

Dairy Manufacturing – Process Heat and Greenhouse Gas Emissions

FACT SHEET



What is process heat?

In the dairy manufacturing sector, process heat is heat used to produce hot water or steam, typically generated onsite using a boiler or air heater. Some sites have cogeneration facilities that produce both steam and electricity (some of which may be exported).



What does the dairy manufacturing sector produce?

The dairy manufacturing sector makes products including milk, milk powders, cream, butter, cheese, ice-cream and associated protein products.¹

How is it used in the dairy manufacturing sector?

Specific processes requiring process heat include:

- **Pasteurisation** (or heat treatment) to ensure dairy products are safe to consume and to extend their shelf-life.
- **Evaporation** to increase the concentration of milk solids before further processing.
- **Spray drying** to produce shelf stable products (e.g. milk powder). This is the most energy-intensive dairy manufacturing process.

What is the fuel demand for process heat in this sector?²

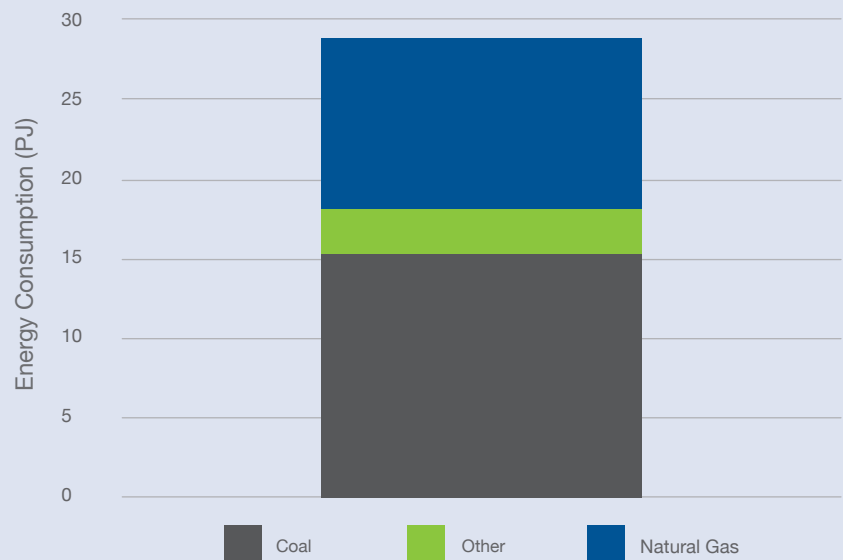
How many households in New Zealand can be powered by 28.4 PJ in a year?

800,000 households, or 45% of all households in New Zealand.³

In 2016, the dairy manufacturing sector used 28.4 Petajoules (PJ) of fuel to generate process heat.

Of the 28.4 PJ used, coal accounted for **54%** and natural gas for **38%**. Other fuels, which includes liquid fuels (e.g.diesel) and geothermal, accounted for the remaining **7%**.⁴

Figure 1: Fuel demand in the dairy manufacturing sector, 2016



What are the greenhouse gas (GHG) emissions generated from process heat in this sector?

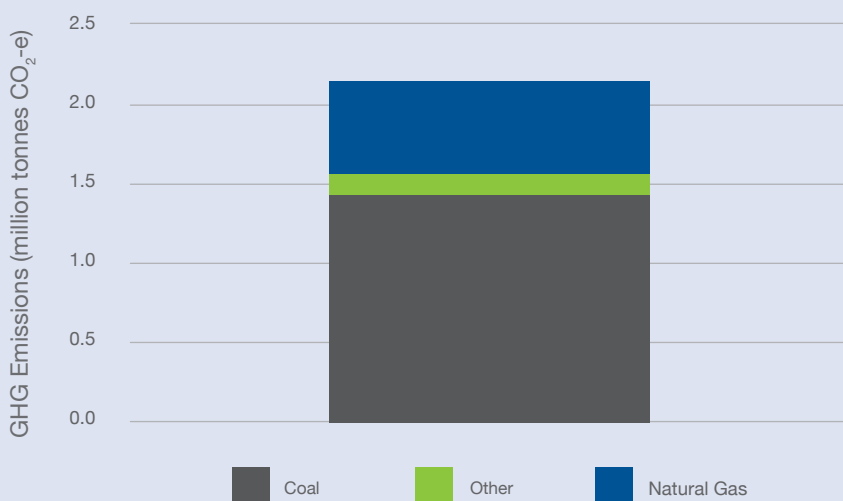
How many internal combustion engine cars would emit 2.1 million tonnes CO₂-e?

900,000 internal combustion engine cars would produce 2.1 million tonnes CO₂-e.⁵

The 28.4 PJ of fuel used produced 2.1 million tonnes of carbon dioxide equivalent (CO₂-e).

Coal is one of the most emissions-intensive fuels used in process heat. Of the 2.1 million tonne emissions, coal contributed **67%**, natural gas **28%**, and other fuels **5%**.

Figure 2: GHG emissions in the dairy manufacturing sector, 2016



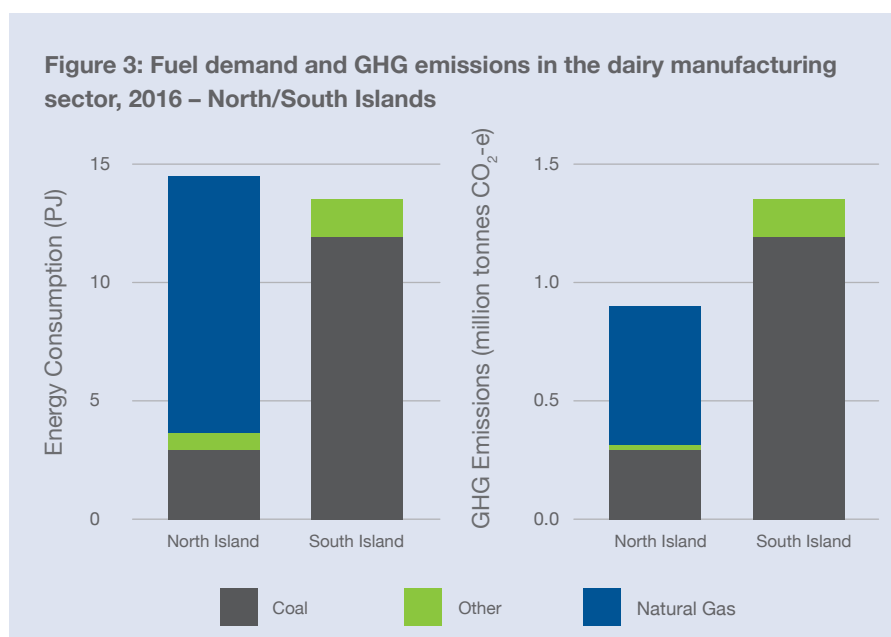
Differences between the North and South Island

There are 66 dairy manufacturing sites using process heat in the North Island and 33 in the South Island.

In the North Island, reticulated natural gas delivered **75%** of the fuel demand. In the South Island, coal delivered **89%** of fuel demand.

Reticulated natural gas is a lower emission fuel than coal but it is typically more expensive. However, the advantages of gas mean it is generally the preferred fuel where available. As natural gas is not available in the South Island, coal is the preferred fuel due to its availability and low cost. This means that dairy manufacturing in the South Island is more emissions-intensive than in the North Island.

Figure 3: Fuel demand and GHG emissions in the dairy manufacturing sector, 2016 – North/South Islands



Sources

1. Refers to Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 Group 113 'Dairy Product Manufacturing' (2016) <http://www.abs.gov.au/ausstats/abs@.nsf/39433889d406eeb9ca2570610019e9a5/a77d93484dc49d63ca25712300056842!OpenDocument>.
2. All data shown is for 2016 from the MBIE/EECA Heat plant database (2018). This data was aggregated to maintain commercial confidentiality. Fuel demand data includes estimates of the fuel required to generate steam supplied by cogeneration.
3. Based on Statistics New Zealand 2018 household estimates data and MBIE 2016 Residential energy demand data (published 2017) <http://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/energy-in-new-zealand/?searchterm=energy%2A>.
4. The fuels types included in the "Other" group are Diesel, LPG, Light Fuel Oil, and Geothermal.
5. Based on EECA modelling using Ministry of Transport 2015 light fleet data.



You can find out more about Process Heat in New Zealand (PHiNZ) on the Ministry of Business, Innovation & Employment (MBIE) website - <http://www.mbie.govt.nz/PHiNZ>

For more information on PHiNZ please contact us at energymarkets@mbie.govt.nz