Government Leadership

Regional Energy Transition Accelerator (RETA)

Hawke's Bay – Summary Report

December 2024

TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

He kupu whakataki

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 Hawke's Bay Regional Energy Transition Accelerator (RETA) ki te poipoi i te māramatanga whānui ki ngā tūāoma e waiwai ana ki te whakapiki whāomoomo me te whakaheke i te tukuwaro i te rohe mā tētahi hātepe mātau, ruruku pai.

Kei te iho o tēnei tātaritanga ko te tūhura i te pitomata o Te Matau-a-Māui mō te papatipu koiora, ka hua ake nei 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 i te rohe, me te tohu hoki i ngā arawātea me ngā taupā motuhake o Te Matau-a-Māui mō ngā mahere mahi hei whakawhiti i te pūngao i te rohe.

E whakaatu ana tēnei pūrongo i ngā ara whakaheke waro pōkākā huhua, e whakatauira ana i tā ngā whakatau tōpū a ngā kaiwhakamahi huhua ārahi i ngā rautaki mahi tahi ki ngā wero tūāhanga nō te tirohanga tukunga.

Ka whakaatu i ngā angamahi whakatau kanorau hei whakaaro ake pea mā ngā rōpū whakahaere hātepe pōkākā i a rātou ka kōwhiri i ngā kora kāinga rua, i muramura mai ai ngā hua huhua ka taea. Ka hua ake hoki i te popono papatipu koiora ko ētahi ara mahi i te rohe.

Mā te tirohanga ā-rohe e taea ai tētahi arotakenga whānui o ēnei tūāhuatanga, e mātau ake ai ngā whakatau a ngā kiritaki hātepe pōkākā, tuku kora anō hoki. 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 pūngao wera o te rohe, i te taha o ngā aromatawai tuku ngao whakahou.

E whanake ana te hōtaka RETA i ngā whāomoomotanga ā-pūngao, whakawhititanga kora anō hoki kua whakaterea kētia i te rohe. He huhua ngā pakihi i Te Matau-a-Māui kua whai kē i tētahi ara puhanga-iti, ā, kua whakamaheretia ki EECA. Koia ko te tauira o ngā mahi e taea ana, waihoki, he nui te wāhi ki ā rātou mahi me tō rātou ngākaunui ki te tuari i tā rātou i ako ai ki ētahi atu, i tēnei hātepe.

I hua ake ngā mōhiotanga i runga i te āta mahi tahi ki te umanga o Hawke's Bay Regional Economic Development, ngā EDB Firstlight Networks o te takiwā, Firstlight me Unison, 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 whakahaere 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 authoritative information alongside strong regional collaboration.

The Hawke's Bay Regional Energy Transition Accelerator (RETA) is designed to foster a comprehensive understanding of the steps necessary for increasing efficiency and lowering emissions in the region through a well-informed and coordinated approach.

Central to the analysis is the exploration of Hawke's Bay'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 as well as identifying unique, Hawke's Bay-specific opportunities and barriers for regional energy transition roadmaps.

This report illustrates various process heat decarbonisation pathways, demonstrating how the collective decisions of multiple users can lead to shared approaches to infrastructure challenges from a supply perspective.

It presents diverse decision-making frameworks that process heat organisations might consider when choosing alternative fuels, highlighting the potential range of outcomes. The potential demand for biomass will also create job opportunities in the region.

A regional view enables a comprehensive evaluation of these factors, allowing process heat consumers and fuel suppliers to make more informed decisions. 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.

The RETA programme builds on energy efficiency and fuel switching work already happening in the region. Several businesses in Hawke's Bay 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 Hawke's Bay Regional Economic Development agency, local EDBs Centralines, Firstlight and Unison, 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 look forward to continuing to support the region as we work together to unlock its potential.

Dr Marcos Pelenur
Chief Executive, 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 Hawke's Bay region
- Hawke's Bay Regional Economic Development Agency
- Local Electricity Distribution Businesses Centralines, Firstlight and Unison
- 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:

- **Lumen** – process heat demand-side assessment
- **Whirika and Margules Groome** – biomass availability analysis
- **Ergo Consultants** – electricity network analysis
- **EnergyLink** – electricity price forecast
- **Sapere Research Group** – report collation, publication, and modelling assistance

Photo credit: Adobe Stock

Several businesses in Hawke's Bay already have a low-emissions pathway mapped out with EECA.

Dr Marcos Pelenur, Chief Executive, EECA

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Hawke's Bay is the focus for New Zealand's eleventh Regional Energy Transition Accelerator (RETA).

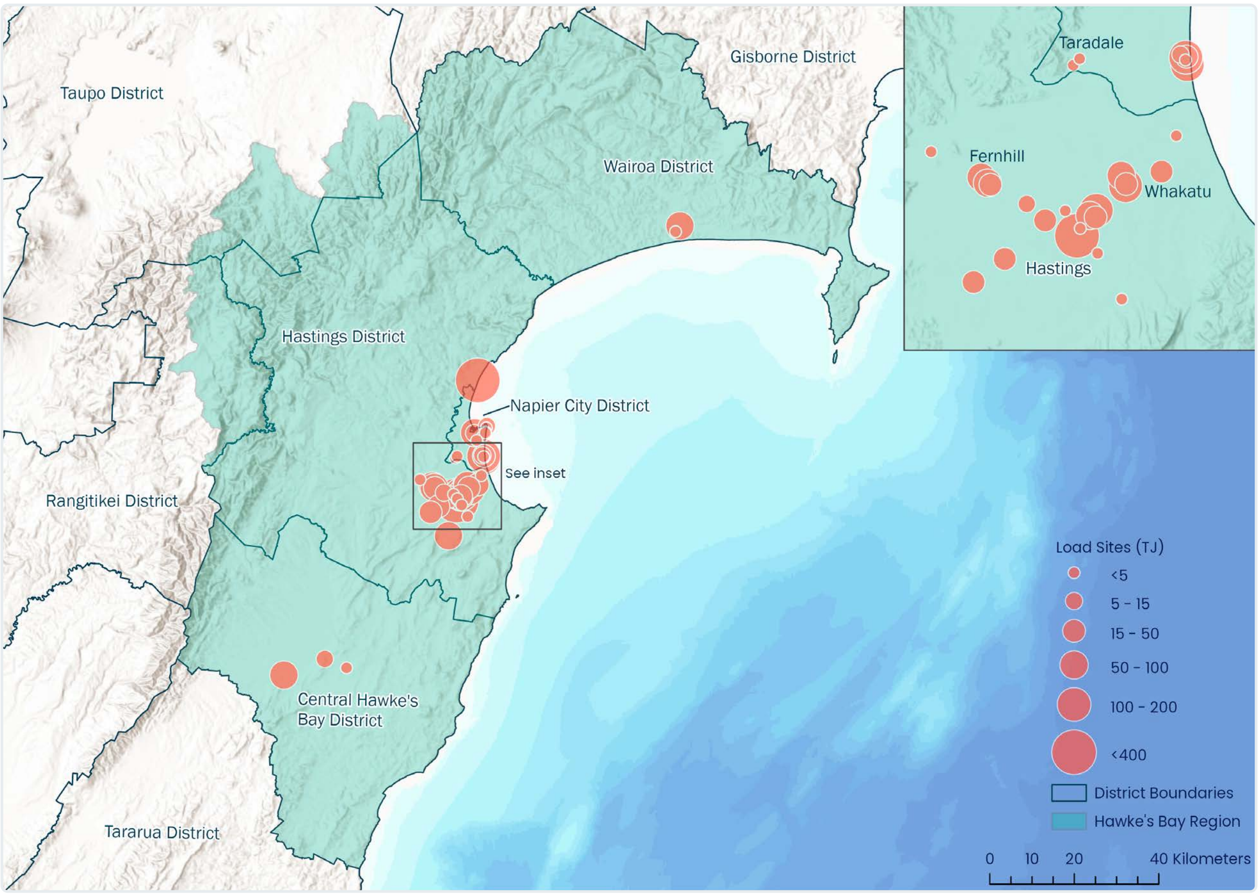
4 Hawke's Bay overview

This report provides a snapshot of the planning phase of the Regional Energy Transition Accelerator (RETA) prepared for the Hawke's Bay region (shown in Figure 1).

The report brings together information on the demand for fossil fuels for process heat in Hawke's Bay, along with information on electricity network and biomass availability in the region, in order to:

- Provide process heat users with coordinated information specific to the region that can be used to make more informed decisions on fuel choice and timing.
- Improve fuel supplier confidence to invest in supply side infrastructure (including electricity and biomass).
- Surface issues, opportunities, and recommendations.

Figure 1 – Map of area covered by the Hawke's Bay RETA



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

Our analysis of energy requirements in Hawke's Bay uses year 2022 as baseline. We note that since then, constraints in gas supply have affected prices for natural gas, and as a result have altered natural gas consumption patterns.[1] There are 44 sites covered in the report, spanning the meat, industrial and commercial sectors.[2] These sites have fossil-fuelled process heat equipment larger than 500kW and include sites for which EECA has detailed information about their potential decarbonisation pathway.[3] The sites, shown in Figure 1 by location and size of their annual energy requirements, collectively consumed 2,117TJ of process heat energy, almost exclusively in the form of fossil gas, and produced 121kt pa of carbon dioxide equivalent (CO_2e) emissions.

Table 1 – Summary of Hawke's Bay RETA sites fossil fuel process heat demands and emissions

Sector	Sites	Thermal capacity (MW)	Thermal fuel consumption (GWh/yr)	Thermal fuel consumption (TJ/yr)	Thermal fuel emissions ($ktCO_2$-e/yr)
Industrial	21	176	462	1,665	94
Commercial	23	57	126	452	27
Total	**44**	**233**	**588**	**2,117**	**121**

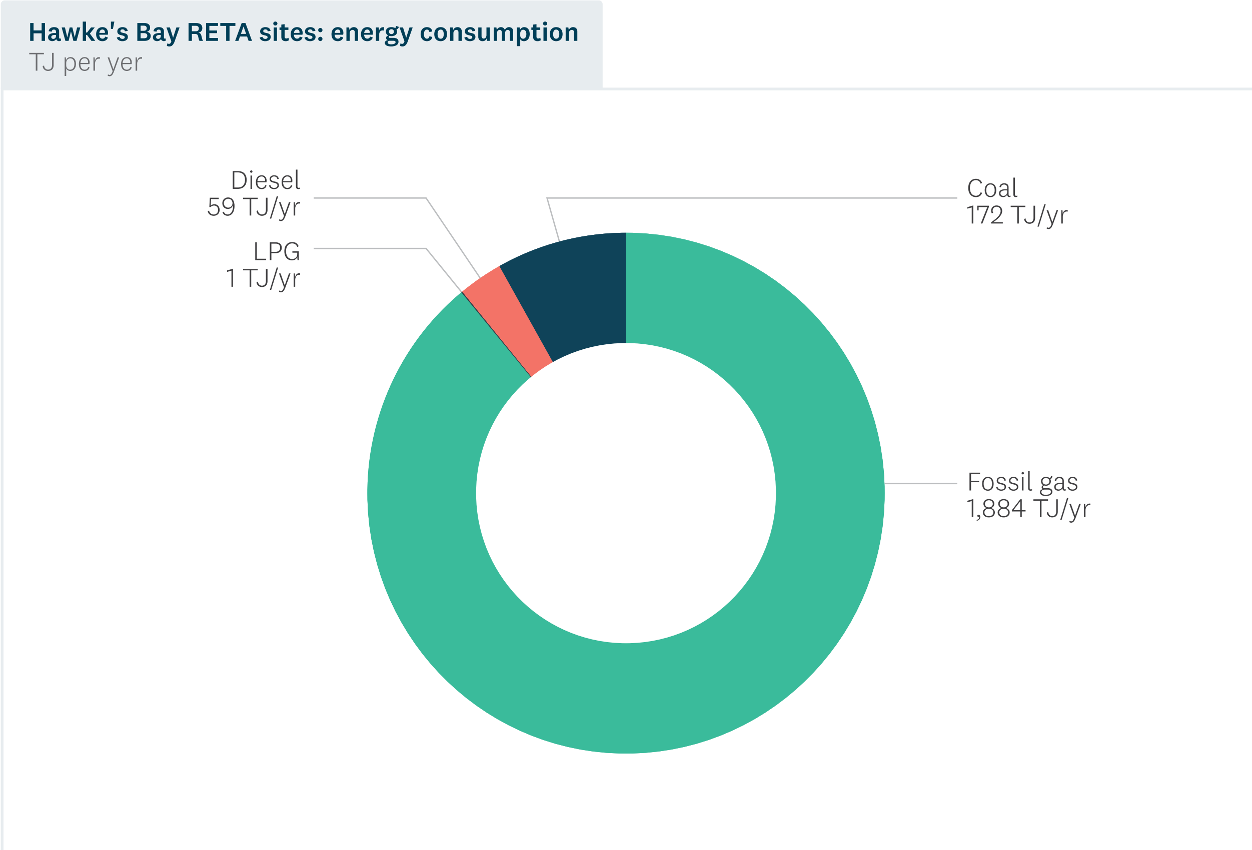
Photo credit: Meridian

1 MBIE notes that gas production forecast is expected to fall below demand https://www.mbie.govt.nz/about/news/gas-production-forecast-to-fall-below-demand.

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

3 For many large process heat users in New Zealand, process heat decarbonisation opportunities have been captured in an EECA Energy Transition Accelerator (ETA) report.

Figure 2 – 2022 fuel consumption for process heat. Source: EECA



The objective of the Hawke's Bay RETA is to demonstrate pathways that 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).
- Heat pumps (for heat requirements <100°C, which may be integrated with heat recovery).
- Fuel switching (from fossil-based fuels to a low-emissions source such as biomass and/or electricity).

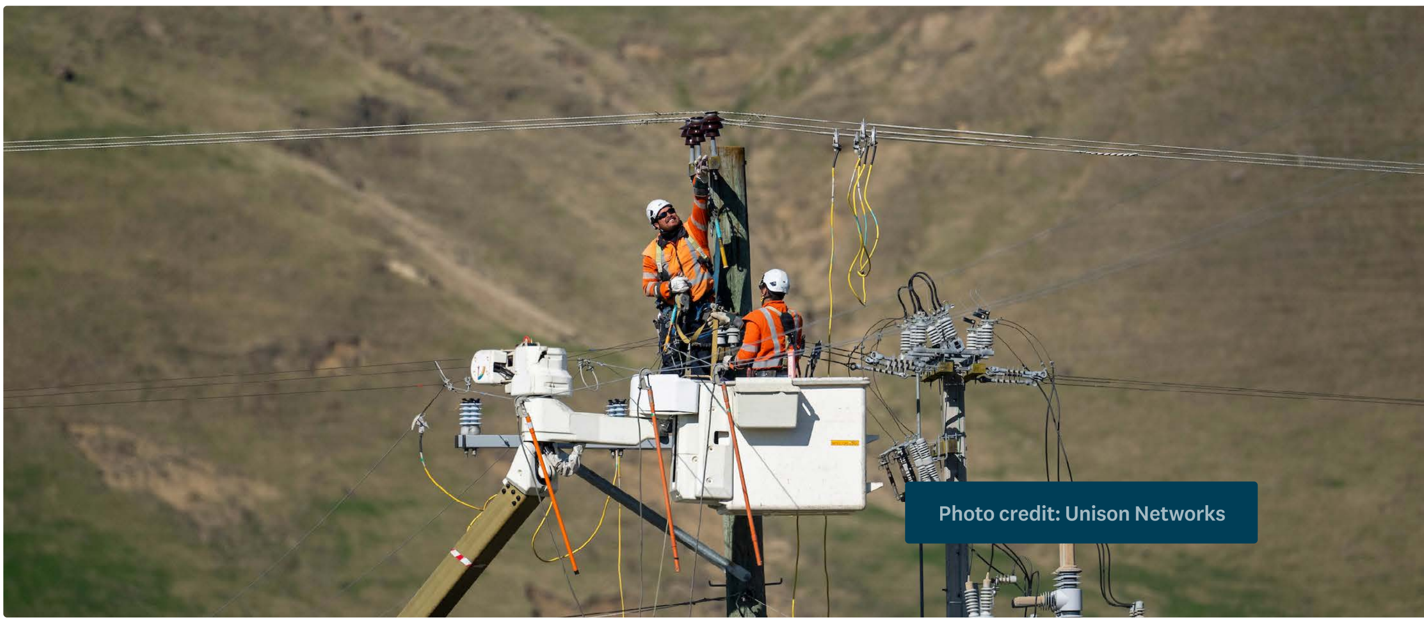
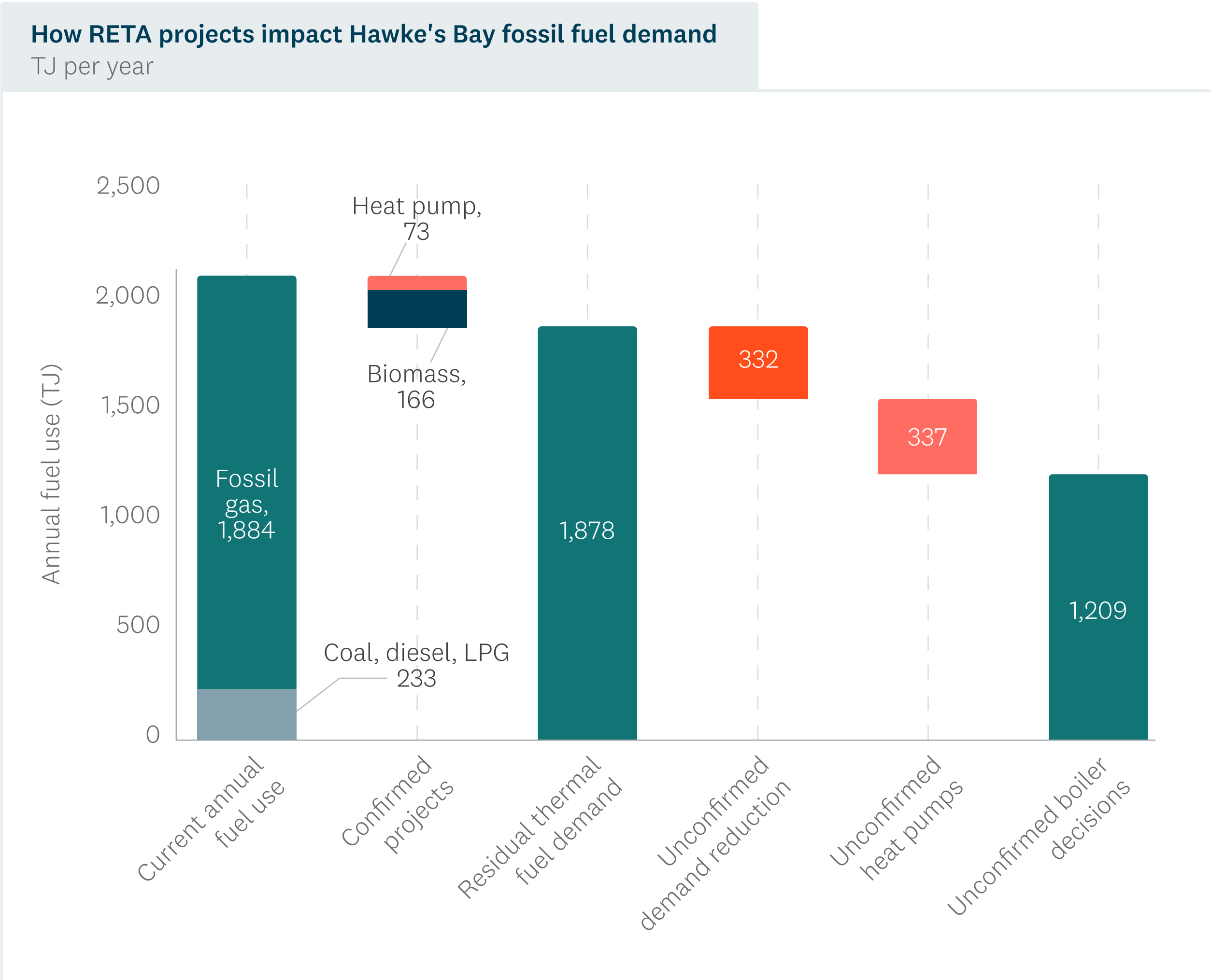


Photo credit: Unison Networks

Figure 3 illustrates the potential impact on Hawke's Bay's regional fossil fuel demand of process heat demand reduction and fuel switching decisions for those investments that are already confirmed and those where decisions are yet to be made.

Figure 3 – Potential impact of fuel switching on fossil fuel usage, 2022–2050. Source: EECA



The analysis shows that there is around 1,880TJ per year of residual fossil fuel thermal demand in Hawke's Bay. While demand could be reduced by 330TJ per year, with a further 337TJ per year of demand being met by heat pumps, it is estimated that around 1,210TJ per year used in boilers would need to be replaced by biomass or electricity to fully decarbonise process heat in Hawke's Bay (referred to as unconfirmed fuel switch decisions).

The RETA analysis looks at the pathways by which these fuel switches could occur, considering both biomass and electricity as potential fuel sources. EECA's assessment focuses 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 capacity of the networks to deliver the fuel to the process heat users' sites. This assessment is unique to the Hawke's Bay region and has been used to simulate possible fuel switching pathways 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

Across the 44 sites considered in this study, there are 97 individual projects spanning the three categories discussed above – demand reduction, heat pumps and fuel switching.

Table 2 shows the current status of the Hawke's Bay RETA process heat projects. Four have been confirmed by the process heat organisation (i.e. the organisation has committed to the investment and funding allocated). The other 93 projects are unconfirmed (i.e. in that the process heat organisation is yet to commit to the final investment).

Table 2 – Number of projects in Hawke's Bay RETA: Confirmed vs Unconfirmed. Source: Lumen, EECA.

Status	Demand reduction	Heat pump fuel switch	Boiler fuel switch	Total
Confirmed	0	2	2	4
Unconfirmed	40	29	24	93
Total	**40**	**31**	**26**	**97**

Demand reduction and thermal efficiency are key parts of the RETA approach and, in most cases, enable (and help 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.

Table 3 shows the expected fuel demands remaining at each site after any demand reduction projects and/or heat pump projects are accounted for. The table presents biomass demands both in TJs and green tonnes (55% moisture content) and reports the peak demand from the boiler, should it convert to electricity.

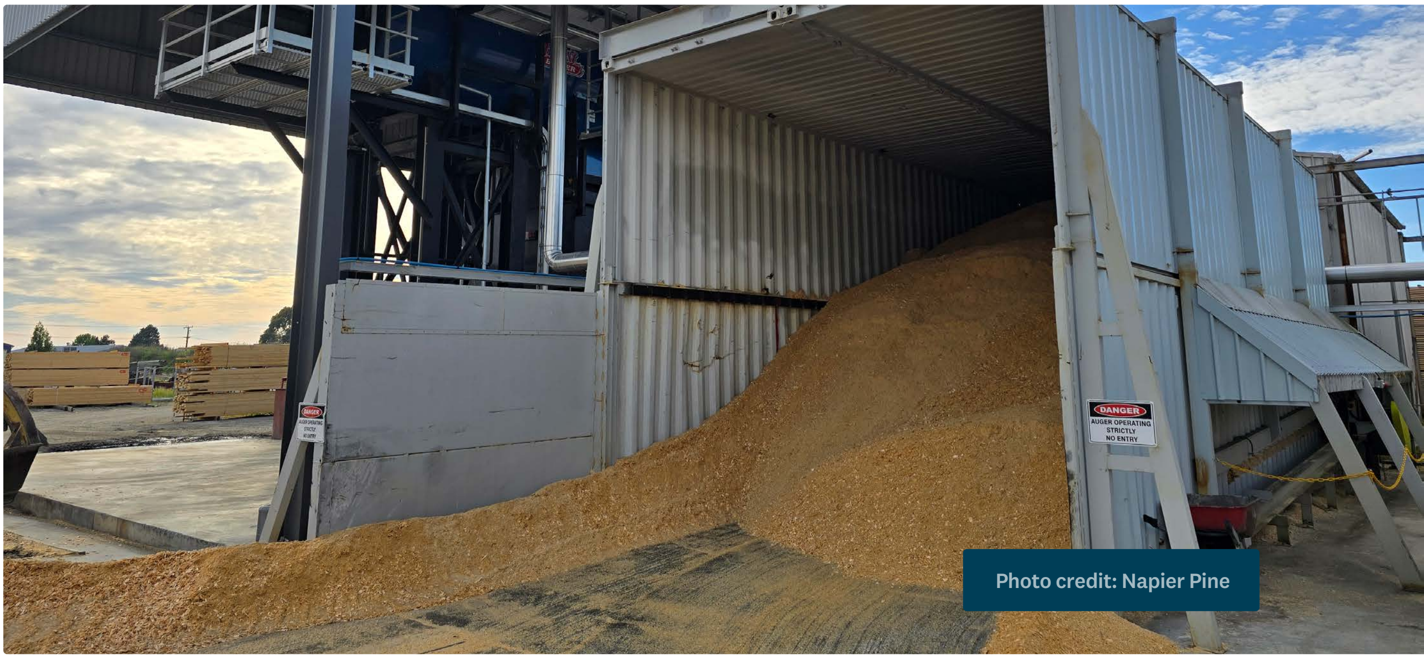


Photo credit: Napier Pine

Table 3 – Summary of Hawke's Bay RETA sites with fuel switching requirements

Site name	Industry	Project status	Bioenergy required		Electricity peak demand
			TJ/yr	kt/yr	
Bremworth Napier	**Industrial**	**Confirmed**			**1.04**
AFFCO Wairoa	**Industrial**	**Confirmed**	**70.88**	**9.87**	
Napier Pine	**Industrial**	**Confirmed**	**95.62**	**13.31**	
WoolWorks Awatoto	Industrial	Unconfirmed	**97.92**	**13.63**	4.04
WoolWorks Clive	Industrial	Unconfirmed	**33.67**	**4.69**	4.36
Hawk Group Whakatū	Industrial	Unconfirmed	**93.67**	**13.04**	3.07
Webster's Hydrated Lime Company Havelock North	Industrial	Unconfirmed	**70.45**	**9.81**	5.15
Silver Fern Farms Pacific	Industrial	Unconfirmed	**55.91**	**7.78**	3.28
Silver Fern Farms Tākapau	Industrial	Unconfirmed	**83.20**	**11.58**	6.70
Cedenco Foods Fresh Fields	Industrial	Unconfirmed	**40.75**	**5.67**	10.82
Hawke's Bay Fallen Soldiers Memorial Hospital	Commercial	Unconfirmed	**5.08**	**0.71**	0.95
Heinz Watties Limited King Street (Stage 1)	Industrial	Unconfirmed	**233.71**	**32.53**	11.11
Heinz Watties Limited King Street (Stage 2)	Industrial	Unconfirmed	**49.57**	**6.90**	22.44
Pan Pac Whirinaki	Industrial	Unconfirmed	**285.73**	**39.77**	
Heinz Watties Limited Tomoana	Industrial	Unconfirmed	**89.86**	**12.51**	8.63
Hawke's Bay Protein	Industrial	Unconfirmed	**111.71**	**15.55**	9.12
Profruit (2006) Limited Hastings	Industrial	Unconfirmed	**25.52**	**3.55**	1.25
Lowe Corporation Hastings Tannery	Industrial	Unconfirmed	**29.96**	**4.17**	4.10
Russell Asphalt	Industrial	Unconfirmed	**30.38**	**4.23**	5.93
McCain Foods Hastings	Industrial	Unconfirmed	**38.56**	**5.37**	6.27
Tumu Timbers Limited	Industrial	Unconfirmed	**18.36**	**2.56**	0.78
Higgins Napier	Industrial	Unconfirmed	**2.97**	**0.41**	0.92
Higgins Port of Napier	Industrial	Unconfirmed	**9.74**	**1.36**	4.11
Hawke's Bay Regional Prison	Commercial	Unconfirmed	**15.01**	**2.09**	4.48
Humes Hastings	Industrial	Unconfirmed	**3.74**	**0.52**	0.49

Site name	Industry	Project status	Bioenergy required		Electricity peak demand
			TJ/yr	kt/yr	
ZIWI Limited Napier	Industrial	Unconfirmed	**6.90**	**0.96**	0.91
Diamond Apparelmaster Hastings	Industrial	Unconfirmed	**34.88**	**4.86**	3.84
Scenic Hotel Te Pania	Commercial	Unconfirmed			**0.09**
Napier Health Centre	Commercial	Unconfirmed			**0.09**
Wairoa Hospital	Commercial	Unconfirmed			**0.21**
Splash Planet	Commercial	Unconfirmed			**0.14**
Havelock North Village Pool	Commercial	Unconfirmed			**0.06**
Clive War Memorial Pool	Commercial	Unconfirmed			**0.03**
AFFCO Napier	Industrial	Unconfirmed			**0.23**
MTG Hawke's Bay	Commercial	Unconfirmed			**0.11**
Liqueo Bulk Storage Port of Napier	Industrial	Unconfirmed			**0.31**
Fresh Meats NZ Limited Napier	Industrial	Unconfirmed			**0.18**
William Colenso College	Commercial	Unconfirmed			**0.23**
Progressive Meats Limited Hastings	Industrial	Unconfirmed			**0.19**
Central Hawke's Bay College	Commercial	Unconfirmed			**0.20**
Eastern Institute of Technology Hawke's Bay Campus	Commercial	Unconfirmed			**0.41**
Oceania Healthcare Gracelands	Commercial	Unconfirmed			**0.13**
Oceania Healthcare Eversley	Commercial	Unconfirmed			**0.08**
Oceania Healthcare Ātawhai	Commercial	Unconfirmed			**0.09**
Pukeora Estate Limited Waipukurau	Industrial	Unconfirmed			**0.41**

Notes: Blue shading indicates confirmed projects; green highlighting indicates the preferred fuel option according to a commercial decision making criteria explained below.

Three sites have already confirmed their fuel of choice (shaded in blue), representing a demand for 1.04 MW of electricity in one site and 166 TJ of biomass in the remaining two sites.

5 Simulated decarbonisation pathways

There are a range of decision criteria that individual organisations may apply to determine the timing of their decarbonisation investments. Decisions are impacted by available finance, product market considerations, strategic alignment and other factors.

Rather than attempting to model all these factors for individual process users, we have developed a range of different scenarios, referred to as decarbonisation pathways, that reflect different decision-making criteria that process heat users (who have not confirmed their fuel choice) might use.

Two pathways represent ‘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’ (MAC), to quantify the cost to the organisation of decarbonising their process heat, expressed in dollars per tonne of CO_2e reduced by the investment. A MAC allows us to determine what the lowest cost investment is (electricity or biomass), as well as the best timing of the investment. The timing is chosen to be 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 used in the analysis are as follows:

Pathway name	Description
Biomass Centric	All unconfirmed site fuel switching decisions proceed with biomass, where possible, in 2049 (in line with New Zealand's target of net zero greenhouse gas emissions by 2050 in the Climate Change Response (Zero Carbon) Amendment Act.
Electricity Centric	All unconfirmed fuel switching decisions proceed with electricity, where possible, in 2049 (in line with New Zealand's target of net zero greenhouse gas emissions by 2050 in the Climate Change Response (Zero Carbon) Amendment Act
BAU Combined[4]	All unconfirmed fuel switching decisions (i.e. biomass or electricity) are determined by the lowest MAC value for each project and take place in 2049 (i.e the same timing as for the fuel-centric pathways).
MAC Optimal	Each site switches to a heat pump or 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 10-year rolling average of the future NZ Treasury's shadow carbon prices. If the MAC does not drop below the 10-year rolling average before 2049, then the timing based on the fuel-centric pathway is used.

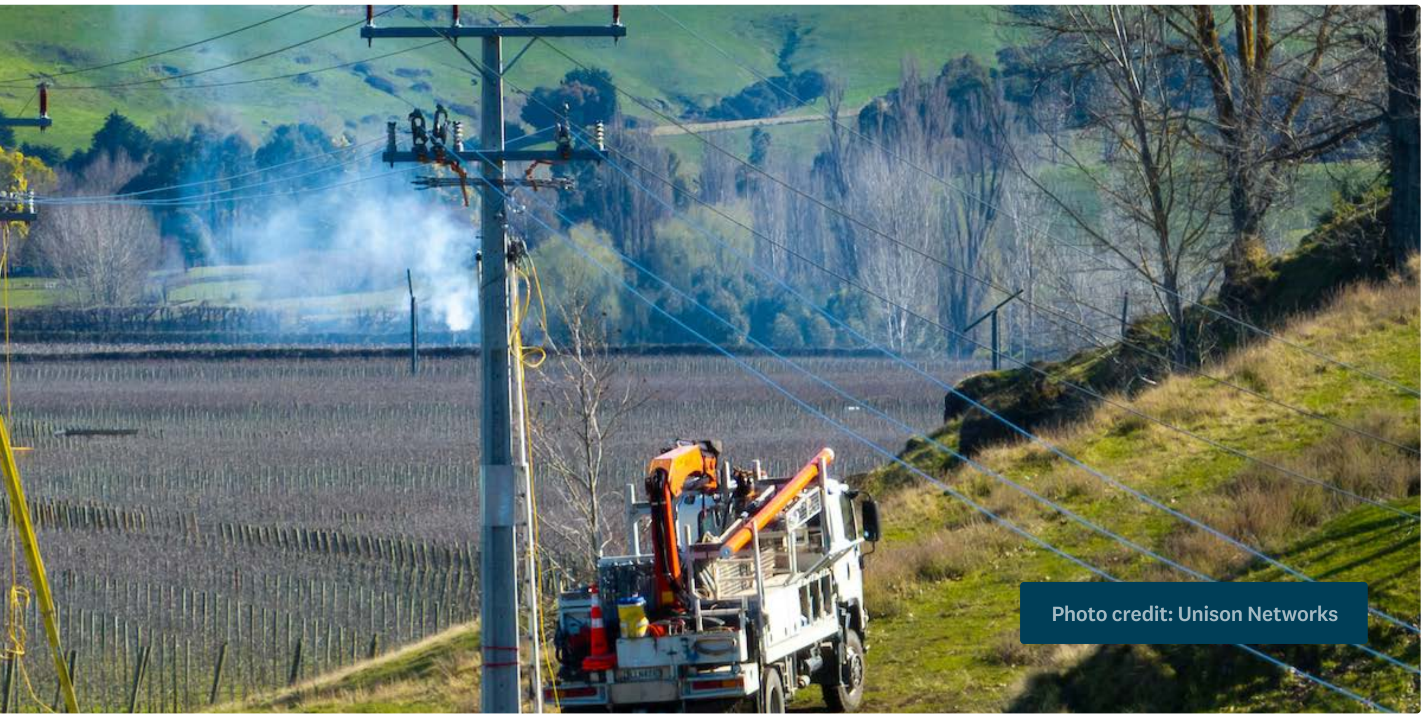


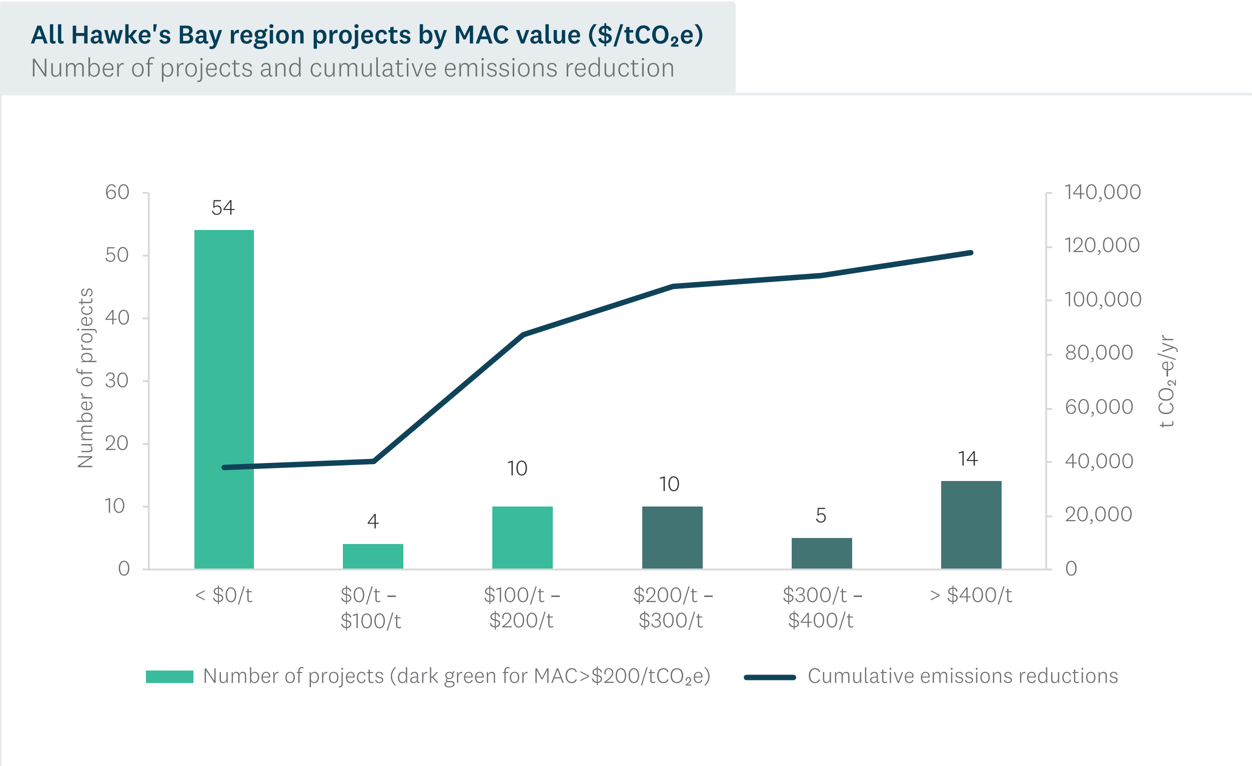
Photo credit: Unison Networks

4 We acknowledge that some projects are likely to go ahead earlier in line with the National Direction for GHGs from Industrial Process Heat, which requires emissions plans submitted with resource consents to include an assessment of any 'technically feasible and financially viable lower-emissions alternatives.' https://environment.govt.nz/assets/publications/climate-change/National-Direction-for-Greenhouse-Gas-Emissions-from-Industrial-Process-Heat-Industry-Factsheet.pdf

5.1 Even without a carbon price, 39% of emissions reductions from RETA projects are economic[5]

Using the biomass and electricity costs outlined 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



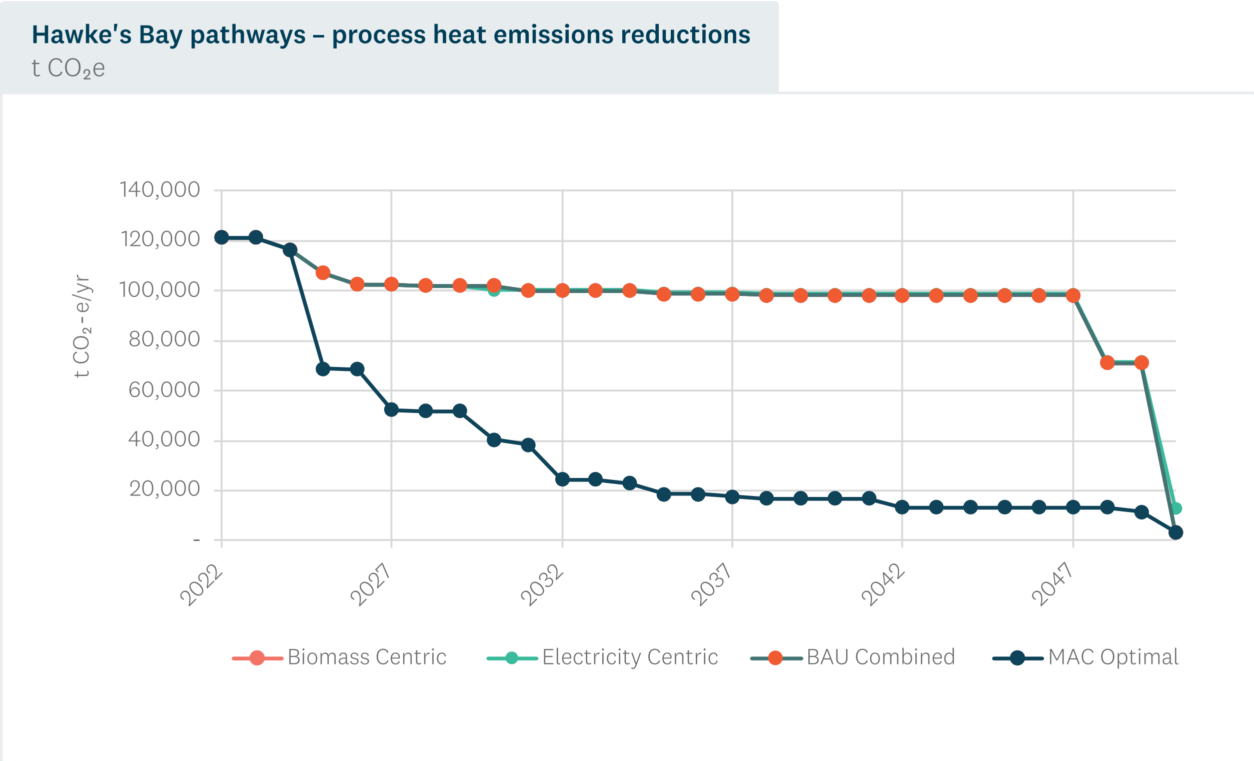
Out of 121kt of process heat emissions from Hawke's Bay RETA sites, 38kt (31%) have MACs less than zero, while a total of 40kt (33%) have MACs less than $200/tCO$_2$e. Using a commercial MAC decision-making criterion, combined with expected future carbon prices (MAC Optimal), it would be commercially favourable to execute these projects over the next 10 years.

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 118kt over the period of the RETA analysis to 2050 (Figure 5).[6]

[5] 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). Fifty four RETA projects (constituting 31% of RETA Hawke's Bay's process heat emissions) have a Marginal Abatement Cost less than zero.

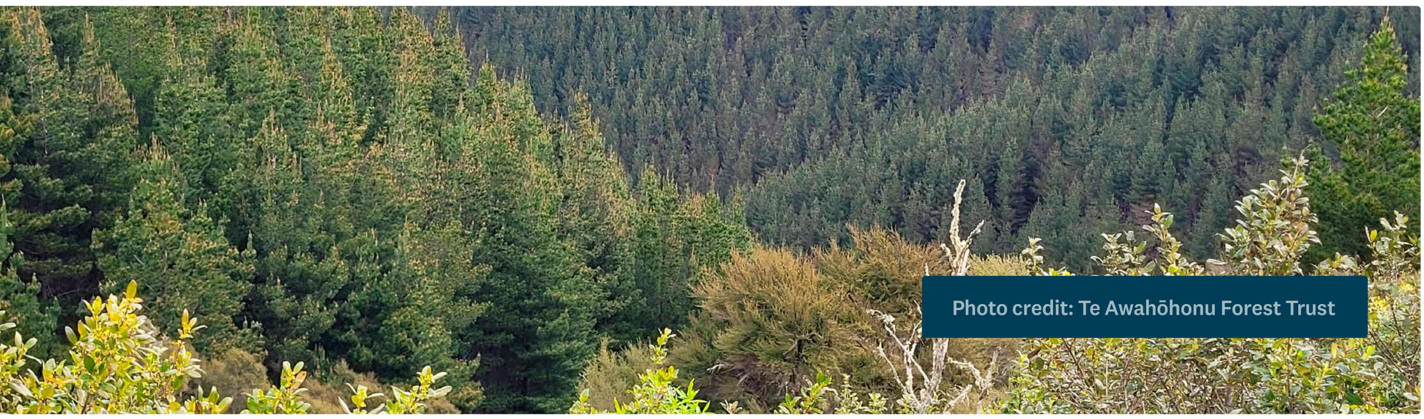
[6] Note that the Electricity Centric and Biomass Centric pathways are obscured in the chart by the BAU Combined pathway. This is because the project timings and therefore the emissions reductions associated with these three pathways are identical until fuel switching occurs, in 2049.

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



The MAC Optimal pathway proceeds faster, with the majority of emissions reductions economic immediately, primarily as a result of a large number of demand reduction and heat pump projects which are economic at today's carbon prices.

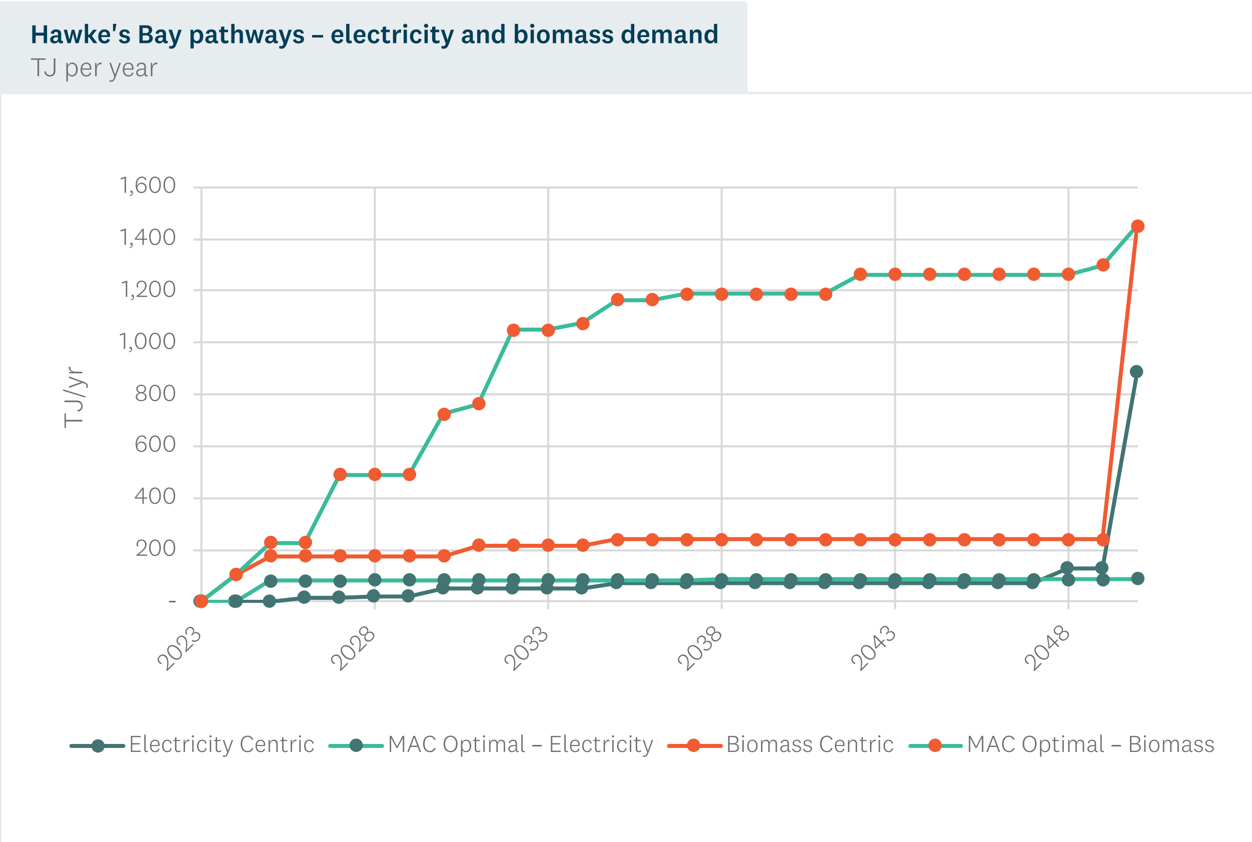
By 2035, the MAC Optimal pathway would reduce the region's process heat emissions by 100,000tCO_2e, an 80% reduction compared to the 2022 emissions from the sites considered in the study. This pathway would see 22 large heat pump installations and 12 biomass boilers installed by 2035. Supporting these installations will require only minor modifications to local EDB networks and would increase electricity demand by 23GWh per year, and the demand for biomass by 160,000 tonnes per year. All of these projects and ongoing energy requirements present opportunities for employment in the region.



5.1.1 Pathway implications for electricity and biomass demands

The MAC Optimal pathway sees fuel decisions that result in 6% of the energy needs in 2050 supplied by electricity, and 94% supplied by biomass (Figure 6). We expand further on these fuel switching outcomes in the sections below.

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



It is important to recognise the impact that demand reduction has on the overall picture of the Hawke's Bay region's process heat. As show in Figure 3, investment in demand reduction meets 14% of the process heat demands from Hawke's Bay process heat users in 2022, which in turn reduces the necessary fuel switching infrastructure required: thermal capacity from new biomass or electric boilers would be reduced by around 30MW if these projects were completed.[7] We estimate that demand reduction would avoid investment of between $33M and $36M in electricity and biomass infrastructure.[8]

7 This is true for both energy consumption and the peak thermal demand required from biomass or electric boilers.

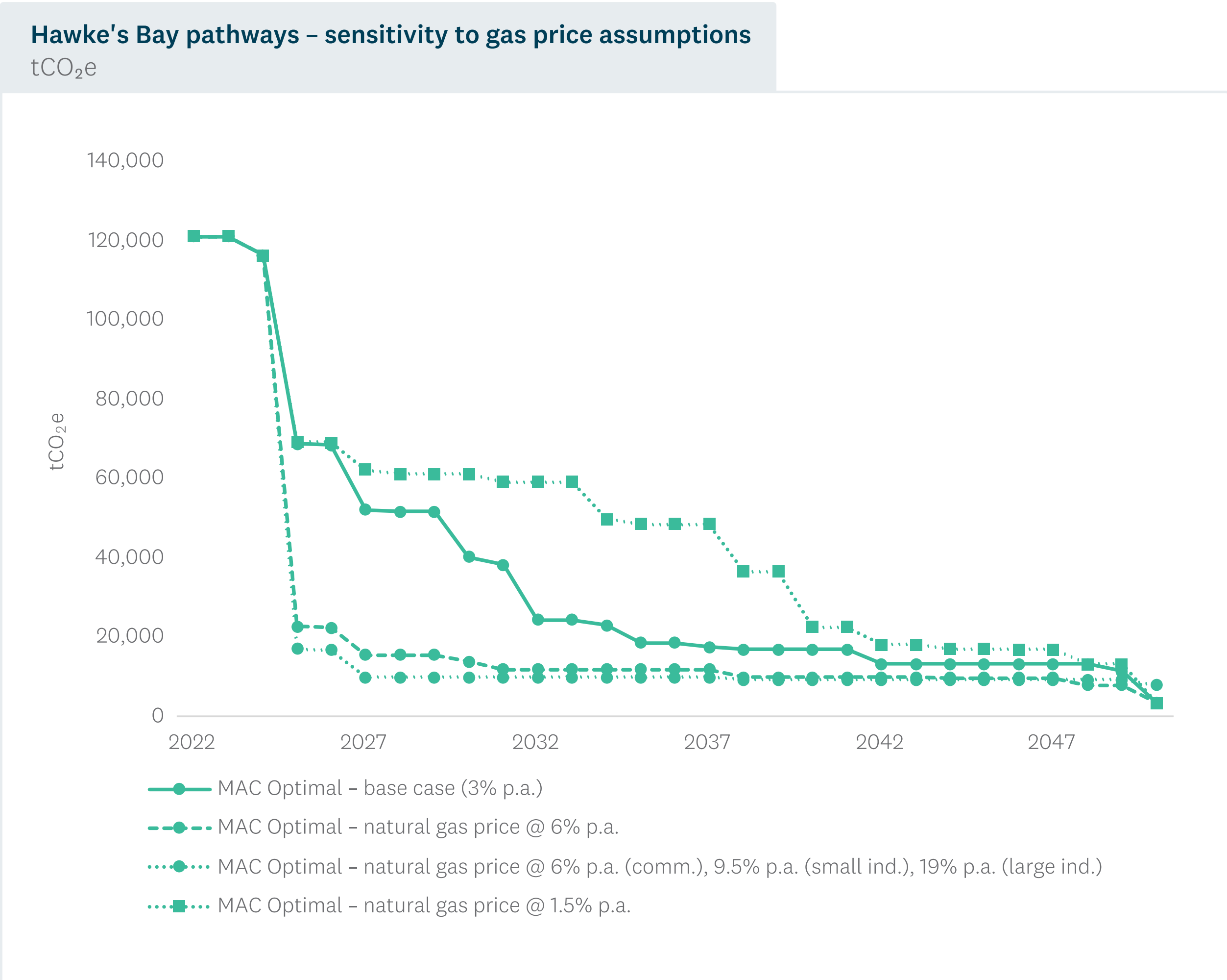
8 On the assumption that the capital cost of electrode boilers is $1.1M and biomass boilers is $1.2M. The electrode boiler cost does not consider the connection cost of electrode boilers, which average $1M for the Hawke's Bay, but are very site specific.

5.1.2 Gas sensitivities

A range of sensitivities have been tested in the modelling, including electricity, biomass and carbon prices and are discussed in the main report. Given the importance of gas in Hawke's Bay and the current constraints in supply, additional analysis of the sensitivity to gas prices was undertaken.

The modelling assumed a base gas price of $15/GJ ($0.054/kWh), excluding ETS, for industrial process heat users (based on the mid-point of MBIE estimates for commercial and industrial users). As shown in Figure 7, we found that halving the annual escalator for natural gas from 3% to 1.5% resulted in 337kt CO_2e of additional emissions on a cumulative basis through to 2050. By contrast, doubling the escalator to 6% accelerated 19 projects, delivering an additional 366kt CO_2e emissions reduction by 2050. A significant increase in the natural gas price to $45/GJ by 2035 (excluding ETS charges) changed 10 fuel switch projects from biomass to electric and accelerated 23 projects with a cumulative additional reduction of 411kt CO_2e by 2050.

Figure 7 – Sensitivity of emissions reductions pathways to different gas price assumptions. Source: EECA



6 Biomass – resources and costs

To assess the total availability of harvestable wood in the Hawke's Bay region, both a top-down and bottom-up analysis has been undertaken. The bottom-up analysis is 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. It 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. This analysis allows us to estimate practical levels of sustainably recoverable woody residues.

A top-down analysis suggests that an average of around 3,120kt pa (23,000TJ pa) of wood will be harvested in the Hawke's Bay region over the next 15 years.[9]

Figure 8 shows that there is some annual variation in total available wood resource, with a visible decline in export logs between 2024 and 2037. The annual variation occurs due to the age distribution of the existing forests, and yield assumptions combined with assumptions on how forests are harvested, noting that it can be difficult to accurately model forest management as market conditions change.

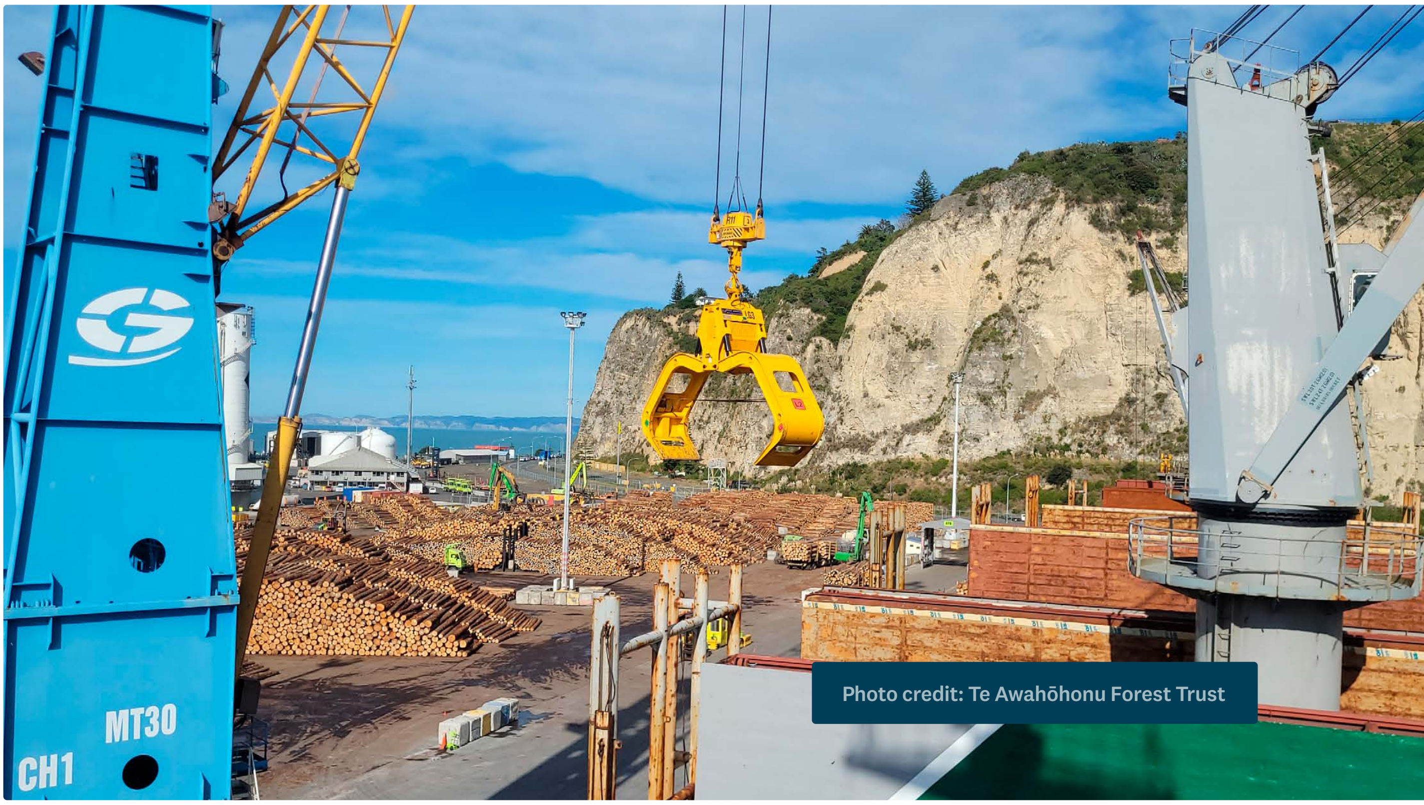
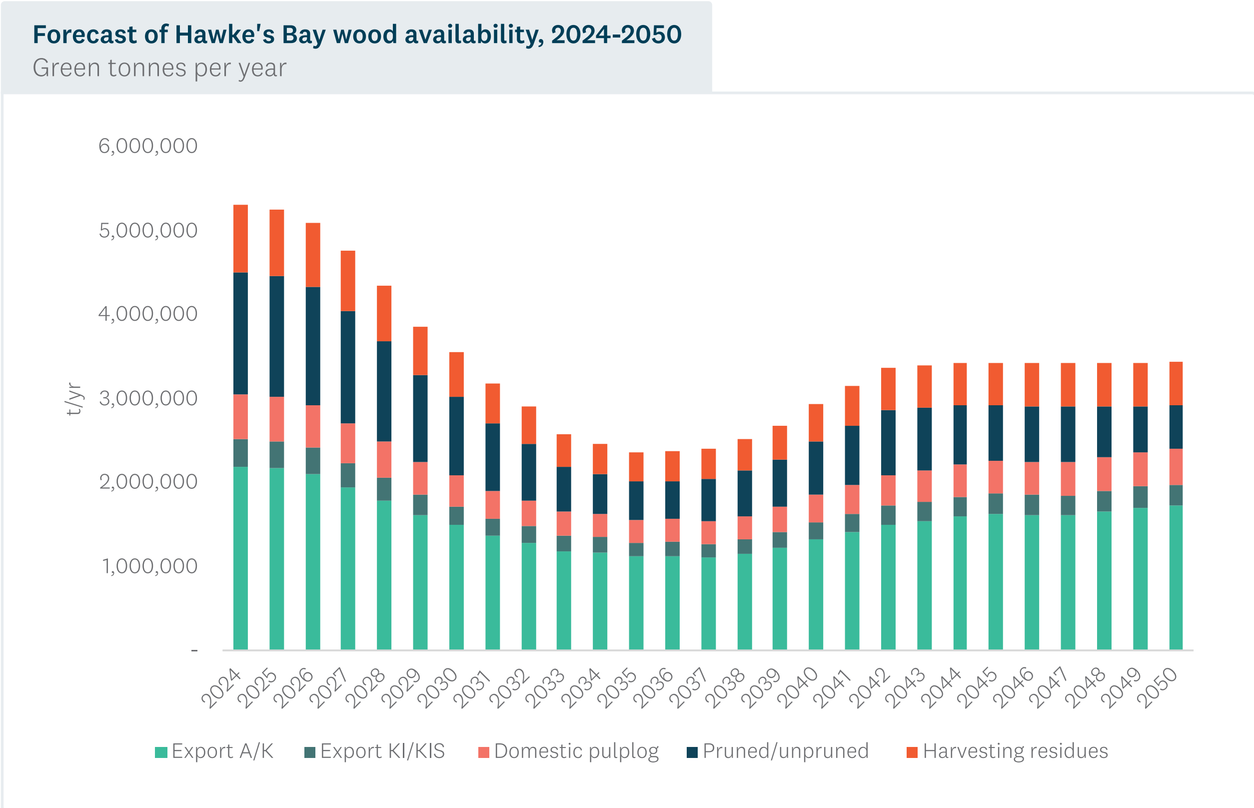


Photo credit: Te Awahōhonu Forest Trust

[9] We use 15 years as a reasonable assessment of the near-term period that process heat users considering biomass would likely want to contract for, if they were making the decision in the next few years.

Figure 8 – Forecast wood availability in Hawke's Bay. Source: Whirika and Margules Groome.

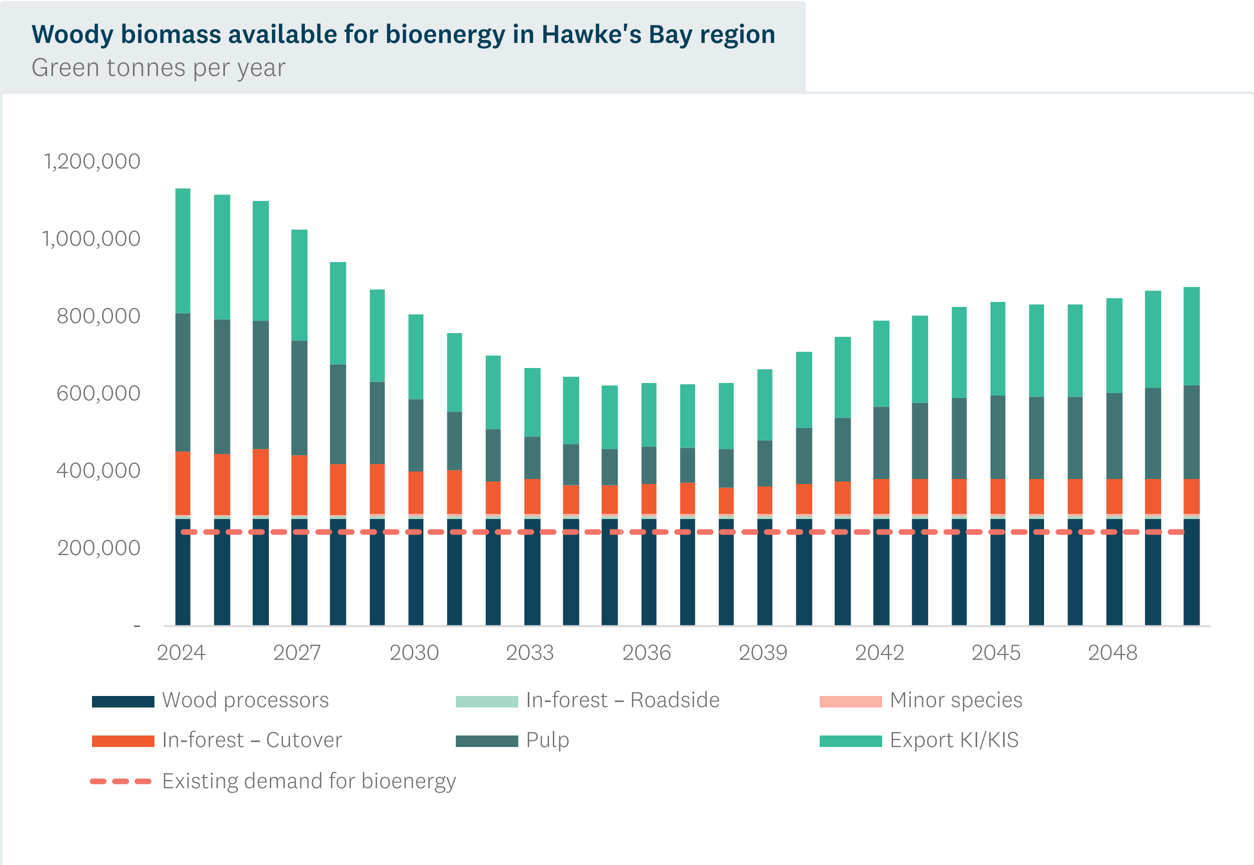


A more comprehensive view of resource availability, that combines the top-down and bottom-up analyses reveals:

- On average, 199kt of harvest residues can be economically recovered. Around 88kt (635TJ) per year of roadside residues is currently being recovered and used for the production of pulp (82kt or 588TJ) and bioenergy (7kt or 47TJ). The remaining available residues, mainly cutover residues (111kt or 796TJ) are not currently utilised, and could be available for new bioenergy demand.
- Interviews with sawmills suggested that around 482kt (3,460TJ) per year of processing residues are produced. Out of this, 205kt (1,470TJ) per year is woodchip used by PanPac, and 237kt (1,710TJ) per year is already used for bioenergy (mainly bark, sawdust and shavings). The remaining 39kt (1,283 TJ) per year of processor residues is unutilised.
- On average through to 2038, the KI/KIS log resource is 225kt (1,620TJ) per year, and the total pulp resource is 372kt (2,670TJ) per year. Out of the total pulp volume, 180kt per year is used by PanPac. The remainder 192kt (1,380TJ pa) of pulp logs is unutilised.

The resulting potential volume for bioenergy is shown in Figure 9.

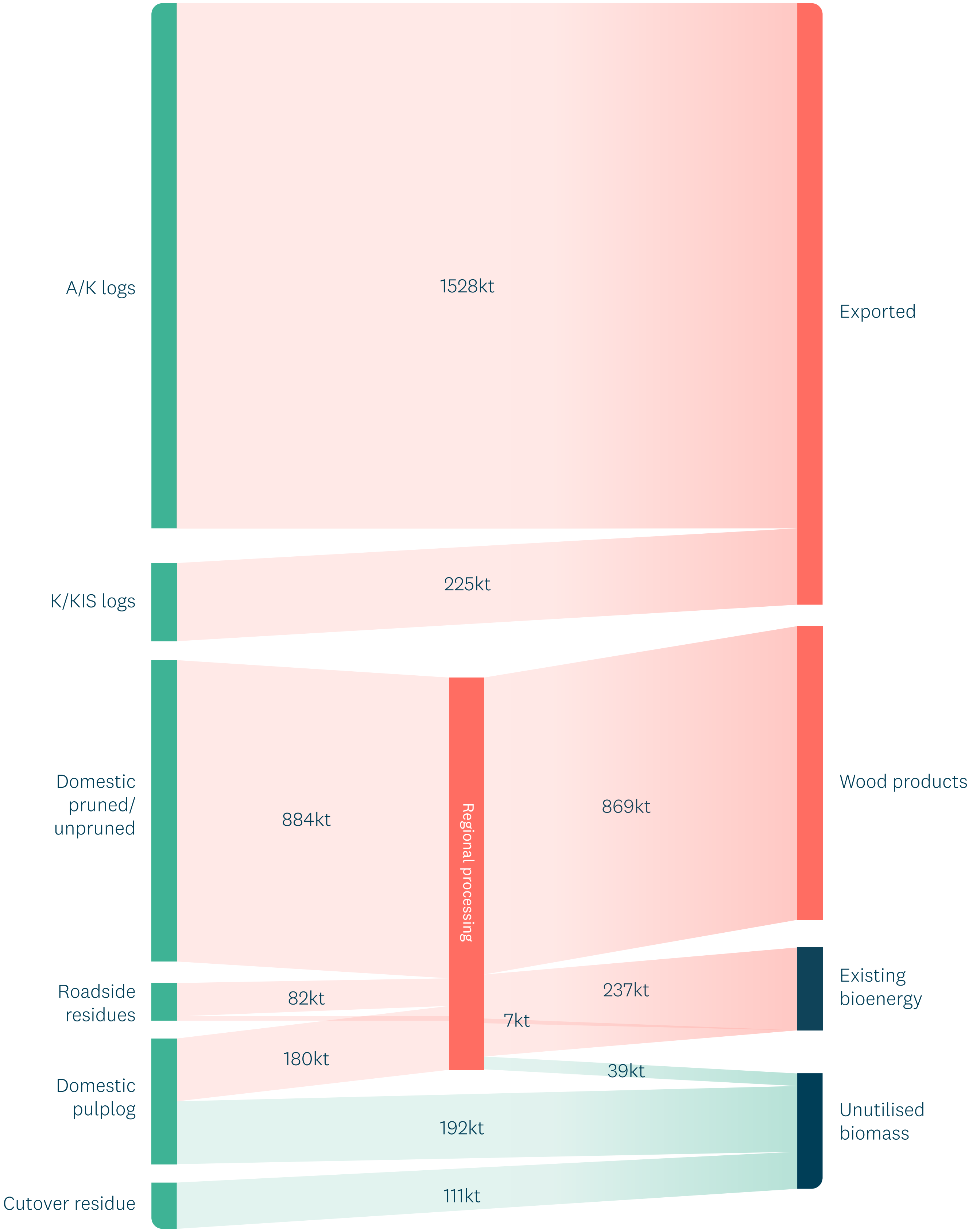
Figure 9 – Woody biomass resource availability in the Hawke's Bay region. Source: Whirika and Margules Groome



The overall analysis of the Hawke's Bay region is summarised in Figure 10.

Photo credit: Te Awahōhonu Forest Trust

Figure 10 – Average wood flows in the Hawke's Bay region, 2024-2038. Source: Whirika and Margules Groome

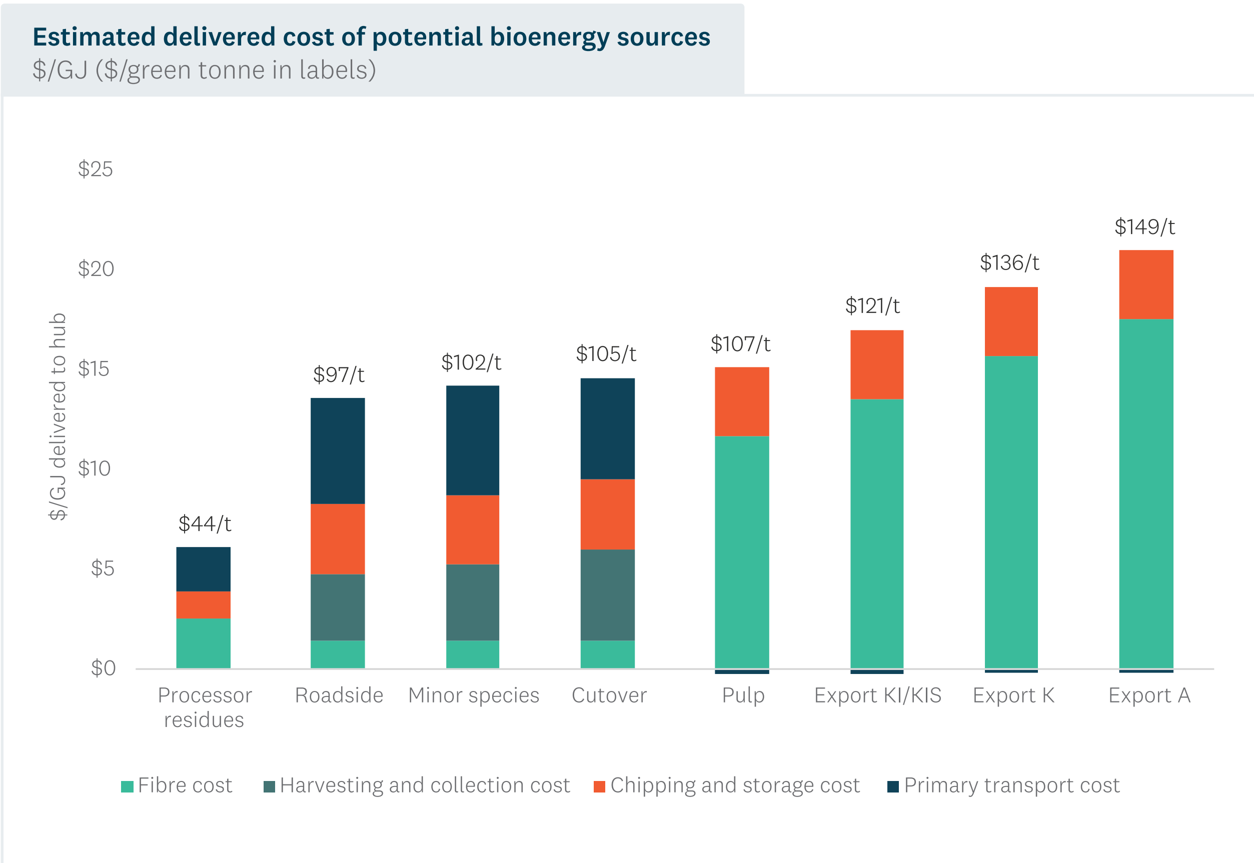


Overall, EECA estimates that, on average over the next 15 years, approximately 342kt per year (2,460TJ per year) of woody biomass (cutover, processor residues and pulp) is currently unutilised and could be recovered for new boiler demands without disrupting low grade export markets or existing bioenergy consumers.

However, this average disguises the significant variance in the annual availability shown in Figure 8.

The costs of accessing this biomass, and delivering it to the process heat user's site, is presented in Figure 11.

Figure 11 – Average estimated delivered cost of potential bioenergy sources. Source: Whirika and Margules Groome



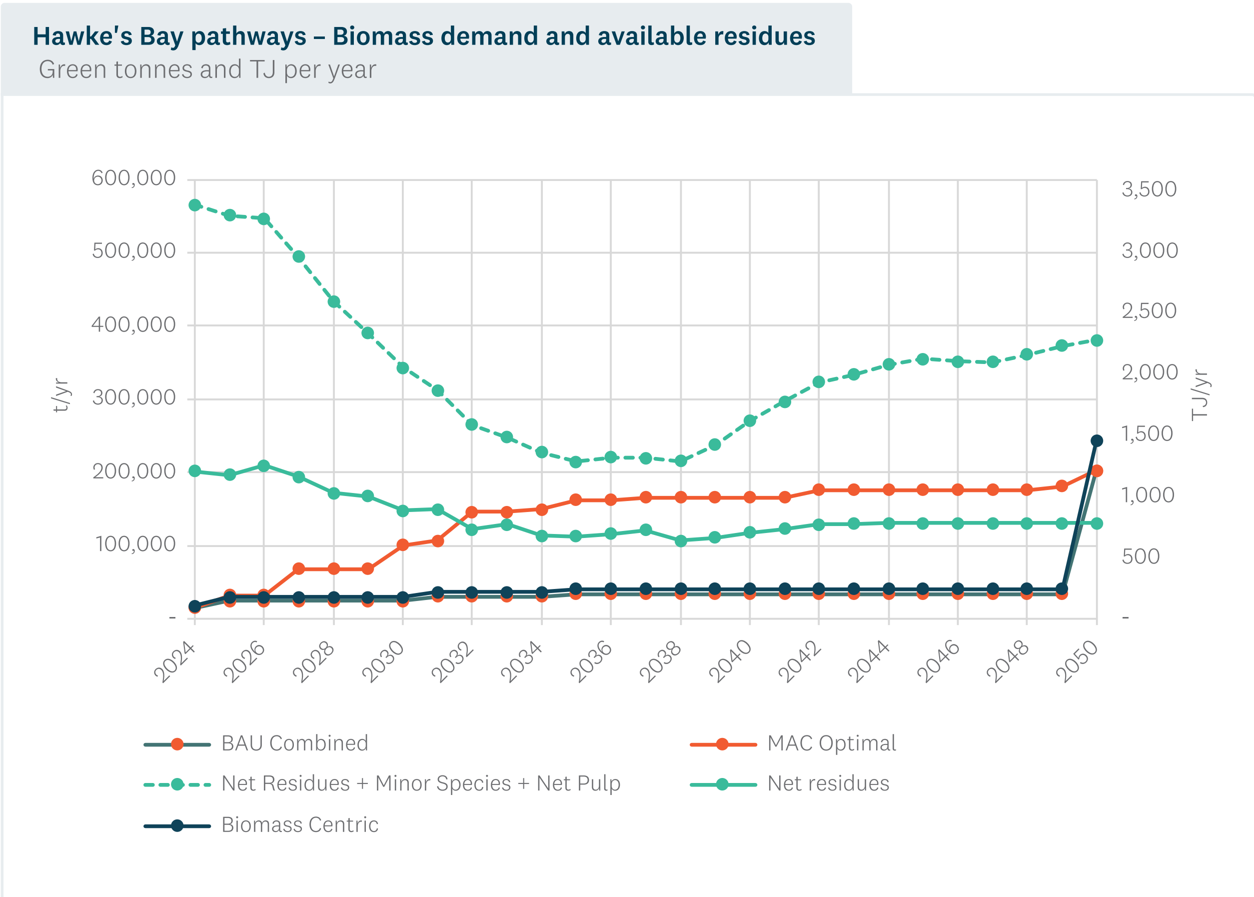
Export grade K and A logs have been retained in the analysis to represent 'scarcity values' if our scenario analysis indicates that other more plausible and sustainable sources of bioenergy are insufficient. However, we do not believe these are sustainable or practical sources of bioenergy.

6.1 Impact of pathways on biomass demand

Our analysis shows the growth in biomass demand (in both tonnes and TJ per year) arising from each of the decarbonisation pathways against the expected available residues (net of existing demand, Figure 12).

Expected harvesting and processor residues are only sufficient to meet the MAC Optimal biomass demand until around 2032. However, the addition of unutilised pulp would be sufficient to meet biomass demand in all pathways over the entire RETA period.

Figure 12 – Growth in biomass demand from Hawke's Bay pathways. Source: EECA



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 may require higher-grade raw material.

7 Electricity – network capacity and costs

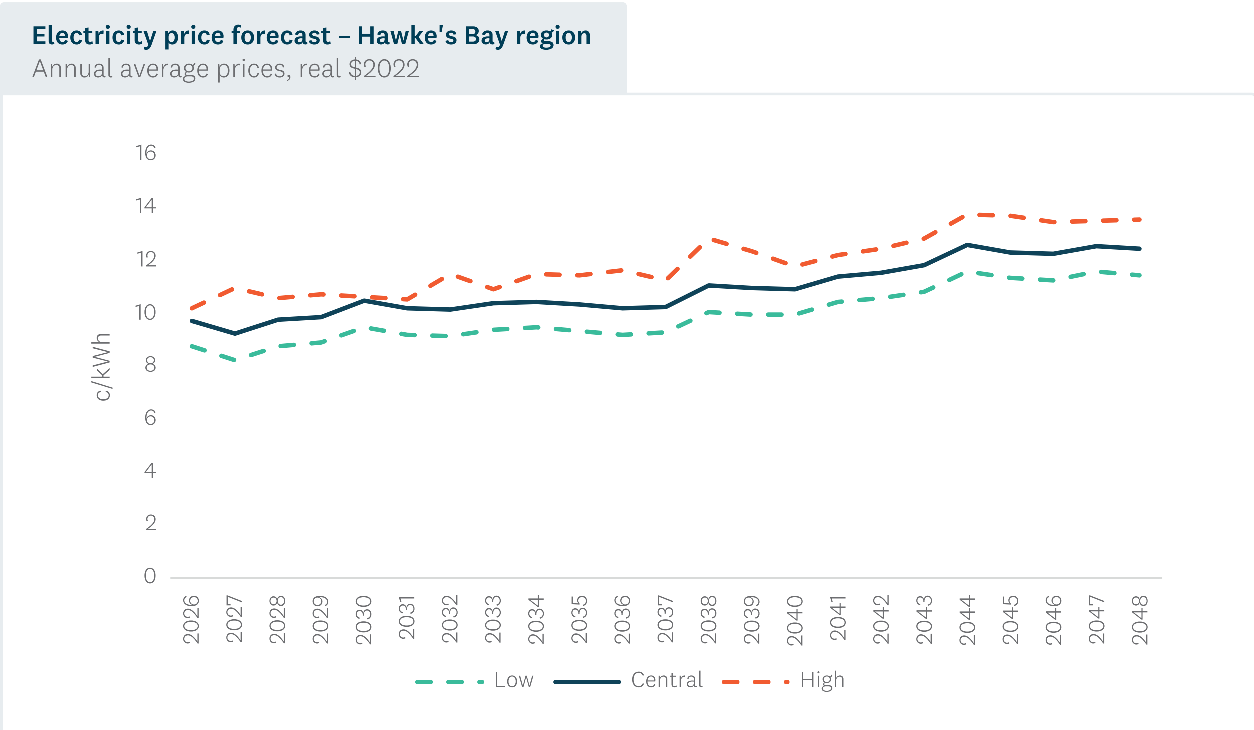
The availability of electricity to meet the demand from process heat users is largely determined at a national 'wholesale' level. Supply is delivered to an individual site through electricity networks – a transmission network owned by Transpower, and a distribution network, owned by electricity distribution businesses (EDBs), that provides power to individual consumers. The EDBs connect to the transmission network at grid exit points, or GXPs. There are three EDBs serving the Hawke's Bay region – Centralines, Firstlight and Unison.

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 13, the forecast price of retail electricity (excluding network charges) is expected to increase (in real terms) from 10c/kWh in 2026 to 11.3c/kWh in 2040 under a 'central' scenario. However, different scenarios could see retail prices higher or lower than that level.

Figure 13 – Forecast of real annual average electricity price for large commercial and industrial demand in the Hawke's Bay region. Source: EnergyLink



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

Beyond 2040, 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.

On top of retail charges, EDBs charge electricity consumers for the use of the existing distribution network. Relevant EDBs set their distribution charges for large commercial and industrial customers based on the size of the connection (kVA) and peak coincident demand (kW). As such, distribution prices will vary per site. In addition, transmission charges are a combination of capacity (kVA) and average demand (kW) charges. Our modelling approximates these charges for each site.

An approximation of the potential charges faced by process heat users who electrify is presented in Table 4. These are based on each of the EDB's announced prices for the year 2023/24.

Table 4 – Estimated and normalised network charges for Hawke's Bay large industrial process heat consumers, by EDB; $ per MVA per annum.

EDB	Distribution Charge	Transmission Charge	Total Charge
Centralines	$105,000	$25,000	$130,000
Firstlight Network	$36,000	$27,000	$63,000
Unison Network's Hawke's Bay network	$75,000	$25,000	$100,000

Finally, where the connection of new electric boilers requires EDBs 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'.

Transpower and the relevant EDBs are experiencing an increasing need for investment as a result of continued population and business growth, distributed generation, and the electrification of transport and process heat.[11] 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 relevant EDBs 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 EDBs' networks to supply electricity-based process heat conversions.
- The cost of any upgrades required to accommodate the demand of a process heat user, considering 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.

[11] While this RETA analysis only examines demand from process heat electrification this broader context of potentially rapid growth in demand is important to understanding the challenges associated with accommodating new load.

- 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 EDBs 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 $300,000 and experience connection lead times of less than six months.

More substantial upgrades to the distribution network are required for two of the sites, with higher costs (up to $4.5M, dependent on the level of security) and longer lead times (up to 36 months).

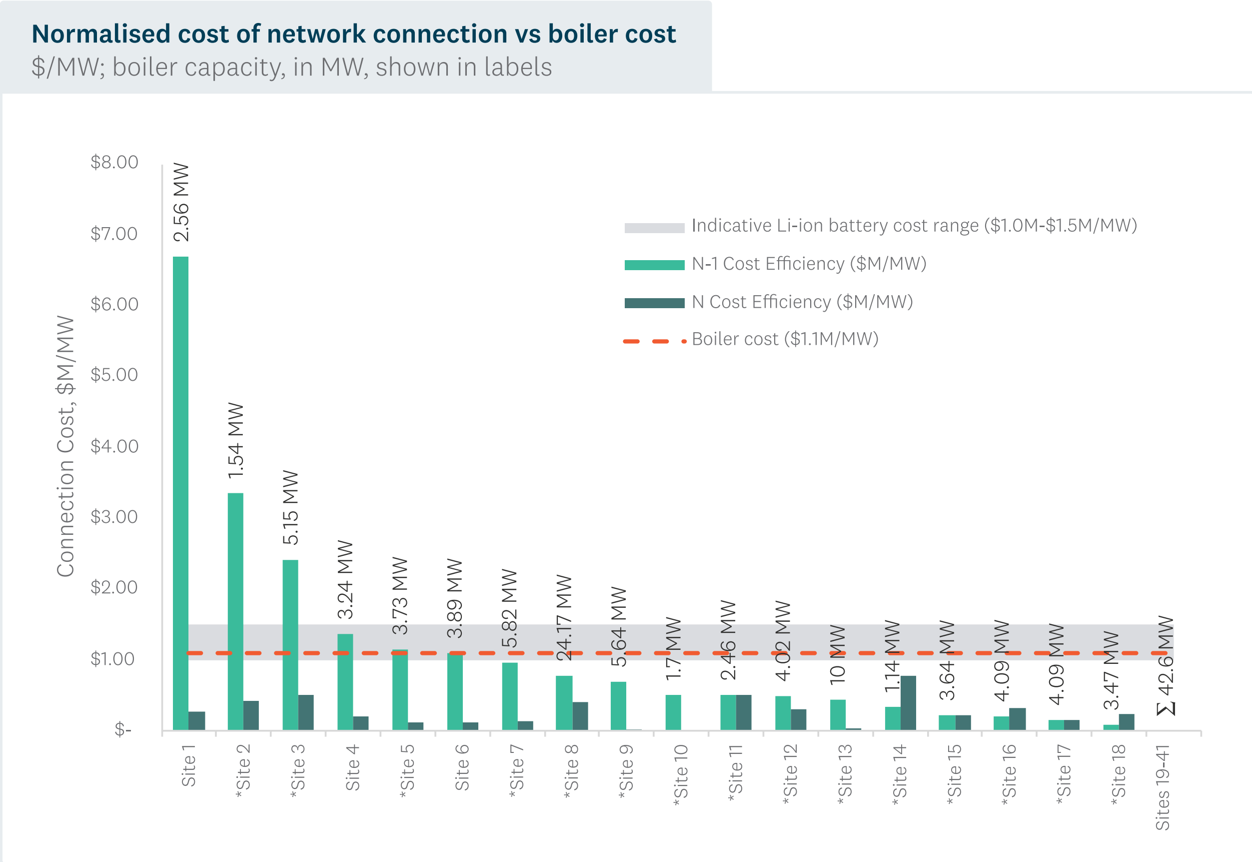
A number of sites may require major distribution and transmission upgrades, depending on level of network security required. The cost of the upgrades may reach $28M for one site (which includes a number of stages). These upgrades may take up to 48 months per stage to execute.

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 EDBs to discuss connection options and refine the cost estimates we have included in this report.

As highlighted above, a majority of sites considering electrification can be connected to the network at minimal cost. For the remaining sites, Figure 14 shows each site's connection costs expressed in per-MW terms, i.e. relative to the capacity of the proposed boiler. It also shows that there are 22 sites which are likely to have connection costs that are very low.

Photo credit: Rayonier Matariki Forests

Figure 14 – Normalised cost of network connection vs boiler cost, Hawke's Bay RETA sites. Source: Ergo, EECA



The red dashed line in Figure 14 compares these per-MW costs to the estimated cost of an electrode boiler ($1.1 million per MW). 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 the relevant EDB.

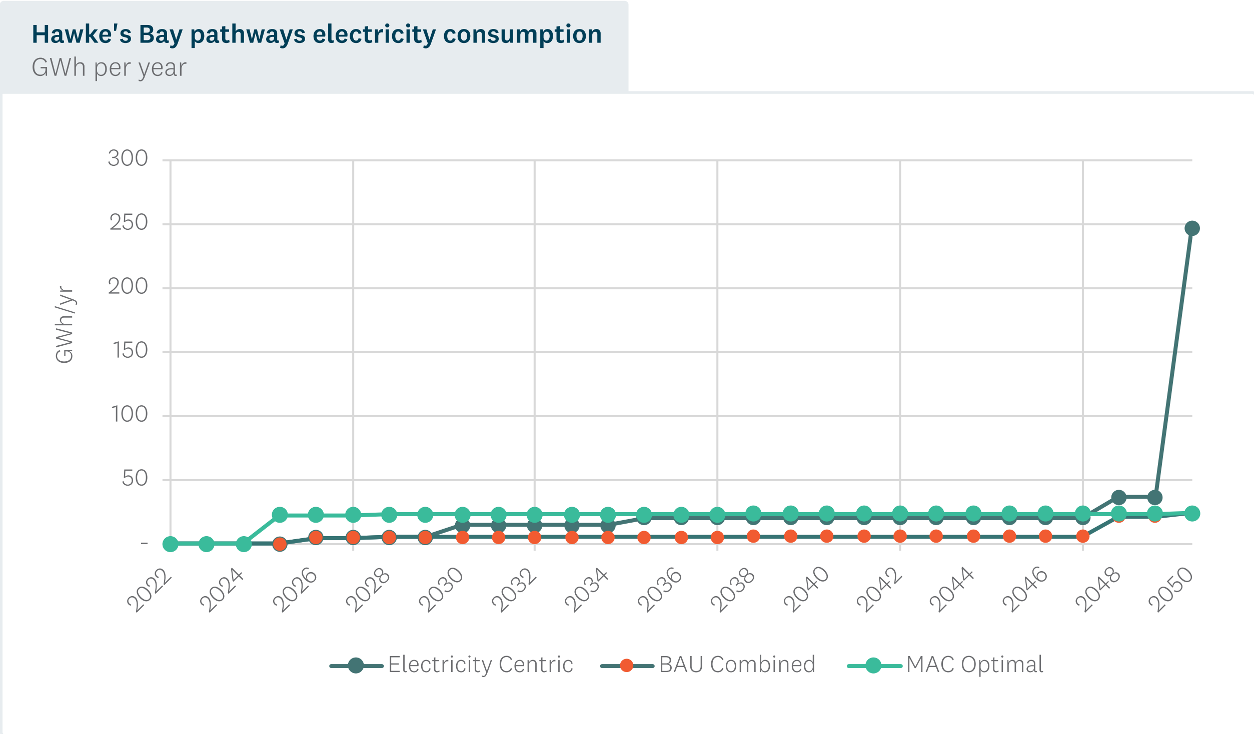
The timeframes for connection above assume these investments do not require Transpower or the relevant EDB to obtain regulatory approval. We note that if connections also rely on wider upgrades to the network, EDBs would have to seek regulatory approval for these investments, which could also add to 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 sites who may require access to similar parts of the network.

7.1 Impact of pathways on electricity demand

Figure 15 shows the pace of growth in electricity consumption under the different pathways.

Figure 15 – Growth in electricity consumption from fuel switching pathways. Source: EECA



The Electricity Centric pathway, where all unconfirmed sites choose electricity, would result in a significant increase in the annual consumption of electricity in the region, although this wouldn't occur until 2050 (and is unlikely to occur all at once as shown in Figure 15). In the MAC Optimal and BAU Combined pathways, electricity consumption in Hawke's Bay would grow by only 24GWh (around 2% of today's consumption) by 2050. Most of this growth would be observed by 2025 in the MAC optimal pathway.

EDBs' investments will be driven more by increases in peak demand than by growth in consumption over the year. Figure 16 shows how the different pathways affect peak demand across the local network.

Figure 16 – Potential increase in peak electricity demand from fuel switching pathways. Source: EECA

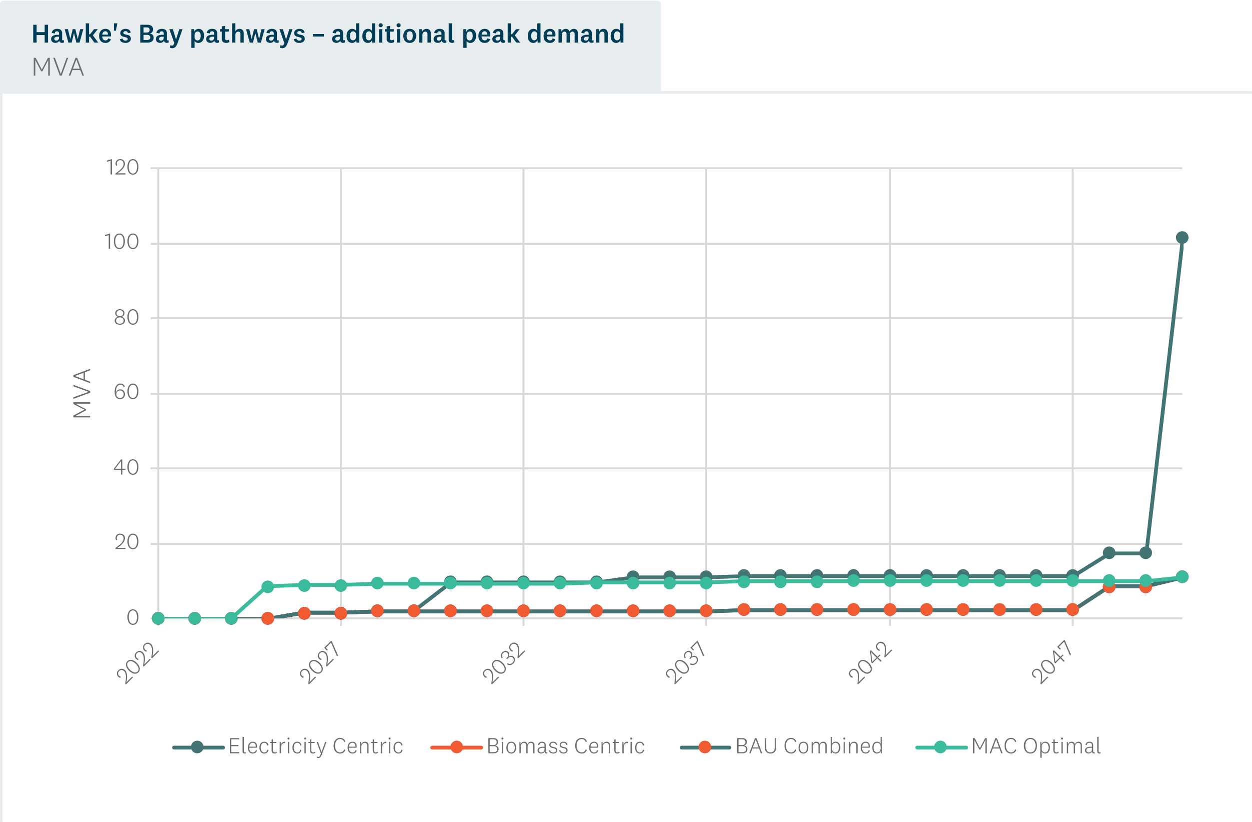


Figure 16 shows that should all unconfirmed process heat users in Hawke's Bay convert to electricity (the Electricity Centric pathway), the increase in demands could be significant – an increase in peak demand of 101MVA by 2050,[12] an increase of 36% compared to today's peak demand. However, in the more commercially realistic MAC Optimal pathway, the increase would only be 11MW (4%), most of which would occur by 2025.

12 This chart shows the cumulative increase in peak demand assuming all electricity projects peak at the same time. The main report discusses a more realistic view which considers the natural diversity between process heat users in terms of when each is likely to peak. This results in a slightly lower peak demand requirement from the networks.

EDBs are responsible for any upgrades required to accommodate process heat users who electrify. Table 5 breaks down these costs under the two pathways.

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)*
Unison	97.7	$30.6	8.8	$0.0
Centralines	3.5	$5.1	2.1	$0.0
Firstlight Networks	0.2	$0.0	0.2	$0.0
Total	**101.4**	**$35.7**	**11.1**	**$0.0**

The costs of connection are shown as zero in this column due to the way we assess network upgrade costs for very small connections. In reality, each of these very small connections may require no additional electrical infrastructure, some may need up to $300,000 of additional components, but we have insufficient information about these small sites to be definitive either way.

Up to $36M will be spent connecting new process heat plant to the local networks, depending on the pathway.

Table 5 may not necessarily reflect the connection costs paid by process heat users, as they may be shared between the relevant EDB and the new process heat user. The degree of sharing (‘capital contributions’) depends on the policies of individual EDBs.

Photo credit: Meridian

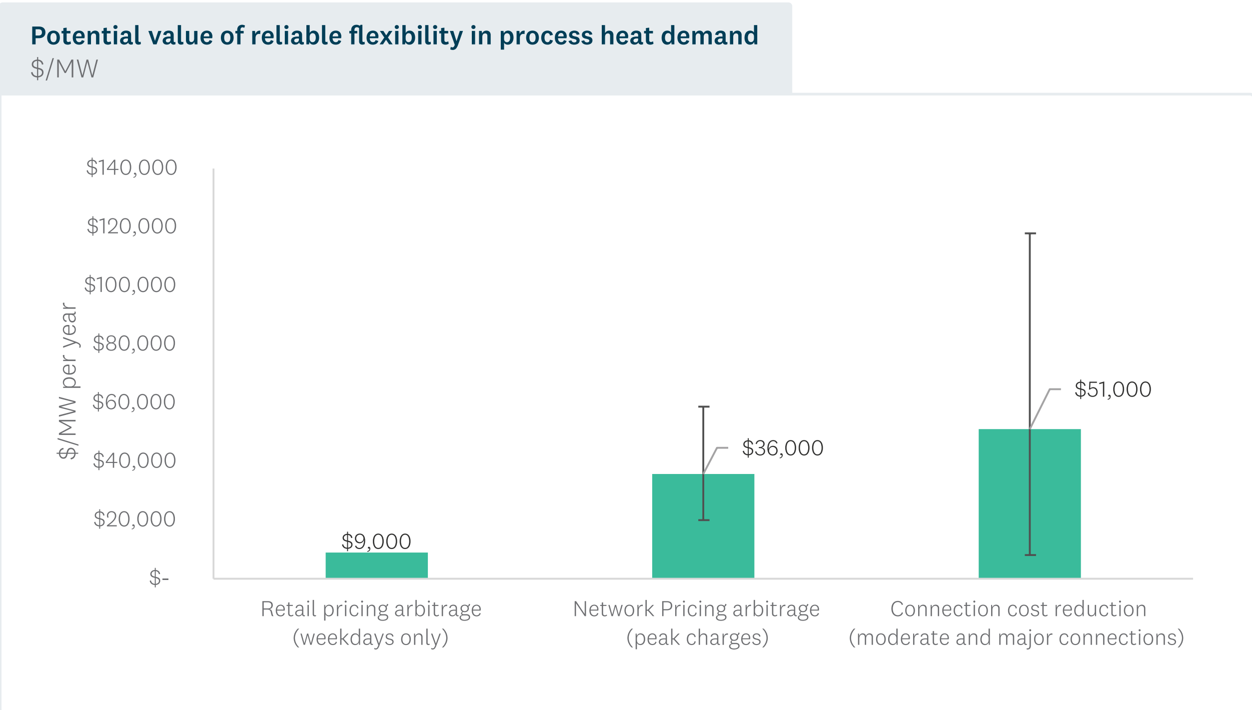
7.2 Opportunity to reduce electricity-related costs through flexibility

Process heat flexibility can improve system resilience and reduce both electricity system costs and process heat electricity-related costs.

Analysis was carried out to illustrate the potential cost savings associated with enabling flexibility in process heat demands.

As shown in Figure 17, Hawke's Bay process heat users could potentially reduce their electricity procurement costs by up to $45,000 per MW of flexibility deployed every year. In addition, at the planning stage, they could also reduce costs associated with the size of their connection to the electricity network – the investment required in the physical connection, as well as any network charges from the relevant EDB that relate to the size of the connection. We estimate that this could provide an additional reduction in cost of $51,000 (annualised), if it allows them to reduce the size of their connection to the network.[13]

Figure 17 – Estimates of the value of flexibility in Hawke's Bay RETA. Source: EECA



Some process heat users may find it challenging to alter their underlying process to achieve this. Even then, onsite batteries could be used to extract these cost savings. Over a 20-year timeframe, the cost savings above could be sufficient to underwrite an investment in a battery. Onsite battery storage also provides extra resilience in network failure scenarios. EECA is working with process heat users to better understand the value streams associated with batteries that are integrated into their electrification plans.

13 We note that, in reality, the estimate for reducing connection costs may vary significantly, as the underlying equipment underpinning network investment comes in standard sizes – varying peak process heat demand by a relatively small amount may not change the connection costs.

8 Recommendations

Our analysis has highlighted a range of opportunities and recommendations which would improve the overall process heat decarbonisation 'system'. These recommendations are summarised here.

Recommendations to improve the use of biomass for process heat decarbonisation.

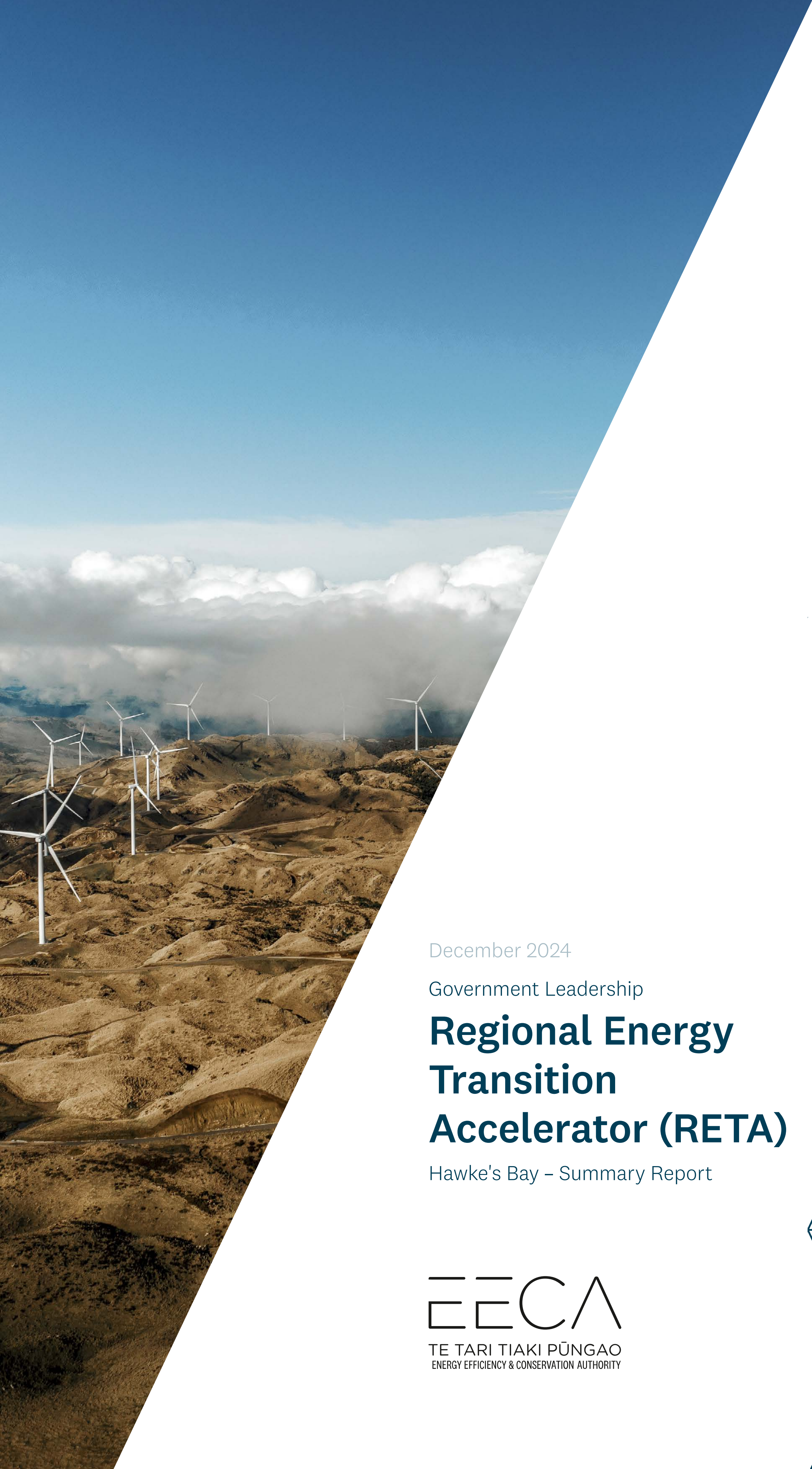
- Although information is improving since the commencement of the RETA programme (nationally), there may still be opportunities to refine the understanding of residue costs, volumes, energy content (given the potential susceptibility of these residues to high moisture levels) and alternative methods of recovering harvesting residues.
- Work should be undertaken with forest owners to understand the logistics, space and equipment required for harvesting residues.
- The development of an 'energy – grade', or 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.
- Investigate and establish mechanisms to help suppliers and consumers within and outside the region 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. The analysis for Hawke's Bay showed that the cost of biomass can significantly affect investment decisions; given the significant potential demand for biomass relative to available residues in the region (processing and harvest), process heat users would benefit from a mechanism that could help identify opportunities for inter-regional trade of biomass resources.
- EECA to collaborate with forest managers in the region to progress biomass supply.
- EECA to collaborate with process heat users to develop their biomass options and investigate the potential for centralised systems.
- 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.
- Undertake research into the likely competing demands for wood fibre from other emerging markets, such as biofuels and wood-derived chemicals.

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

- EDBs to proactively engage on process heat initiatives to understand 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. EDBs should ensure Transpower, and other stakeholders (as necessary) are aware of information relevant to their planning at an early stage especially since, in Hawke's Bay, Whakatū and Fernhill may need to be upgraded as a result of process heat user decisions.
- Process heat users to proactively engage with EDBs, keeping them well-informed 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.
- EDBs 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).
- To support this early engagement, EDBs 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 EDBs, and a network section where EDBs provide high-level options for the connection of the process heat user's new demand. Information provided by EDBs 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, EDBs 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.
- EDBs and retailers should ensure that the tariffs they offer process heat users are incentivising the right behaviour.
- EECA 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:

- EECA to work with the Treasury and Ministries (such as Ministry for the Environment) to create an easily accessible centralised portal that publishes up-to-date carbon price assumptions and scenarios that are used to guide policy and regulatory decisions, e.g. Treasury's shadow carbon prices used for cost-benefit analysis, Treasury's ETS price assumptions for fiscal forecasting etc.



December 2024

Government Leadership

Regional Energy Transition Accelerator (RETA)

Hawke's Bay – Summary Report

TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY