Sustainable action for a better tomorrow

Transpower

Industrial Electrification Survey Summary

Final Report

30/09/2025

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Executive Summary

Transpower New Zealand, the state-owned System Operator and electricity transmission provider for New Zealand's electricity grid, wanted to understand the impact of industrial electrification on load growth. Selected industrial electricity customers were surveyed regarding primarily the electrification of their process heat infrastructure and decarbonisation transition plans. Several drivers are responsible for the choice of energy source for process heat in New Zealand, including electricity, which is expected to grow as fossil fuels are phased out.

A list of 30 organisations was targeted for surveys by DETA on behalf of Transpower. These organisations represent the largest fossil fuel process heat users who are likely to have electrification as a possible decarbonisation pathway. At the time of writing this final report, meetings were setup and completed with 22 organisations, and the remaining 8 organisations were either non-contactable or unwilling to participate. Of particular note was Fonterra, who chose to directly engage with Transpower on this subject.

This report discusses the possible decarbonisation strategies of the 22 organisations that responded and provided information. However, it is worth noting that there was a varying degree of participation, responses and data provided, some assumptions were made for aspects such as the likely fossil fuel abatement, and project timelines for when specific loads may be converted to electricity.

A load growth pathway was modelled, based on the sites that indicated that they were likely to transition using electrification and their respective timeframes. Sites with projects that were considered to have a high likelihood of occurring were included in the model (for example, if the site indicated they would likely implement a specific project). Sites that did not indicate a likely fuel preference were not included in the model.

For the sites surveyed,

- There is strong interest in electricity as the preferred fuel for decarbonisation, with the aggregated peak electrical demand likely to increase by 270 MW by 2050. This corresponds to a 714 GWh increase in required electricity volume and a 1,418 GWh (5.1 PJ) reduction in fossil energy (primarily coal and natural gas). The smaller increase in electricity volume is due to the inherently more efficient use of electricity, particularly with adoption of heat pump technology, which can achieve efficiencies of 300% and higher (COP 3+).
- Several sites have indicated that they would likely consider biomass fuels over electricity. This is mainly due to increasing retail prices for electricity, compared with what is considered a more stable biomass market. This is a noted change from previous plans at some sites which had indicated electricity as the preferred decarbonisation fuel. In the recent past, electricity retailers offered 10-year electricity

contracts with significantly reduced flat rate pricing for process heat electrification. These contracts underpinned many of the recent electrification projects in the South Island. Since then, wholesale prices for electricity have increased significantly.

- Despite targets to meet carbon neutrality by July 2025, the public sector agencies have not yet committed to the implementation of specific decarbonisation projects at every site. Many sites have had decarbonisation roadmaps carried out, and some sites have specific projects scoped, however specific funding toward these projects has not been allocated.
- Typically, biomass pricing sits in between $10-$24/GJ (3.6-8.6 c/kWh) whilst wholesale electricity prices are in the range 12 – 16 c/kWh on average. Electricity prices tend to be more volatile and also have lines charges in addition to wholesale prices. However, electricity has greater availability in many locations than biomass.
- Two industries with the most active or implemented projects are the meat and dairy industries, both of which took advantage of GIDI funding to transition to a combination of electric heat pumps and electric boilers, as well as biomass boilers.
- Many of the organisations engaged through this project have a good understanding of their energy use and energy using assets. Increasing public and commercial interest in energy sources, as well as energy pricing, is one of the drivers behind this.

Next Steps:

- Work in this area will continue through projects with other parties, to better understand electrification in certain regions. This information will continue to assist with demand models.
- This project could be expanded to include more industrial users, specifically in high demand or constrained areas of Transpower's network.
- Given the current issues with the depletion of natural gas supply in the North Island, electrification would be one of the ways this could be alleviated. Modelling of this impact would assist Transpower and Central Government to more broadly to understand the effectiveness of this option, and which users are better placed to transition quickly.

1. Introduction

1.1 Objectives and Scope of the Study

Transpower would like to better understand large industrial sites' future intent for energy transition, namely those sites currently employing fossil fuels that are likely to electrify. Information on these plans are used by Transpower for planning future electricity load growth, alongside general load growth, electrification of transport and increased renewable generation, for demand modelling. This project built upon previous work carried out by DETA on behalf of EDBs, EECA and Transpower on process heat users.

The project intended to identify the largest 30 thermal fuel sites in New Zealand and collect relevant information to assist the long-term infrastructure planning needed to deliver a decarbonised future.

The key information collated from the study included:

- Annual fossil fuel use (natural gas, LPG, diesel, coal)
- Major equipment using fossil fuels (type, size, etc)
- Processes & target temperatures for the above fossil fuel equipment
- Decarbonisation / electrification plans / opportunities for the fossil fuel equipment
- Overall site / organisational decarb / net zero plans / targets
- Any notable barriers to transition
- Any plans / investigations into onsite solar PV
- Consideration of demand flexibility onsite and in plant design.

1.2 Data Collection & Surveys

A target list of 30 organisations was used, which was based on New Zealand's largest process heat users with a likelihood of electrification.

Sites were contacted with the intent of setting up a short discussion via MS Teams. These interviews were used to run through the questionnaire and gain a better understanding of the site operations and future energy needs.

Of the target 30 organisations, 22 meetings were setup and completed, and the remaining 8 sites were either non-contactable or unwilling to participate.

1.3 Survey Interpretation

Many of the potential projects identified in this study are contingent upon many factors such as the successful outcomes of precursor projects, the availability of external funding and/or electricity infrastructure upgrade costs. The site-based fuel-switching projects proposed in this work are the best estimates of likely outcomes based on information available at the time.

The forward timeline for this study was focused on the period to 2050, when NZ is expected to meet its emissions targets under the Paris Agreement, at this point it is expected that most low to medium temperature process heat energy will be provided by a low carbon source (e.g. electricity, biomass). Sites were asked to define their expected timeframe for any planned decarbonisation projects, particularly those involving electrification.

The criteria did not take into consideration any limitations surrounding the site's electrical capacity.

Electrical capacity has been modelled as electricity input, to show the possible impact on the electricity network. As a result, the total energy use shows a modelled decrease where heat pumps are potential projects, due to the high efficiency of this technology.

The term electrical capacity has been used instead of electrical demand, as this analysis is based upon the existing and planned thermal capacity of assets as indicated by the survey respondents. Actual utilisation of this capacity can vary in practice but serves a guide for likely demand growth.

Please note that for the purposes of analysis, it is assumed that thermal energy demand will remain unchanged into the future.

2. Total Impact Summary

Overall, there is a strong desire from organisations within the region to decarbonise and transition away from fossil fuel for process heating.

2.1 Projected Pathway

A model of the projected electrical demand, electricity, biomass and fossil energy use for indicated projects has been visualised in Figure 1. Modelling was chosen to start in 2021, because this timeframe includes several projects completed since previous surveys were undertaken.

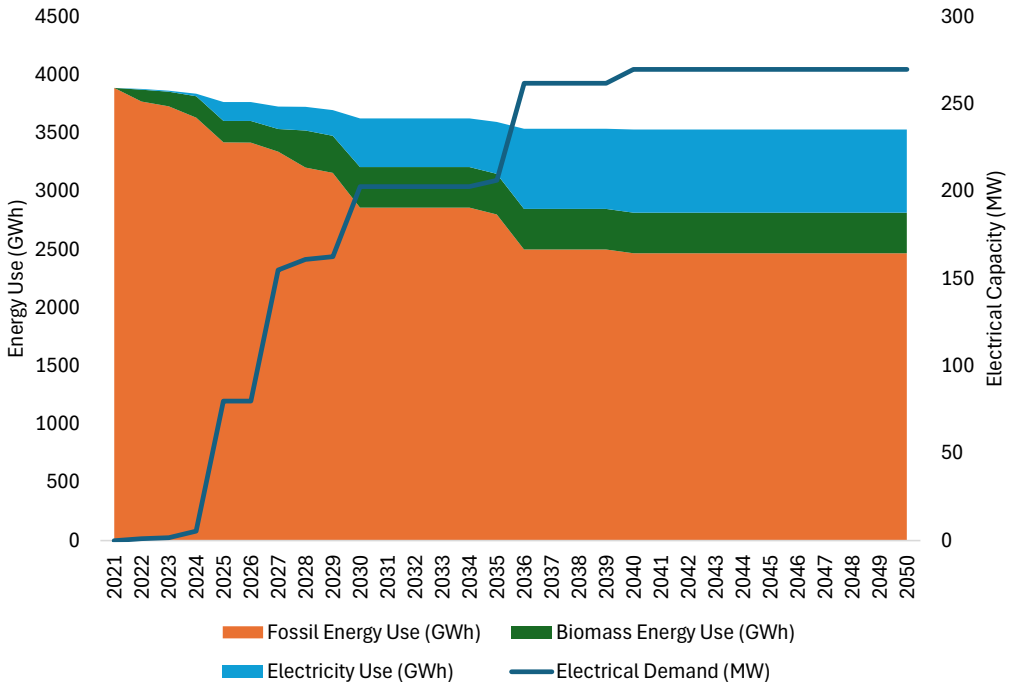

Figure 1 Projected Transition Pathway

Key findings from the model include:

- There remains strong interest in electricity as the preferred fuel for decarbonisation, with the aggregated peak electrical demand for decarbonisation is likely to increase by 270 MW by 2050. This corresponds to a 714 GWh increase in required annual electricity use and a 1,418 GWh (5.1 PJ) reduction in fossil energy (primarily coal and natural gas). The smaller increase in electricity volume is due to the inherently more efficient use of electricity, particularly with adoption of heat pump technology, which can achieve efficiencies of 300% and higher (COP 3+).
- Several biomass projects are also likely to occur, with a 349 GWh (1.3 PJ) increase by 2050.

- Fossil fuel use is dominated by coal and natural gas. Which is expected to decrease by 1,159 GWh (4.2 PJ) over the period to 2050.
- The largest increases in electricity demand and consumption are expected to occur in 2030 and 2036. The 2036 date is significant, as this is in time for the coal boiler ban in 2037.
- Planned projects represent 33% of the fossil energy use of those surveyed. It is expected that the remaining fossil energy use will eventually transition to a low-carbon alternative, however no projects are planned, suggesting these transitions may occur closer to 2050. Most of these organisations are expected to be in the North Island, using natural gas, since coal use for medium temperatures (<300°C) is to be phased out by 2037.

2.2 Possible Pathway

A model of the possible electrical demand, electricity, biomass and fossil energy use for each organisation surveyed has been visualised in Figure 2. This was based on several assumptions regarding the preferred decarbonisation fuel, technology and timing. This is intended to provide an upper estimate of the likely electrification load (MW), and the energy required (GWh).

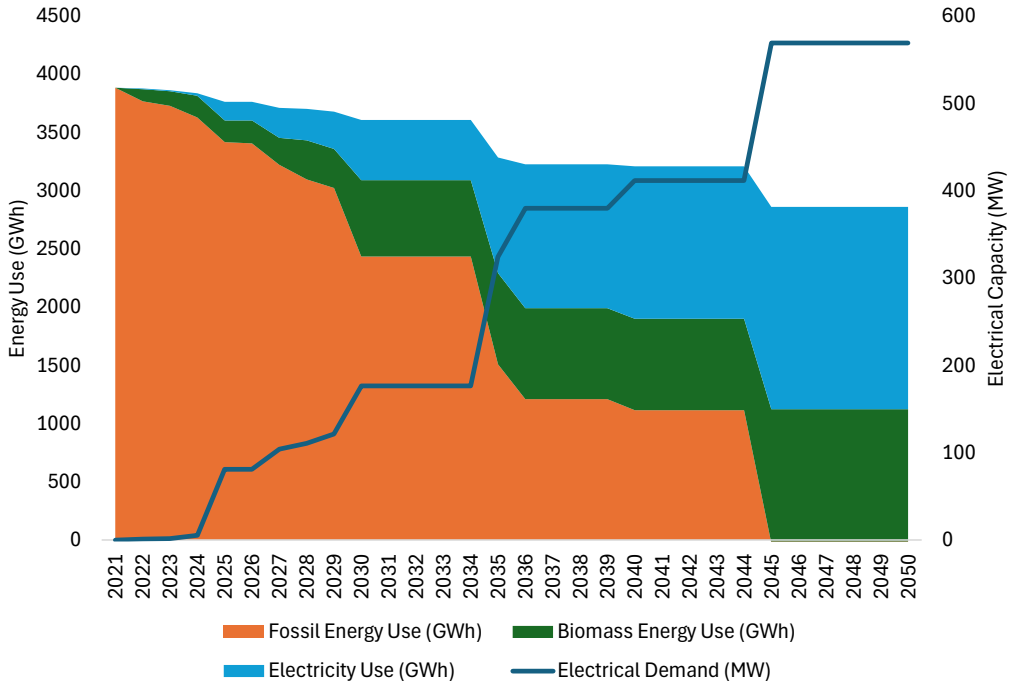

Figure 2 Possible Transition Pathway

Key findings from the model include:

- Aggregated peak electrical demand for decarbonisation could increase by 569 MW by 2050. This corresponds to a 1,739 GWh increase in required annual electricity use and a 3,912 GWh (14 PJ) reduction in fossil energy (primarily coal and natural gas).
- Several biomass projects may also occur, with a 1,149 GWh (4.1 PJ) increase by 2050.

- Fossil fuel use is dominated by coal and natural gas. Which may decrease by 3,549 GWh (12.8 PJ) over the period to 2050.
- The largest increases in electricity demand and consumption could occur in 2030, 2036 and 2045. The 2036 date is significant, as this is in time for the coal boiler ban in 2037. The 2045 date is set based on the assumption that all process heat sites would meet New Zealand's 2050 Paris Agreement target.

2.3 Key Barriers to Electrification

Throughout the meetings, there were several barriers that were common amongst sites:

- Capital funding and return on investment – this has particularly been affected by the withdrawal of GIDI funding from central government.
- The rapidly diminishing supply of natural gas in the North Island – this is expected to expedite many decarbonisation projects to low carbon fuels in the next 2-5 years, as users roll onto new contracts, realising significant cost increases for this fuel.
- Electricity prices – both retail and network costs are increasing, which has significantly changed the economics of some projects. Electricity retailers are no longer offering the same low-cost long term contracts for decarbonisation.
- Operating and maintenance costs of specific opportunities – electrification oftens reduces labour and maintenance costs.
- Uncertain site plans / developments – some sites are affected by larger strategic decisions around the future of their facilities.
- Availability / maturity / reliability of new technologies – some sites indicated concerns around viable alternatives to their existing fossil fuels, although this was a small number of respondents.
- Electrical capacity and network upgrade costs – unclear policies around capital contributions (cost sharing between networks and customer), high costs for increased capacity.

2.4 Flexibility

A number of sites participate in different forms of demand flexibility, with the follow general trends:

- The most common form of demand flex was found to occur amongst those sites which have network-signalled load shedding, such as Orion's control periods.
- Other sites have chosen to partner (or intend to partner) with a flexibility service provider, to respond to signals from the Reserves Market (FIR, SIR) and in response to wholesale electricity prices. It is presumed that the level of incentive provided (availability payments, lower electricity prices) exceeds the costs to install the required control hardware to enable flexible operation.
- Some organisations also have entered agreements with a retailer to provide longer-term demand response (for weeks at a time) by using backup boiler assets, particularly redundant coal boilers. Like the Reserve Markets, this retailer pays the end user an availability payment each year for the right to request the user switches off their electric boiler or heat pump and use their non-electric boiler for a specified

number of weeks. The retailer also makes a payment during this time toward fuel costs for the non-electric boiler (e.g. coal). This arrangement requires the user to also be purchasing their electricity for the asset in question from the same retailer, as the retailer uses this programme as a dry year hedge when lake levels are low.

- Overall, there was less awareness and participation in demand flexibility (in all its forms) than expected. Whilst some sites do participate in EDB led initiatives or through retailer led programmes, there were as many sites that said they did not implement flexibility.