

# The State of Biogas in New Zealand

## Abstract

This paper provides an overview of the current state of the biogas industry in New Zealand. The historical lack of effective economic, regulatory and environmental drivers for recycling of organic waste to biogas has resulted in a low uptake of the anaerobic digestion technology in New Zealand. However, a newly recognised role for the government to lead the development of New Zealand's key markets towards a low-carbon, sustainable and circular bioeconomy future has given rise to new legislation and commitment of policies and programmes that aim to increase the uptake of anaerobic digestion by both the private and public sector.

A low population density continues to make economies of scale challenging. There are however newly recognised opportunities mainly in the primary industry for cost-effective carbon-led transition to utilisation of organic waste instead of disposal to landfill by recycling to biogas and digestate as substitutes to the use of current carbon-intensive resources. A substantial body of work from the industry groups as well as local and central government has been identified as necessary in order to realise the high potential for anaerobic digestion in New Zealand.

## Historical Context

New Zealand, an island country in Australasia with 270,000 km<sup>2</sup> of land, 5 million inhabitants and one of the advanced market economies in the world (ranked 16<sup>th</sup> highest regarding human development index in 2018).

New Zealand's abundant natural resources offer a high potential for renewable energy production. Currently around 40% of New Zealand's primary energy and approximately 85% of New Zealand's electricity is produced from renewable resources. Energy is mainly from hydro, wind and geothermal with 10% from solid biofuels. Primary industry and manufacturing generate process heat mostly from coal and/or natural gas, however coal is expected to be banned from 2035 and natural gas supply is diminishing. Low spread-out population and mountainous topography have led New Zealand to rely heavily on road and air transport for people, with some use of coastal marine and rail transport of goods.

High proportion and low price of renewable electricity, coupled with low population density and therefore lack of critical scale in most regions and low cost of organic waste disposal to landfill, historically led to a low interest in biogas production. A market led energy supply system and complete absence of any feed-in-tariffs or subsidies did not allow justifiable return on investment for biogas projects in the private sector.

The national waste strategy of the last two decades focused mainly on minimisation with poor incentives for reuse or recovery, giving way to majority use of landfills for disposal. Municipal waste management has been outsourced to private sector with no regulation and disposal of organic wastes being driven by least cost solutions. Landfill gas capture is mandated only for large new landfill. New Zealand has less AD plants now than in 1985, mostly located at large wastewater treatment plants for reduction of biosolids mass and disposal cost.

As for agriculture, i.e. the other main sector that has globally enjoyed the benefits of waste to biogas, NZ's agriculture is mainly pasture based with consequently inefficient animal waste collection and smaller herd-sizes. This again leads to low cost-efficiency with consequentially high emissions footprint of the sector.

## Current situation

While New Zealand's renewable energy sector was initially developed by Government this ceased in the period 1984 – 2017 when energy supply was privatised, and the role of government was minimised. The market led energy supply has consequently been without reliance on government subsidies. In 2017 the incoming Government made a universal shift in focus to sustainability and climate change, and this has led to a new recognition that there is a major role for Government and that market solutions are not effective in complex multi-party markets.

New Zealand has passed the Climate Change Response (Zero Carbon) Amendment Act, legally committing the government to reduce net emissions to 50 percent below gross 2005 emissions and achieve net zero carbon emissions by 2050. This has changed thinking across the government and private sector so that new initiatives are being encouraged and financially supported via various government funding schemes. The government relies on the Emissions Trading Scheme as a key economic tool to drive decarbonisation, which has seen a sharp increase in the carbon price in the last 24 months to the current level of \$70/t CO<sub>2</sub>e.

Waste and process heat are two of the key focus areas for the government's decarbonisation strategy with a recognised need for systematic change acknowledged in the current proposals for an Emissions Reduction Plan. Similarly, a proposed new (draft) Waste Strategy focuses on circular bioeconomy with potential mandate of organic waste collection for councils and businesses and a signalled ban on organics to landfill as key tools for material and energy reuse and recovery. The government has committed to a significant increase in the existing landfill levy (\$10 increase per year for 5 years) and proposed an extension requirement for gas capture at all landfills.

In the process heat area, natural gas and LPG supply are becoming constrained due to the 2018 ban on any new future offshore oil and natural gas exploration. This is encouraging alternative energy sources. While there is significant competition from renewable electricity (for heat or hydrogen generation), complete conversion to electricity solutions would require significant new investment in wind, geothermal and solar electricity generation. As none of these are controllable to match demand, there is a recognised need for storable energy sources such as in the form of renewable gas.

Government funding enhanced by a progressive step by NZ's largest council for voluntary kerbside food waste collection, has contributed to the development of New Zealand's first commercial scale AD plant. The plant is designed for 75,000 tpa of household, commercial and industrial organic waste and is due to be commissioned in mid-2022 with biomethane upgrading of excess biogas for natural gas injection and digestate as certified biofertiliser substituting mineral fertiliser by sheep and beef farmers.

To further enhance the uptake of AD in New Zealand, the Bioenergy Association is leading the development of a certification scheme for the use digestate as biofertiliser for source-separated AD plants. This will decouple the use of digestate from the waste-related legislation and promote the use of digestate as a substitute to mineral fertiliser.

Bioenergy Association is leading a campaign for Government to adopt a policy of zero recyclable organic waste to landfill by 2030. By a combination of composting and new AD facilities this is achievable.

## The Opportunity

The Bioenergy Association has estimated that biogas can contribute 10% (15-20 PJ/year) to total bioenergy potential with additional 65% from biomass and 25% from liquid biofuels. There is also a substantial additional scope for growing energy crops as a break crop, strengthening the business case for on-farm AD systems.

As a major global food producer (meat, dairy, fish, fruit and vegetable, wine), New Zealand has a substantial opportunity for adoption of circular use of organic resources via the use of processing residues to supply on-site energy. Biomethane upgrading for grid injection offers a transitional versatile alternative fuel to natural gas complementarily with production of hydrogen. Solutions for rLPG and rDME are also being seriously investigated to support regions not connected to the natural gas grid.

Due to the vital role of the gas supply network for the economic sustainability of the primary industries, and business desire for a faster transition to having renewable gases available, industry groups are advocating for government to have a Renewable Gas Mandate similar to a Sustainable Biofuels Mandate they are introducing for transport by 2023. Introduction of renewable gas certification scheme would further allow users of biogas to get credit for using a low carbon product and would provide transparency on the price premium in the market that helps to fund and finance renewable gas developments.

The availability of digestate as biofertiliser to the agriculture, viticulture and horticulture would further enhance the “green” brand that New Zealand’s producers have been enjoying globally. The geography and substantial natural resources provide New Zealand with a unique opportunity to establish fully circular energy and food system and enhance regional economic sustainability and resiliency at the community level. This would bring significant opportunities for iwi and Māori businesses in that gas would be able to be produced in their tribal areas and utilising waste from their land. Māori are culturally already vested in the circular economy and are likely to be active supporters of biogas opportunities.

The Government has signalled a desire to transition to a circular bioeconomy and this will provide additional markets for biogas.

## What is needed?

The Bioenergy Association has identified the following items as necessary for realising the potential for anaerobic digestion to become a key component of the future energy and food cycle in New Zealand:

- Adoption of a national policy of zero recyclable organic waste to landfill by 2030
- Education and support to local councils to navigate a systematic change in waste management away from seeing it as a cost, to seeing it a recycling methodology, and an economic and wellbeing opportunity
- Education and demonstration of the principles of a circular economy
- Establishment of a Biofertiliser Certification Scheme
- Demonstration of cross-sectoral benefits of AD for waste, energy, fertiliser sectors and communities and in particular why it can lead to more resilient businesses.
- Successful commissioning of additional AD plant and biomethane upgrading plant as examples to provide confidence to potential investors
- Development of fact-based information sheets – e.g. comparison between biomethane and green hydrogen; carbon sequestration potential of digestate; comparison of recycling organics for on-site

energy supply vs economies of scale of regional scale biogas facilities; case studies providing lifecycle capital and operational economic information as guidance to potential investors.

- Development of carbon accounting protocol for AD facilities
- Development of credible testing of certified biofertiliser and establishing of a forecast for nutrient values to encourage farmer use
- Sourcing of case studies of accelerating AD adoption from other countries
- Education and demonstration on how biogas can be a foundation for a circular bioeconomy.
- Building the expertise and capability of equipment suppliers, advisers and designers to support and stimulate a fast-growing circular bioeconomy.
- Expansion and application of an existing scheme for registration of Gaseous Biofuel Advisers