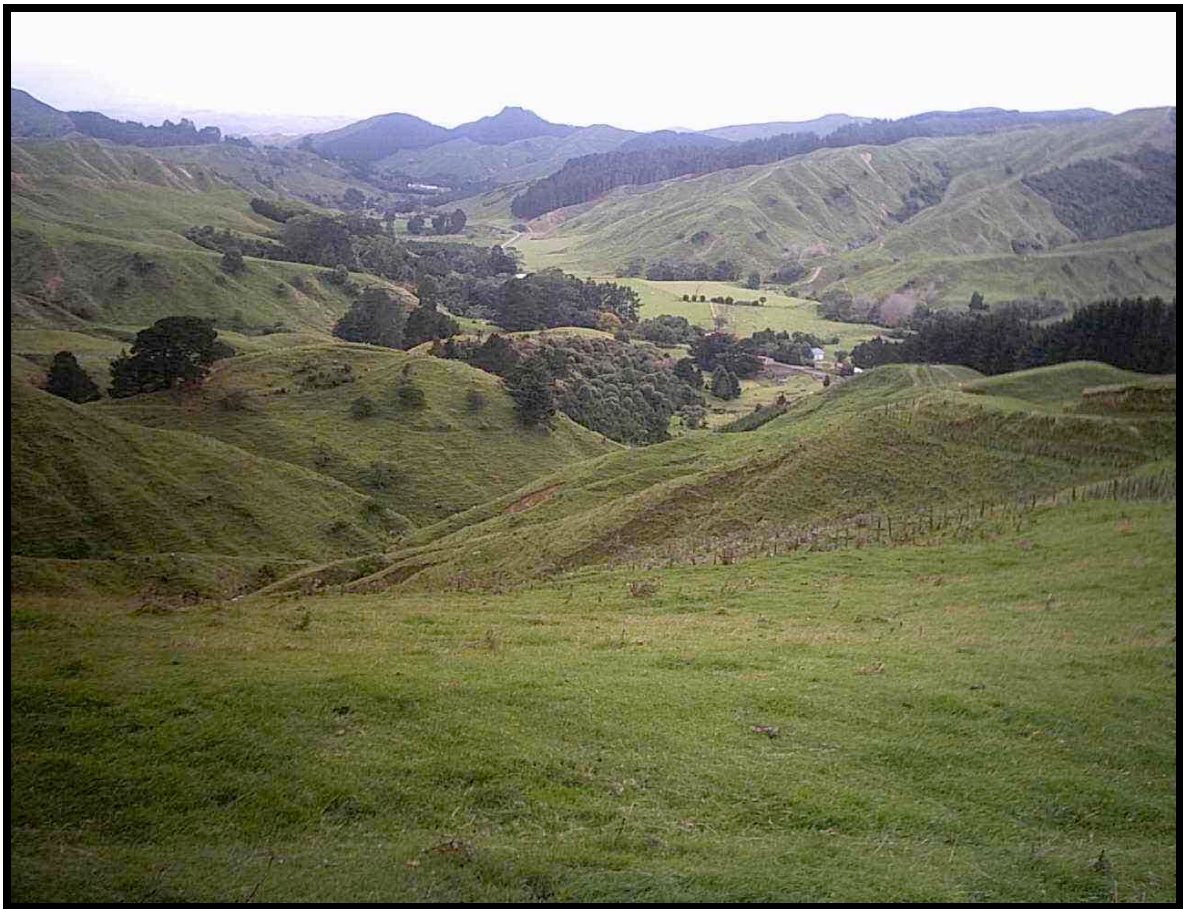


Totara Valley Micro-Hydro Development

**A thesis presented in partial fulfillment of the
requirements for the degree of**

Master of Applied Science

in Renewable Energy Engineering



Massey University, Palmerston North,

New Zealand

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Abstract

This study focuses on the design, construction and operation of a distributed generation system based on micro-hydro technology.

The project is sited in the Totara Valley, a small rural community approximately 70km from the Massey University, Turitea campus, Palmerston North.

The Massey University Centre for Energy Research (MUCER) has a long history of renewable energy research within the Totara Valley community. This project complements these existing schemes and provides a foundation for future research into distributed generation technologies. The project encompasses the following objectives:

- to gain practical experience in the design, engineering and implementation of a distributed generation system in rural New Zealand;
- to evaluate contemporary micro-hydro technology and compare the performance of this equipment in a theoretical and practical context;
- to identify barriers that hinder the widespread adoption of micro-hydro systems in rural New Zealand;
- to develop a spreadsheet based life cycle costing tool.

The results from this study demonstrate that economic considerations are the fundamental aspect to be considered when assessing the long-term viability of these projects.

The viability of micro-hydro projects are primarily determined by four factors:

- the volume and head (height) of water available above the turbine site;
- the length and therefore the cost of the pipeline required for transporting water to the turbine;
- the legal and administrative costs involved in obtaining a resource consent to maintain access to the water resources;
- the prices received and paid for electricity.

Considerable charges were payable to the local authority to secure and maintain the right to harness the water resources at this site. This cost contributed considerable risk to the project and creates a significant barrier to establishing similar systems at other sites.

The reduction of resource consent charges to levels that fairly reflect the negligible environmental impacts of these projects would encourage the adoption of this technology and deliver benefits to rural New Zealand communities.

Cover image: Looking west down the Totara Valley, taken 200m from intake site June 2005.

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It is also with regret that I record the passing of *Mike Poulton (Snr)* during 2006. Mike kindly offered his property as the location for this project. Over the years Mike tirelessly supported Massey University research projects in the Totara Valley.

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