

Petroleum, Chemical & Rubber Manufacturing – Process Heat and Greenhouse Gas Emissions

FACT SHEET



What is process heat?

In this sector, process heat is heat used to produce steam, hot water, or hot oil. It is typically generated onsite using a boiler or furnace. How process heat is supplied and used varies depending on the product. For instance, process heat is used at different temperatures for the following:

- **Refining crude oil** - medium to high temperatures
- **Producing methanol** - medium to high temperatures
- **Manufacturing plastic products** – medium temperatures
- **Producing polymers** - low to medium temperatures.¹

2016 data shows this sector had 22 process heat using sites in New Zealand – 15 in the North Island and seven in the South Island.²



Image courtesy of Russell Street

What does Petroleum, Chemical & Rubber Manufacturing cover?

This sector covers:³

- **Petroleum product manufacturing** including automotive diesel, petrol, aviation fuel, brake fluid and lubricating oil.
- **Basic chemical and chemical product manufacturing** including methanol, fertilisers, and pesticides.
- **Polymer product and rubber product manufacturing** including plastic bags and bottles, glue, paint, ink, and polymers.

Two technology types are utilised to produce process heat in the petroleum, chemical and rubber manufacturing sector; boilers and furnaces produce **95%** of the process heat, and resistance heating produces the remaining **5%**. This sector primarily uses higher temperatures, with **58%** of heat use at high temperatures (over 300°C), and **42%** at medium temperatures (100°C to 300°C). Only a very small amount of process heat is used at low temperatures (less than 100°C).

What is the fuel demand and greenhouse gas emissions volume from process heat in this sector?

The sector is New Zealand's second largest consumer of process heat energy, after the wood processing sector. In 2016, it used **52.9** petajoules (PJ) of process heat (or **26.5%** of total process heat demand⁴). To put this in context, **52.9 PJ** is the amount of energy consumed by around **85%** of New Zealand's households in a year.⁵

Almost all (**97%**) of the energy consumed was from non-renewable sources, mainly reticulated natural gas (see Figure 1). The renewably-sourced process heat was entirely supplied by electricity.⁶ Figure 2 shows a breakdown by fuel type.

Figure 1: Petroleum, chemical and rubber manufacturing sector fuel demand and energy-related GHG emissions, 2016 – percentages and actuals by energy source⁷

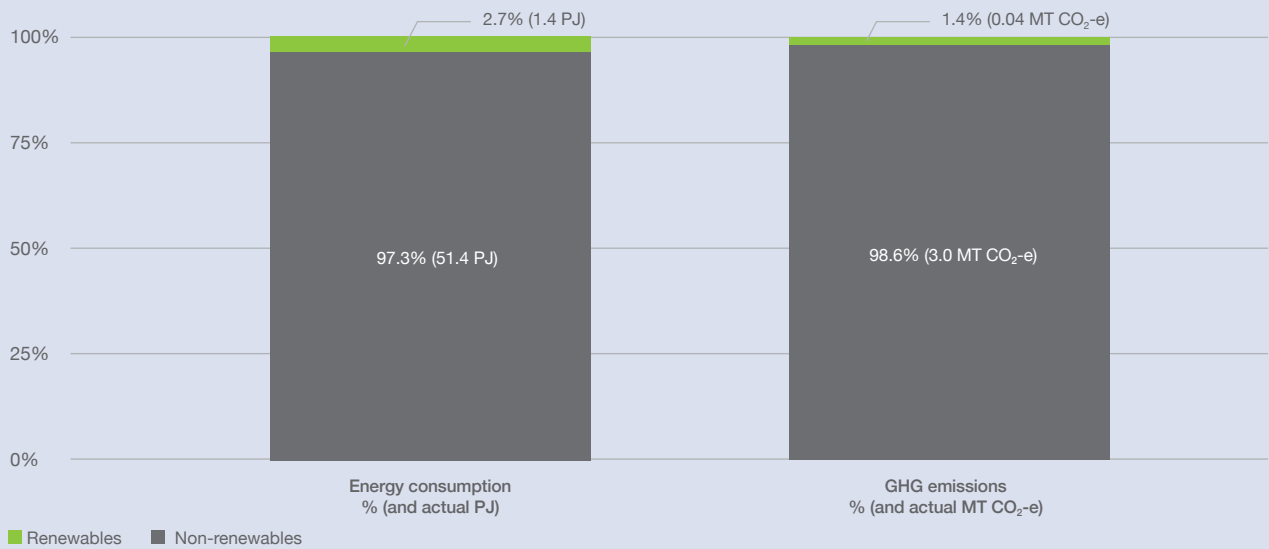
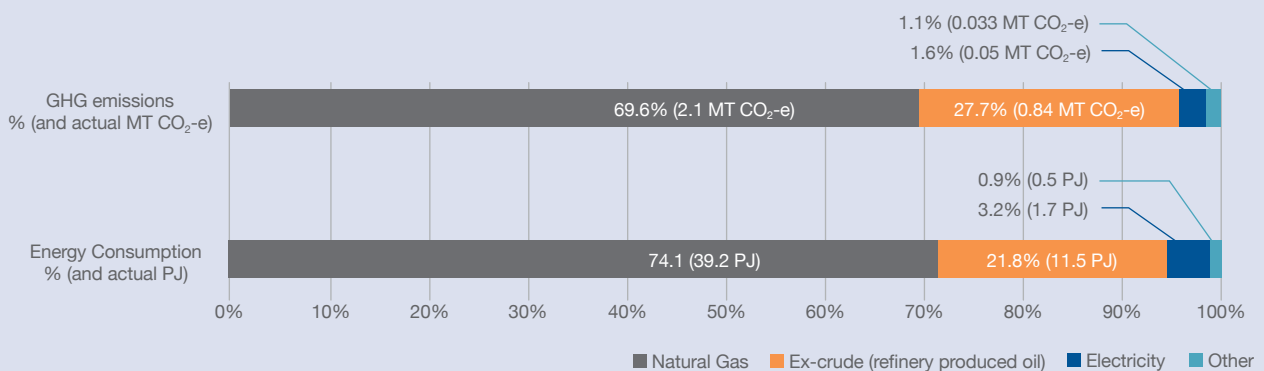


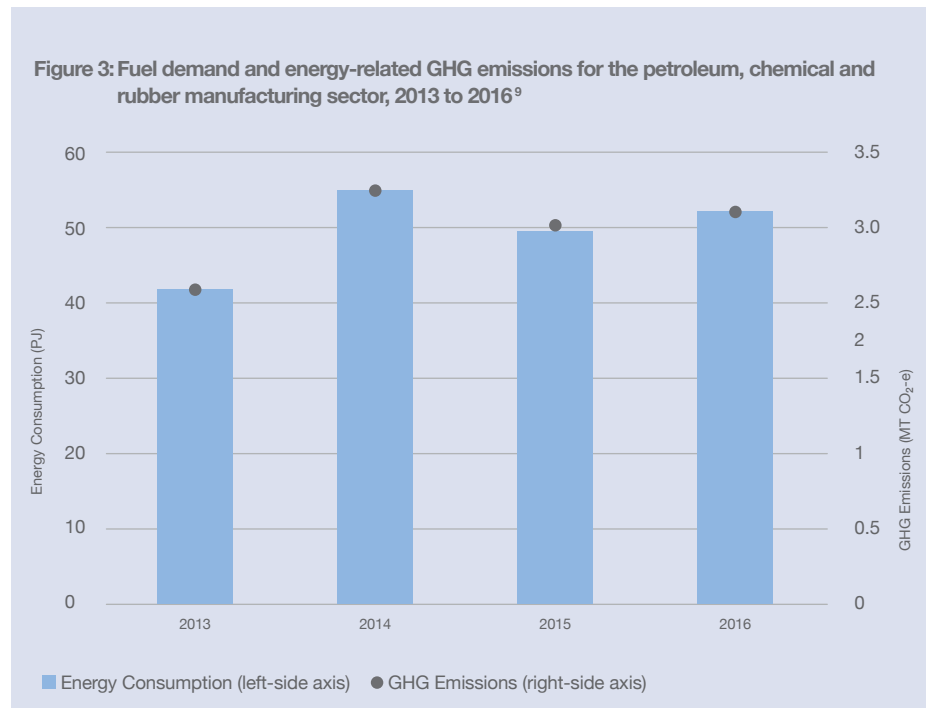
Figure 2: Petroleum, chemical and rubber manufacturing sector fuel demand and energy-related GHG emissions, 2016 – percentages and actuals by fuel type⁸



Note: The group 'Other' comprises of fossil fuels – diesel, fuel oil, LPG and coal.

In 2016, the petroleum, chemical and rubber manufacturing sector's emissions were around 3 million tonnes of carbon dioxide equivalent (CO₂-e). Around **68%** of these were from natural gas. Electricity accounted for **2.2%** of emissions, and the remainder was from other fossil fuels.

GHG emissions in the sector followed the same pattern as energy consumption, suggesting that the mix of fuel use and technology has remained constant over this time, as shown in Figure 3.



Methanol production is a large process heat user

Production of methanol accounts for the largest proportion of natural gas use for process heat in this sector. Changing methanol production levels between 2013 and 2016 account for most of the variation in the energy consumption shown in Figure 3. Methanol is produced in two Taranaki-region plants - one at Motunui and one in the Waitara Valley. In 2012, the Motunui plant returned to full production, and in late-2013, the Waitara Valley plant also returned to full production.¹⁰ This caused much of the increased energy demand seen in 2014. In 2015 mechanical issues at both the Motunui and Waitara Valley plants resulted in reduced methanol production, so less natural gas was used for heat - explaining much of the dip in energy consumption for 2015, seen in Figure 3.

New Zealand's petroleum and chemical manufacturing plants generally have emissions intensive processes. Their process-heat technology and fossil-fuel use is specifically built into their manufacturing processes, which limits the opportunity for using alternative technologies and fuels. However, there may be opportunities for gains in energy efficiency (for instance, through energy management practices).



3 million tonnes
of carbon dioxide equivalent (CO₂-e)

The approximate number of the petroleum, chemical and rubber manufacturing sector's emissions in 2016.

Sources

1. Low temperatures are less than 100°C, medium temperatures are 100°C - 300°C, and high temperatures are more than 300°C.
2. 2016 Heat Plant Database, MBIE/EECA (2018). Note, the number of sites for this sector as at 2018 may be different from the 2016 data.
3. Refers to Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 Subdivisions C17, C18, and C19.
4. Note, a number of sites in this sector use energy for both process heat and as input into their manufacturing processes.
5. Based on Statistics New Zealand 2018 household estimates data and MBIE 2016 Residential energy demand data (published 2017).
6. 85% of electricity consumption is attributed to renewable sources – Source: Energy in New Zealand: 2016, MBIE (2017).
7. 2016 Energy End Use Database (EEUD), EECA (2018). (<https://www.eeca.govt.nz/resources-and-tools/tools/energy-end-use-database/>); 2017 Refining New Zealand Annual Report (2018)
8. 2016 EEUD, EECA (2018); 2017 Refining New Zealand Annual Report (2018).
9. 2016 EEUD, EECA (2018); 2017 Refining New Zealand Annual Report (2018).
10. The New Zealand Gas Story, Sixth Edition (December 2017)



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

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