

# Wind

Renewable electricity generation makes up a substantial part of Genesis Energy's portfolio and includes three hydro-electric schemes and one wind farm – Hau Nui Wind Farm, in the Wairarapa.

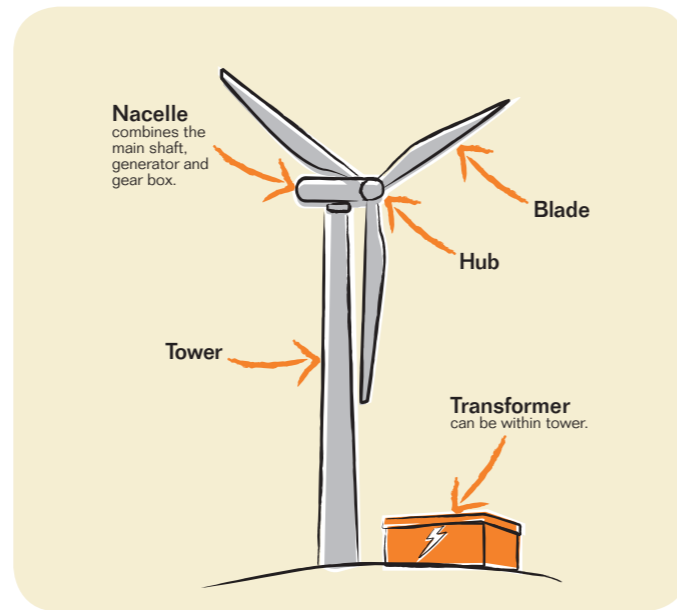
Producing electricity from the energy of the wind is an important part of Genesis Energy's operations, and in future, it will become even more so as the need for cleaner, renewable energy increases.

## Hau Nui Wind Farm

Hau Nui Wind Farm is located in the hills south of Martinborough in the Wairarapa, and has been operating with a capacity factor of 43 percent since 1996. In December 2004, eight 600kW turbines were added, increasing Hau Nui's capacity to 8.65MW and there's potential for further development in the future. Most of the Hau Nui site remains available for farming, with the turbines and roading taking up just two per cent of the land.

## How does a typical wind turbine produce electricity?

- The wind flows over the blades and makes them turn.
- Attached to the hub of the blades is the main shaft, which rotates with the blades.
- The rotating shaft drives rotation in the generator (usually via a gearbox to increase rotational speed).
- The generator uses magnetic fields to convert the rotational energy into electrical energy.
- The power from the generator goes to a transformer which increases the voltage to match either the local electricity network voltage or the national grid voltage.



## Why is wind energy important?

The greatest benefit of harnessing wind energy is its minimal impact on the environment.

At Hau Nui, all the cables are underground – so agricultural land is undisturbed and remains in full production. The structures on the site are painted in colours that have been assessed as having the least visual impact. Wind generation also supports our country's commitment to reduce greenhouse gas emissions under the Kyoto Protocol.

## Are wind turbines safe?

Yes. Each wind turbine has an internal control system, which monitors the direction and speed of the wind to ensure a safe operating level. When wind speeds exceed the maximum or 'rated' capacity of the turbines, they automatically shut down to avoid damage.

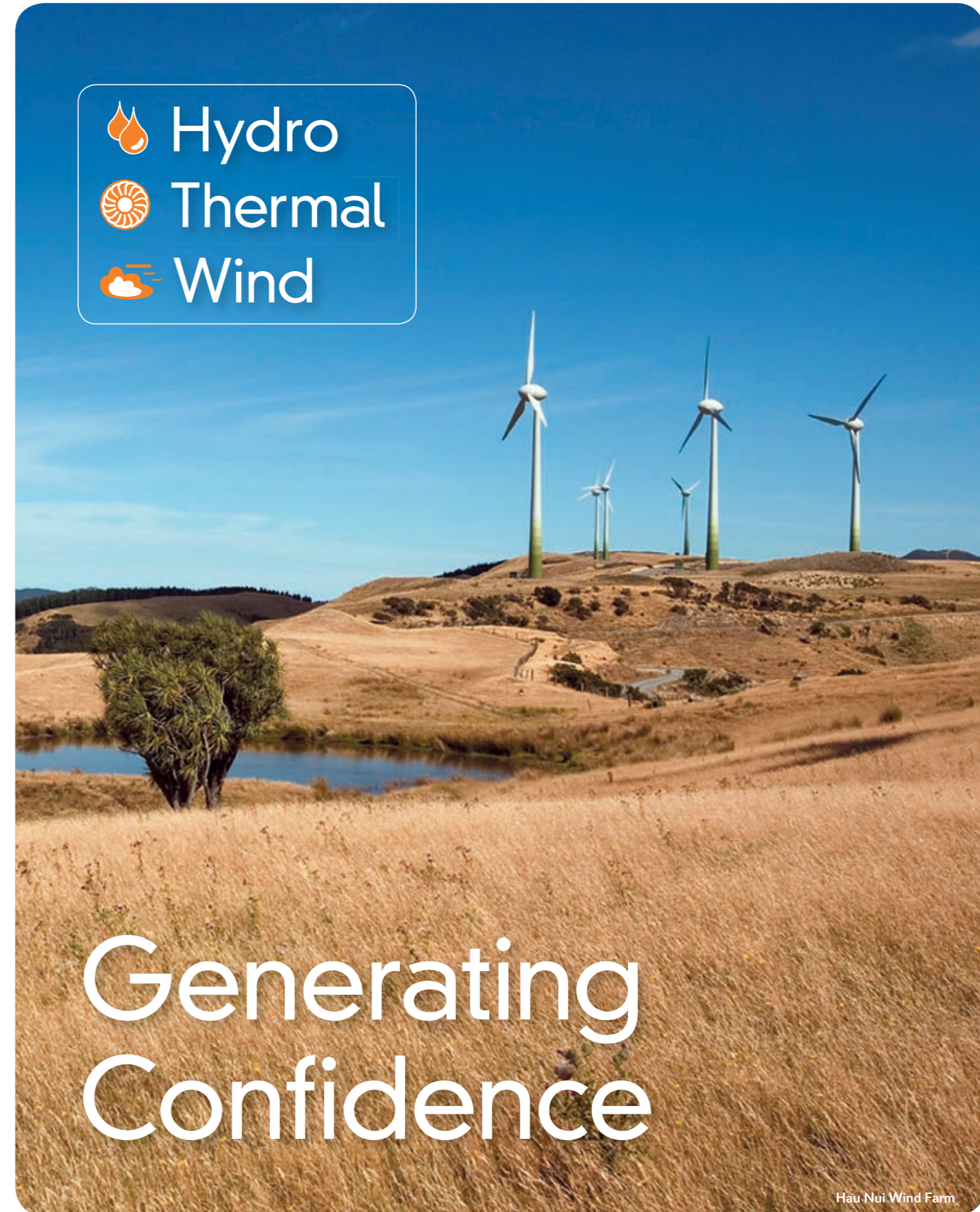
There are several safety features on turbines, including independent fail-safe brake mechanisms, an aerodynamic braking system and vibration sensors to monitor turbine and blade performance.

## The Future

Genesis Energy has an ongoing nationwide programme of wind prospecting to find sites that may be suitable for development. The company is also exploring partnerships with other wind farm developers which could take the form of power purchase agreements, or partnering through the site development process.

With the most diverse generation portfolio of any New Zealand energy company and the largest customer base, Genesis Energy is well suited to such roles. The company has expertise owning and operating generation plant and selling power into the wholesale market.

 Hydro  
 Thermal  
 Wind



# Generating Confidence



HELLO TOMORROW |  genesis ENERGY

Genesis Energy is a state-owned electricity generator and energy retailer. It's one of New Zealand's largest energy companies, with a portfolio that includes gas production, 2000MW of electricity generation, and a retail business providing electricity and gas to over 650,000 homes and businesses throughout the country.

Genesis Energy generates power from more sources than any other electricity generator in New Zealand – including hydro, thermal and wind – and has also installed solar systems for schools across the country through the Schoolgen programme. Genesis Energy is committed to maintaining and expanding its diverse generation portfolio

and is continually investigating new wind, geothermal and hydro prospects.

Genesis Energy is committed to ensuring all its non-generation activities are carbon-neutral, which means they don't add any carbon to the atmosphere over their lifetimes. Offsetting is regarded as an option only after all other avenues have been explored.

The company is working to minimise its footprint – the impact staff have on the environment on a day-to-day basis. This includes staff travel, waste minimisation practices, electricity used in the offices, and the introduction of Sustainable Purchasing and Building Guidelines.

# Hydro

**Genesis Energy has three hydro schemes, with seven power stations in total:**

- **Tongariro Power Scheme** – the Tokaanu and Rangipo power stations in the Central North Island (362MW).
- **Waikaremoana Hydro Scheme** – the Kaitawa, Tuai and Piripaua power stations in northern Hawke's Bay (138MW).
- **Kourarau Hydro Scheme** – located in the lower North Island in eastern Wairarapa hill country (1MW).

## What are the environmental issues surrounding hydro power?

Hydro power does not generate Carbon Dioxide (CO<sub>2</sub>) or other greenhouse gases, but Genesis Energy has a dedicated environmental team that carefully manages and monitors other environmental effects. The Tongariro Power Scheme sits on the fringes of the Tongariro National Park, an area that is featured on the World Heritage List for its ecological and cultural values. The Waikaremoana Hydro Scheme is located on the boundary of the Te Urewera National Park, an area of outstanding natural beauty.

## How does Genesis Energy work with the surrounding community?

Genesis Energy places huge importance on positive and supportive relationships with its local communities, which include councils, schools, tangata whenua, landowners, and conservation and recreational groups.

The company acknowledges the special relationship that Maori have with their ancestral lands and waterways, and their role as kaitiaki (guardians) of many of the resources used or impacted by the operation of the power schemes. Genesis Energy works with tangata whenua to undertake environmental, cultural and educational projects.

# Thermal

**Thermal generation accounts for up to 40 per cent of New Zealand's electricity needs, with the remainder made up of a combination of geothermal, hydro and wind generation.**

**Renewable energies such as hydro and wind power can be limited by natural events such as droughts or lack of wind, so Genesis Energy's strategy is to have a mix of thermal, hydro and wind generation. This ensures a secure supply of electricity, now and well into the future. The company is also investigating several geothermal energy options.**

## What are the environmental issues surrounding thermal power?

Genesis Energy has responsibilities to better its people, its surrounding communities and the environment – responsibilities the company takes seriously.

Staff monitor the environment around the Huntly Power Station, taking samples from around the station each month to check the air and water, and the Helper Cooling Tower cools the water used in generation by six to nine degrees before releasing it into the Waikato River. This ensures that Huntly Power Station can still operate during summer months, while complying with the maximum river temperature consent conditions.

The Huntly Environmental Team also plant predominantly native trees around the station, to improve the environmental aspect and further reduce the amount of CO<sub>2</sub> released into the atmosphere.

## Huntly Unit 5

Huntly Unit 5 uses natural gas as its fuel source, and is able to generate up to 400MW of electricity – enough to power approximately 370,000 households.

Its combined cycle technology is regarded as the most technically advanced means of converting natural gas into electricity that is available today. This combination of high efficiency and lower CO<sub>2</sub>-emitting gas has enabled Genesis Energy to reduce its CO<sub>2</sub> emissions from the Huntly Power Station by a third: in just one year, Unit 5 can save up to 1.8 million tonnes of CO<sub>2</sub> otherwise emitted by coal-fired generation.

## Huntly Power Station

Huntly is a thermal power station that can use coal, gas or both simultaneously as fuel. Coal is delivered to the station via conveyor belt or by truck. Gas is piped to the station from the Taranaki region.

With a present output of 1,448MW, Huntly Power Station is New Zealand's largest thermal power station and can provide up to 20 per cent of the country's electricity. The station has four separate generating units of 250MW, which are capable of burning coal, natural gas or a combination of the two; the 400MW combined cycle gas turbine, and a 48MW open cycle gas turbine.

## How is hydro power made?

Hydro generation uses the pressure and flow of the water to turn the turbine runner, which turns a generator that produces electrical power. A transformer boosts the voltage for the national electricity grid.



Huntly Power Station