

National Centre for Climate–Energy Solutions

finding the energy to move New Zealand forward

A NEET solution

A project run by NIWA's Māori Development Unit, Te Kūwaha, aims to improve the lives of people in two rural Māori communities through the use of New and Emerging Energy Technologies (NEET).



Te Kūwaha is working with the communities at Waihi (Lake Taupo) and Waipoua (Northland) to assess the potential for solar, wind, and hydro energy at both sites; for geothermal at Waihi; and for wave energy at Waipoua.

A potential small scale hydropower site.

So far, future possibilities for Waihi include development of a micro-hydro system and selling the power to the national grid. At Waipoua – which is not connected to the national grid – solar power and/or small scale wind and hydro may be able to meet household needs.

In February, community members retrofitted insulation in most of the homes. We worked with Negawatt Resources, and the Energy Efficiency and Conservation Authority, to provide training in how to install home insulation and energy efficiency measures, indoor air quality management, and renewable energy technologies.

After several months, householders report their homes are warmer, drier, and fresher. With the right support, there is the potential for them to start up businesses retrofitting buildings in neighbouring communities.

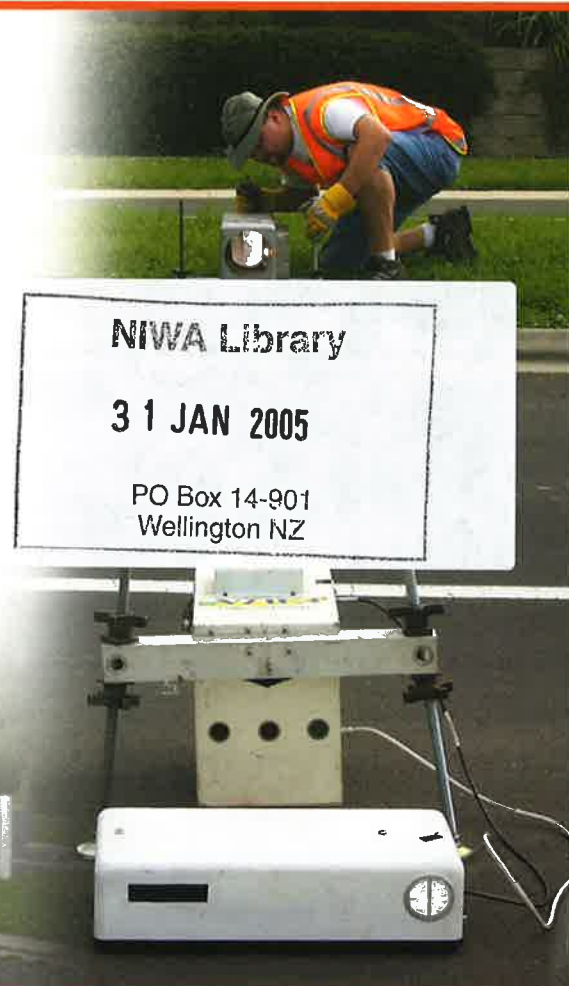
The NEET programme is funded by the Foundation for Research, Science & Technology.

How are your emissions?

NIWA has acquired the Accuscan RSD4000EN remote sensor and will be putting it to work for the Auckland Regional Council in October and November. It will enable us to analyse vehicle emissions by vehicle age, fuel type, origin (imported or New Zealand new), distance travelled, and WoF status.

In April 2003, NIWA successfully collected emissions data from over 40 000 vehicles in the Auckland region using similar remote sensing technology.

One interesting fact that came out of the 2003 study was that imported Japanese used vehicles emitted lower levels of pollutants than New Zealand new vehicles manufactured in the same year. The data have been used to devise potentially effective vehicle emission control strategies by identifying the sections of the fleet containing large proportions of 'gross emitters' and which would therefore benefit most from inspection and maintenance schemes.



New project to develop wave energy device

We are working with Industrial Research Ltd and Power Projects Ltd on a complex project to develop a prototype device to generate electricity from open water ocean waves.

It only takes a passing familiarity with New Zealand's coasts to appreciate the immense power contained in ocean waves, but this is not an enterprise to be entered into lightly. The wave energy generator must survive in a harsh, corrosive, constantly moving environment.

There needs to be enough energy to make the device economic, but not too much so that it is destroyed. To assess this, NIWA has developed a satellite-based description of 20 years of wave history for the deep ocean around New Zealand, as well as a model of how waves evolve as they move into shallow, coastal water.

The data allow us to examine the variability in wave energy from an economic perspective. There is greater demand for electricity in winter, so we need to determine the size of the wave energy resource at these times.

Most people see waves coming into shore as nicely ordered crests, but out at sea it's a different story. Waves can come from all directions and have a range of wave-lengths. Sitting in a small boat in a reasonable sea is like being in a tumble dryer – only wet. The simplest approach is to make sure your device is good at coping with the range of likely wave frequencies. But NIWA is working on a smarter approach – understanding and modelling the dynamics of individual waves, then designing the device to adapt to the conditions.

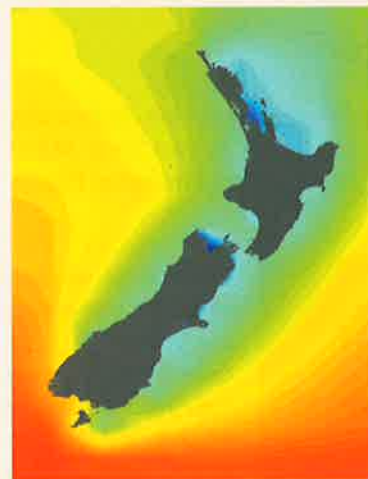
There's no point having a smart device if it gets washed away and dashed to pieces on the shore. The challenge here is the interaction between the drag induced by the waves and currents and the elasticity of the mooring.

Recent collaboration between NIWA and the Ocean Engineering Laboratory at the University of New Hampshire has modelled such interactions for offshore mussel farms, and could apply the same approach to the wave energy device. If the device is going to remove energy from the wave then it changes the wave – even if only slightly. We need to understand these changes and their wider implications in order to determine how the wave energy device will affect the local environment.

This work is funded by the Foundation for Research, Science & Technology.

The three essential ingredients for good wave power are: consistency, high energy, and a high wave period.

Wave period is the time it takes for successive waves to pass a fixed point. For example, the waves in the western reaches of Foveaux Strait are generated by winds over the whole south Tasman Sea and Southern Ocean extending to the Indian Ocean. The waves arrive as swell that has been generated hundreds or thousands of kilometres away. On average, the period of the waves is high; about 95% of the time, the most energetic parts of the waves are 11 seconds or more apart.



0 1 2 3 4
Wave height (m)

Average significant wave height around New Zealand for 1979–98.

Waves in Foveaux Strait also meet the other two criteria, being consistently high, with the 'significant wave height' exceeding 2 m nearly 70% of the time. Significant wave height is the average of the highest one-third of waves in a fixed-length record.

NIWA has the database and expertise to advise on the best potential sites for marine energy generation.

Climate change & business

The Australia-New Zealand conference and Trade Expo 04

NIWA is a sponsor of this event which will be held at the Sky City Convention Centre, Auckland from 3 to 5 November.

Key objectives

- To promote business opportunities and understanding of risks arising from climate change
- To showcase technologies and actions that reduce greenhouse gas emissions
- To identify how Government can link with business to address climate change

Further information from www.climateandbusiness.com or secretariat@climateandbusiness.com

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