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Committee Parks, Forests and Utilities
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Wainuiomata mini hydro power generation

1. Purpose

To inform the Committee of the results of an investigation into renewable hydro power generation using water supply from the Orongorongo catchment; and to seek Committee approval to include this development in the 2009/10 wholesale water capital works programme and draft LTCCP.

2. Significance of the decision

The matters for decision in this report **do not** trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002.

3. Background

Source water for the Wainuiomata water treatment plant is provided from the Orongorongo and Wainuiomata catchments. Water from the Orongorongo catchment is transported to the treatment plant via a 5.6 km long pipeline with the approximate 100-metre head difference being dissipated by pressure reducing valves just upstream of the treatment plant.

The concept is to bypass the pressure reducing valves and utilise the available pressure head to drive a turbine and generate electricity. The electricity generated would be available to provide power to the treatment plant with any excess power being supplied to the local electricity network by our energy provider.

A comprehensive report on the investigation has been completed by engineering consultants MWH NZ Ltd.

4. Results of the hydro power investigation

Taking into account the river flows, consent abstraction limits, and the hydraulics of the pipeline, the investigation has identified that optimum results

would be obtained from a turbine sized for a maximum flow of around 40 million litres per day (MLD).

At a flow rate of 40 MLD, approximately 308 kW of power would be generated, which is sufficient to meet around 95% of the power demand of the Wainuiomata water treatment plant operating at full capacity. To maximise the level of electricity generated it is proposed that the turbine would be operated at the full capacity of the source water available up to 40 MLD. The water treatment plant would utilise whatever water was needed for the wholesale water supply and the excess water would be discharged into George Creek which flows into the Wainuiomata River.

Use of an impulse turbine has been suggested since it would provide efficient generation over a relatively wide range of flows, and this type of turbine allows responsive control of the level of power generated. Analysis of previous flow records indicates that 1,800 MWh of renewable electricity could be expected to be generated annually using an impulse turbine. This is about 9% of the energy used in the wholesale water system.

The power generated would be used primarily for water treatment plant operations with any excess fed into the local power distribution network. For a high percentage of the time the power generated would fully meet the needs of the Wainuiomata water treatment plant. Use of this electricity at the treatment plant reduces the need to import electricity, allows lower maximum demand charges and lower line charges and is the most cost effective use of the power generated.

4.1 Economic assessment

The capital cost of the complete turbine generator installation is estimated at \$1.84 million, including a 15% contingency. This is based on budget estimates provided by suppliers and recent tender prices for the main items of equipment.

The price for electricity imported by GWRC in 2009 is projected conservatively to be 8.8 cents/kWh, and the projected exported sale price is 7.9 cents/kWh. The savings from the renewable electricity generated have been estimated based on 70% use by the treatment plant and revenue earned from 30% exported to the local electricity network. The Orongorongo water flow records and energy costs for the last 2 years indicate it is a reasonable assumption at this stage.

The annual combined savings and revenue earned from the electricity generated is estimated at \$165,000. This provides a simple payback on the capital cost of a little over 11 years, however that assumes electricity prices will not exceed the rate of inflation.

A calculation of the internal rate of return for this development (including an annual allowance for maintenance costs) has been carried out over a 20 year period assuming a 2% real increase annually in electricity prices. Even with

this conservative estimate, an Internal Rate of Return of 8.2% was achieved. This is above the Council's weighted average cost of capital and is considered to be a competitive rate of return for such a project.

4.2 Savings in carbon emissions

In addition to savings in electricity costs, the generation of renewable energy would also provide savings in carbon emissions of up to 400 tonnes per year. This is approximately 50% of the carbon emissions savings target for the bulk water supply to be achieved by 2012. It is based on using renewable energy, as opposed to energy provided through the national grid which originates from a mix of renewable and non-renewable sources.

5. Discussion

The investigation has shown that hydro power generation from the Orongorongo water supply can generate sufficient renewable electricity to meet all but the very maximum power demand of the Wainuiomata water treatment plant, and provide sufficient power to meet all electricity needs of the plant for a large proportion of the time it is operating. The analysis has shown that this can be achieved with an acceptable payback period and at an internal rate of return that is above the Council's weighted cost of capital benchmark.

Sustainability and renewable energy is a key objective of Greater Wellington, as demonstrated by the targets identified for reduced carbon emissions. The Wainuiomata mini hydro power generator would provide a tangible demonstration of the commitment to sustainability from renewable energy generation and make a substantial contribution to reducing the Council's carbon emissions.

6. Next steps

Discussions are needed with key stakeholders (DoC, iwi, and Fish and Game) on maximising the extraction of Orongorongo source water up to 40 MLD and the discharge of water not needed for water treatment into George Creek. Initial enquiries have been initiated with GWRC Environmental Division on the existing resource consent conditions and new resource consent requirements.

It is proposed that the Wainuiomata mini hydro power generation project is included within the 2009/2010 wholesale water capital works programme and the draft 2009/2019 LTCCP, with design to commence in 2009.

7. Communications

A media release is not considered to be required since the project will be available for public consultation under the draft LTCCP.

8. Recommendations

That the Committee:

1. ***Receives*** the report and notes its content.
2. ***Notes*** the level of carbon emissions savings that can be achieved from renewable hydro power generation at Wainuiomata.
3. ***Agrees*** in principle with the generation of renewable electricity utilising the pressure available from the Orongorongo pipeline.
4. ***Agrees*** with the commencement of stakeholder consultation on the discharge of water into George Creek that is not required for water treatment following electricity generation.
5. ***Approves*** the inclusion of the Wainuiomata mini hydro power generation project within the wholesale water capital works programme for 2009/2010 and the draft 2009/2019 LTCCP.

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