

# Wind Energy and Climate Change

## **Wind energy plays an important, global role in addressing climate change.**

New Zealand has ratified the Kyoto Protocol and so must take steps to reduce its greenhouse gas emissions. The Kyoto Protocol is an international treaty that sets out to reduce the emission of greenhouse gases that cause climate change. Between 2008 and 2012 New Zealand is required to reduce its greenhouse gas emissions to an annual average equal to or below its 1990 emissions level, or to take responsibility for the excess emissions.

One way we can reduce our greenhouse gas emissions – as well as our dependency on non-renewable fossil fuels – is by increasing the proportion of electricity that is generated from wind and other renewable energy resources.

## **ELECTRICITY GENERATION AND GREENHOUSE GAS EMISSIONS**

New Zealand generates about 70% of our electricity from renewable resources, with the majority coming from hydro. Until recently, this proportion has been dropping as new coal and gas generation has been built over the last 20 years to meet growing demand. Because of this growth in thermal generation, electricity generation has been one of the fastest growing sources of greenhouse gas emissions in New Zealand. Between 1990 and 2009 greenhouse gas emissions from electricity generation increased by approximately 72%.<sup>1</sup>

New Zealand has a plentiful supply of renewable energy sources that can be harnessed to generate clean, low to zero emission, electricity. The government has set an aspirational target for 90% of New Zealand's electricity to come from renewable resources by 2025. New wind and geothermal generation will play a key role in achieving this target and helping to reduce emissions from the electricity system.



## **DO WIND FARMS REALLY PREVENT EMISSIONS?**

The use of wind, instead of gas or coal, to generate electricity substantially reduces greenhouse gas emissions. Overseas studies have shown that the lifecycle emissions (including manufacturing of components, construction, operation and decommissioning) from wind farms are

about 1% of the emissions from thermal generation.<sup>2</sup>

Essentially, every unit of electricity produced by a wind farm is one unit that does not need to be produced by a coal or gas power station. Wind farms don't emit greenhouse gases as they generate electricity, whereas coal and gas stations do.

<sup>1</sup> Ministry of Economic Development, New Zealand Greenhouse Gas Emissions (2010)

<sup>2</sup> Windstats Newsletter, Vol 20, No 2, 2007.



In addition, within six months a wind farm will have produced more energy than it will use in its entire lifetime. In contrast a thermal station will use about twice as much energy as it produces in the form of electricity.<sup>3</sup> Using coal or gas to generate electricity creates a lot of waste heat that cannot be easily used for generating electricity.

#### WHAT HAPPENS WHEN THE WIND IS NOT BLOWING?

The reality is New Zealand is a windy country. A study of wind data from a range of actual and proposed wind farm sites across New Zealand revealed that over the term of one year, there was not a single day when there was insufficient wind for electricity generation from at least one site.<sup>4</sup>

However, wind generation does vary with the natural fluctuations in wind speeds. Arguments that wind farms provide no benefit when the wind is not blowing miss two crucial points:

- » energy supplies for electricity generation are managed on an annual cycle, not a daily or hourly cycle
- » New Zealand has extensive storage-based hydro resources that provide a flexible complement to variable wind generation.

Essentially, if we use wind generation when it is available we can reduce hydro generation and keep some of the water stored in the hydro lakes. This water effectively becomes a battery of energy that can be drawn on to meet peaks in demand or to cover for wind on calm days. Using wind and hydro

together like this will have the overall effect of reducing our use of thermal generation and, consequently, the greenhouse gas emissions caused by electricity generation.

#### BUT WHAT ABOUT THE LOCAL ENVIRONMENT?

Every form of electricity generation is going to have an impact on the environment. Wind farms are no exception. However, wind energy has one of the lowest environmental impacts of all forms of electricity generation.

The area occupied by wind turbines, roads and other structures is small – typically 1 to 3% of the land area in a wind farm. The land's existing use – usually agriculture – continues around the wind farm's infrastructure. As a result the impact of a wind farm on the local environment is usually minimal once construction is complete.

Wind turbines tend to be located on hills and ridges as this is usually where the wind speeds are highest. Higher wind speed sites will usually have a lower per unit cost of generation as they generate more electricity per unit of installed capacity. New Zealand wind farms do not receive any form of subsidy, so wind speeds at a site are a critical factor in determining the commercial viability of a wind farm. However, these locations make wind farms a prominent feature on the landscape. There is little doubt that in terms of local environmental effects, the visual impact of a wind farm tends to dominate the debate.

Environmental effects of wind farms must be assessed on a case-by-case basis as each site has unique features and the effects will depend on the project's design. How people feel about being able to see a wind farm is ultimately a matter of personal preference;

71% of people would support or not object to a wind farms that can be seen from their home<sup>5</sup>.

In New Zealand, wind farm developers undertake research into local wildlife, to ensure that a proposed wind farm will not cause problems. Wind developers are often able to integrate beneficial local environmental measures into their construction and operational activities. This can include planting native species, protecting native bush areas, pest and weed management or erosion control.

<sup>5</sup> EECA Public perceptions of renewable energy 2008

[www.windenergy.org.nz](http://www.windenergy.org.nz)

Find out more about wind energy and wind farms in New Zealand at [www.windenergy.org.nz](http://www.windenergy.org.nz).

#### NZ Wind Energy Association

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The New Zealand Wind Energy Association (NZWEA) is an industry association that works towards the development of wind as a reliable, sustainable, clean and commercially viable energy source. We aim to fairly represent wind energy to the public, government and the energy sector. Our members include 80 companies involved in New Zealand's wind energy sector, including electricity generators, wind farm developers, lines companies, turbine manufacturers, consulting firms, researchers and law firms.



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<sup>3</sup> Ministry for the Environment, Environment New Zealand, 2007.

<sup>4</sup> Goran Strbac and others, Summary of Findings, New Zealand Wind Integration Study, April 2008