

# RENEWABLE ENERGY



## We're turning greenhouse gases into renewable energy

We understand how important it is to safely manage the potential environmental impacts of the Kate Valley Landfill, including capturing and destroying the greenhouse gases produced by decomposing organic waste. Left to escape to the atmosphere the methane would contribute to New Zealand's carbon emissions and global warming.

Thankfully there's a smart solution to the problem of what to do with unwanted gases and that's to consider them as a valuable resource that everyone wants and needs – renewable energy. Read on to find out how Transwaste Canterbury Ltd (Transwaste), who own and operate the Kate Valley Landfill, is converting this methane to renewable electricity.



### A quick note about the Kate Valley Landfill

The Kate Valley Landfill is the most comprehensively engineered waste management facility in the South Island of New Zealand. The 37-hectare site in the Hurunui District, about one hours drive north of Christchurch City, opened in 2005 and was designed to the highest international standards, fully compliant with New Zealand landfill guidelines, and the US Environmental Protection Agency and European Union standards for municipal waste landfills.

## Waste lives on in the landfill

It's easy to think of waste buried in the Landfill as being 'gone and forgotten'. Yet some waste hasn't finished its lifecycle. Within the Landfill organic material such as food, paper and wood scraps and clothing made from natural fibres, for example wool and cotton, undergoes a further process of transformation. Over time this waste breaks down into two main components – landfill gas and liquid (called leachate which is collected and removed from the Landfill). The Landfill gas is made up of several individual gases, but is mainly methane and carbon dioxide. Carbon dioxide occurs naturally in decomposition of all organic waste and is required by plants for their growth (photosynthesis). Methane, however, has a high potential impact on global warming if it escapes into the atmosphere.

That's why at the Kate Valley Landfill as the waste is deposited and compacted a series of gas extraction wells are installed. All the wells are connected to a network of collection pipes. By applying a vacuum to the pipe network, gas is extracted from the Landfill in a controlled way rather than allowing the gas to escape into the atmosphere.

*... The story doesn't end there.*

The gas extracted from the Landfill is mainly methane (50-60%) and carbon dioxide. Transwaste is committed to capture and destroy methane in line with New Zealand's Emissions Trading Scheme. While burning the gases would destroy them, there's a better option and that's to use methane as a fuel to run internal combustion engines and produce renewable energy - electricity - the option Transwaste chose.

## Turning gas into electricity

Specialised machinery is required to convert methane gas into electricity. At the Kate Valley Landfill there are four 1 megawatt (MW) Jenbacher landfill gas to electricity generators. Jenbacher is an Austrian-based company that specialises in making industrial sized gas powered generators. They are expensive to purchase and install due to their specialised nature, and the need for foundations, pipework, transformers and electrical connections to make the generators fully functional.

Each Jenbacher generator produces a maximum output of just over 1MW, which is enough electricity to power about 1,000 New Zealand homes. The four generators are producing enough electricity to power 4,000 homes. The Kate Valley Landfill supplies electricity via high voltage power lines into the national electricity grid at Waipara.



## Use it or burn it

At the end of 2019, the Kate Valley Landfill was producing about 2,700 cubic metres of gas per hour (m<sup>3</sup>/h). Each Jenbacher generator consumes approximately 450-500m<sup>3</sup>/h of landfill gas to produce 1MW of electrical energy. With four generators in operation that's approximately 2,000m<sup>3</sup>/h being consumed, leaving an excess of 700m<sup>3</sup>/h when all four generators are at maximum generating capacity.

The Landfill has a purpose-built landfill gas flare, designed specifically with a maximum flaring capacity of 3,800m<sup>3</sup>/h, to burn and destroy all of the excess gas not used for generation. This size of flare enables all the landfill gas to be destroyed should the generators not be able to operate due to servicing or grid outages. A second flare will be installed when gas produced in the Landfill exceeds 3,800m<sup>3</sup>/h.

### More renewable energy is on its way

The Kate Valley Landfill is consented to receive waste until 2040. This is 35 years after it first received waste in June 2005. That means there's time for considerably more organic material to be disposed of in the Landfill. As the decomposition of organic material occurs over a long time, gas production will continue for several years even after the Landfill stops receiving waste. That period may vary depending on types of organic material received, though it is expected to take approximately 20-30 years.

As the production of gas increases further generators are likely to be purchased to take ongoing advantage of the beneficial aspects of the gas. Based upon current estimates that could be another four or even up to six generators increasing the renewable energy output from the Kate Valley Landfill to as much as 10MW, enough electricity for 10,000 homes.

### Keeping the current flowing

The Jenbacher generators are operated 24 hours per day, and are only stopped when they require maintenance work like oil changes. They are also taken out of service periodically to carry out more significant repairs, including the replacement of worn parts. Jenbacher generators have a useful life of about 10 years. As the gas volumes drop near the end of the Landfill's life, the Jenbacher generators can be moved to other landfills to work out their remaining life.



## We've put safety first

The generators are very complicated mechanical and electrical devices that require care when working around them. Electricity can be very dangerous, particularly when it involves high voltage. At the Kate Valley Landfill there are thorough systems to ensure people know all the risks associated with the operation of the generators, including training staff with very detailed and specific "Work Instructions" and "Risk Assessments". These procedures are regularly reviewed and updated to ensure staff and visitor safety.

# INTRODUCING TRANSWASTE



Transwaste is an innovative public-private partnership that was set up to own and operate the Kate Valley Landfill on behalf of the councils of Canterbury. The public shareholders are Christchurch City Council and the District Councils of Ashburton, Hurunui, Selwyn and Waimakariri. The private sector shareholder is Waste Management NZ Ltd, New Zealand's leading resource recovery, recycling and waste management provider. The public and private partners each hold 50% of the shares making this a truly equal partnership. Since 2005 Transwaste has been trusted managing our community's waste.

## Tiromoana Bush and Walkways

Transwaste, when they were developing the Kate Valley Landfill, committed to an ambitious plan to protect, restore and manage a 407-hectare Conservation Management Area adjacent to the Landfill called Tiromoana Bush.

Public access is a core component of the project so people can see the restoration project in progress. Walking tracks by regenerating bush and the wetlands were constructed in 2006. In 2017/2018 the walkway was improved and extended, with new interpretation panels and information displays.

Transwaste worked closely with the local Tangata Whenua Ngāi Tūāhuriri, who has mana whenua (customary ownership) over the area, when the walkway was upgraded in 2017/18. Ngāi Tūāhuriri designed and built an ika pou whenua (mahinga kai fishing marker) at the walkway's coastal lookout. The carvings on the pou relate to the importance of the area to Ngāi Tūāhuriri and especially values associated with mahinga kai (resources from the area).

There is no charge for visiting the bush. It is open year round during daylight hours, only closing at times of high fire risk. On the website is information about opening and closing hours, and a Walkways brochure with a detailed map of all the tracks, lookouts, picnic spots, toilets and beach access.



[tiromoanawalkways.nz](http://tiromoanawalkways.nz)

## Did you know?

We welcome your questions and enquiries. It is possible for groups to visit the Landfill and take a closer look at the gas to electricity operation. Visits are strictly limited and must be pre-arranged. It is not possible to visit the Landfill without prior consent.



## Want to know more?

For more information contact us or visit our website.

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