Government Leadership

Regional Energy Transition Accelerator (RETA)

Tairāwhiti – Summary Report

August 2024

TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

He kupu takamua

E tutuki ai te whāomoomo ā-pūngao me te whakawhiti kora kaitā, me whai pārongo whai mana i te taha o te mahi ngātahi pakari ā-rohe. Kua hoahoatia te Tairāwhiti Regional Energy Transition Accelerator (RETA) ki te āwhina i ngā kaiwhakamahi, kaiwhakarato pūngao katoa i tēnei haerenga.

Ko te wera o te whakanao me te tukatuka rawa mātāmua te 25% o ngā puhanga ngao o te motu, nā reira ka nui te pānga o te whakaheke i te whirinakitanga ki ngā kora mātātoka.

Kei te iho o te tātaritanga ko te tūhuratanga o te pitomata o te Tairāwhiti hei papatipu koiora whakahou, e hua ake rā hei kāinga rua utu-pai mō ngā whakamahinga ahumahi me whai koropupū pāmahana-taikaha. E ai ki te pūrongo, e matomato ana ngā rawa ngahere o te rohe, ā, ka whakamahia pea hei whāngai i te koioratanga i roto o te rohe, me te whai hoki i ētahi anō rōrahi hei whakamahi i rohe kē atu.

Nā reira ka taea e ngā pakihi o te takiwā te whakawhiti i runga i te mōhio e nui ana te tukunga. Mā te whakarite ara arumoni hei kohi i ngā waihotanga e heke ai te nui me te rōrahi o ngā haenga rākau e toe ana i te ngahere i muri i te kohanga.

Mā te tohu i ngā ara motuhake me te turaki i ētahi momo taupā i roto o te rohe o te Tairāwhiti, e whai ana a RETA ki te whakahaere i ngā whakaputanga-whakatau mātau i waenga i ngā kaiwhaipānga.

E tohu ana tēnei pūrongo i te tihi o te tūāoma whakamahere o te hōtaka, e tuku ana i ngā matapae me ngā mahere o te popono ngao wera o te rohe, i te taha o ngā aromatawai tuku ngao whakahou. I runga i te whakamuramura i ngā painga o te whakahāngai ā-rohe, e whai ana te pūrongo ki te āwhina i ngā kaiwhakaputa whakatau ki te nanao atu ki ngā haumitanga rawa, tūāhanga anō hoki, e heke ai ngā utu.

E whanake ana te hōtaka RETA i ngā whāomoomo ā-pūngao, whakawhiti kora anō hoki kua whakaterea kētia i te rohe. He huhua ngā pakihi i te Tairāwhiti kua whai kē i tētahi ara puhanga-iti, ā, kua whakamaheretia ki EECA. Ko rātou te tauira o ngā mahi ka taea, waihoki, kua tino mānawatia i roto i tēnei hātepe tō rātou kaha me tō rātou pīrangi tuari i ō rātou akoranga ki ētahi atu.

I hua ake ngā mōhiotanga i runga i te āta mahi tahi ki a Trust Tairāwhiti – the Regional Economic Development agency, local EDB Firstlight Networks, Transpower, ngā kamupene ngahere o te rohe, ngā pūtukatuka rākau, ngā kaiwaihanga hiko me ngā kaihoko, otirā ngā kaiwhakamahi pūngao ahumahi waenga, ki te nui. E mihi nui ana ki ngā rōpū nei i tā rātou whai wāhi mai, ā, i tō rātou hiamo anō hoki.

E hiamo ana mātou ki te tautoko tonu i te rohe i a tātou ka mahi tahi ki te tūhura i tōna pitomata.

1 Foreword

Achieving energy efficiency and fuel switching at scale requires valuable information alongside strong regional collaboration. The Tairāwhiti Regional Energy Transition Accelerator (RETA) is designed to help energy users and suppliers along this journey.

Heat used in manufacturing and in the processing of primary products currently makes up around 25% of our country's energy-related emissions, and so reducing our reliance on fossil fuels, like gas and coal, will have a big impact.

Central to the analysis is the exploration of Tairāwhiti's potential for renewable biomass, which emerges as a cost-effective alternative for industrial applications requiring high-temperature boilers. The report shows the region's abundant forestry resources could contribute to biomass's viability within the region, while having significant additional volumes that could be utilised in other regions.

This means local businesses can make the switch and be confident there is supply. Creating commercial opportunities for harvesting residues will reduce the size and volumes of post-harvest slash remaining in forest.

By identifying unique opportunities and overcoming specific barriers within the Tairāwhiti region, RETA seeks to facilitate informed decision-making among stakeholders.

This report marks the culmination of the programme's planning phase, offering forecasts and maps of regional stationary heat energy demand, alongside renewable energy supply assessments. Highlighting the advantages of regional alignment, the report aims to assist decision makers in optimising asset and infrastructure investments, ultimately lowering costs.

The RETA programme builds on energy efficiency and fuel switching work already happening in the region. Several businesses in Tairāwhiti already have a low-emissions pathway mapped out with EECA. They are an example of what can be achieved, and their efforts and willingness to share what they have learned with others has been valuable to this process.

Surfacing the insights has involved working closely with Trust Tairāwhiti – the Regional Economic Development agency, local EDB Firstlight Networks, Transpower, regional forestry companies, wood processors, electricity generators and retailers, and medium to large industrial energy users. A big thank you to these organisations for their input and enthusiasm.

We are looking forward to continuing to support the region as we work together to unlock its potential.

Dr Marcos Pelenur
Chief Executive, EECA

EECA

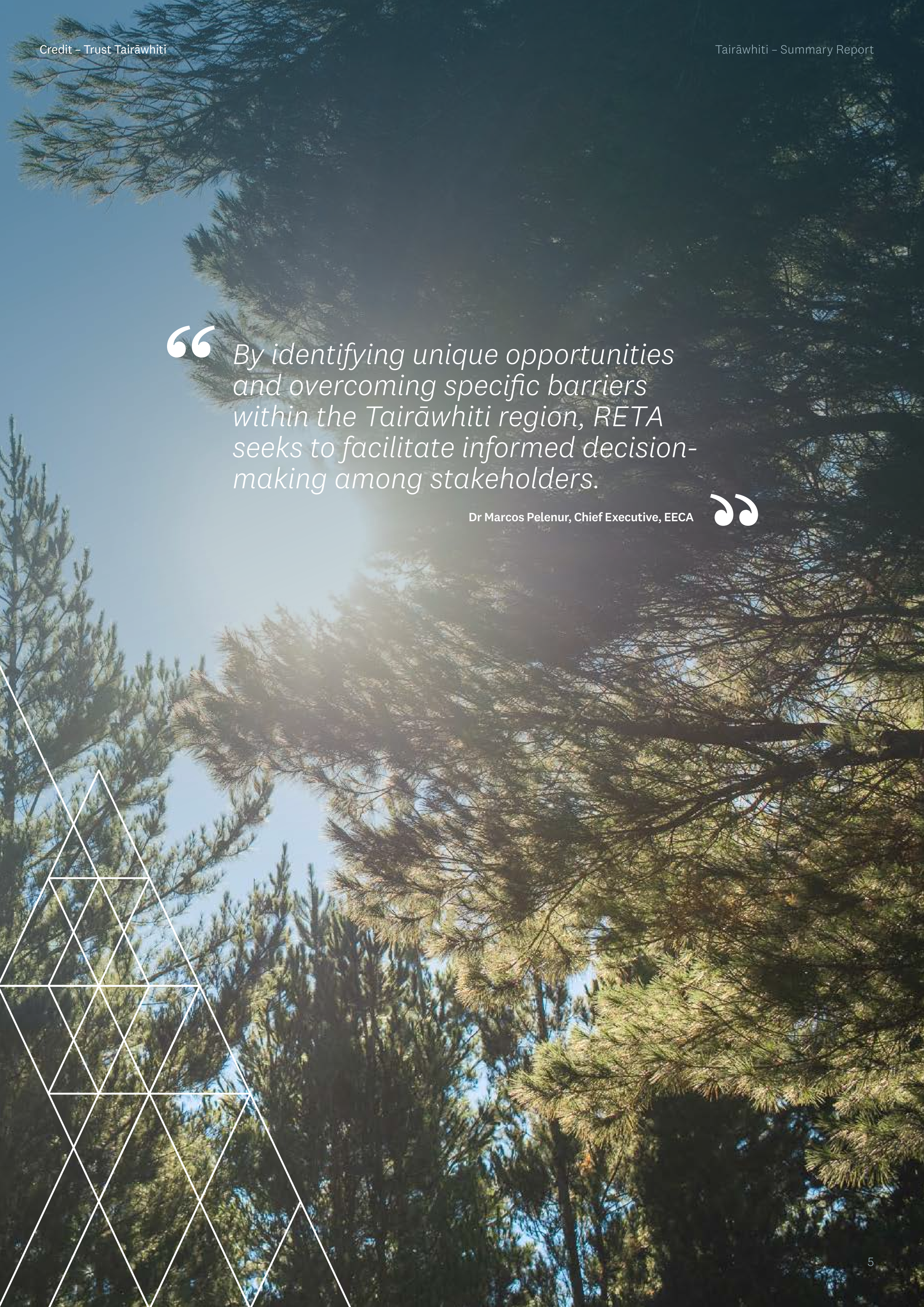
2 Acknowledgements

This RETA project has involved a significant amount of time, resource and input from a variety of organisations. We are especially grateful for the contribution from the following organisations:

- Process heat users throughout the Tairāwhiti region
- Trust Tairāwhiti, Regional Economic Development Agency
- Local Electricity Distribution Business Firstlight Networks
- National grid owner and operator Transpower
- Regional forestry companies
- Regional wood processors
- Electricity generators and retailers

This RETA report is the distillation of individual workstreams delivered by:

- **DETA** – process heat demand-side assessment
- **Ahikā, Margules Groome** – biomass availability analysis
- **ElectroNet Consultants** – electricity network analysis
- **EnergyLink** – electricity price forecast
- **Wayne Manor Advisory** – report collation, publication and modelling assistance



Credit – Trust Tairāwhiti

> *By identifying unique opportunities and overcoming specific barriers within the Tairāwhiti region, RETA seeks to facilitate informed decision-making among stakeholders.*
>
> **Dr Marcos Pelenur, Chief Executive, EECA**

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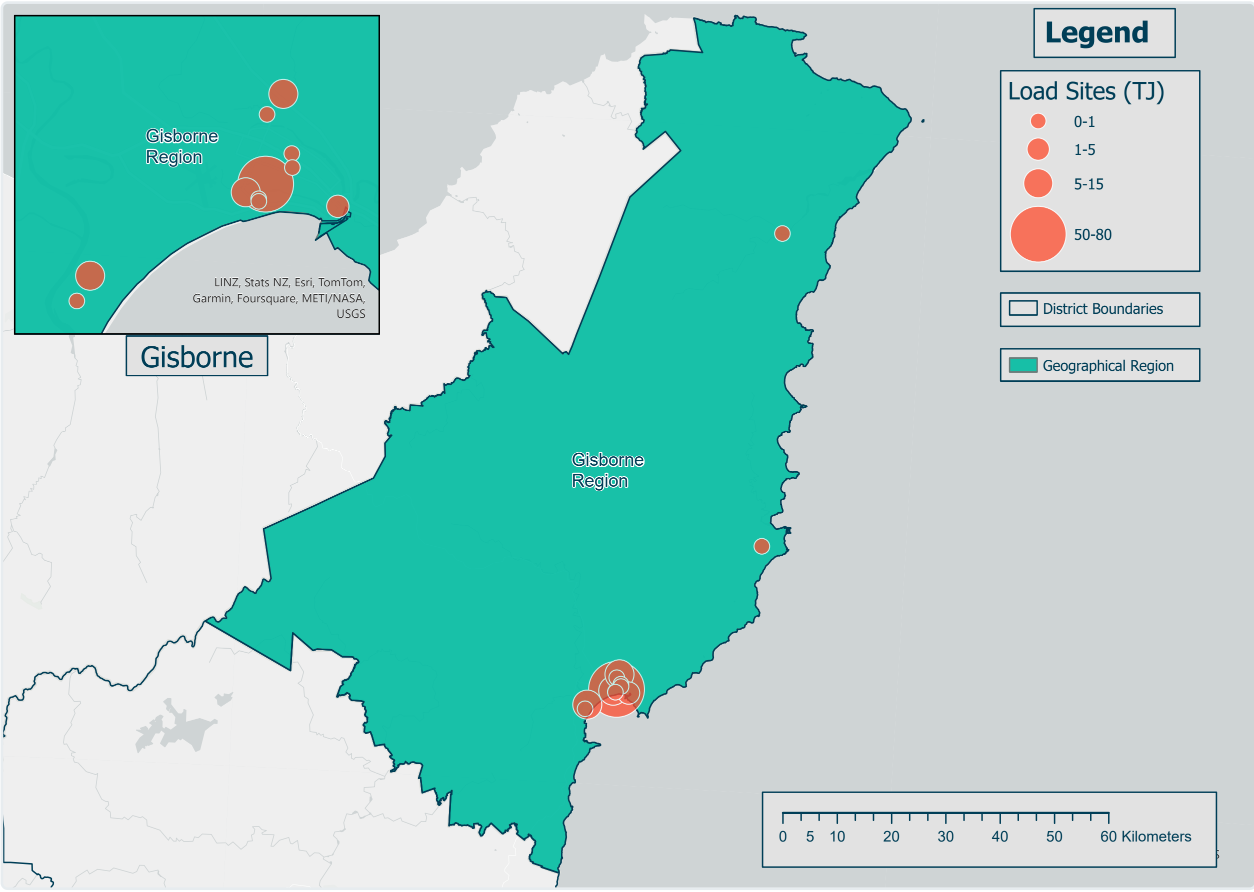
Tairāwhiti is the focus for New Zealand's ninth Regional Energy Transition Accelerator (RETA).

4 Tairāwhiti overview

This region covers the Tairāwhiti districts (Figure 1).

Figure 1 – Map of area covered by the Tairāwhiti RETA



The Tairāwhiti RETA brings together information about process heat decarbonisation plans from EECA's Energy Transitional Accelerators (ETAs) with individual organisations and data from the Regional Heat Demand Database (RHDD) completed by, Transpower and EECA. While ETAs focus on the decarbonisation pathways and plans of individual organisations, the RETA expands this focus to consider barriers and opportunities for regional supply-side infrastructure (e.g. networks and regional resources) to better support decarbonisation decisions.

This report is the culmination of the RETA planning phase in the region and aims to:

- Provide process heat users with coordinated information specific to the region to help them with making more informed decisions on fuel choice and timing
- Improve fuel supplier confidence to invest in supply side infrastructure
- Surface issues, opportunities, and recommendations.

The next phase of a RETA focuses on implementing recommendations from phase 1 that remove barriers or accelerate opportunities for decarbonisation of process heat.

The 10 sites covered the industrial and commercial[1] sectors. These sites either have fossil-fuelled process heat equipment larger than 500kW (i.e. process heat equipment details have been captured in the Regional Heat Demand Database) or are sites for which EECA (Energy Efficiency and Conservation Authority) has detailed information about their decarbonisation pathway.[2] Together, these sites collectively consume 240TJ of process heat energy, primarily in the form of piped fossil gas, and currently produce 13kt pa of carbon dioxide equivalent (CO_2e) emissions.

Table 1 – Summary of Tairāwhiti RETA sites fossil fuel process heat demands and emissions

Sector	Sites	Thermal capacity (MW)	Thermal fuel consumption (GWh/yr)	Process heat demand today (TJ/yr)	Process heat annual emissions (kt CO_2e/yr)
Industrial	5	29	50	181	10
Commercial	5	9	16	59	3
Total	**10**	**38**	**67**	**240**	**13**

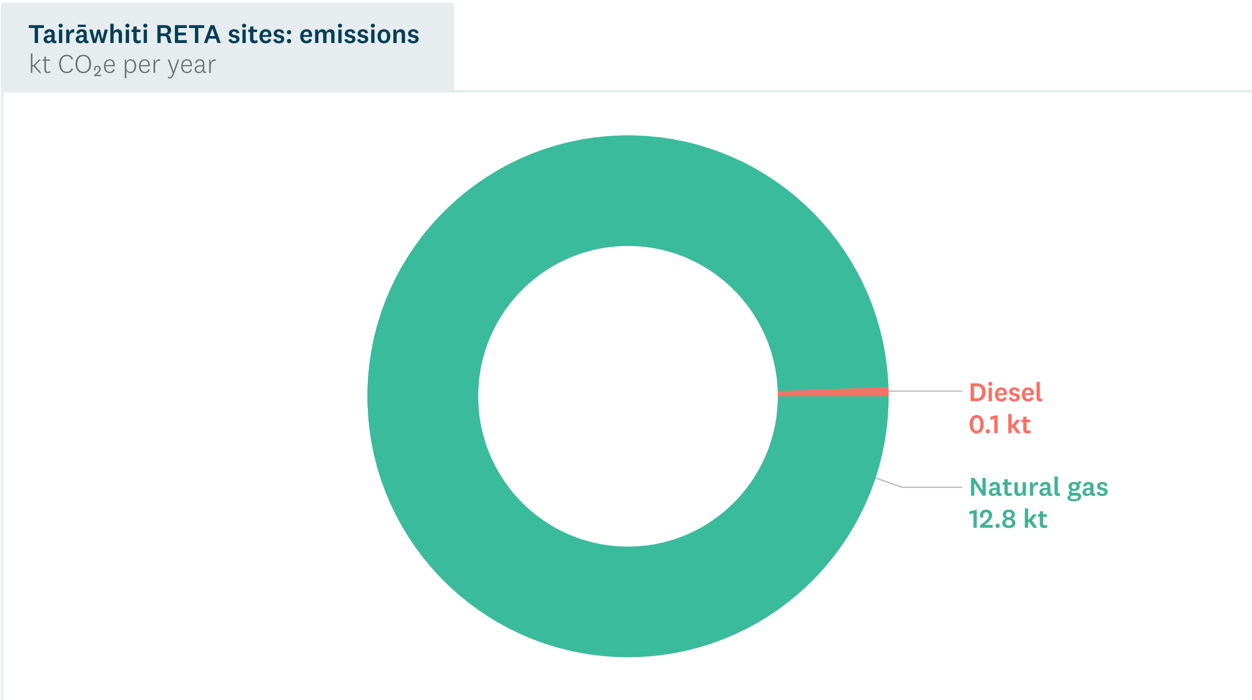
Photo credit: Trust Tairāwhiti

1 The commercial sector includes schools, hospitals, and accommodation facilities.

2 For example, process heat equipment details have been captured in an ETA opportunities assessment report.

All of the demand relates to the consumption of fossil fuels, with most Tairāwhiti RETA emissions coming from piped fossil gas (Figure 2).

Figure 2 – 2022 annual emissions by process heat fuel in Tairāwhiti RETA. Source: EECA



The objective of the Tairāwhiti RETA is to eliminate as much of these process heat emissions as possible. It does this by supporting organisations in their consideration of:

- Demand reduction (for example reducing heat demand through process optimisation)
- Thermal efficiency (for example installation of highly efficient heat pumps)
- Switching away from fossil-based fuels to a low-emissions source such as biomass and/or electricity.

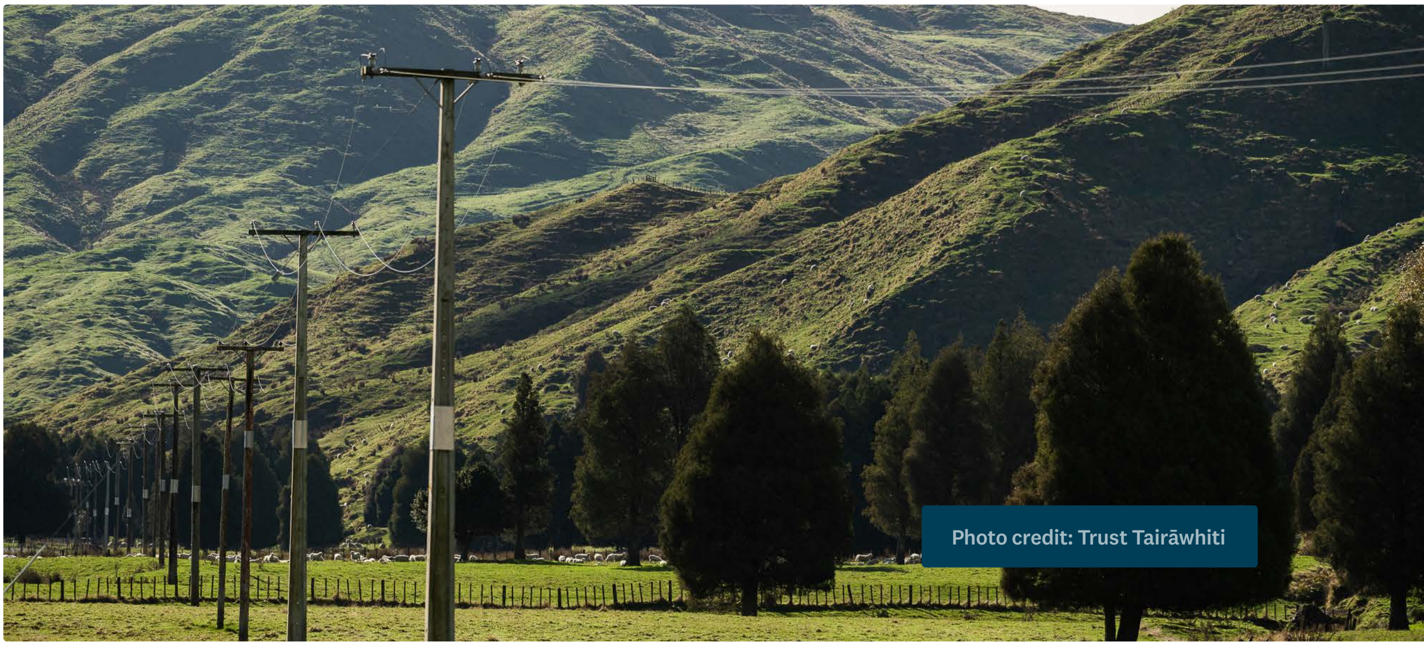
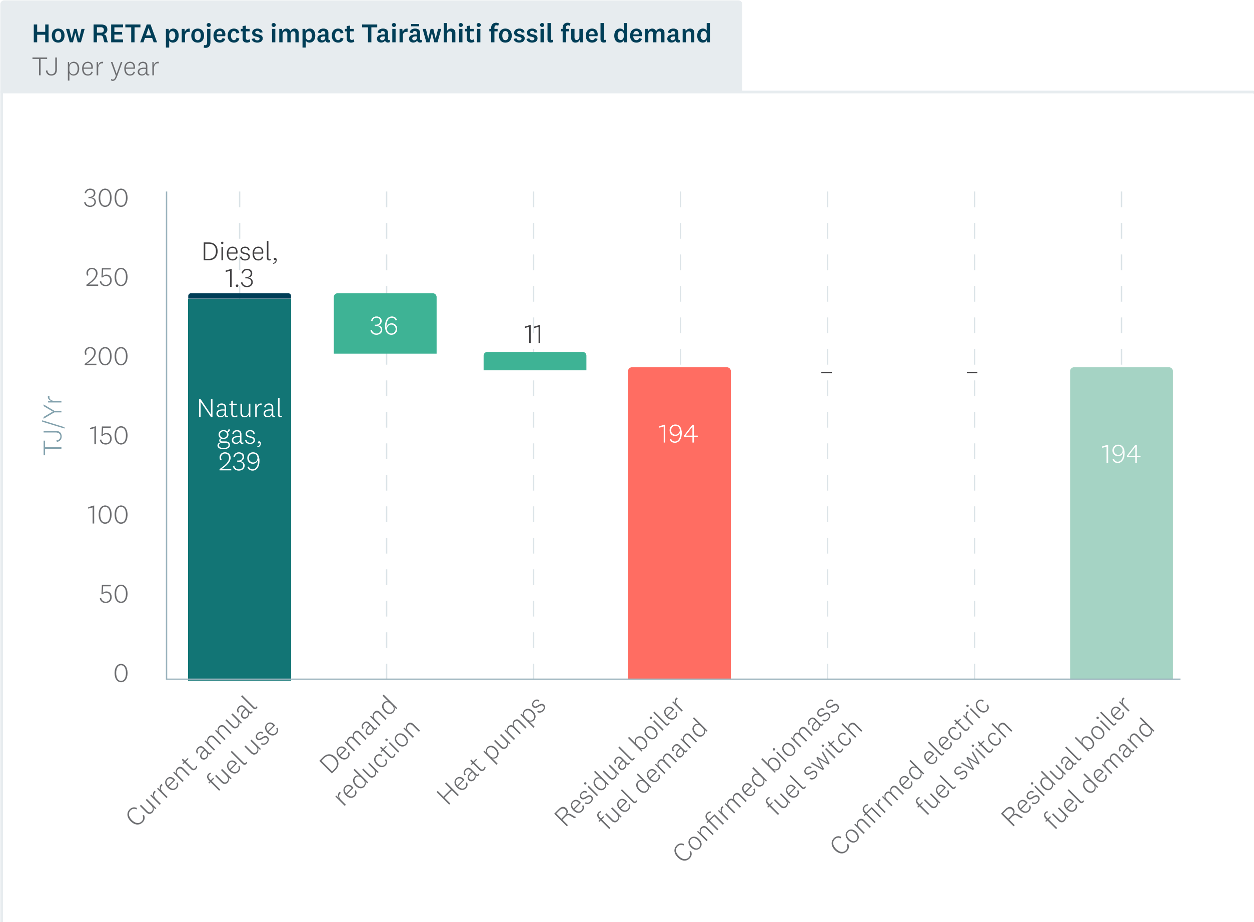


Photo credit: Trust Tairāwhiti

Figure 3 illustrates the potential impact of RETA sites on regional fossil fuel demand, both as a result of decisions where investment is already confirmed, and decisions yet to be made.

Figure 3 – Potential impact of fuel switching on fossil fuel usage. Source: EECA



As explored below, this RETA looks at a number of pathways by which the 194TJ of unconfirmed fuel switching decisions (all fuel switching projects) could occur. Both biomass and electricity are considered as potential fuel sources. EECA's assessments of biomass and electricity focus on the key issues that are common to all RETA process heat sites contemplating fuel switching decisions. This includes the availability and cost of the resources that underpin each fuel option, as well as the sufficiency of the networks required to ensure that the fuel can be delivered to the process heat users' sites.

This assessment is unique to the Tairāwhiti region. The availability and cost of supply resources and connection can then be used to simulate RETA sites' collective decisions about fuel switching under different sets of assumptions. This provides valuable information to individual process heat decision makers, infrastructure providers, resource owners, funders, and policy makers.

4.1 RETA site summary

As outlined above, there are 10 sites considered in this study. Across these sites, there are 23 individual projects spanning the three categories discussed above – demand reduction, heat pumps and fuel switching.

Table 2 shows the current status of the Tairāwhiti RETA process heat projects. All 23 projects are unconfirmed, in that the process heat organisation is yet to commit to the final investment.

Table 2 – Number of projects in Tairāwhiti RETA: Confirmed vs Unconfirmed. Source: DETA, EECA.

Status	Demand reduction	Heat recovery	Fuel switching	Total
Confirmed	0	0	0	0
Unconfirmed	9	2	12	23
Total	**9**	**2**	**12**	**23**

Demand reduction and thermal efficiency are key parts of the RETA process and, in most cases, enable (and helps optimise) the fuel switching decision. This RETA report has a greater level of focus on the fuel switching decision, due to the higher capital and fuel intensity of this decision.

Below we show the expected remaining fuel demands from each site in the Tairāwhiti RETA, after any demand reduction projects and/or heat pump projects are accounted for. We present biomass demands both in TJs and green tonnes (55% moisture content) and report the peak demand from the boiler should it convert to electricity.

Table 3 – Summary of Tairāwhiti RETA sites with fuel switching requirements. Green highlighting indicates the preferred fuel option according to a commercial decision making criteria explained below.

Site name	Industry	Project status	Bioenergy required TJ ('000t)/yr	Electricity peak demand (MW)
Cedenco Foods, Gisborne	Industrial	Unconfirmed	**266.2 (20.5)**	18.87
Ministry of Health, Gisborne Hospital	Commercial	Unconfirmed	13.1 (1.8)	**0.92**
Pioneer Brand Seeds, Gisborne	Industrial	Unconfirmed	**19.6 (2.7)**	5.80
Ovation NZ Ltd, Gisborne	Industrial	Unconfirmed	10.5 (1.5)	**0.28**
Fulton Hogan, Gisborne Asphalt Plant	Industrial	Unconfirmed	**1.4 (0.2)**	0.03
Ministry of Education, Lytton High School	Commercial	Unconfirmed	1.3 (0.2)	**0.23**
Indevin, Gisborne	Industrial	Unconfirmed	**0.4 (0.1)**	0.46
Ministry of Education, Gisborne Girls High School	Commercial	Unconfirmed	0.5 (0.1)	**0.09**
Ministry of Education, Gisborne Boys High School	Commercial	Unconfirmed	0.5 (0.1)	**0.09**
Corson Grain, Gisborne	Industrial	Unconfirmed	**6.5 (0.9)**	0.36


Lake Waikaremoana — courtesy of Wairoa District Council

5 Simulated decarbonisation pathways

There are a range of decision criteria that individual organisations may use to determine the timing of their decarbonisation investments. Decisions are impacted by available finance, product market considerations, strategic alignment, and other factors. It is challenging to incorporate many of these into a single analysis of the likely decision by each process heat user.

Rather than attempt to include all these factors, we present a range of different potential Tairāwhiti-specific pathways reflecting different decision-making criteria that process heat users will use.

Two pathways present 'bookends' that focus exclusively on one of the two fuel options (biomass or electricity) for unconfirmed projects. Two others use a global standard 'marginal abatement cost', or MAC, to quantify the cost to the organisation of decarbonising their process heat. This is expressed in dollars per tonne of CO_2e reduced by the investment. A MAC value allows us to:

- Determine the lowest cost fuel option for the process heat user (i.e. biomass, electricity or other)
- Determine the timing of this investment as being the earliest point when a decarbonisation decision saves the process heat user money over the lifetime of the investment – the point in time that the MAC of the project is exceeded by the expected future carbon price.

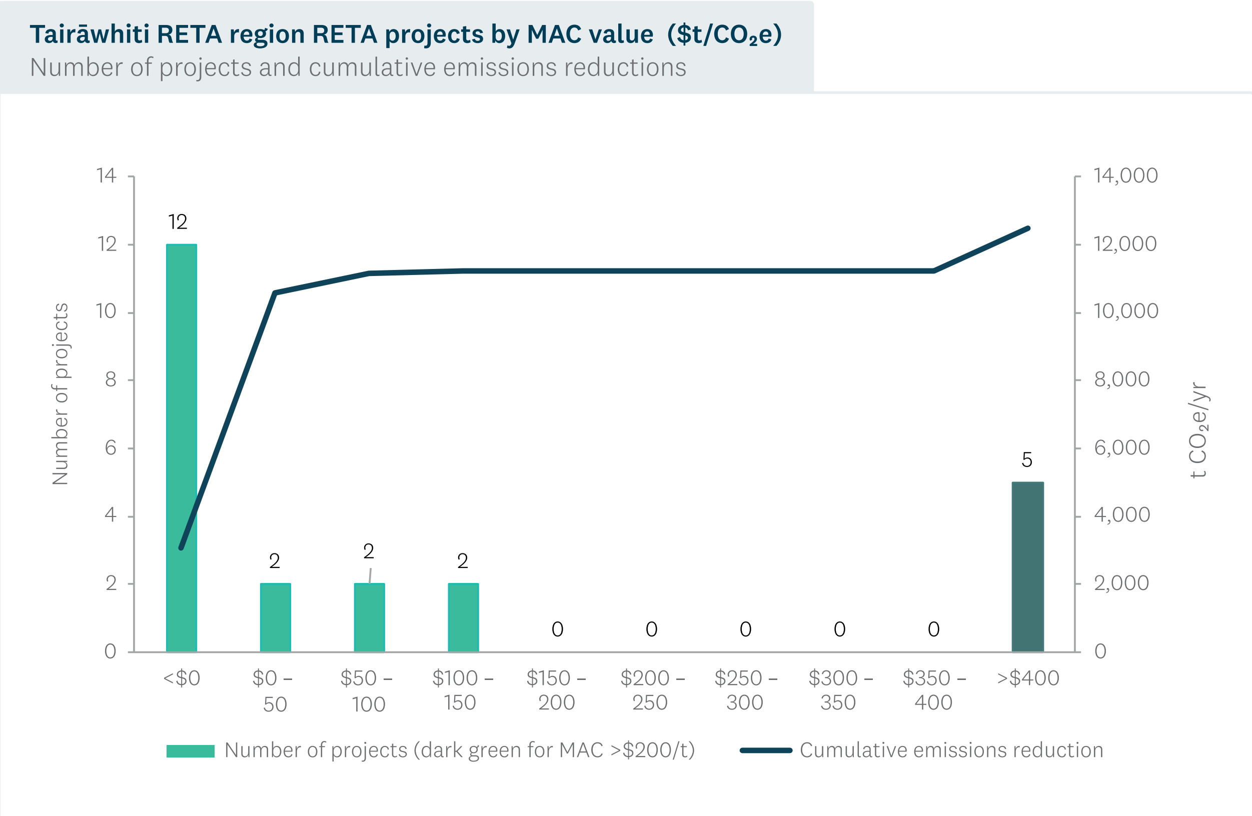
The pathways were then developed as follows. Note that 2049 has been used in the two Centric and BAU Combined pathways in line with New Zealand's target of net zero greenhouse gas emissions by 2050 in the Climate Change Response (Zero Carbon) Amendment Act:

Pathway name	Description
Biomass Centric	All unconfirmed site fuel switching decisions proceed with biomass in 2049.
Electricity Centric	All unconfirmed site fuel switching decisions proceed with electricity in 2049.
BAU Combined	All unconfirmed fuel switching decisions (i.e. biomass or electricity) are determined by the lowest MAC value for each project in 2049.
MAC Optimal	Each site switches its boiler to the fuel with the lowest MAC value for that site. Each project is timed to be commissioned in the first year when its optimal MAC value first drops below a ten-year rolling average of the Climate Change Commission's future carbon prices in their Demonstration Path.

5.1 At expected carbon prices, 87% of emissions reductions are economic[3]

Using the biomass and electricity costs presented in Section 6 and Section 7, Figure 4 summarises the resulting MACs associated with each decision, and the emissions reduced by these projects.

Figure 4 – Number of projects by range of MAC value. Source: EECA



Out of 12.9kt of process heat emissions covered in the Tairāwhiti RETA, 11.2kt (87%) have marginal abatement costs (MACs) less than $150/tCO$_2$e. Based on an expectation the carbon prices will follow the Climate Change Commission's Demonstration Pathway, these emissions reduction projects would be economic prior to 2028.

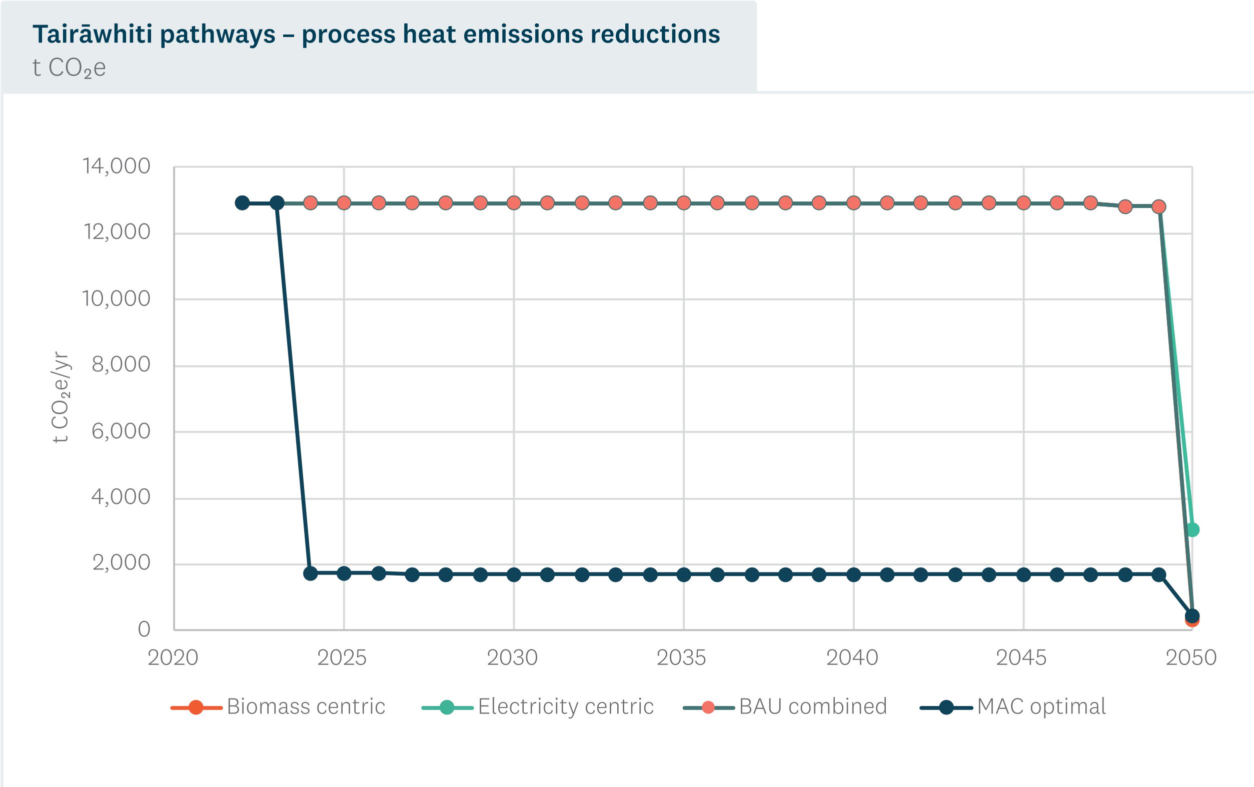
Twelve of these projects, representing 24% of the potential emissions reductions from RETA sites in Tairāwhiti, would be economic without any carbon price at all.

Compared to a scenario where each of these projects was executed based on the organisations' current plans (a BAU pathway), the MAC Optimal scenario would accelerate decarbonisation, and reduce the release of long-lived emission by a cumulative 292kt over the period of the RETA analysis to 2050 (Figure 5).[4]

[3] By 'economic', we mean that at a 6% discount rate these projects would reduce costs for the firms involved over a 20-year period (i.e. the Net Present Value would be greater than zero, at the assumed trajectory of carbon prices).

[4] Note that the Electricity Centric and Biomass Centric pathways are obscured in the chart by the BAU Combined pathway.

Figure 5 – Simulated emissions using Electricity Centric, Biomass Centric, BAU Combined and MAC Optimal pathways. Source: EECA



Our analysis suggests that the majority of decarbonisation projects would occur in 2024, if the commercial framework underpinning the 'MAC Optimal' pathway was used. However, this pace could be constrained by practical matters such as:

- The ability of process heat users to secure funding and commit to these investments in this timeframe
- The ability of infrastructure providers to deliver the necessary network upgrades
- The ability of forest owners and bioenergy aggregators to make sufficient resource available.

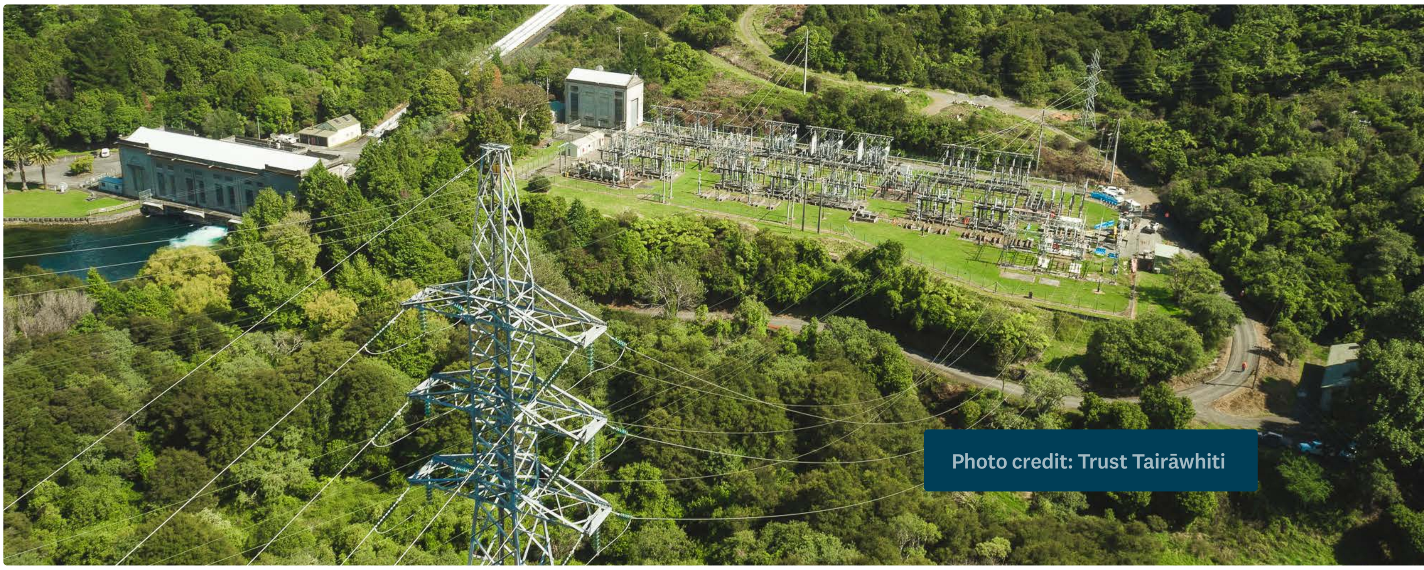


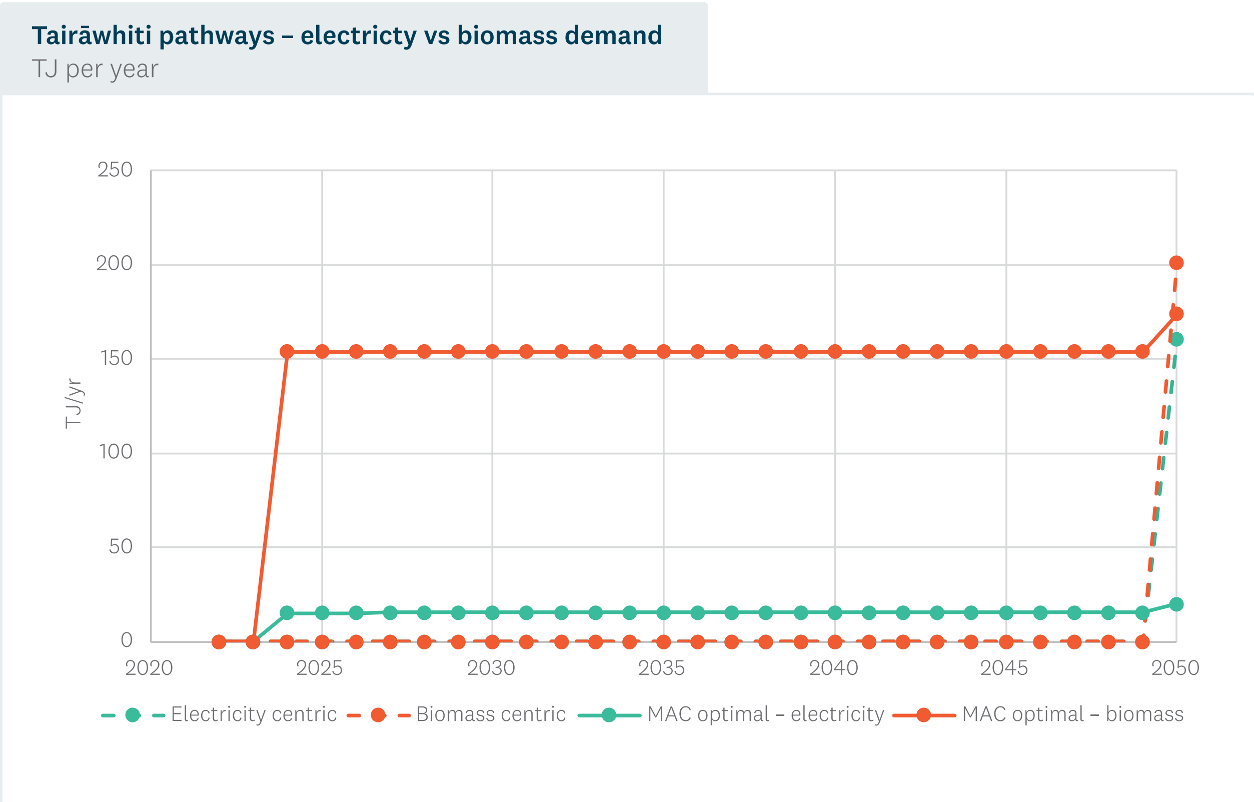
Photo credit: Trust Tairāwhiti

5.2 Pathway implications for electricity and biomass demands

The MAC Optimal pathway sees fuel decisions that result in 10% of the energy needs in 2050 supplied by electricity, and 90% supplied by biomass (Figure 6). The sheer dominance of biomass reflects its lower overall cost as a fuel for high temperature boilers for their process heat.[5]

We expand further on these fuel switching outcomes in the next sections.

Figure 6 – Electricity and biomass demand in MAC Optimal pathway. Source: EECA



Before doing so, it is important to recognise the significant impact that demand reduction and heat pump efficiency projects have on the overall picture of Tairāwhiti process heat decarbonisation. As shown in Figure 3, investment in demand reduction and heat pumps meets 20% of today's Tairāwhiti energy demands[6] from process heat users, which in turn reduces the necessary fuel switching infrastructure required: thermal capacity required from new biomass and electric boilers would be reduced by 0.32MW if these projects were completed. We estimate that demand reduction and heat pumps would avoid investment of $0.32M to $0.48M in electricity and biomass infrastructure.[7]

[5] That is, they can't fuel switch using high efficiency heat pumps alone.

[6] This is true for both energy consumption and also the peak thermal demand required from biomass or electric boilers.

[7] On the assumption that 1MW of electrode boilers, and associated network connections, or 1MW of biomass boilers, cost on average between $1M-$1.5M.

6 Biomass – resources and costs

The use of woody biomass for bioenergy requires careful consideration of emissions and sustainability – for example, depending on the source, the diversion of wood to bioenergy may change the timing of the release of emissions by a significant period (compared to the natural decomposition of biomass). Suppliers and consumers of biomass for bioenergy need to be confident they understand any wider implications of their choices. No formal guidelines or standards exist in New Zealand at this point, and EECA recommends one is developed for the New Zealand context, drawing on international standards and experience.

A good sense of the total availability of harvestable wood in the Tairāwhiti region requires both a top-down and bottom-up analysis (based on interviews with major forest owners), as forest owners' actual intentions will often deviate from centralised forecasts due to changes in log prices and other dynamic factors. The bottom-up analysis also provides an assessment of where the wood is expected to flow through the supply chain – via processors to domestic markets, or export markets, as well as volumes that are currently being utilised for bioenergy purposes. It also allows us to estimate practical levels of recovery of harvesting residues.

A top-down analysis shows that Tairāwhiti's forestry resources are significant (Figure 7). There is some annual variation in total available wood resource, with a visible decline in volumes over the 2027-2036 period. The annual variation occurs due to the age distribution of the existing forests, and yield assumptions combined with assumptions on how forests are harvested.

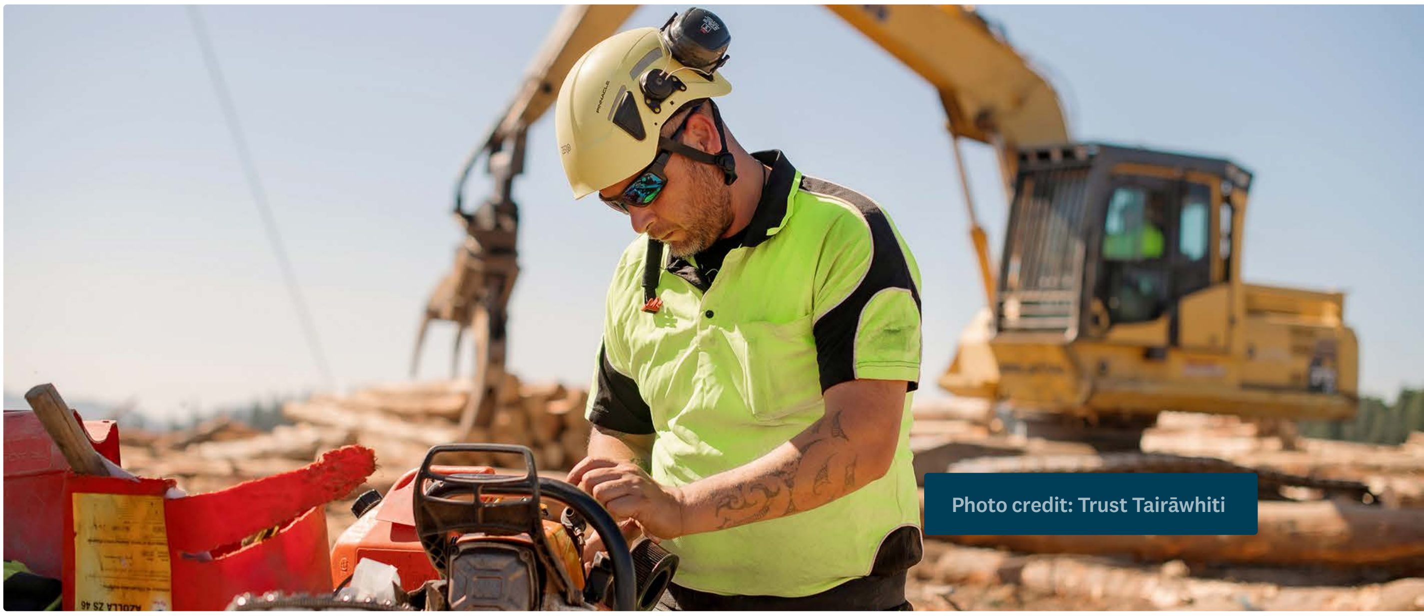
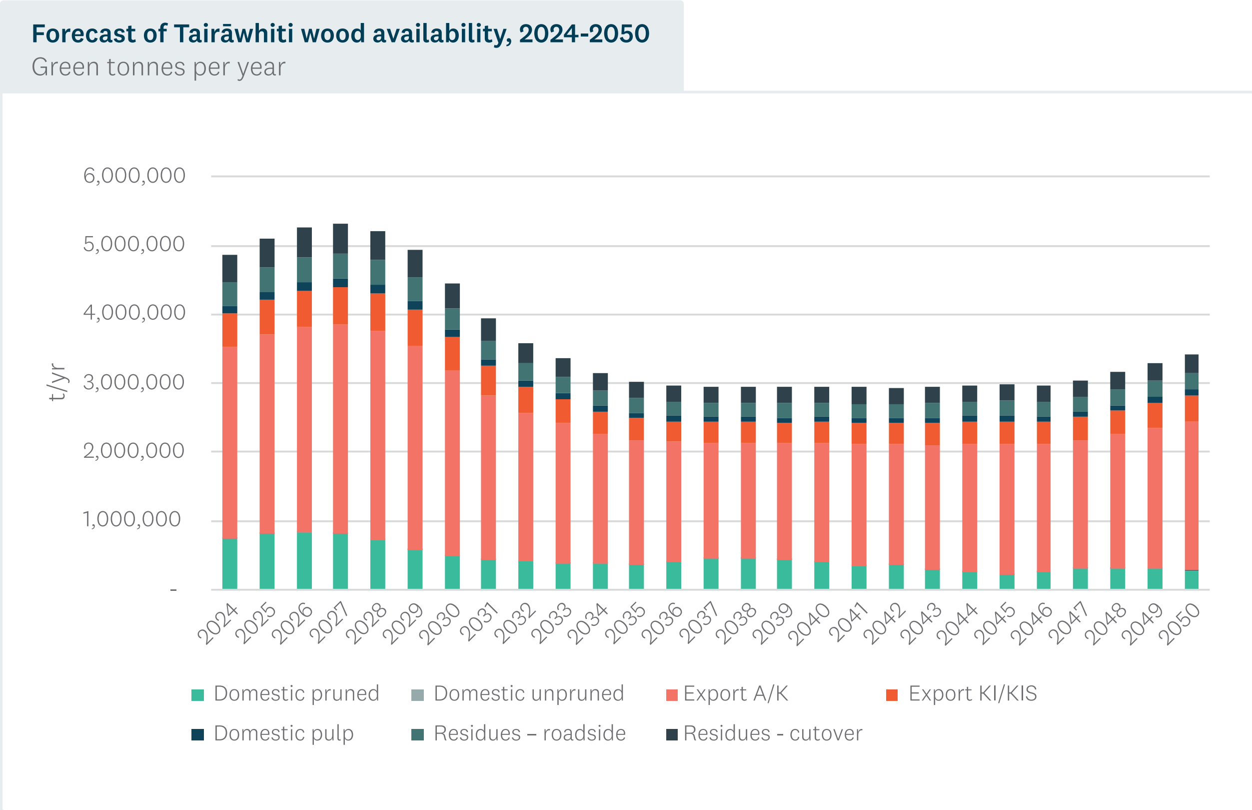


Photo credit: Trust Tairāwhiti

Figure 7 – Wood resource availability in Tairāwhiti region, 2024-2050.

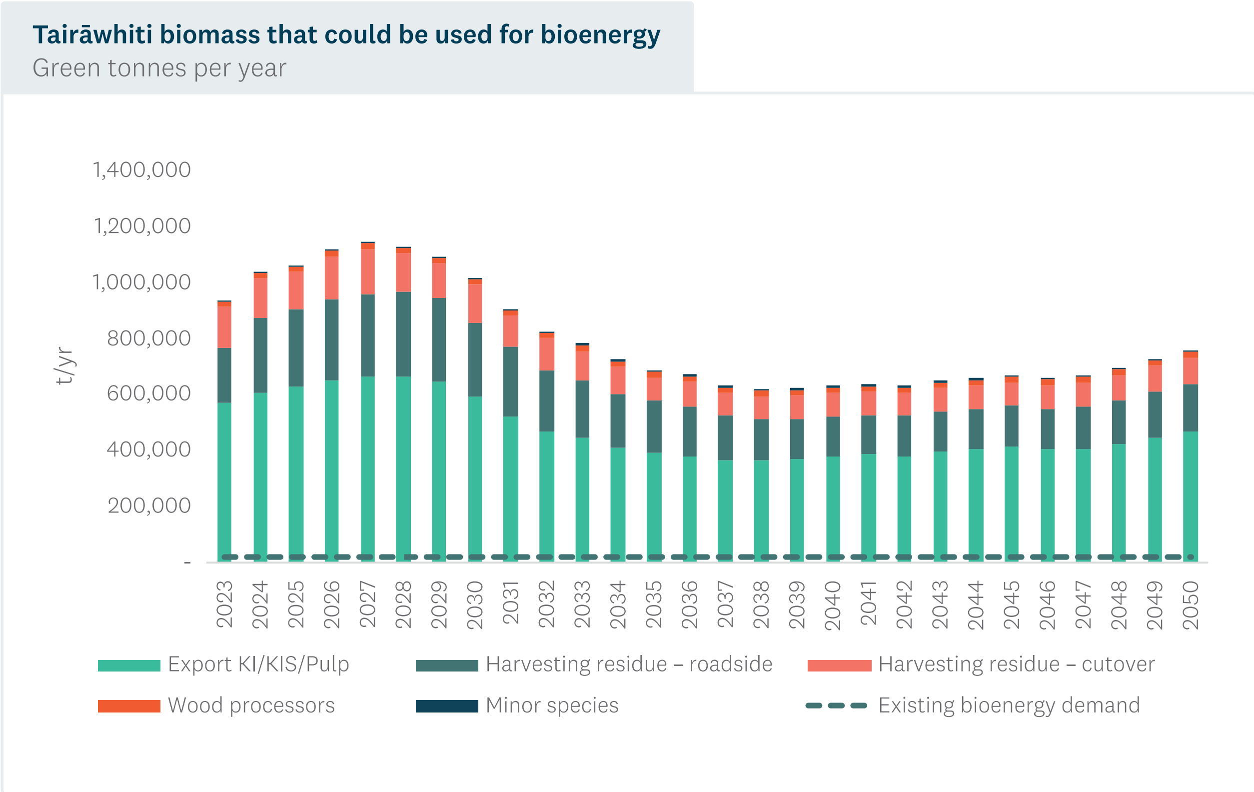


A more comprehensive view of resource availability, that combines the top-down and bottom-up analyses, reveals the potential volumes that could be available for bioenergy. This analysis:

- Considers the potential volumes arising as residues from processing sawlogs for the domestic market
- Removes volumes that are currently contracted to domestic timber markets
- Takes a more realistic approach to estimating the potential harvesting residues (binwood, salvage wood and cutover) than the theoretical potential used in Figure 7
- Overlays the existing demand for bioenergy, that already draws on these resources.

The resulting potential volume for bioenergy is shown in Figure 8.

Figure 8 – Assessment of available Tairāwhiti woody biomass that could be used for bioenergy.



The overall analysis of the Tairāwhiti region is summarised in Figure 9. Wood flows that could – in part or in full – be diverted to new bioenergy demand from process heat are shown in green.

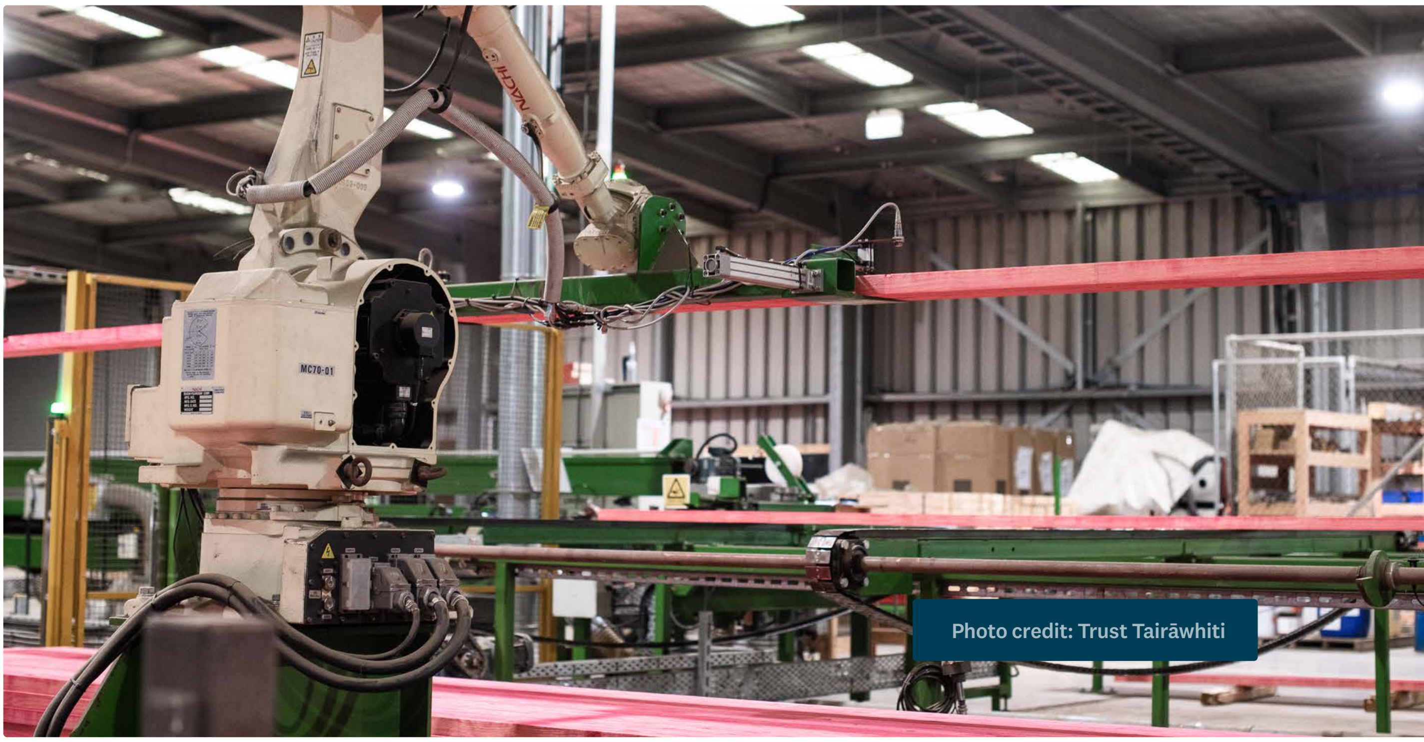
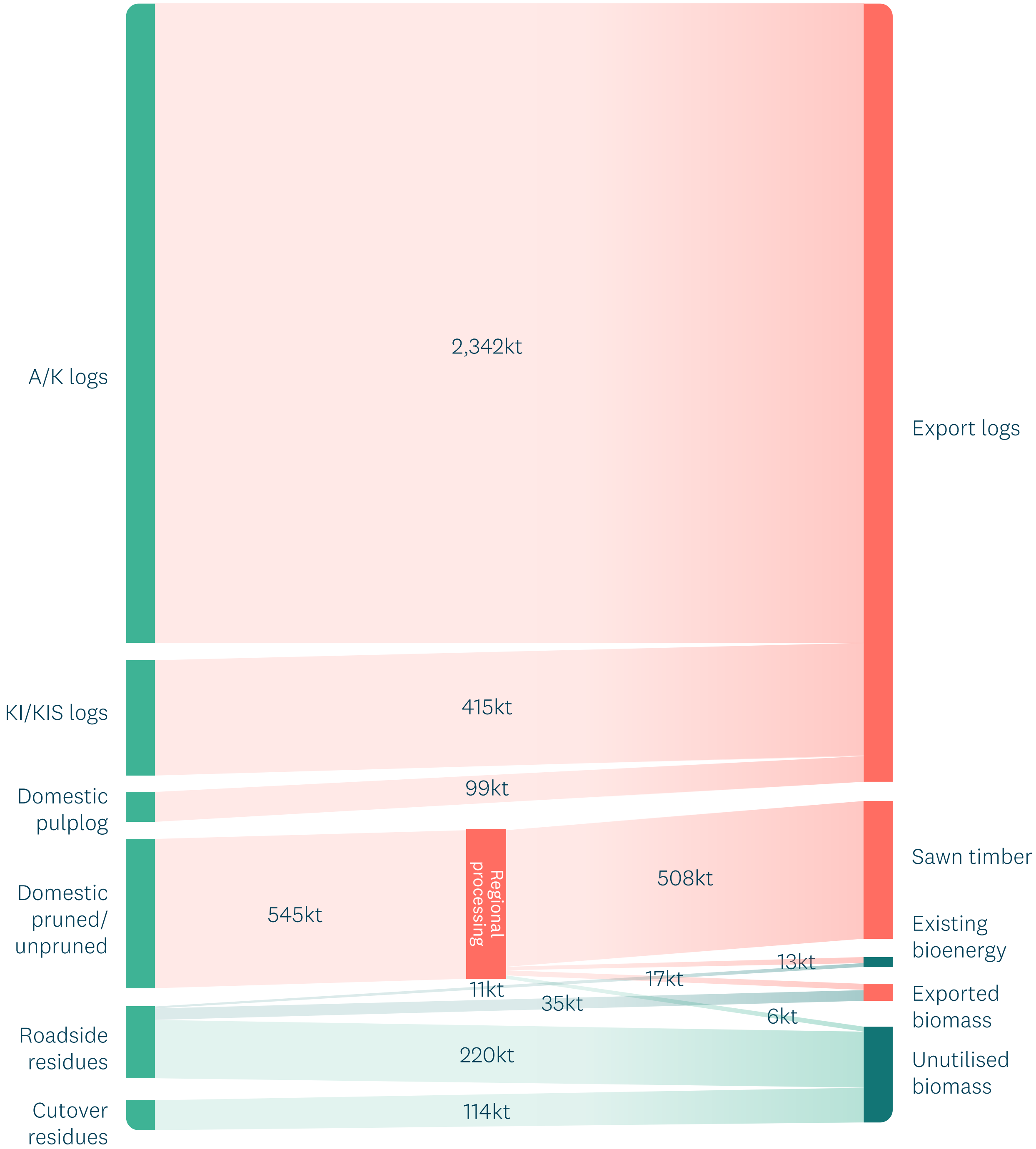


Figure 9 – Average wood flows over 15 years in Tairāwhiti region. Source: Ahika, Margules Groome

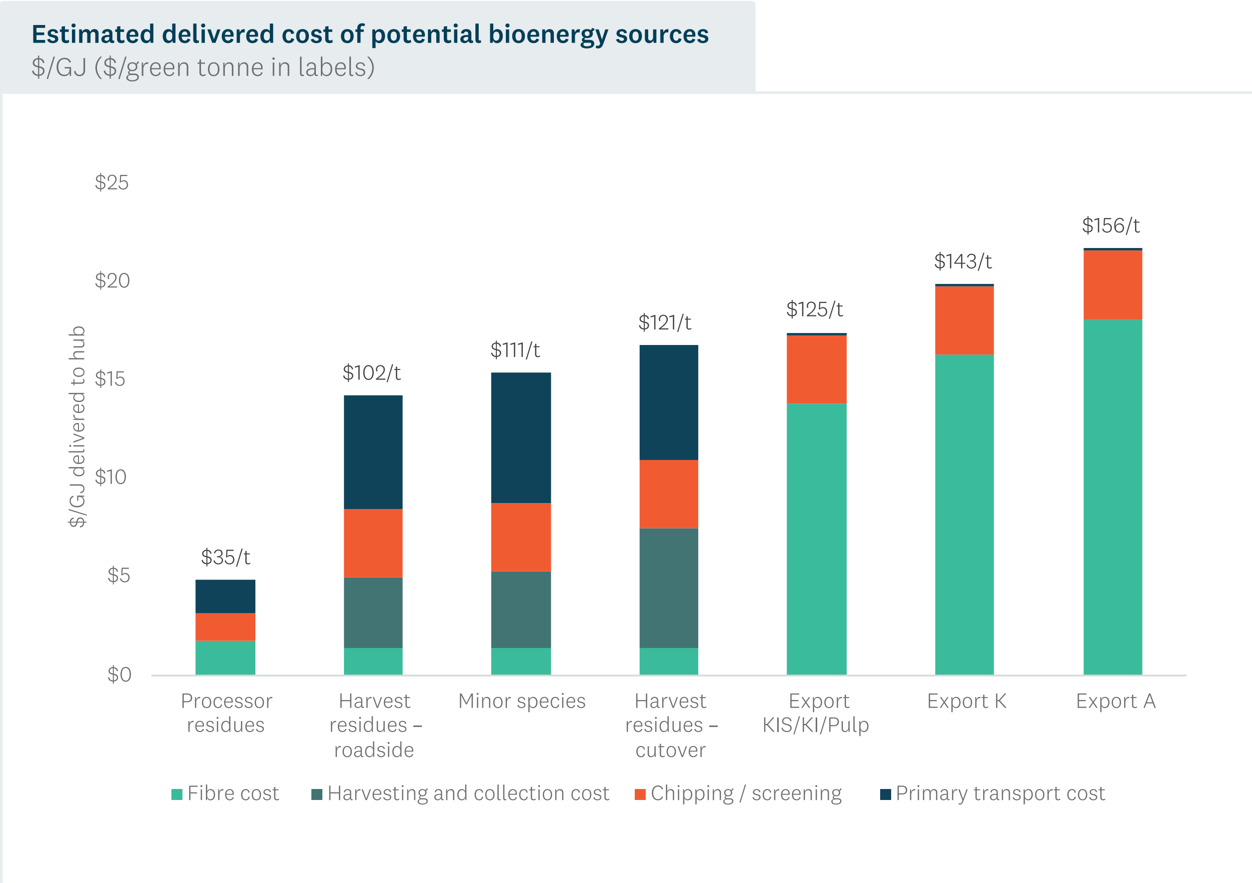


Overall, EECA estimates that, on average, around 3,780kt (27,100TJ) of wood could be harvested in the Tairāwhiti region over the next 15 years.

We note, however, that these are modelled estimates that do not account for exogenous factors such as weather or access to export markets. Weather events such as Cyclone Gabrielle in 2023 can have a significant impact on the region's ability to achieve the modelled peak wood availability.

The costs of accessing this biomass, and delivering it to a central processing hub, is presented in Figure 10.

Figure 10 – Estimated delivered cost of potential Tairāwhiti bioenergy sources. Source: Ahika, Margules Groome, average value 2024-2050



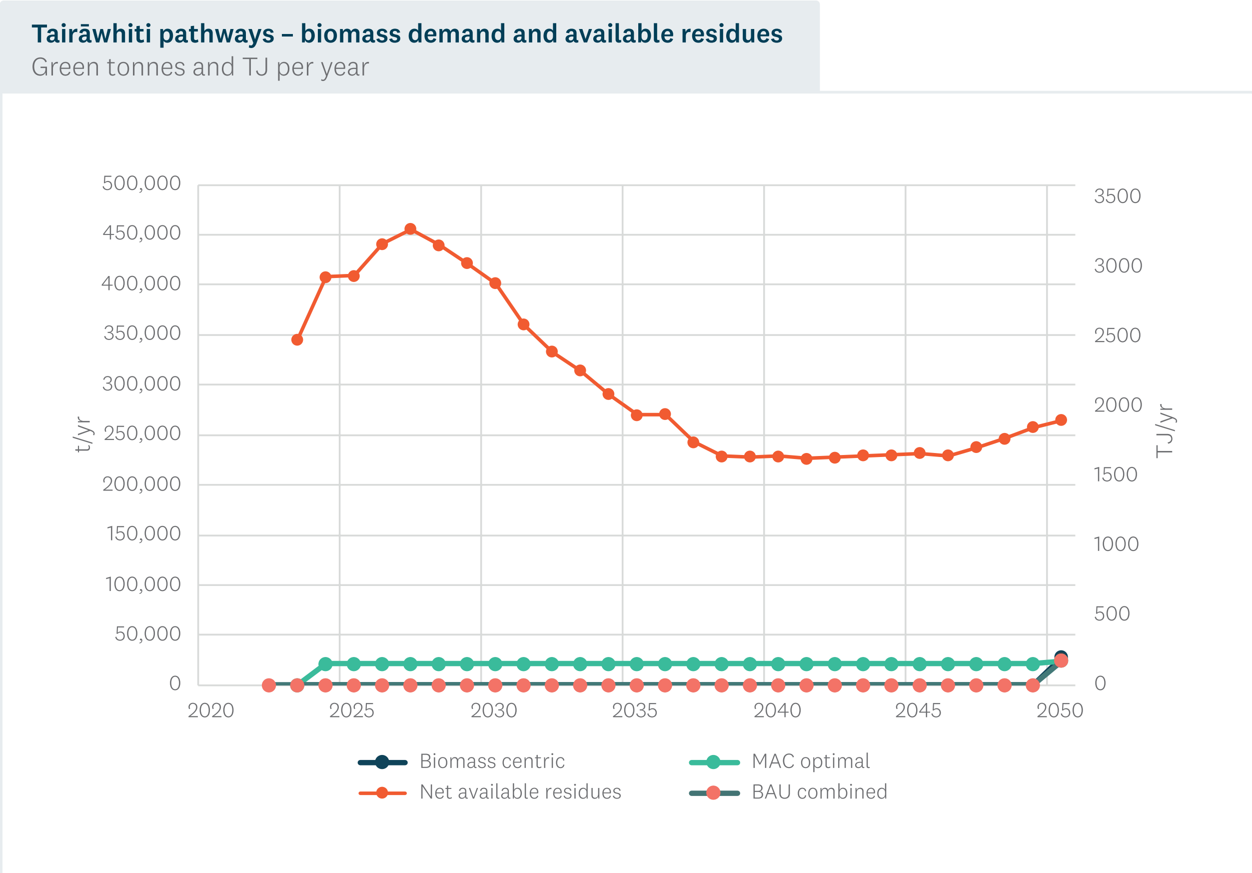
We retain export grade A and K logs in the analysis to represent 'scarcity values' if our scenario analysis below should indicate that other more plausible and sustainable sources of bioenergy are insufficient. We do not believe these are sustainable or practical sources of bioenergy.

6.1 Impact of pathways on biomass demand

Our pathway analysis below shows the growth in biomass demand (in both tonnes and TJ per year) arising from each of the pathways (Figure 11). The different pathways are broadly similar for the majority of the period considered in our analysis.

The pathways also show that the availability of harvesting and processing residues dwarfs this demand arising from each pathway, reflecting the significance of forestry in Tairāwhiti. In fact, it highlights that there may be potential for the Tairāwhiti region to export biomass to neighbouring regions, depending on transport costs. Note that Figure 11 only includes available residues from harvesting and wood processors, and excludes export KI, KIS, and Pulp grades that were shown earlier in Figure 8 as our intention is to not disrupt existing markets.

Figure 11 – Growth in biomass demand from Tairāwhiti pathways. Source: EECA



Based on the biomass cost figures provided above, our analysis suggests that, under the MAC Optimal pathway, the value of the residues required by local Tairāwhiti process heat users could be worth a total of $66M[8] (on a cost basis) over the period 2024-2050. In addition, given the significant surplus of residues that could be exported to other regions of the country, the value of the total available *supply* for these residues could be around $36M per year on average[9] through to 2050.

The degree to which these resources are used is a commercial decision, which would include a comparison with alternatives in terms of cost, feasibility, and desirability. Depending on the process heat users' preference of fuel type some types of resources may not be suitable. In some situations, higher cost pellets may be required, which in turn require higher-grade raw material.

8 In total, 4,100TJ over the period 2024-2050 at a cost of $16/GJ, not including costs associated with processing into dried wood chips or secondary transport from the hub to each process heat user.

9 Cost of 2,250TJ per year of biomass collected and delivered to a hub for $16/GJ, not including costs associated with processing into dried wood chips or secondary transport from the hub to each process heat user.

7 Electricity – network capacity and costs

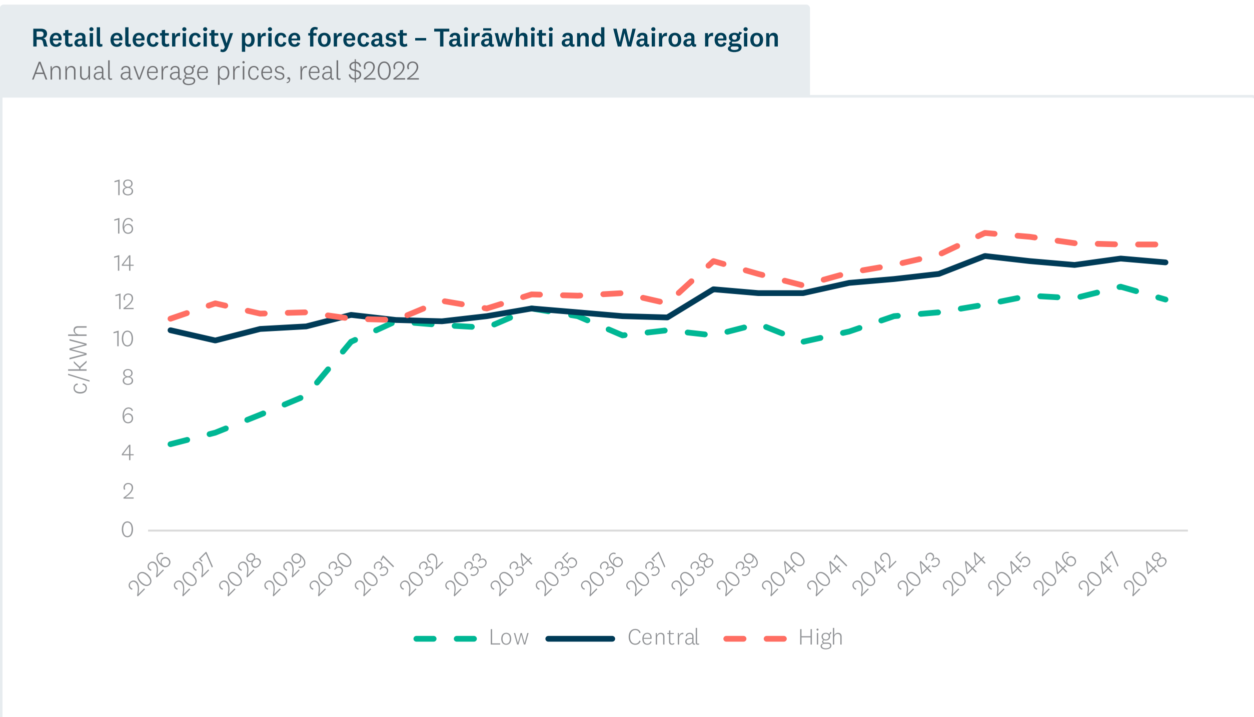
The availability of electricity to meet the demand from process heat users is largely determined at a national 'wholesale' level. Supply is delivered to an individual RETA site through electricity networks – a transmission network owned by Transpower, and a distribution network, owned by Firstlight (the local electricity distribution business, or EDB), that connects individual consumers to the boundary of Transpower's grid (known as grid exit points, or GXPs).

The price paid for electricity by a process heat user is made up of two main components:[10]

- A price for 'retail electricity' – the wholesale cost of electricity generation plus costs associated with electricity retailing
- A price for access to the transmission and distribution networks.

As shown in Figure 12, the forecast price of retail electricity (excluding network charges) is expected to increase (in real terms) from 10c/kWh in 2026 to 11c/kWh in 2037 under a 'central' scenario. However, different scenarios could see real retail prices higher or lower than that level by 2037.

Figure 12 – Forecast of real annual average electricity price for large commercial and industrial demand in the Tairāwhiti region. Source: EnergyLink



[10] Other smaller components include metering and regulatory levies.

Beyond 2037, this forecast sees more significant increases in electricity prices. However, it is difficult to predict pricing out to 2050. Some New Zealand market analyses suggest real prices may remain constant after 2035, due to the downward pressure on generation costs (especially solar and wind) as technology and scale increases. Other analyses see continued increases. We cannot be definitive about electricity prices 20 years into the future and suggest business cases consider a range of scenarios.

Firstlight charges electricity consumers for the use of the *existing* distribution network. In addition, where the connection of new electric boilers requires Firstlight to invest in distribution network upgrades, the cost of these can be paid through a mix of ongoing network charges, and an up-front 'capital contribution'. Firstlight maintains policies that govern the degree of capital contribution, and process heat users need to discuss these with Firstlight staff.

In addition, process heat users who connect new electric boilers directly to Transpower's grid will face equivalent transmission charges, as determined under the Transmission Pricing Methodology (TPM). Process heat users who connect to Firstlight's network will also face a share of these transmission costs, as determined by Firstlight's pricing methodology.

Transpower and the country's EDBs are experiencing an increasing need for investment as a result of continued population and business growth, distributed generation, and the electrification of transport[11] and process heat. The timing of demand growth (that drives this investment) is uncertain, which results in a challenging decision-making environment for network companies. As we recommend below, it is important that process heat users considering electrification keep Firstlight abreast of their intentions.

The primary considerations for a process heat user considering electrification are:

- The current 'spare capacity' (or headroom) and security of supply levels in Transpower and Firstlight's network to supply electricity-based process heat conversions.
- The cost of any upgrades required to accommodate the demand of a process heat user, taking into account seasonality and the user's ability to be flexible with consumption, as well as any other consumers looking to increase electricity demand on that part of the network.
- The timeframe for any network upgrades (e.g. procurement of equipment, requirements for consultation, easements and regulatory approval).
- The price paid for electricity to an electricity retailer (or direct to the wholesale market, for large sites), and any other charges paid by electricity consumers (e.g. use-of-network charges paid to Firstlight and Transpower).
- The level of connection 'security' required by the site, including its ability to tolerate any rarely occurring interruptions to supply, and/or the process heat user's ability to shift its demand through time in response to a signal from the network or the market. This flexibility could reduce the cost of connection, and the supply costs of electricity.

For the majority of sites considering electrification, the 'as designed' electrical system can likely connect the site with minor distribution level changes and without the need for substantial infrastructure upgrades. Our estimates suggest most of these minor upgrades would have connection costs under $1M (and many under $300,000) and experience connection lead times of less than 12 months.

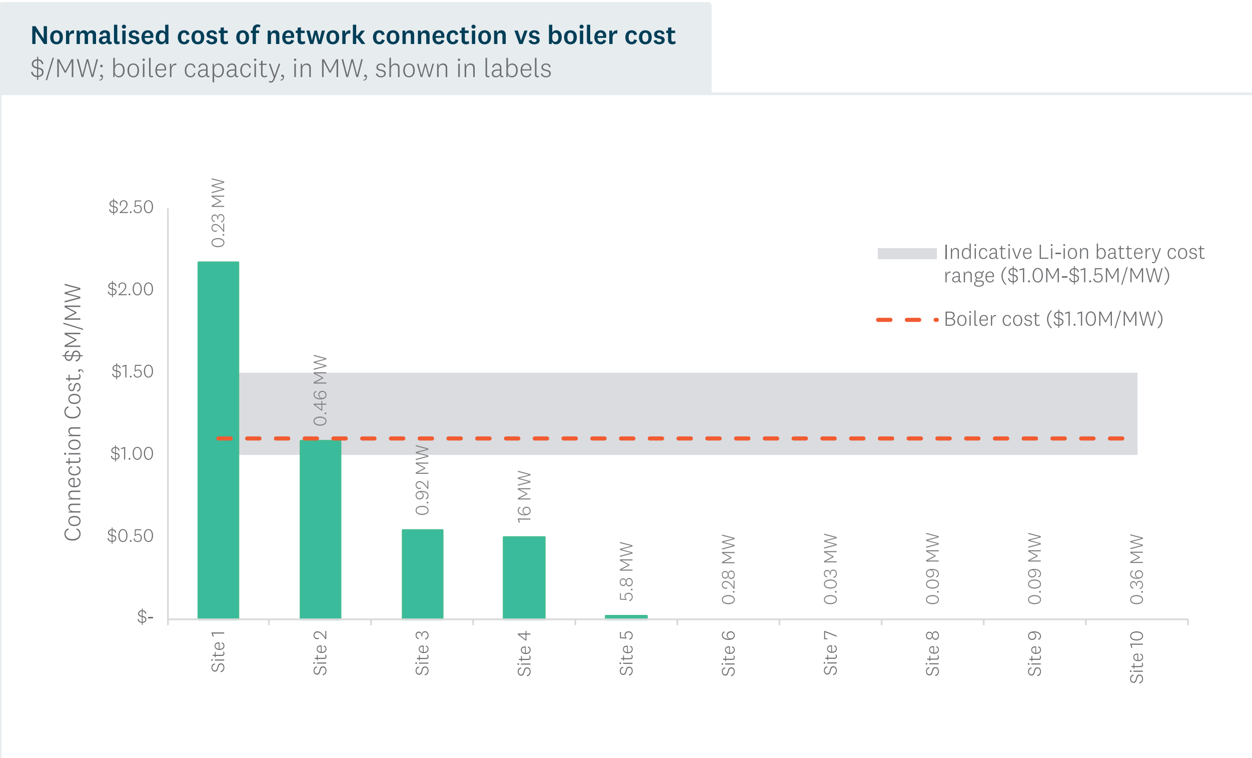
[11] While this RETA analysis only examines demand from process heat electrification, and public EV charging facilities where this information is available to EECA, this broader context of potentially rapid growth in demand is important to understanding the challenges associated with accommodating new load.

More substantial upgrades to the distribution network are required for one out of the 10 sites, with commensurately higher estimated costs (between $4.7M and $8M) and longer lead times (18 months).

The costs of connection can be a significant part of the overall capital cost associated with electrifying process heat demand, and process heat users need to engage with Firstlight to discuss connection options and refine the cost estimates we have included in this report.

Figure 13 shows each site's connection costs expressed in per-MW terms, i.e. relative to the capacity of the proposed boiler.

Figure 13 – Normalised cost of network connection vs boiler cost, Tairāwhiti RETA sites. Source: ElectroNet, EECA



The red dashed line in Figure 13 compares these per-MW costs to the estimated cost of an electrode boiler ($1.1M per MW). The figure shows not only a wide variety of relative costs of connecting electrode boilers, but that for three sites, the connection cost almost doubles the overall capital cost associated with electrification. We note that these costs represent the total construction costs of the expected upgrades. The degree to which process heat users need to make capital contributions to these upgrades depends on a variety of factors and needs to be discussed with Firstlight.

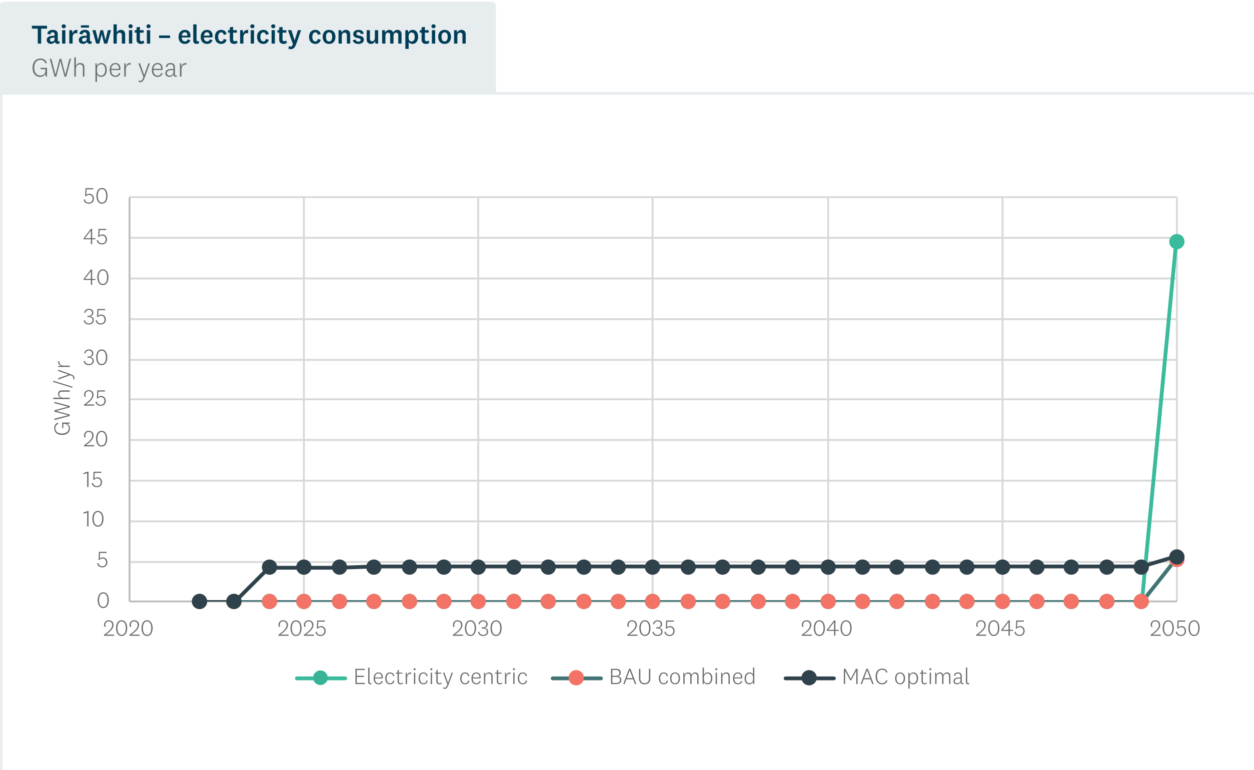
The timeframes for connection above assume these investments do not require Transpower or Firstlight to obtain regulatory approval. We note that if connections also rely on wider upgrades to the network, Firstlight would have to seek regulatory approval for these investments, which could also add to the timeline.

The costs provided above are indicative and appropriate for a screening analysis. They should be further refined in discussion with network owners, and the final costs in some situations will depend on the collective decisions of a number of RETA sites who require access to similar parts of the network.

7.1 Impact of pathways on electricity demand

Figure 14 shows the pace of growth in electricity consumption under the different pathways.

Figure 14 – Growth in Tairāwhiti electricity consumption from fuel switching pathways. Source: EECA

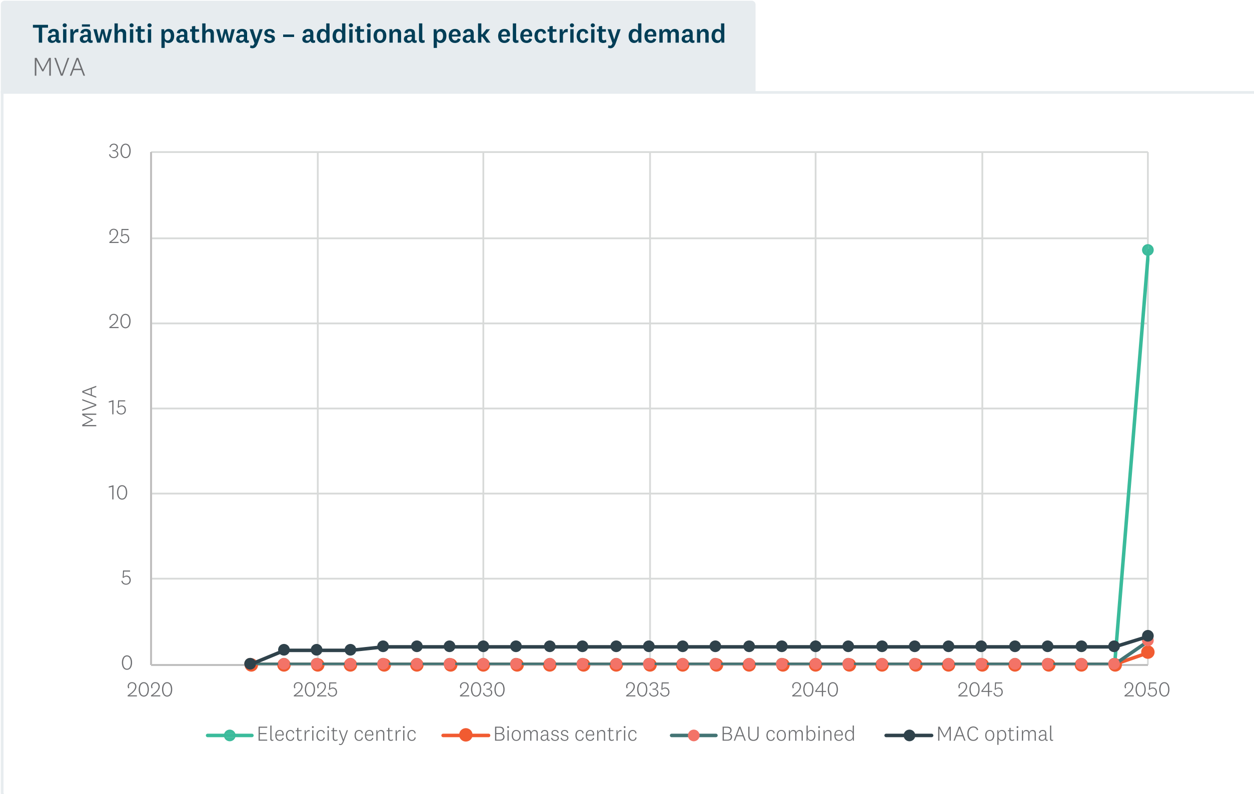


The Electricity Centric pathway, where all unconfirmed sites choose electricity, would result in a 25% increase in the annual consumption of electricity in the region, although this wouldn't occur until 2050 – an outcome that is the result of our pathway assumptions.[12] In the MAC Optimal and BAU Combined pathways, electricity consumption in Tairāwhiti grows minimally – by around 3%. In the MAC Optimal pathway, most of this growth would be observed in the very near term.

Firstlight's investments will be driven more by increases in peak demand than by growth in consumption over the year. Figure 15 shows how the different pathways affect peak demand across the three networks.

[12] Specifically, that unconfirmed projects must have completed their fuel switch decision by 2050, in line with New Zealand's net zero committment. In the fuel-centric pathways, these unconfirmed decisions are all assumed to happen during the year 2049.

Figure 15 – Potential Tairāwhiti peak electricity demand growth under different pathways.



Again, reflecting our assumptions behind the fuel-centric pathways, electricity demand in the Electricity Centric pathway significantly increases in 2050, reaching 24 MVA. In the more realistic MAC Optimal pathway, peak demand only increases by around 1MVA.

Table 5 shows how process heat connections potentially affect Firstlight's network investment between now and 2050. Note that these costs are only the upgrades required to accommodate each process heat user in isolation of demand growth from other process heat users, or wider growth from transport electrification or 'normal' growth. They do not include a share of the cost of any investments deeper in the network that might be triggered by this collective growth picture.

Table 5 – New connections (MW) and customer-driven connection costs under Electricity Centric and MAC Optimal pathways.

EDB	Electricity Centric pathway		MAC Optimal pathway	
	Connection capacity (MW)	Connection cost ($M)	Connection capacity (MW)	Connection cost ($M)
Firstlight Network	28.0	$1.7	1.4	$0.1

Table 5 shows Firstlight will experience 1.4MW of process heat-related electricity demand in the MAC Optimal pathway results. EECA's estimates suggest $1.7M will be spent connecting new process heat plant to the local networks.

Note that the network upgrade costs presented in Table 5 may not necessarily reflect the connection costs paid by RETA organisations, as they may be shared between Firstlight and the new process heat user. The degree of sharing ('capital contributions') depends on Firstlight's policies.

7.2 Opportunity to reduce electricity-related costs through flexibility

There is a potentially significant opportunity for process heat users considering electrification to reduce the costs of connection, and the total costs of purchasing electricity, by enabling flexibility in their consumption. This could take the form of being able to shift demand by a relatively small number of hours; allowing for a very small probability of interruption to their electricity supply; or maintaining a standby supply of fuel to be used in prolonged period of high electricity prices. The lowest cost way for flexibility to be enabled is for it to be designed into the electrification investment. Several service providers provide this expertise.

Photo credit: Trust Tairāwhiti

9 Recommendations

Our analysis has highlighted a range of opportunities and recommendations which would improve the overall process heat decarbonisation 'system'. Below we summarise key recommendations and opportunities.

Recommendations to improve the use of biomass for process heat decarbonisation in Tairāwhiti, and to develop the opportunity for exporting biomass to be used as bioenergy in other regions within the North Island:

- **More analysis, and potentially pilots, are conducted to understand costs, volumes, energy content (given the potential susceptibility of these residues to high moisture levels) and methods of recovering harvesting residues.**
- **Work with forest owners to understand the logistics, space and equipment required for harvesting residues. Similarly, work with Eastland Port to understand capacity requirements that would enable exporting forest residues outside the region.**
- **The development of an E-grade would greatly assist in the development of bioenergy markets. Further, clarity regarding the grade and value of biomass should help the development of an integrated model of cost recovery, achieving the best outcomes in terms of recovery cost and volumes.**
- **Undertake analysis to determine the impact of recovering harvesting residues on soil quality, carbon sequestration, the risk of forest fires and what actions may be required to offset this.**
- **Investigate and establish mechanisms to help suppliers and consumers within and between regions to see biomass prices and volumes being traded and have confidence in being able to transact at those prices for the volumes they require. These mechanisms could include standardised contracts which allow longer-term prices to be discovered, and risks to be managed more effectively.**
- **National guidance or standards should be developed, based on international experience tailored to the New Zealand context regarding the sustainability of different bioenergy sources, accounting for international supply chain effects, biodiversity, carbon sequestration and the risk of forest fires.**

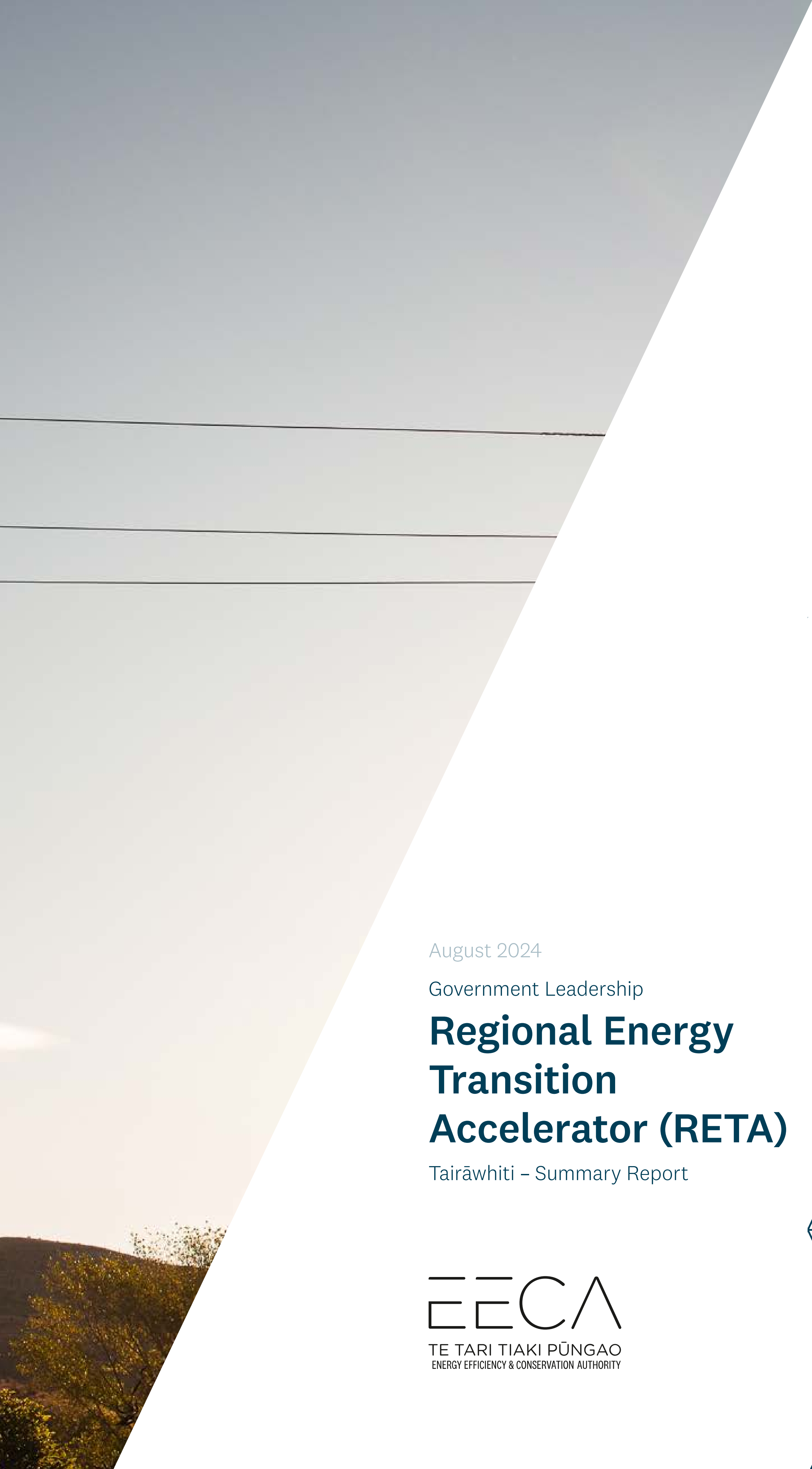
Recommendations to improve the use of electricity for process heat decarbonisation:

- **Firstlight to proactively engage on process heat initiatives to understand their intentions and help process heat users obtain a greater understanding of required network upgrades, cost, security levels, possibilities for acceleration, use of system charges and network loss factors. Firstlight should ensure Transpower, and other stakeholders (as necessary) are aware of information relevant to their planning at an early stage.**

- **Process heat users to proactively engage with Firstlight, keeping them abreast of their plans with respect to decarbonisation, and providing them with the best information available on the nature of their electricity demand over time (baseload and varying components); the flexibility in their heat requirements, which may allow them to shift/reduce demand, potentially at short notice in response to system or market conditions; the level of security they need as part of their manufacturing process, including their tolerance for interruption; and any spare capacity the process heat user has onsite. While the costs associated with network connection used in this report have been estimated based on the best publicly available information available to us, when process heat users provide the information above, it will allow EDBs to provide more tailored options and cost estimates.**
- **Firstlight to develop and publish clear processes for how they will handle connection requests in a timely fashion, opportunities for electrified process heat users to contract for lower security, and how costs will be calculated and charged, especially where upgrades may be accommodating multiple new parties (who may be connecting at different times).**
- **Firstlight and process heat users to engage early to allow Firstlight to develop options for how the process heat user's new demand can be accommodated, what the capital contributions and associated network charges are for the process heat user, and any role for flexibility in the process heat user's demand.**
- **To support this early engagement, Firstlight to explore, in consultation with process heat users and EECA, the development of a 'connection feasibility information template' as an early step in the connection process. This template would include a section for process heat users to provide key information to Firstlight, and a network section where Firstlight provides high-level options for the connection of the process heat user's new demand. Information provided by Firstlight would include the potential implications of each option for construction lead times, capital contributions, network tariffs and the use of the customer's flexibility.**
- **Retailers, flexibility aggregators, Firstlight and the Electricity Authority should assist by sharing information that helps process heat consumers model the benefits of providing flexibility.**
- **The electricity sector and process heat users should collaborate to explore and demonstrate flexibility. This is consistent with steps in the FlexForum's Flexibility Plan.**
- **Firstlight and retailers should ensure that the tariffs they offer process heat users are incentivising the right behaviour.**
- **EECA will expand future iterations of regional analyses to include transport as a decarbonising decision that will compete for electrical network capacity and biomass.**

Recommendations to assist process heat users with their decarbonisation decisions:

- **Ministries (such as Ministry for the Environment) need to work with reputable organisations to develop scenario-based carbon price forecasts that decarbonising organisations can incorporate into their business cases.**



August 2024

Government Leadership

Regional Energy Transition Accelerator (RETA)

Tairāwhiti – Summary Report

EECA
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