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Regional Heat Demand Database

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Measuring the primary energy demand for heat to enable decarbonisation

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Foreword

EECA is pleased to have been part of the collaborative effort with Transpower and the South Island's Electricity Distribution Businesses (EDBs) to deliver an accessible, anonymised and open dataset about heat demand in New Zealand. Climate change is one of the most urgent environmental issues of our time and with 28% of New Zealand's[1] energy-related emissions coming from process heat, this is a key emission reduction opportunity for New Zealand which can be better addressed by having a view of the regional heat demand.

Process heat is the energy used in the form of heat mainly by the industrial and commercial sectors for industrial processes, manufacturing, and warming spaces. Some process heat emissions can be reduced by redesigning the underlying processes, but decarbonising the remaining heat demand will require switching from fossil fuels to low-emission fuels, such as wood fuels in boilers or electricity in electric boilers or heat pumps.

The Regional Heat Demand Database maps and quantifies existing process heat demands to help enable process-heat decarbonisation consideration through better planning, fuel switching and decision making. Over time the Regional Heat Demand Database will include more regions and sectors and it will be updated on the EECA website as an open dataset to enable more people to make informed decisions around how we can meet the challenges of decarbonising process heat across New Zealand.

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EECA

[1] https://www.mbie.govt.nz/assets/8c89799b73/process-heat-current-state-fact-sheet.pdf

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1. Introduction

1.1 The need for a Regional Heat Demand Database

Process heat is energy used as heat - mainly by the industrial and commercial sectors for industrial processes, manufacturing, and warming spaces. Over half of New Zealand's process heat demand is met by burning fossil fuels such as coal or natural gas, and in 2020 burning fossil fuels to supply process heat emitted 8.8 million tonnes of CO2e or about 29% of New Zealand's overall energy emissions. Reducing these emissions is a key emission reduction opportunity for New Zealand, and having a better understanding at a regional level is an important step in enabling this. The breakdown of process heat energy consumption by sector is shown in Figure 1, while Figure 2 shows the emissions associated with each fuel type.

Figure 1 - Process heat energy consumption by high level sectors in 2016 (% of energy consumed)

Figure 2 - Energy consumption and GHG emissions from process heat in 2016 – by fuel type

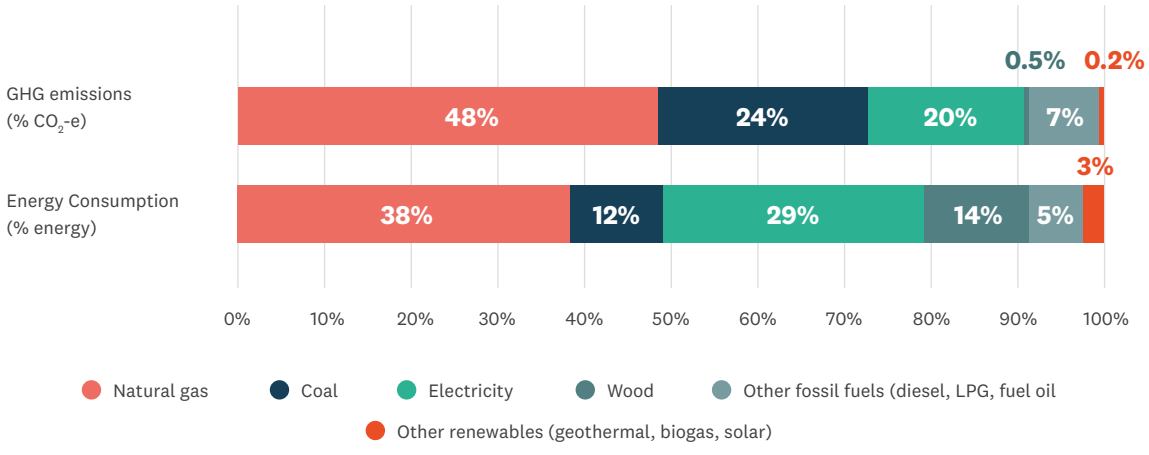

Figure 1

Some of these emissions can be reduced by redesigning the underlying processes, but decarbonising the remaining heat demand will require switching from fossil fuels to low-emission fuels, such as wood fuels in boilers or electricity in electric boilers or heat pumps.

These changes will have implications. Switching to electricity will increase loads on electricity networks, at both the distribution and transmission levels, and may require investments to increase capacity. Alternatively, switching to wood fuels will depend on fuel availability, which varies regionally, and on the level of competition for the resource.

To help inform these decisions and better plan for the future, the Regional Heat Demand Database records both where existing process heat demands are, and information about the nature of this demand such as temperature and output type. This database is the most up to date, comprehensive and holistic assessment of heat demand across New Zealand, and making this available in a timely manner will support fuel switching and decarbonisation decision making.

1.2 Background

EECA, Transpower and the South Island's Electricity Distribution Businesses (EDBs) started a journey in early 2020, collaborating on a project to better understand the South Island's process heat use. This consortium has resulted in this iteration of the Regional Heat Demand Database, which records information about a site's process heat use, with a focus on understanding heat supplied by fossil fuels in the South Island.

The project's impetus was the growing need to understand the implications of decarbonising fossil fuelled process heat, as this is expected to increase the demand for lower emission fuels like those from wood and electricity. Transpower and the EDBs are particularly interested in understanding the potential impacts on their electricity networks, so that they can better plan and respond to these. Longer term there are plans that the Regional Heat Demand Database will also include the North Island, and work has started to engage across the North Island EDBs to build a picture of the North Island's heat demand.

2. Regional Heat Demand Database

The Regional Heat Demand Database is an open database which records the location and nature of existing process heat demand by region and sector across New Zealand. Data is aggregated by region and by sector to maintain anonymity for the sites concerned.

Primary fuel demand has been used as a proxy for heat demand

Unless stated otherwise, 'demand' refers to the amount of fuel used to supply the heat requirements.

Due to metering and other limitations, many sites are unable to supply reliable information about the amount of heat supplied from their equipment e.g., the amount of steam supplied by their boilers. For this reason, the amount of fuel used by a site's equipment has been used as a proxy for the heat demand e.g., the GWh of fuel used by their boilers.

The following section provides an overview of the methodology and data structure of the Regional Heat Demand Database.

2.1 Data in scope for primary data collection

The data which was in scope for the primary data collection, and which has populated the Regional Heat Demand Database, includes sites with a heating capacity above 500 kW. The dataset includes both renewable (wood and electricity) and non-renewable (coal, LPG, diesel) fuels.

The information is recorded on a site basis and includes:

- The site's location (aggregated to a regional view in the Database).
- The sector of the site's process.
- The type and amount of fuel or fuels used to supply the heat e.g., coal, diesel.
- The output type of the equipment used to supply the heat e.g., steam, hot water < 100 degrees, and its characteristics:
    - Rated capacity, in MW,
    - Typical peak output, in MW,
    - Age of the equipment, if known,
    - Efficiency, if known.
- The site's temperature requirements – this can be different to the temperature of the steam or hot water (for example) that the site's heating equipment produces.
- Information, if available, on the site's decarbonisation intentions and currently favoured decarbonisation fuel switching option.

2.2 Data collection methodology

The data is gathered on an EDB-basis through interviews and surveys with sites. Each regional data collection activity has been co-funded by the relevant EDB, EECA and Transpower. As of 10 November 2022, information collection has been completed for all regions of the South Island.

DETA Consulting led the effort to co-ordinate the primary data collection on behalf of the sponsors. A variety of information sources were used to identify sites of interest. Surveys and telephone interviews were then used to collect the site-specific information on the fuel use and heat demands, and also the site's current view (if they had one) of how they might decarbonise. Where a site was unable to respond, estimates of were used.

So far about 90% of applicable sites identified have engaged with the process with a coverage of around 85% of the estimated overall coal use for the South Island.

2.2.1 Enabling a publicly available open dataset

Each of the sites included in the open dataset have signed a data collection consent form acknowledging that EECA will anonymise and aggregate the data with other responses to create regional and sectoral statistical summaries published on EECA's website. This ensures that individual sites cannot be identified in the Regional Heat Demand Database.

2.3 Data available in the open dataset

- The installed capacity of the equipment used to supply the heat, in MW,
- The annual demand of fuels, in GWh,
- A count, by output type, of the equipment used to supply the heat,
- Region and sector breakdowns.

This data is aggregated by region and by sector, and if there are fewer than three sites in a region/sector aggregation, then information is suppressed to maintain anonymity.

The following fuel types are included in the dataset: Coal, Diesel, LPG, Biomass, and By-products for both the South Island and the North Island, while Natural gas will be included for the North Island only.

There is also a grouping of output types which includes steam, hot water < 100 degrees, hot water > 100 degrees, direct fired heat, indirect fired heat.

2.3.1 Regional aggregation

Regions are based on Statistics NZ region definitions; this being chosen over grouping by EDB to maintain anonymity in an open database. This release includes South Island regions only. These are Nelson/Marlborough/Tasman, West Coast, Canterbury, Otago and Southland. It is anticipated that future releases will cover all North Island regions: Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Hawke's Bay, Taranaki, Manawatu-Wanganui and Wellington.

2.3.2 Sector aggregation

Sector groupings, with constituent site types are listed in the table below.

Sector Groupings	Site Types
Commercial	Accommodation (Hotels / Motels), Entertainment venues and other commercial enterprises
Diary Product Manufacturing	Diary product manufacturing / dairy processing sites
Education	Tertiary Education (University/Polytechnic), Schools (Primary and Secondary)
Food and Beverage Product Manufacturing (Ex. Dairy, Meat)	Food and Beverage Product Manufacturing (Excluding Dairy and Meat). This includes fruit and vegetable product manufacturing, seafood products, alcoholic drinks and juice products
Government (Central / Local)	Council buildings, Defence / Military bases, Prisons
Healthcare	Hospitals and Age care facilities
Indoor Cropping	Glasshouses, Indoor cropping buildings
Meat Product Manufacturing	Meat product manufacturing / meat processing sites
Other Manufacturing (incl. Mining)	Textile manufacturing, Non-metallic minerals, and Mining
Wood Product Manufacturing	Wood products, Sawmills

2.3.3 Government Investment in Decarbonising Industry

As EECA administers the Government Investment in Decarbonising Industry Fund (GIDI) we also include the location of publicly disclosed sites that have received GIDI funding to reduce their emissions on the Regional Heat Demand Database online app. These are shown as specific, identified pinpoints as the information related to these projects is already in the public domain through GIDI funding announcements on the EECA website. As additional funding announcements are made for GIDI projects, these will be updated in the Regional Heat Demand Database.

2.4 Frequency of data releases to the Regional Heat Demand Database

Work is starting on expanding coverage of the Regional Heat Demand Database to include the North Island regions and it is expected that this will be completed across the course of 2022.

The best ways to keep up to date on new data releases to the Regional Heat Demand Database are to register for the EECA Newsletter (sign up here) and check the website frequently for updates. All data releases will be added to release notes in the About page text on the data visualisation tool.