the report assumes a one megawatt wind turbine would be used, but the actual size would depend on the developer of any wind farm.

4.1 Puketiro

This site is to the east of the Battle Hill Farm Forest Park, the area is currently used for exotic forestry, but the ridges where the wind turbines could be placed tend to be more open.

4.1.1 Puketiro wind resource

Wind recording has started at the site but because of earlier technical difficulties (now resolved) there is inadequate information so far to draw any conclusions about the long-term wind resource.. However, given the proximity of the area to the Belmont site and their similar elevation it is expected that the average speed of the two sites would also be similar. Sufficient wind data should be available by December this year or March next year, depending on how well it correlates with the Belmont wind data. A preliminary layout for a wind farm indicates that there could be 20 wind turbines of one megawatt each

positioned on the Council's land. Discussions are continuing with some adjoining landowners which could see a combined site supporting up to 62 turbines of one megawatt capacity.

4.1.2 Puketiro other key issues

Access to the site would depend on the physical extent of the wind farm. Three possible access routes have been identified and these will be refined during the coming financial year.

An internal assessment is being made of ecology and landscape issues.

Other resource studies at Puketiro would be left to the developer of the wind farm, should the Council proceed with making the land available.

4.2 Mt Climie

4.2.1 Mt Climie wind resource

Anemometers have been recording wind speeds at this site since late August 2003. Usually 12 months of data is required to obtain a reliable average wind speed. An average wind speed of close to or greater than 10 metres per second at the turbine hub height is necessary to make a wind farm economically viable. Based on six months of data, the predicted long-term average wind speed 50m above ground level at the Mt Climie site is 13.74m/s. The executive summary of the preliminary wind speed resource assessment report prepared by PB Power is included as **Attachment 2**. PB Power was asked to calculate an annual capacity factor for a Vestas V47 (660kW) wind turbine at the site and this came to 64.6%. The Vestas 660kW turbines were chosen for this exercise simply because there is public information about the Vestas V47 output from the Tararua wind farm. At the Tararua wind farm it is understood that the capacity factor is just under 50% on a long-term basis. As a further comparison, the best monthly average wind speed reported by the Tararua wind farm is just over 12 metres per second. In December 2003, it averaged 15.7m/s at Mt Climie. The Tararua wind farm is already recognised internationally as being one of the best performing wind farms as far as the capacity factor is concerned. A preliminary layout for the Mt Climie site indicates it could support up to 63 turbines of one megawatt capacity. The land is entirely Council owned.

4.2.2 Mt Climie other key issues

There is an existing access road to the Mt Climie site but this passes through the Tunnel Gully recreation area and this part of the road should be avoided if at all possible. Two other routes have been identified and these will be evaluated in more detail over the next few months.

Because of its elevation – about twice the height of the high points of the Belmont site – the main ridge at Mt Climie can be seen from many parts of Upper Hutt City and other parts of the region. Resolving landscape/visual issues will be particularly important for this site. From an ecological point of

view, the Mt Climie site is a sensitive area and Council staff will undertake an ecological evaluation in the 2004/05 financial year.

Noise is unlikely to be an issue, the nearest houses are 2.5km from the site and at a much lower elevation. There are no aviation constraints. Vector, the local power network utility, is currently evaluating how the power could be taken from the site.

Several communications structures are located at Mt Climie and discussions are continuing with the owners to ensure any wind farm does not conflict with their operations.

4.3 Belmont

4.3.1 Belmont wind resource

Wind speed is being recorded on a 70m mast incorporating several sensors. There is only three months of data and the average wind speed so far is just over 10m/s measured 70m above ground level. This is similar to the long-term projections derived from data recorded at the site a few years ago by another organisation. Twelve months of data will be available early in 2005, together with about seven months of data from three secondary anemometers near the corners of any development enabling a more accurate projection of the long-term wind resource. **Attachment 3** is a summary of the wind information obtained to date.

The Belmont Regional Park land has the capability of supporting up to 81 one megawatt turbines. If two private adjoining landowners' land is suitable for wind turbines, then the total capacity could increase to 108 megawatts.

4.3.2 Belmont other key issues

There are several owners of the Belmont park area and although discussions are continuing with them, there are no agreements in place at this stage to allow for the full development of the 81 turbines. Clearly, any development would need the landowners agreement so this is a key factor in determining the feasibility of the site. Hutt City Council are a key player in this site and we intend to continue to work closely with them and the other landowners over the next 12 months. Our objective is to resolve these issues in the next financial year.

There are several access roads to the site and the study to determine the most appropriate is ongoing. A key factor is to minimise inconvenience to residential property owners.

Initial contact with local Iwi has been positive but they are awaiting more details of the proposal. The Friends of the Belmont Regional Park are being kept informed of progress.

A recreation and tourism study is underway and should be completed in July.

The area identified as potentially being suitable for wind generation is above the 300m contour and most of the land is open grassland. Taking account of the ecology is important and a study is expected to be completed in July. A bird study is scheduled for completion in May.

An archaeological study is being undertaken as part of the Belmont Regional Park planning process and this may be able to be utilised for the wind energy feasibility study.

The aviation study has been completed and based on the preliminary wind turbine layout and size, no particular issues have been identified. The final layout and turbine size for any wind farm though would still be subject to a further check.

5. Other issues

It was recognised last year that some of the Council land was originally obtained for water supply purposes and this had limitations imposed by the Wellington Regional Water Board Act 1972, with regard to wind energy developments or any other electrical development, such as a run of river mini hydro. Accordingly, a Water Board Functions Bill has been prepared and submitted to the House of Representatives. The Bill is expected to be introduced into the House at about the time the Council considers this report. At this stage, the best advice is the Bill could be enacted by the end of 2004.

Work is continuing with landowners who adjoin the Council's wind energy sites and who have indicated they would like to consider development on their own land. Some economy of scale aspects could result from this. Draft landowner agreements have been prepared for consideration by the various landowners.

There are ongoing discussions with other interested parties such as the City Councils, Transpower, and the local network provider Vector.

6. Discussion

The work so far suggests that all three sites mentioned in this report may achieve the minimum wind speed of about 10m/s required for a wind farm to be economic at current electricity prices. Thus, it is likely that any decision to proceed will be based on factors other than the wind resource.

From a wind resource perspective, the most outstanding site of the three is undoubtedly Mt Climie. Of the possible 63 turbine locations at Mt Climie, approximately 40 could be subject to a wind resource that will allow a capacity factor of approximately 65%. For 8% of the time, the wind speed is above 90km/h when turbines are normally shut down compared with 1% or less in a more average New Zealand wind generation situation. Harnessing some of this energy will increase the capacity factor. Provisionally, the balance of the turbines could be located on a ridge of slightly lesser elevation than the main ridge, but will still be subject to a very good wind speed. With one megawatt turbines and say an average capacity factor of the whole site of 55%, then the

site has a capability of producing 300 gigawatt hours of electricity a year. To put this in perspective, it is sufficient to power about 35,000 homes or one third of those in the Wellington metropolitan area.

As a means of abating CO₂ under the Kyoto Protocol, a wind farm at Mt Climie could abate 180,000 tonnes of CO₂ a year. Even so, there would be a number of technical challenges in building a wind farm in such a high wind speed regime.

The ecology is another aspect of concern and the full feasibility study will include a section on this.

The Belmont site is expansive but it has a number of issues that still have to be resolved and it is relatively close to some urban areas. The wind data to date suggests that the site may just be economic.

Puketiro is expected to have a wind resource similar to that at Belmont, but unfortunately technical difficulties have limited the wind data so far. The Council part of the site is well removed from any dwellings and it should be possible to find a suitable access.

During the year, there has been several approaches from wind energy generators. If conditions are right, there will be significant interest in any opportunity the Council may offer for development on its land.

7. Other renewable developments

Council is continuing work on the RPS solar and energy efficiency goals. The most promising alternative source of local energy generation in the future will be solar hot water heating systems for households. These systems will become increasingly attractive as the price of electricity increases. There is a funding package of loans currently available from EECA for households that wish to invest in such a system. Additionally, central government is developing policy on standardising the interconnections between the national grid and small scale 'distributed generation'. This policy work could lead to increased local renewable energy generation due to certainty regarding the 'sale' of excess generated electricity to the nation system.

During the year, various literature articles have been reviewed to see what may be of direct interest to the Council. The only item of note is the research in Britain to generate electricity using sea currents. At present, this work is experimental but shows some promise for areas such as Cook Strait. Commercial development at prices that may be economic in New Zealand though is still sometime away.

8. Next steps

An approximate timetable for finishing the technical components of three feasibility studies is as follows:

- Mt Climie November/December 2004
- Puketiro March or June 2005
- Belmont June 2005

Belmont will be subject to the completion of the Belmont Regional Park Plan but the land is not affected by the Wellington Regional Water Board Act. Both the Mt Climie and Puketiro sites are subject to the Wellington Regional Water Board Act and therefore the new legislation is required before development could progress at either site. The Forest Lands Plan also needs to be completed as it covers the Mt Climie and Puketiro areas.

Once the Council has received the feasibility studies and if it decides to continue with the development, then the Council may choose to invite public submissions for each site. Following this, if the Council finds favourably, proposals could be invited for a wind energy development licence at each site.

9. Conclusions

New Zealand's appetite for electricity industry continues with the need for about 150MW of new generation each year. With Meridian Energy now deciding not to proceed with its Project Aqua, there are no large scale developments on the table that utilise New Zealand's renewable resources.

The fall back position without renewable energy being used for new electricity generation developments will undoubtedly be coal, possibly in combination with imported liquid natural gas if there are no new gas discoveries.

Of the three sites investigated so far, the wind energy resource for Mt Climie is confirmed and initial indications for Belmont are promising. There is insufficient data from the Puketiro site so far to give a firm opinion. Progress is being made on investigating other issues for all three sites with a view to concluding the feasibility studies in the next 6-12 months.

Renewable wind generation can provide a significant part of the new generation required in New Zealand over the next 10-20 years. It appears that there will be an opportunity for this Council to make a difference.

10. Communications

It is suggested the Council issues a media release following consideration of the report.

11. Recommendations

That the Committee:

1. *receive the paper and note its contents.*
2. *note the revised dates for completion of the three feasibility studies mentioned in the report.*

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Attachment 1: Additional information about the sustainability aspects in report 03.11

Attachment 2: Executive summary of the preliminary wind speed resource assessment report prepared by PB Power

Attachment 3: Summary of the wind information obtained to date at Belmont