Regional Heat Demand Database

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Regional Heat Demand Database

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 Electricity Distribution Businesses (EDBs) to deliver an accessible anonymised open dataset about heat demand in New Zealand. Climate change is one of the most urgent environmental issues of our time and with 20% 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 as 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. The current publication of the Regional Heat Demand Database covers the entire country. Future updates and enhancements are planned for this dataset, including reviewing and maintaining data with the most current, most accurate information available, as well as including the clean fuel use picture more extensively. The Regional Heat Demand Database can be accessed 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.

Bill Nelson
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EECA

[1] Modelled from EECA's Energy End Use Database


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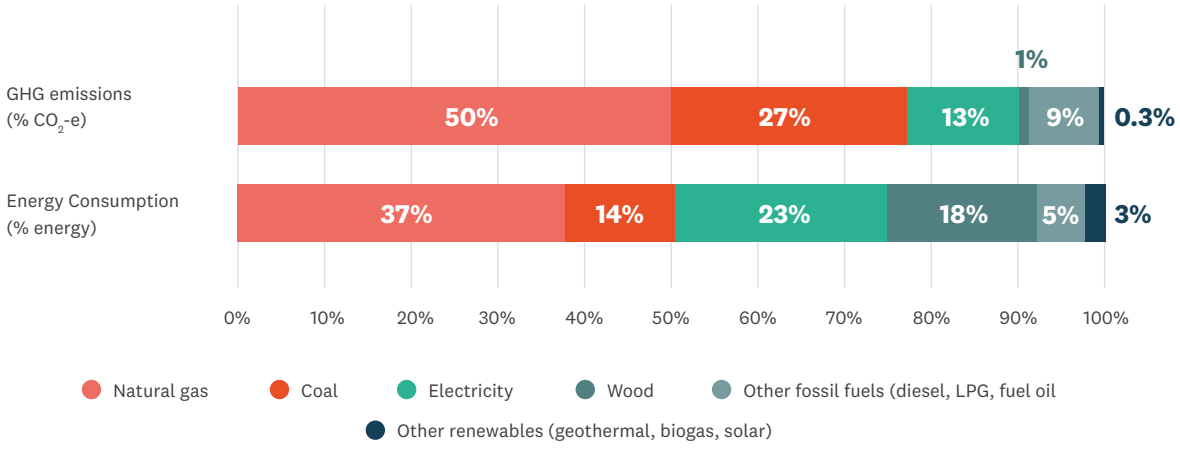
1. Introduction

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 2022 burning fossil fuels to supply process heat emitted 5.5 million tonnes of CO2e or about 20% 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[2].

Figure 1 - Process heat energy consumption by high level sectors in 2022 (% of energy consumed)

Figure 2 - Energy consumption and GHG emissions from process heat in 2022 – by fuel type



[2] Modelled from EECA's Energy End Use Database

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 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 New Zealand.

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.

The data collected in the project was also validated against, and supplemented with, data collected thru EECA's RETA programme of work, to ensure the dataset is of the highest quality currently achievable.

Longer term it is planned that the Regional Heat Demand Database will be maintained and updated with the most current information available on the process heat data picture, and this will include clean fuel usage for process heat as well.

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 rated capacity in MW

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. Estimations were made where participation was not obtained.

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.

High level estimates indicate 85% coverage for the overall coal use for the South Island, and over 90% coverage for the overall Natural Gas use for the North 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,
- 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, Natural Gas, Diesel, LPG, Biomass, Geothermal and By-products.

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 covers regions across the whole country - Nelson/Marlborough/Tasman, West Coast, Canterbury, Otago, Southland, Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Hawke's Bay, Taranaki, Horizons (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
Metals	Steel, aluminium, and metal products
Mining	Mining, quarrying
Non-Metallic Minerals	Concrete, cement, limestone production
Oil & Gas	Gas treatment, hydrocarbon production
Other Manufacturing	Mechanical products, building construction products
Petrochemicals, Chemicals, Polymers and Rubber Product Manufacturing	Petrochemicals, chemicals, asphalt, bitumen, rubber products
Textiles	Textile and fabric manufacturing, associated products
Waste Management	Waste treatment
Wood Product Manufacturing	Wood products, Sawmills