National Centre for Climate–Energy Solutions

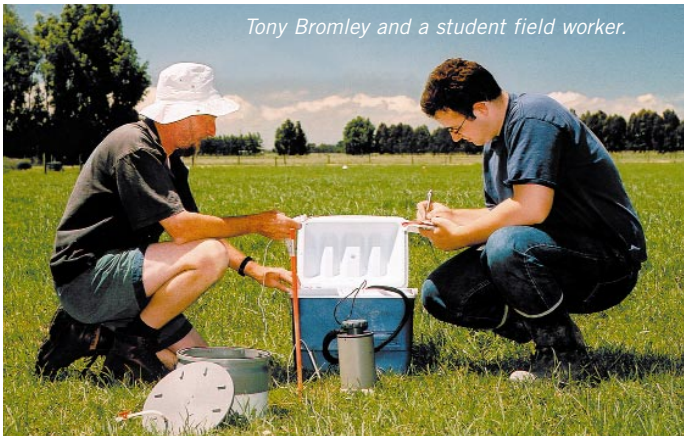
finding the energy to move New Zealand forward

How can we solve the energy requirements of remote communities? The National Centre for Climate–Energy Solutions has been working with two remote Māori communities in Northland and Taupo to assess their current and future energy needs, the energy efficiency of their homes and communal buildings, and their potential to tap into new and emerging sources of renewable energy. Through a series of hui and household energy audits, we have developed a shared understanding of the unique energy requirements for each community, and identified where energy savings can be made. Staff from NIWA's Māori development unit, Te Kūwaha, and other staff have completed renewable energy assessments at each site and installed equipment to monitor wind, solar, wave, and hydrological energy.

Waipoua (Northland).

The Centre is also helping create new economic, social, and environmental opportunities associated with climate change and energy reform. Although the debate has centred on climate change, the main driver for global warming is the release of carbon dioxide into the atmosphere through the burning of fossil fuels. Because of the adverse environmental effects and the finite lifetime of this energy source, we need to look closely at alternative sources of energy and maximise the efficiency of national energy use, particularly in transport. We discuss these issues in our free quarterly newsletter, *Climate–Energy Matters*, which is also available on our website.

www.niwa.co.nz/ncces



Tony Bromley and a student field worker.

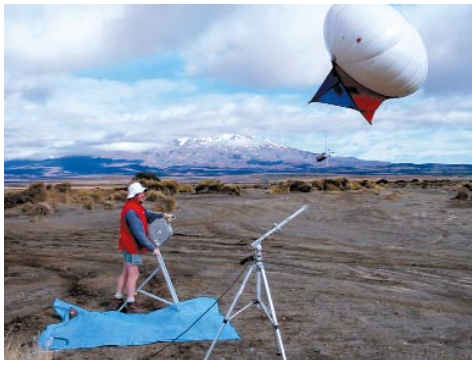
Kyoto Protocol

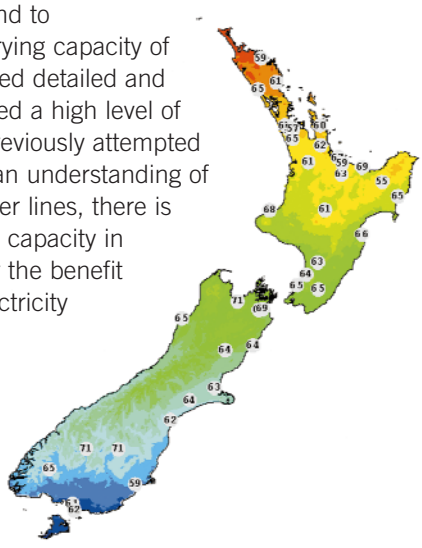
New Zealand will be required to reduce its greenhouse gas emissions between 2008 and 2012 to 1990 levels when the Kyoto Protocol comes into force. We already compile and report annual 'emission inventories' under our obligations to the United Nations Framework Convention on Climate Change. Our obligations under the Kyoto Protocol, which we ratified on 19 December 2002, emphasise the need for accurate and quality-assured inventory estimates, not only for 1990, but also for subsequent years. Our annual inventories are also subject to international scrutiny and review.

New Zealand is unique because our greenhouse gas emissions (e.g., methane, nitrous oxide) mainly come from agriculture and are difficult to estimate accurately. For many other developed countries the major emission is carbon dioxide from the combustion of fossil fuels, which can be estimated relatively accurately from fuel consumption. Our agricultural emissions vary depending on the climate and the way animals are managed and fed. We are researching how we can better quantify New Zealand's agricultural emissions and develop ways to reduce these emissions cost-effectively, while maintaining or improving agricultural productivity.

How much electricity can power lines handle?

The amount of electricity power cables can carry depends not only on the electric current, but also on the air temperature and the strength of the wind across the cable. To enable Transpower to maximise the amount of current they can send down their power lines while maintaining minimum ground clearance (power lines sag as they heat up), we surveyed more than 15 000 transmission line spans. To do this we used laser radar to map the exact position of the cable and recorded climate data such as maximum air temperature for each position. The project covered about half of Transpower's national high voltage transmission line network, and the aim was to determine the precise location of the lines in relation to the ground and vegetation, and to estimate the true current-carrying capacity of the lines. Our models produced detailed and realistic results, which provided a high level of meteorological support not previously attempted anywhere in the world. With an understanding of the microclimate around power lines, there is potential to free up additional capacity in existing transmission lines for the benefit of national grid users and electricity consumers.





Tapping into solar energy. The map shows the amount of solar energy available to New Zealand in 2000 (the values in circles show the percentage correction required to account for cloud cover). A solar panel in Nelson would produce 77 kWh of electricity a year, while the same solar panel would produce 69 kWh a year in Auckland.