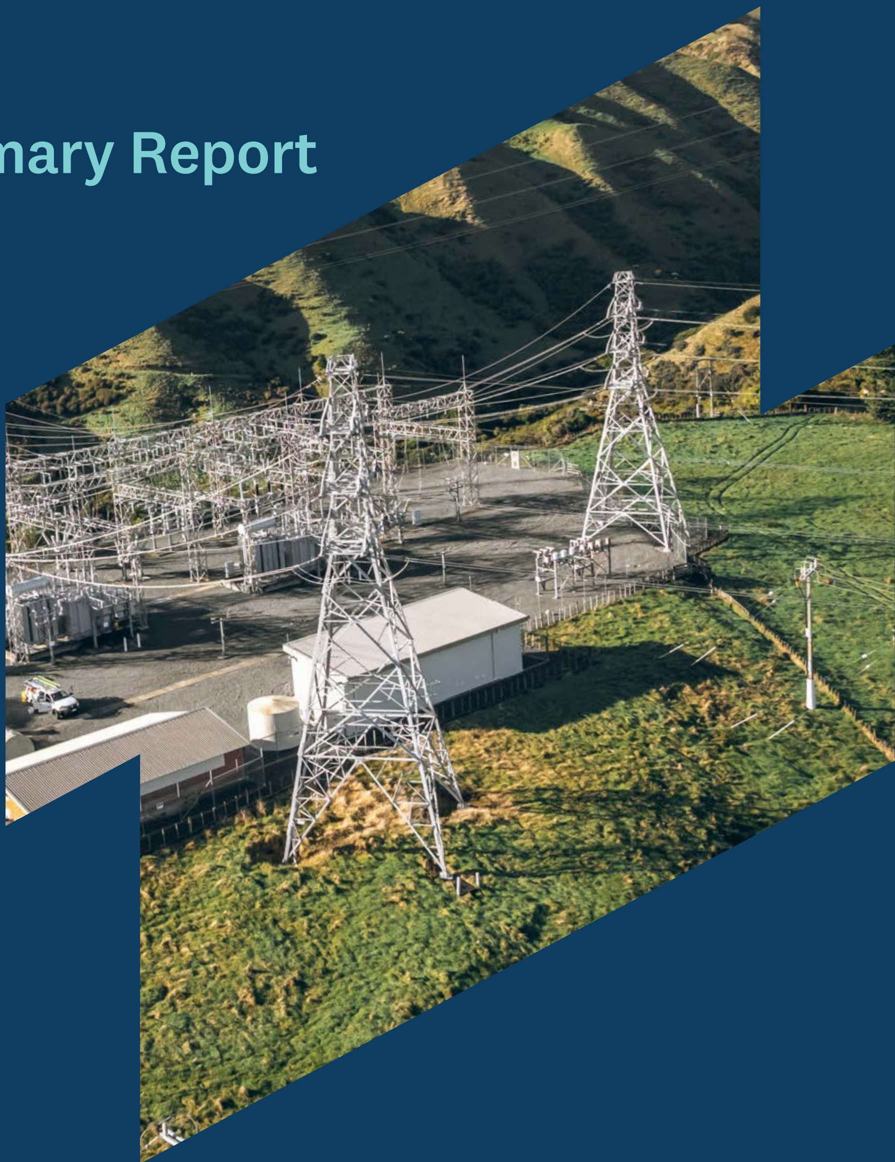
JULY 2026

Government Leadership

Regional Energy Transition Accelerator (RETA)

Wellington — Summary Report



ENERGY EFFICIENCY & CONSERVATION AUTHORITY
TE TARI TIAKI PŪNGAO

He kupu whakataki

Waiwai ana tēnei mea te pūngao mō te tipu me te houkura o Aotearoa. Nā te mea e huri ana te āhua o te pūngao, e tino kitea ana te hirahira o ngā mahi ruruku, o ngā pārongo tōtōpū, me te mārama kehokeho ki ngā pūnaha ā-rohe. Kia tino whai hua ai ō tātou pūngao, kia whakatere ake anō hoki i ngā pūngao whakahou, me mārama tātou ki te āhua o te whakamahi i ngā pūngao i te taumata ā-rohe.

Mai i te pūrongo tuatahi a EECA mō te Regional Energy Transition Accelerator (RETA) i 2022, kua tino panoni te pūnaha pūngao. Nā te pikinga o ngā utu pūngao, nā te pikinga hoki o te pēhanga ki te tuku haurehu, me ngā wero whakamaru pūngao o nā noa nei, kua kaha ake te matea mō ngā whakamahere ā-rohe, me te anga whakamua. E whakaata ana tēnei pūrongo RETA mō Pōneke - te rangahau ā-rohe whakamutunga o te hōtaka - i ēnei panonitanga me te hiranga e tipu haere ana o tētahi pūnaha pūngao tūroa, anga whakamua anō hoki.

He motuhake te āhua ā-rohe o Pōneke. Tērā i ētahi atu wāhanga o te motu, he iti iho tōna papa ahumahi, ā, he kaha ake te kukū o ngā whakamahinga pūngao arumoni, e tino pērā ana i ngā hanganga me ngā whare whakahaere. Manohi anō, e kaha tonu ana te whirinaki a te rohe ki te kora mātātoka. E whakaahua ana tērā i ngā wero me ngā arawātea anō hoki i te wāhi ki te whakawhitinga.

Ko tā tēnei pūrongo he tūhura i te āhua o te whanake o te popono wera tukatuka ka taea ki Pōneke i roto i te wā. Ka tautuhi hoki i tētahi ara e whakakotahi ana i ngā whakapikinga hua pūngao me te kokenga ki ngā hangarau tuku para iti. Ko tētahi kitenga matua, ka taea te whakaiti mārika i ngā tukunga para mā roto mai i ngā haumitanga ā-arumoni ka taea nei te whakatinana, arā, he haumitanga e matapaetia ana ka āta whai hua ā-arumoni i roto i ngā tau e rima e tū mai nei.

E matapaetia ana ka noho te hiko hei pou matua i roto i tēnei whakawhitinga, ā, ka tautokona e te tāwariwari me te whakamahinga whāiti o ētahi atu kora pēnei i te papatipu koiora i ngā wā e tika ana. Ko tētahi āhuatanga hirahira, e whakaatu ana te tātaritanga ka taea te nuinga o tēnei whakahikotanga mā ētahi whakapainga iti noa iho nei ki ngā whatunga toha hiko ā-rohe. Ka tino pērā mehemea ka hono ki ngā kohakoha ki te whakapai ake i te whakahaere, me te whakaheke i te popono.

Ko te whāomotanga pūngao me ngā whakamahinga pūngao mātau ake ka pihi ake hei āhuatanga matua e taea ai tēnei whakawhitinga. Mā te whakaheke i te nui o te pūngao e matea ana, ka whakaheke ēnei mēhua i te whānui, te utu, me te uaua o te whakawhitinga, me te whakangāwari hoki i te pēhanga ki ngā whatunga pūngao me ngā mekameka whakarato.

Mā te titiro ā-rohe ka mārama ake te hononga o te popono pūngao, o ngā tūāhanga, me te whakarato kora. E whakaatu ana tēnei pūrongo i ngā wāhi e taea ai te mahi ngātahi a ngā pakihi, a ngā kaiwhakarato pūngao, me ngā kaiwhakarato whatunga te whakatuwhera huarahi kia pai ake, kia iti ake hoki te utu o ngā putanga.

I whakawhanakehia tēnei pūrongo mā te whai wāhi mai o ngā pakihi tohatoha hiko, ngā kaiwhakarato pūngao, ngā kiriwhaipānga ā-rohe, me ngā kaiwhakamahi pūngao arumoni, ahumahi hoki. He mea āwhina tēnei whai wāhitanga ki te whakaū i tā te tātaritanga whakaata i ngā āhuatanga tūturu o te ao, ā, ki te tautoko hoki i ngā whakataunga whai hua.

I ngā whakahaere o Pōneke e whakatere ana i tētahi taiao pūngao whīwhiwhi, ka noho tēnei pūrongo hei tūāpapa mō ngā kōwhiringa mātau, aronga whakamua hoki. Mā te whakahāngai i ngā haumitanga ki te whāomotanga, ki te hangarau, me ngā tūāhanga, he arawātea mārama tō te rohe ki te whakapakari i te tūroa ā-pūngao, me te koke ki tētahi anamata tuku para iti iho.

1 Foreword

Energy is critical to New Zealand's growth and prosperity. The changing energy landscape underscores the importance of coordinated action, robust information, and a clear understanding of regional systems. To make the most of our energy and accelerate renewables, we need to understand how energy is used at the regional level.

Since EECA's first Regional Energy Transition Accelerator (RETA) report in 2022, the energy system has evolved significantly. Rising energy costs, increasing pressure on gas supply, and recent energy security challenges have reinforced the need for forward-looking, regional planning. This Wellington RETA report - the programme's final regional study - reflects these shifts and the growing importance of a resilient, forward-looking energy system.

Wellington presents a distinct regional profile. Compared to other parts of the country, it has a smaller industrial base and a stronger concentration of commercial energy use, particularly in buildings and institutions. At the same time, the region remains heavily reliant on fossil gas, shaping both the challenges and opportunities for transition.

This report explores how Wellington's process heat demand could evolve over time, identifying a pathway that combines energy efficiency improvements with a shift toward lower-emissions technologies. A key finding is that a substantial proportion of the emissions reductions can be achieved through commercially viable investments, investments that are likely to be commercially attractive within the next five years.

Electrification is expected to play a central role in this transition, supported by flexibility and targeted use of alternative fuels like biomass where appropriate. Importantly, the analysis shows that much of this electrification can be done with only minor upgrades to local electricity distribution networks, particularly when paired with efforts to better manage and reduce demand.

Energy efficiency and smarter consumption emerge as critical enablers. By lowering overall energy requirements, these measures can reduce the scale, cost, and complexity of the transition, while also easing pressure on energy networks and supply chains.

Taking a regional perspective provides a clear picture of how energy demand, infrastructure, and fuel supply interact. This report highlights where coordinated action across businesses, energy suppliers, and network providers can unlock more efficient and cost-effective outcomes.

This report has been developed with input from electricity distribution businesses, energy providers, regional stakeholders, and commercial and industrial energy users. This engagement has helped ensure the analysis reflects real-world considerations and supports practical decision-making.

As Wellington organisations navigate an increasingly complex energy environment, this report provides a base for informed, forward-looking choices. By aligning investment in efficiency, technology, and infrastructure, the region has a clear opportunity to strengthen energy resilience while progressing toward a lower-emissions future.

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 Wellington region
- Wellington local electricity distribution businesses – Electra, Powerco and Wellington Electricity
- National grid owner and operator Transpower
- Regional forestry companies
- Regional wood processors
- Electricity generators and retailers

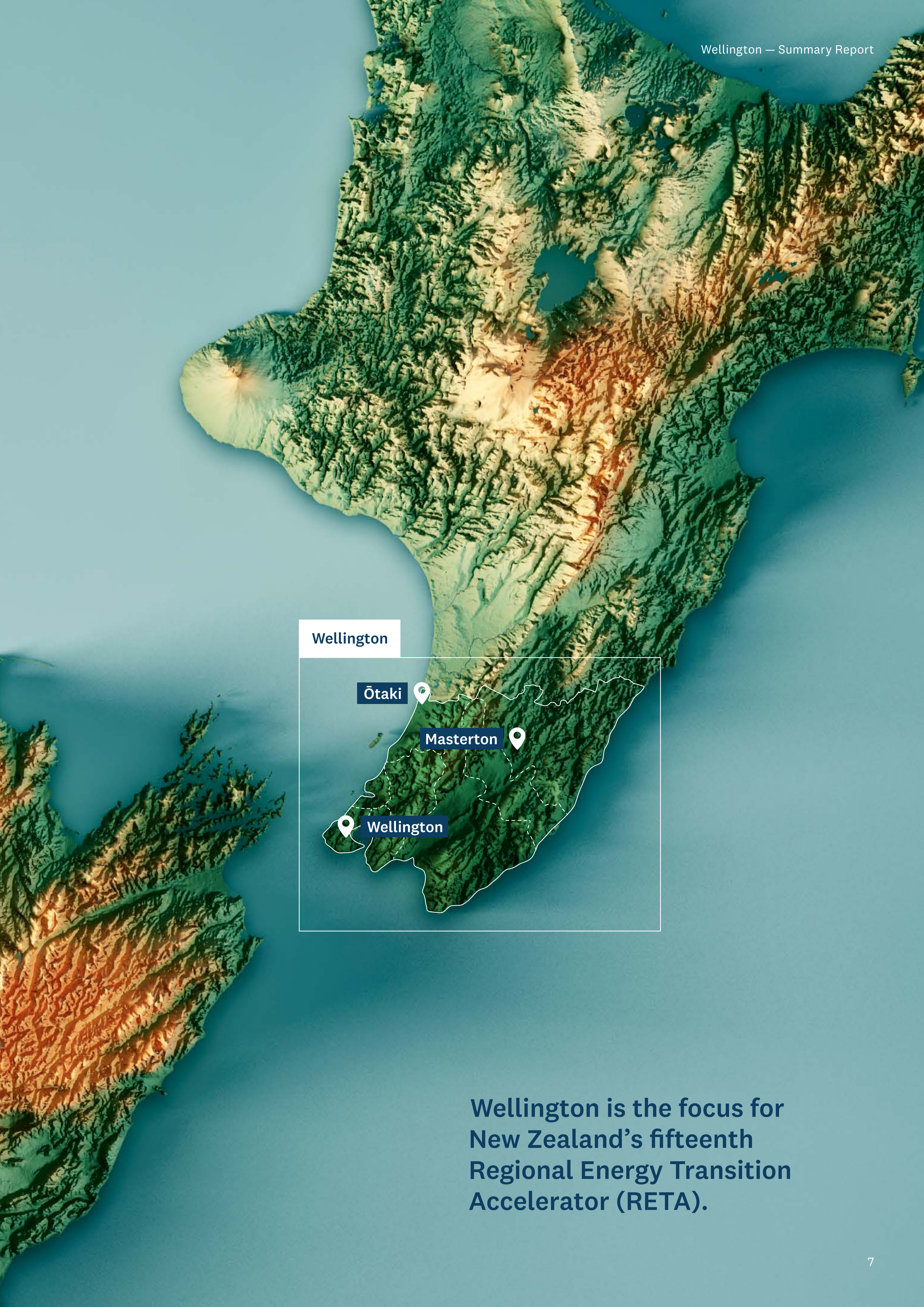
This RETA report is the distillation of individual workstreams delivered by:

- **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

“The changing energy landscape underscores the importance of coordinated action, robust information, and a clear understanding of regional systems.”

Dr Marcos Pelenur, Chief Executive, EECA

3 Table of contents



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

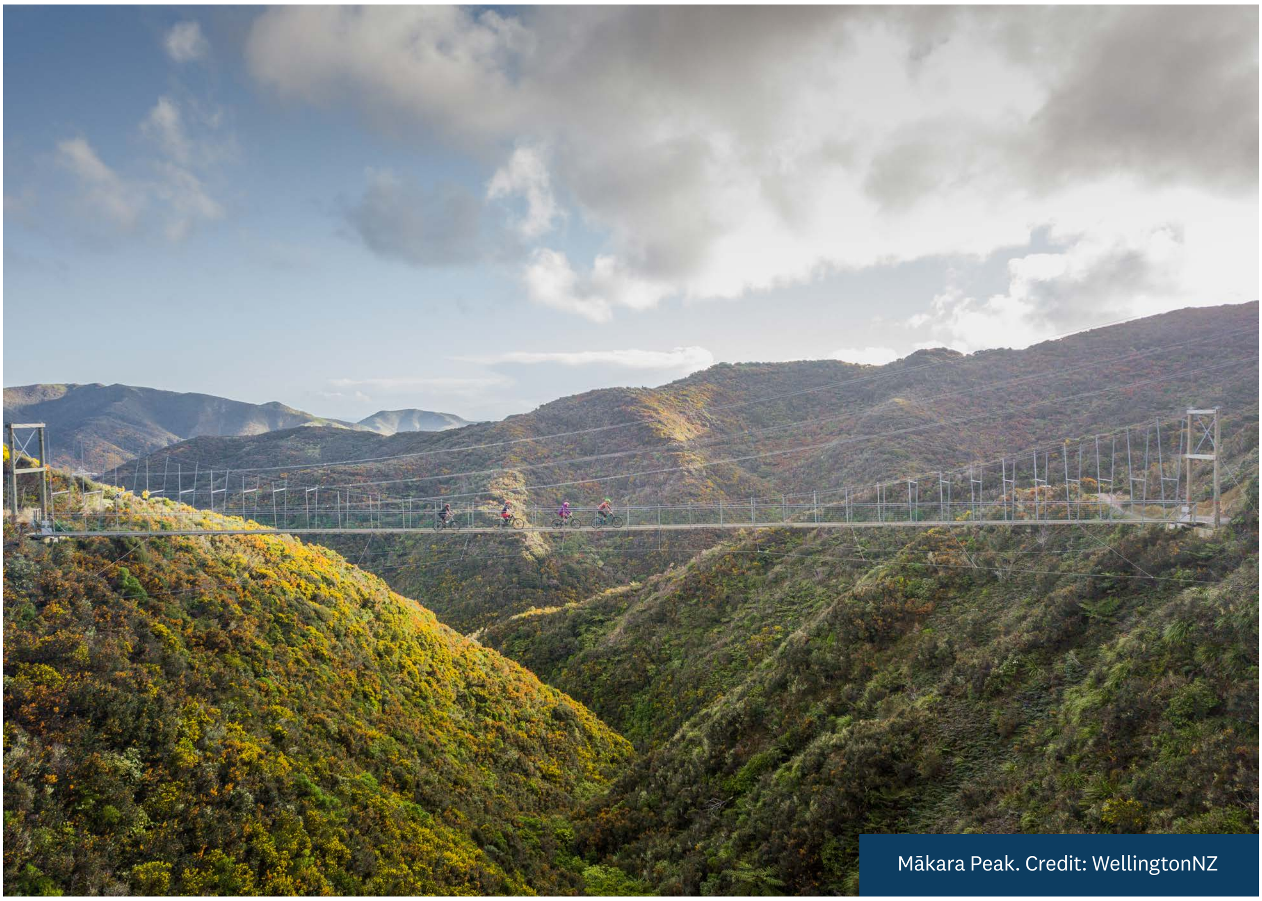
4 Wellington overview

This report provides a snapshot of the Regional Energy Transition Accelerator (RETA) prepared for the Wellington region (shown in Figure 1).

The report brings together information on the demand for fossil fuels for process heat in Wellington, along with information on electricity network and biomass availability in the region, 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.

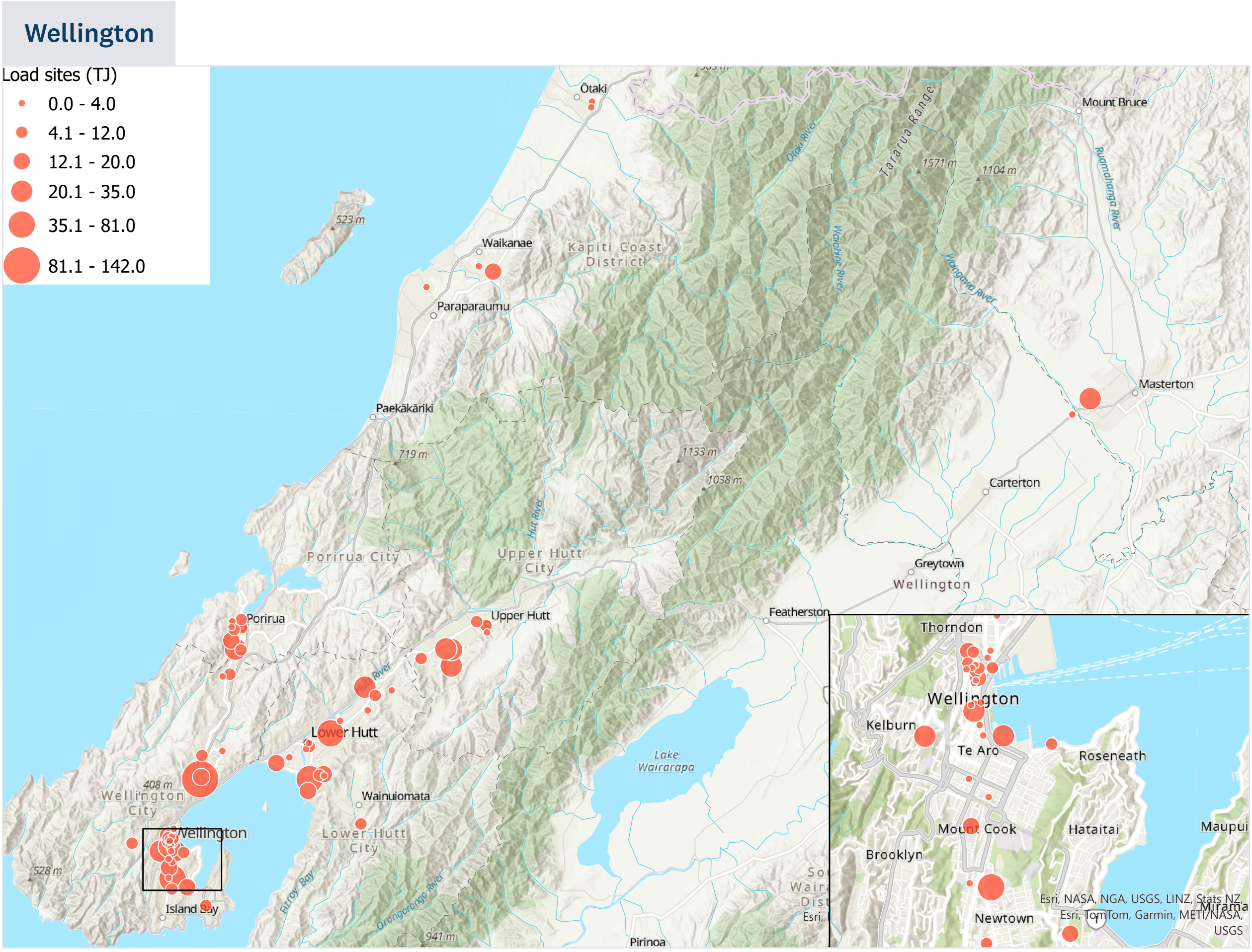
Our analysis of energy requirements in Wellington uses year 2022 as a baseline to be consistent with the previous RETA regional analyses. We note that since then, constraints in gas supply have affected prices and availability of fossil gas, and as a result have altered fossil gas consumption patterns.[1] This means that it is increasingly important for organisations to understand their options for alternative fuels for their processes, ensuring a secure and affordable supply.



Mākara Peak. Credit: WellingtonNZ

[1] See Gas supply reducing faster and sooner than previously forecast | Ministry of Business, Innovation & Employment.

Figure 1 — Process heat demand sites in the Wellington region.



There are 76 sites covered in the report, spanning industrial (including meat, food and beverage, and manufacturing) and commercial use (predominantly facility heating). These sites have fossil-fuelled process heat equipment larger than 500 kW and include sites for which EECA has detailed information about their potential projects to reduce energy use and switch to renewable fuels.[2] The sites, shown in Figure 1 by location and size of their annual energy requirements, collectively consumed 965 TJ of process heat energy, predominantly in the form of fossil gas, and produced 52 kt per year of carbon dioxide equivalent (CO_2e) emissions.

Table 1 shows that the commercial sector dominates emissions, with 61 commercial sites accounting for 64% of the fossil fuel demand. This is a different profile to many other regions where a few very large industrial users dominated the demand.

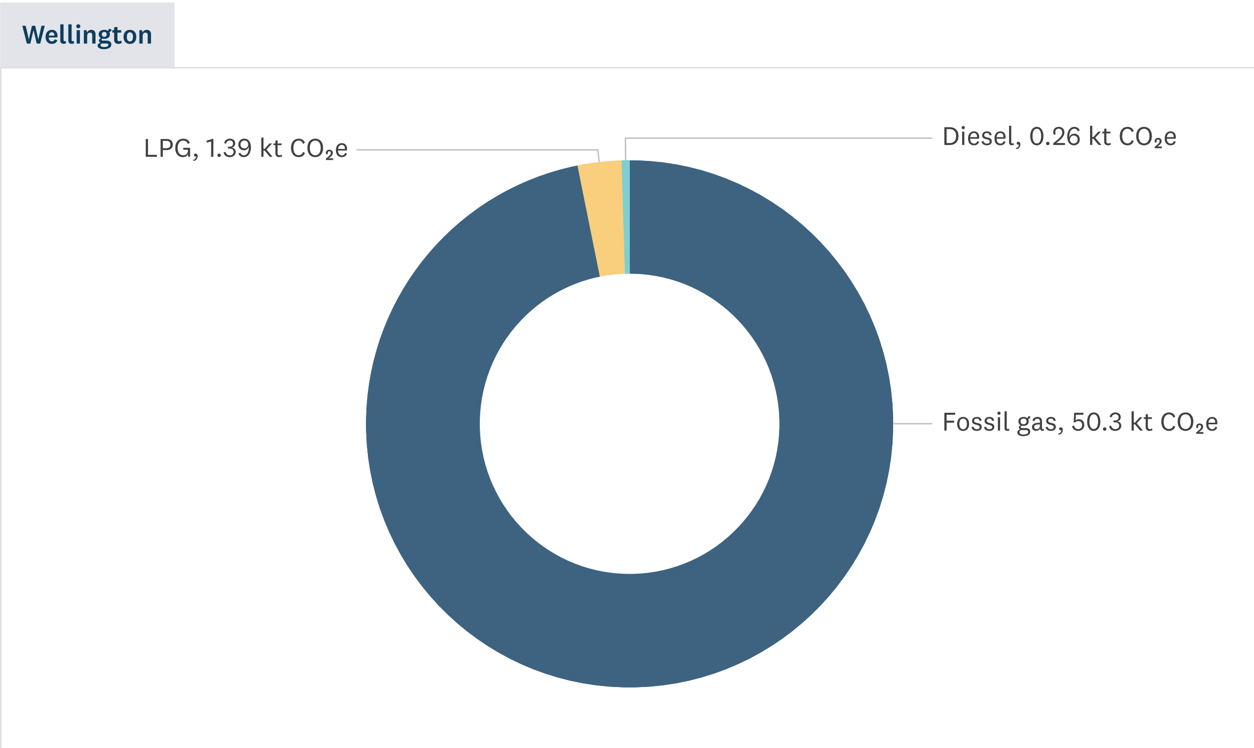
2 For many large process heat users in New Zealand, process heat fuel switching opportunities have been captured in an EECA Energy Transition Accelerator (ETA) report.

Table 1 — Summary of Wellington RETA sites fossil fuel process heat demands and emissions

Type	Sites	Thermal capacity (MW)	Thermal fuel consumption (GWh/yr)	Thermal fuel consumption (TJ/yr)	Thermal fuel emissions (kt CO_2e/yr)
Industrial	15	59	96	347	19
Commercial	61	124	171	617	33
Total	**76**	**183**	**268**	**965**	**52**

The majority of Wellington process heat emissions come from piped fossil gas (97%) (Figure 2).

Figure 2 – Annual emissions by process heat fuel, 2022.

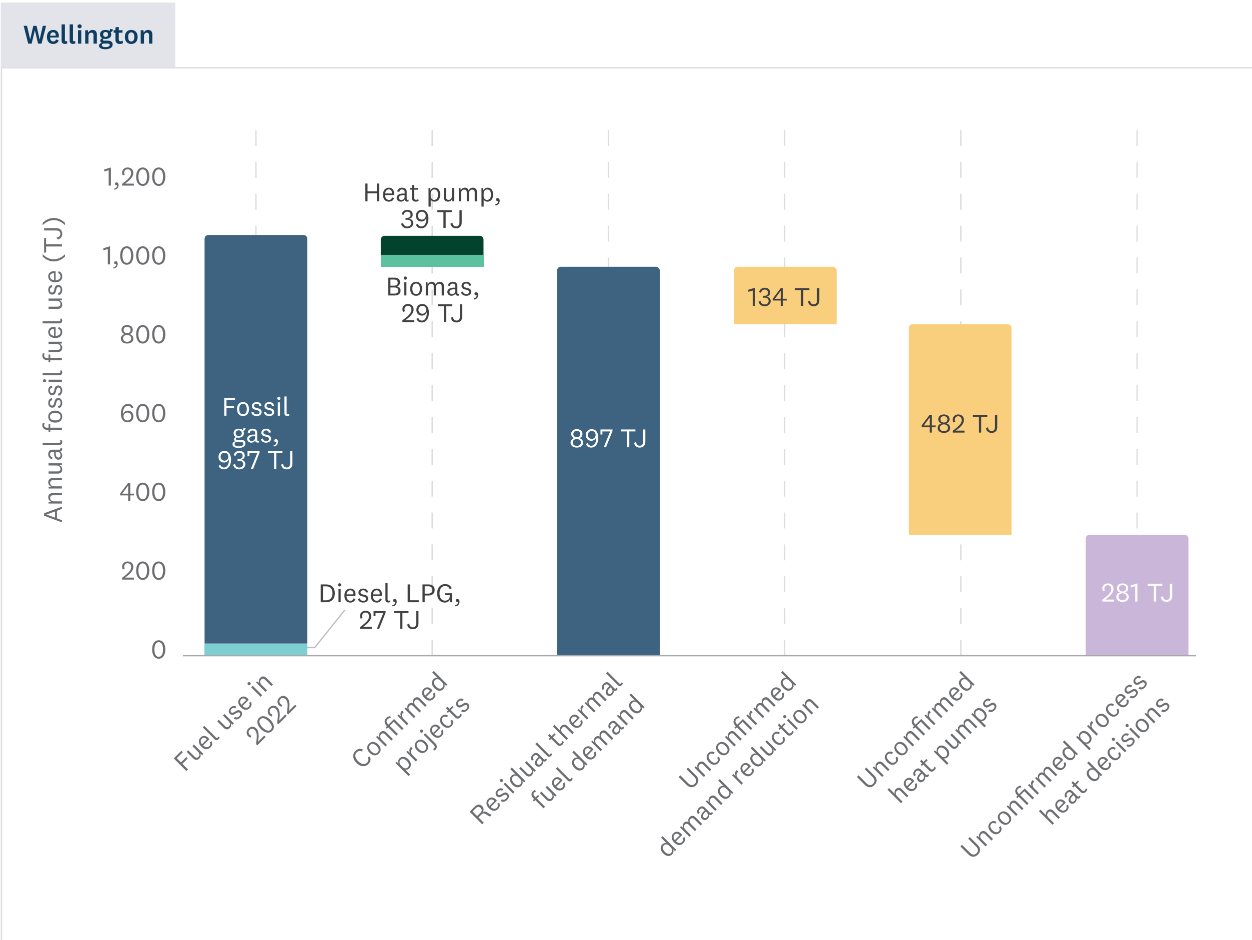


The objective of the Wellington RETA is to demonstrate pathways that eliminate as much of these process heat emissions as possible. It does this by supporting organisations in their consideration of:

- 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 renewable source such as biomass and/or electricity).

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

Figure 3 – Potential impact of demand reduction and fuel-switching on Wellington's fossil fuel usage.



Based on our analysis, 897 TJ of the residual thermal demand could be considered for fuel-switching (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 Wellington 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.

The analysis in this report only considers fuel switching through electrification (particularly air-source heat pumps and electric boilers) and biomass boilers, consistent with the approach taken throughout the RETA programme. However, there are other renewable fuel options, including biogas, geothermal heat, and ground-source heat pumps, that may be appropriate for individual sites or specific locations, and these should be explored further by process heat users.

4.1 RETA site summary

Across the 76 sites considered in this study, 157 individual projects were identified spanning the three categories discussed above – demand reduction, heat pumps and fuel-switching.[3]

Table 2 shows the status of the process heat projects considered in the Wellington RETAanalysis. Eighteen projects have been confirmed by the process heat organisation (i.e. the organisation has committed to the investment and funding allocated). The other 139 are unconfirmed (i.e. the process heat organisation is yet to commit to the final investment).

Table 2 – Number of projects considered in Wellington RETA: Confirmed vs Unconfirmed. Source: Lumen, EECA

Status	Demand reduction	Heat pump	Fuel switching	Total
Confirmed	5	11	2	18
Unconfirmed	61	54	24	139
Total	**66**	**65**	**26**	**157**

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 in TJ per year and reports the peak demand from the boiler, should it convert to electricity.

The sites that have already confirmed their fuel of choice (shaded in blue) represent a peak demand for 6.1 MW of electricity and 36 TJ of biomass.

For unconfirmed projects, the cells shaded with bold text indicate the preferred fuel option according to our commercial decision-making criterion, described in Section 5. Empty cells indicate where fuel choices are not applicable to that site.

[3] This is the number of projects once the optimal fuel switch decision has been determined for a given site (i.e., the number of projects in the MAC optimal pathway).

Table 3 – Summary of Wellington RETA sites with fuel-switching requirements

Site name	Industry	Project status	Bioenergy required (TJ/yr)	Peak electrical demand (MVA)
Hutt City Council Huia Pool	Commercial	Confirmed		0.33
Hutt City Council McKenzie Summer Baths	Commercial	Confirmed		0.10
Hutt City Council Stokes Valley Pool	Commercial	Confirmed		0.10
Hutt City Council The Dowse Art Museum	Commercial	Confirmed		0.10
Hutt City Council Wainuiomata Summer Pool	Commercial	Confirmed		0.21
Kenepuru Hospital - Stage 1	Commercial	Confirmed	14	
Rātonga-Rua-O-Porirua Campus	Commercial	Confirmed	22	
Upper Hutt City Council H2O Xtream	Commercial	Confirmed		0.36
Wellington Airport	Commercial	Confirmed		0.68
Wellington City Council Freyberg Pool & Fitness Centre	Commercial	Confirmed		0.15
Wellington City Council Karori Pool	Commercial	Confirmed		0.08
Wellington City Council Wellington Regional Aquatic Centre	Commercial	Confirmed		0.34
Bostik Wellington	Industrial	Unconfirmed	**3**	0.49
Breadcraft Wairarapa	Industrial	Unconfirmed	24	**0.99**
DB Breweries Tuatara	Industrial	Unconfirmed	**3**	0.85
Downer Ngauranga Asphalt Plant	Industrial	Unconfirmed	**18**	13.57
Executive Laundry Group Limited Petone	Industrial	Unconfirmed	**16**	1.54
Farrah's Breads Upper Hutt	Industrial	Unconfirmed	**5**	0.25
Firth Dricon Waikanae	Industrial	Unconfirmed	**21**	0.99
Fulton Hogan Wellington Asphalt Plant	Industrial	Unconfirmed	24	**7.92**
Godfrey Hirst Lower Hutt	Industrial	Unconfirmed	**6**	2.89
Goodman Fielder Quality Bakers Wellington	Industrial	Unconfirmed	8	**0.92**
Higgins Concrete Wairarapa	Industrial	Unconfirmed	**4**	7.31
Mexicano Corn Chips Lower Hutt	Industrial	Unconfirmed	**7**	0.49
Sealed Air Porirua	Industrial	Unconfirmed	**7**	0.99

Site name	Industry	Project status	Bioenergy required (TJ/yr)	Peak electrical demand (MVA)
Taylor Preston Limited	Industrial	Unconfirmed	**58**	4.17
Welllington Water Seaview Wastewater Treatment Plant	Industrial	Unconfirmed	**51**	5.05
Whittaker's Porirua	Industrial	Unconfirmed	**1**	0.56
Argosy Property Ltd 7 Waterloo Quay	Commercial	Unconfirmed		**0.16**
Argosy Property Ltd MBIE Building	Commercial	Unconfirmed		**0.26**
Argosy Property Ltd TSB Bank Building	Commercial	Unconfirmed		**0.31**
Callaghan Innovation Gracefield	Commercial	Unconfirmed	**6**	1.68
Department of Corrections Rimutaka Prison	Commercial	Unconfirmed		**0.85**
ESR Kenepuru	Commercial	Unconfirmed	1	**0.21**
GNS Avalon	Commercial	Unconfirmed		**0.21**
GNS Lower Hutt	Commercial	Unconfirmed		**0.12**
Hampton Hill School	Commercial	Unconfirmed		**0.39**
Hutt Hospital	Commercial	Unconfirmed	**11**	2.03
Hutt Valley High School	Commercial	Unconfirmed		**0.32**
Kapiti Coast District Council Otaki Pool	Commercial	Unconfirmed		**0.11**
Kapiti Coast District Council Waikanae Pool	Commercial	Unconfirmed		**0.07**
Kenepuru Hospital - Stage 2	Commercial	Unconfirmed	**14**	0.71
Mahinawa Specialist School and Resource Centre	Commercial	Unconfirmed		**0.21**
Massey University Wellington Campus	Commercial	Unconfirmed		**1.50**
Museum of New Zealand Te Papa Tongarewa Cable Street	Commercial	Unconfirmed	**4**	0.54
Museum of New Zealand Te Papa Tongarewa Tory Street	Commercial	Unconfirmed		**0.37**
New Zealand Defence Force Trentham	Commercial	Unconfirmed		**1.47**
Newlands College	Commercial	Unconfirmed		**0.14**
NZ Campus of Innovation and Sport Trentham	Commercial	Unconfirmed		**0.41**
Oceania Healthcare Elderslea Village	Commercial	Unconfirmed		**0.28**

Site name	Industry	Project status	Bioenergy required (TJ/yr)	Peak electrical demand (MVA)
Otaki College	Commercial	Unconfirmed		**0.25**
Paraparaumu College	Commercial	Unconfirmed		**0.20**
Porirua City Council Te Rauparaha Arena and Aquatic Centre	Commercial	Unconfirmed		**0.18**
Precinct Properties Aon Centre	Commercial	Unconfirmed		**0.66**
Precinct Properties Mayfair House	Commercial	Unconfirmed		**0.12**
Precinct Properties NTT Tower	Commercial	Unconfirmed		**0.27**
Precinct Properties Treasury Building	Commercial	Unconfirmed		**0.34**
Reserve Bank of New Zealand	Commercial	Unconfirmed		**0.50**
RJ Holdings Bayleys Building	Commercial	Unconfirmed		**0.16**
RJ Holdings Centrepoint Building	Commercial	Unconfirmed		**0.12**
RJ Holdings Harbour Tower	Commercial	Unconfirmed		**0.14**
RJ Holdings Lambton Centre	Commercial	Unconfirmed		**0.12**
RJ Holdings Lambton House	Commercial	Unconfirmed		**0.18**
RJ Holdings Midlands Chambers	Commercial	Unconfirmed		**0.17**
RJ Holdings Solnet House	Commercial	Unconfirmed		**0.18**
Southern Cross Wellington Hospital	Commercial	Unconfirmed	1	**0.22**
Te Pukenga Weltec & Whitireia Porirua Campus	Commercial	Unconfirmed		**0.30**
Victoria University Kelburn Campus	Commercial	Unconfirmed		**1.81**
Victoria University Old Government Buildings	Commercial	Unconfirmed		**0.14**
Victoria University Rutherford House	Commercial	Unconfirmed		**0.33**
Victoria University Te Aro Campus	Commercial	Unconfirmed		**0.24**
Wakefield Hospital	Commercial	Unconfirmed	**1**	0.28
Wellington City Council Keith Spry Pool	Commercial	Unconfirmed		**0.17**
Wellington City Council Tawa Pool	Commercial	Unconfirmed		**0.15**
Wellington City Council Thorndon Pool	Commercial	Unconfirmed		**0.04**
Wellington Hospital	Commercial	Unconfirmed	**12**	3.06

5 Simulated fuel-switching pathways

There are a range of decision criteria that individual organisations may apply to determine the timing of their 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 pathways, that reflect different decision-making criteria that process heat users (who have not confirmed their fuel choice) might use. The pathways are summarised in Table 4.

The Biomass Centric and Electricity Centric pathways represent 'bookends' that focus exclusively on one of the two fuel options (biomass or electricity) for unconfirmed projects. It is acknowledged that these are artificial scenarios, but in the absence of information about confirmed plans, it serves to provide an indication of the possible total future fuel demand for each type of fuel considered.

For the BAU Combined and MAC Optimal pathways, the fuel-switch decision is based on a global standard 'marginal abatement cost' (MAC), that quantifies 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. In the MAC Optimal Pathway, the timing of the fuel-switch is chosen to be the earliest point when a 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.

Table 4 – Fuel switching pathways used in the RETA analysis

Pathway name	Description
Biomass Centric	All unconfirmed site fuel-switching decisions proceed with biomass, where possible, either in 2036 (for coal*) or in 2049.
Electricity Centric	All unconfirmed fuel-switching decisions proceed with electricity, where possible, either in 2036 (for coal*) or in 2049.
BAU Combined	All unconfirmed fuel-switching decisions (i.e. biomass or electricity) are determined by the lowest MAC value for each project, with the timing as for the fuel-centric pathways above.
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 ten-year rolling average of the future New Zealand Treasury's shadow carbon prices. If the MAC does not drop below the ten-year rolling average before 2049, then the timing based on the fuel-centric pathway is used.

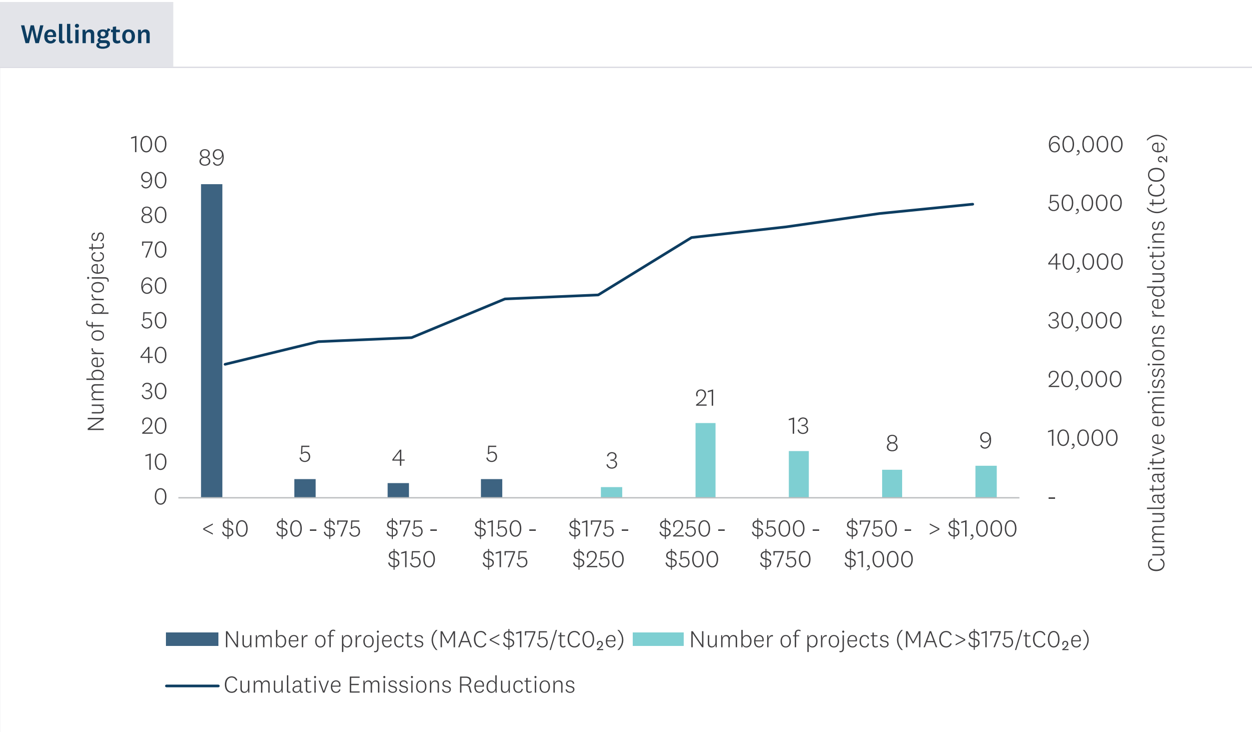
** As no sites in Wellington were using coal in 2022 all unconfirmed fuel switch projects in this analysis were assumed to occur in 2049.*

Credit: Powerco Gas

5.1 Estimated MAC values for Wellington projects

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 potential emissions reduced by these projects.

Figure 4 – Number of projects and cumulative emissions reductions by range of MAC value.

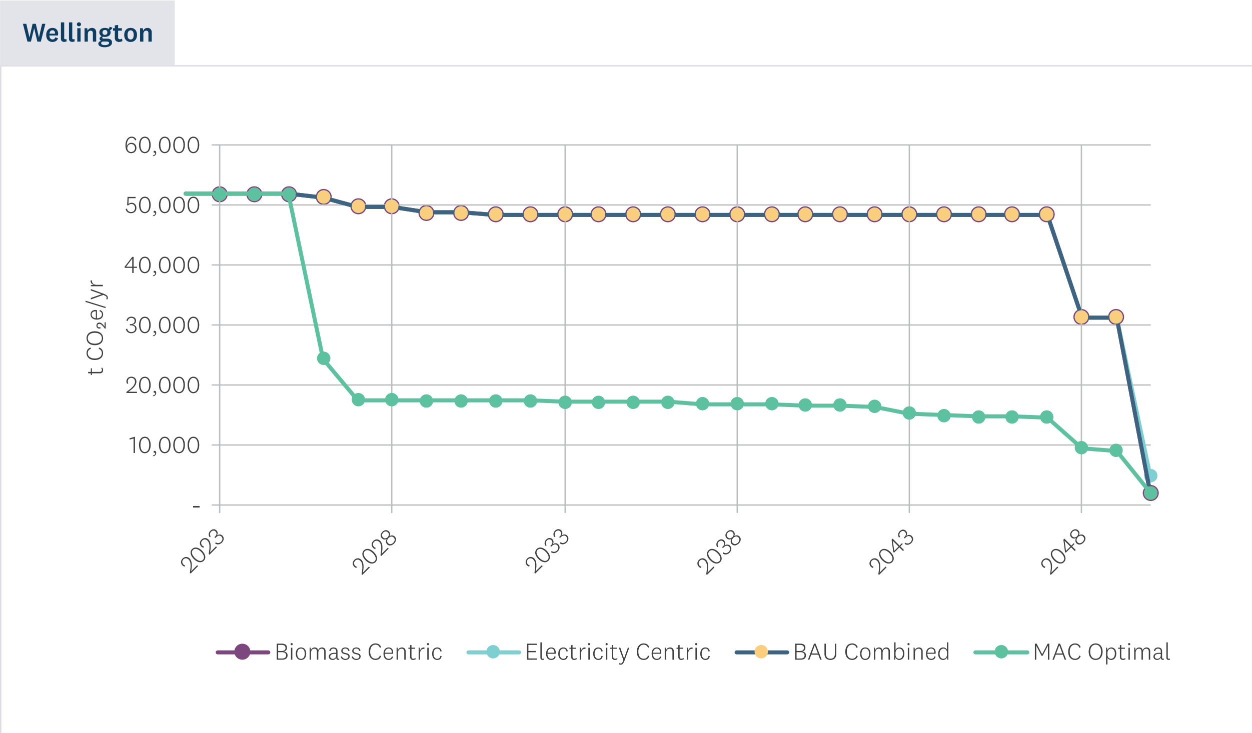


Out of 52 kt CO_2e of process heat emissions from Wellington RETA sites, 23 kt CO_2e (44%) have MACs less than zero, meaning they are economic now, even without a carbon price.[4] Projects accounting for a total of 34 kt (65%) have MACs less than $175/tCO_2e$. Using a commercial MAC decision-making criterion, combined with the assumed trajectory of carbon prices (MAC Optimal), it would be commercially favourable to execute these projects over the next three years.

Compared to a scenario where each of these projects was executed based on the BAU pathway, the MAC Optimal scenario would accelerate fuel-switching, and reduce emissions by a cumulative 746 kt CO_2e over the period of the RETA analysis to 2050, as shown in Figure 5.

[4] 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).

Figure 5 – Simulated emissions reductions under fuel-switching pathways.



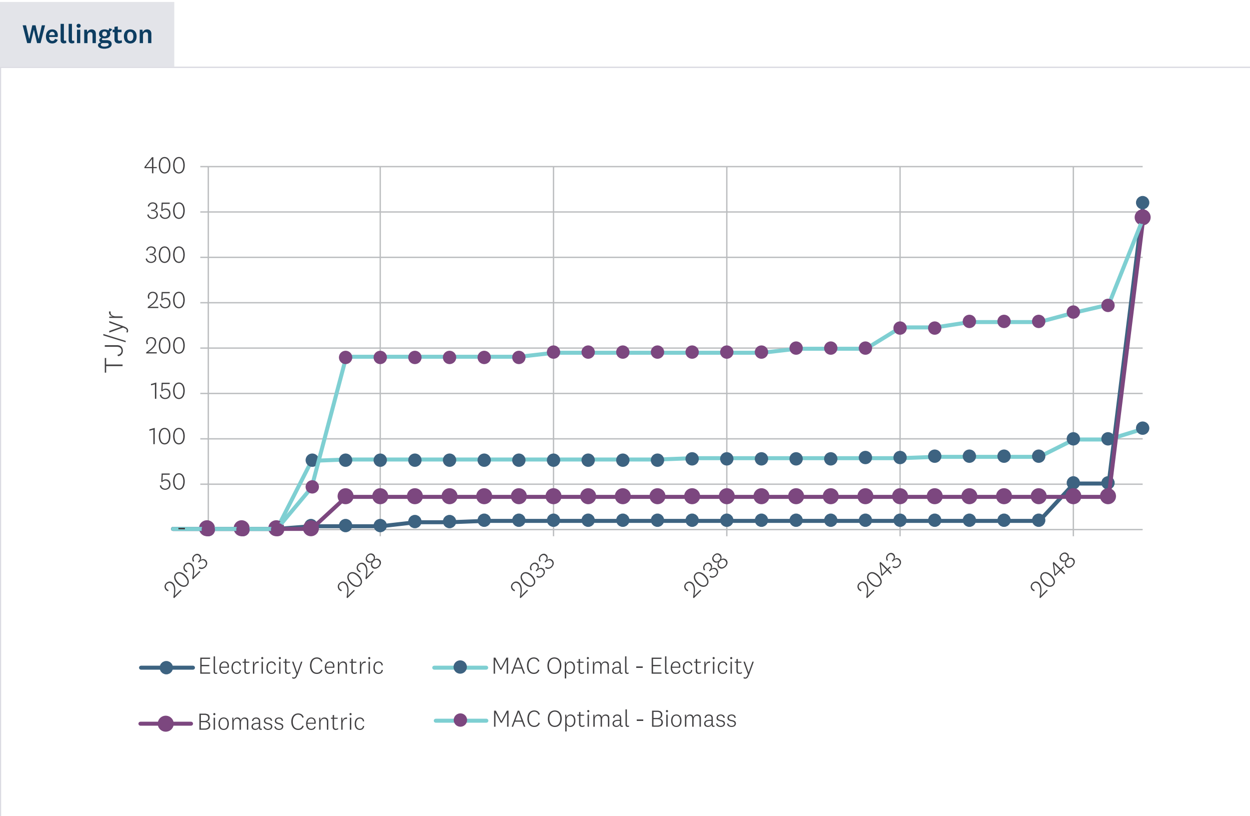
The MAC Optimal pathway proceeds faster, with the majority of emissions reductions economic immediately, primarily as a result of a large number of demand reduction and heat pump projects which are economic at today's carbon prices. Note that the Electricity Centric and Biomass Centric pathways are obscured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

It is important to note that while this analysis identifies that biomass is economically viable, and this is the only consideration in selecting the fuel for the MAC Optimal pathway, central Wellington's density and unique layout presents practical challenges to using biomass at many sites. All organisations will need to evaluate all fuel options carefully, given their own unique set of circumstances. Demand reduction, flexibility and peak demand management will be important components of this evaluation.

5.2 Pathway implications for electricity and biomass demands

The MAC Optimal pathway sees fuel decisions that result in 24% of the region's energy needs in 2050 supplied by electricity, and 76% supplied by biomass (Figure 6). We expand further on these fuel-switching outcomes in sections 6 and 7.

Figure 6 - Electricity and biomass demand in the fuel-switching pathways.



It is important to recognise the impact that demand reduction has on the overall picture of the Wellington region's process heat. As show in Figure 3, investment in demand reduction meets 15% of the process heat demands from Wellington process heat users, which in turn reduces the necessary fuel switching infrastructure required: thermal capacity from new biomass or electric boilers would be reduced by around 27 MW if these projects were completed.[5] We estimate that demand reduction would avoid investment of between $30m and $32m in electricity and biomass infrastructure.[6]

[5] This assumes that both energy consumption and the peak thermal demand required from biomass or electric boilers are equally reduced by demand reduction projects.

[6] On the assumption that the capital cost of electrode boilers is $1.1m/MW and biomass boilers is $1.2m/MW. The electrode boiler cost does not consider the connection costs, which average $0.2m/MW (for N security connections) for the Wellington region, but are very site specific.

5.3 Sensitivity to gas price

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 fossil gas in Wellington and the current constraints in supply, additional analysis of the sensitivity to gas prices was undertaken.

The modelling assumed a base gas price of $21/GJ ($0.075/kWh) 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 33 fuel-switching decisions being deferred, and causing 82 kt CO_2e of additional emissions on a cumulative basis through to 2050. By contrast, doubling the escalator to 6% accelerated 41 projects, delivering 222 kt CO_2e of additional emissions reduction by 2050. A significant increase in the natural gas price to $45/GJ by 2035 (excluding ETS charges) continues to accelerate 35 projects with a cumulative additional reduction of 245 kt CO_2e by 2050.

Figure 7 — Sensitivity of emissions reduction pathways to different gas price assumptions.

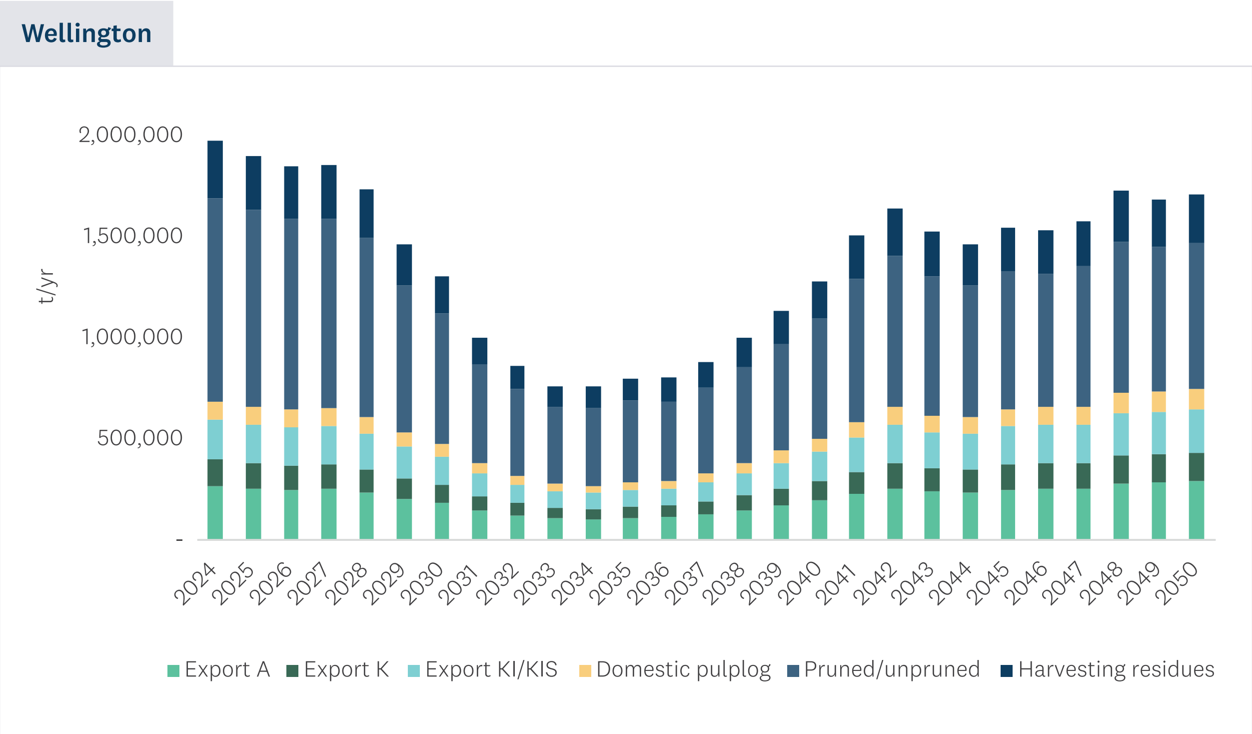
6 Biomass – resources and costs

The Wellington region has approximately 70,865 ha of planted forests, the majority of which are in the Carterton and Masterton districts. To assess the total availability of harvestable wood in the 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 1,168 kt pa (8,390 TJ pa) of wood will be harvested in the Wellington region over the next 15 years.[7]

Figure 8 shows that there is some annual variation in total available wood resource, with a visible decline in the 2030s. The annual variation occurs due to the age distribution of the existing forests, and yield assumptions combined with assumptions on how forests are harvested.

Figure 8 – Forecast of Wellington wood availability, 2024-2050.



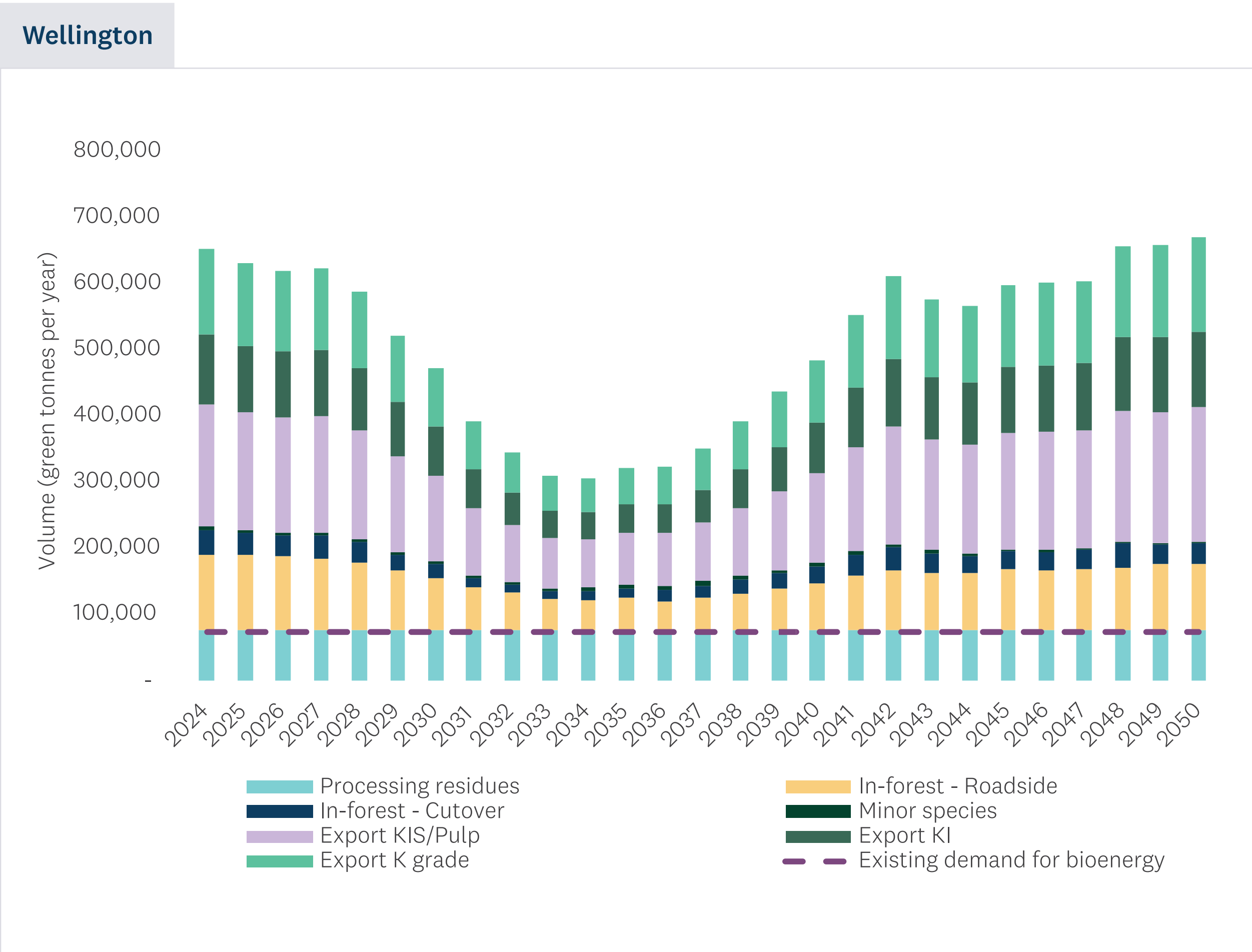
[7] We use 15 years as a reasonable assessment of the near-term period that process heat users considering biomass would likely want to contract for, if they were making the decision in the next few years.

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

- On average, 123 kt of harvest residues can be economically recovered. None of these are currently being recovered, and therefore could be available for new bioenergy demand.
- Interviews with sawmills suggested that around 165 kt (1,189 TJ) per year of processing residues are produced. Out of this, 79 kt (567 TJ) per year is woodchip sold out of region, and another 73 kt (521 TJ) per year is already used for bioenergy (mainly sawdust, shavings and hog fuel). Around 11 kt (81 TJ) per annum are used for landscaping. The remainder 3 kt (19 TJ) of processor residues is currently unutilised.
- On average through to 2039, K log resources are 83kt (593 TJ) per year, and the KI/KIS log resource is 127 kt (910 TJ) per year, and the total pulp resource is 58 t (417 TJ) per year. Interviews with forestry owners suggested there is no market for pulp logs in the region.

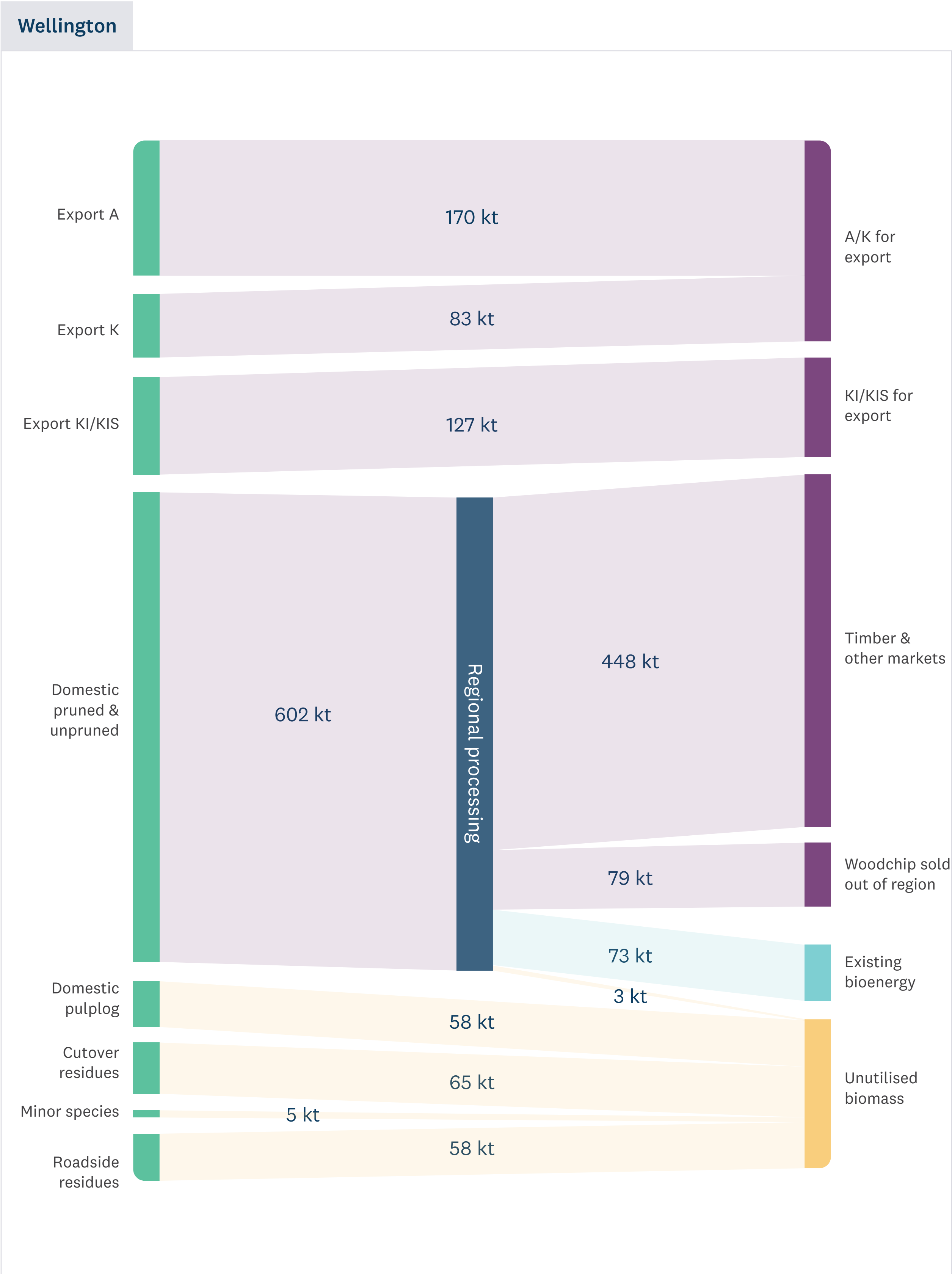
The resulting potential volume for bioenergy is shown in Figure 9.

Figure 9 – Woody biomass available for bioenergy in the Wellington region. Source: Forme



The overall analysis of the Wellington region is summarised in Figure 10.

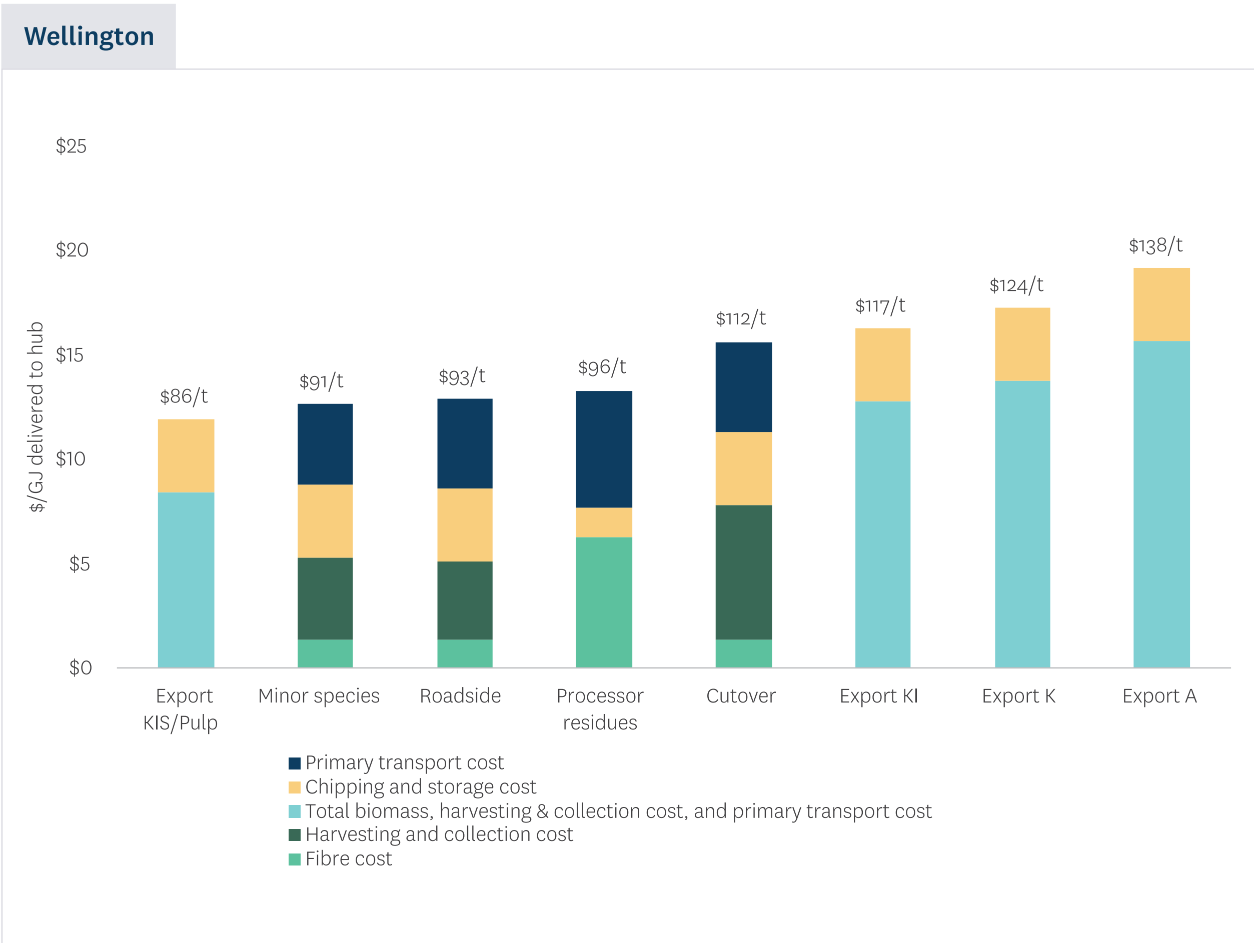
Figure 10 – Average wood flows in the Wellington region, 2024-2038. Source: Forme



Overall, EECA estimates that, on average over the next 15 years, **approximately 189 kt per year (1,360 TJ per year) of woody biomass (forest and processor residues, minor species and pulp) is currently unutilised and could be recovered for new boiler demands without disrupting low grade export markets or existing bioenergy consumers.** A caveat to this analysis however is that the suitability of biomass for urban process heat sites, as well as the transport from the Masterton and Carterton districts to Wellington city, may challenge the economics of the decision.

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

Figure 11 – Estimated delivered cost of potential bioenergy sources ($/GJ and $/green tonne). Source: Forme (2024).



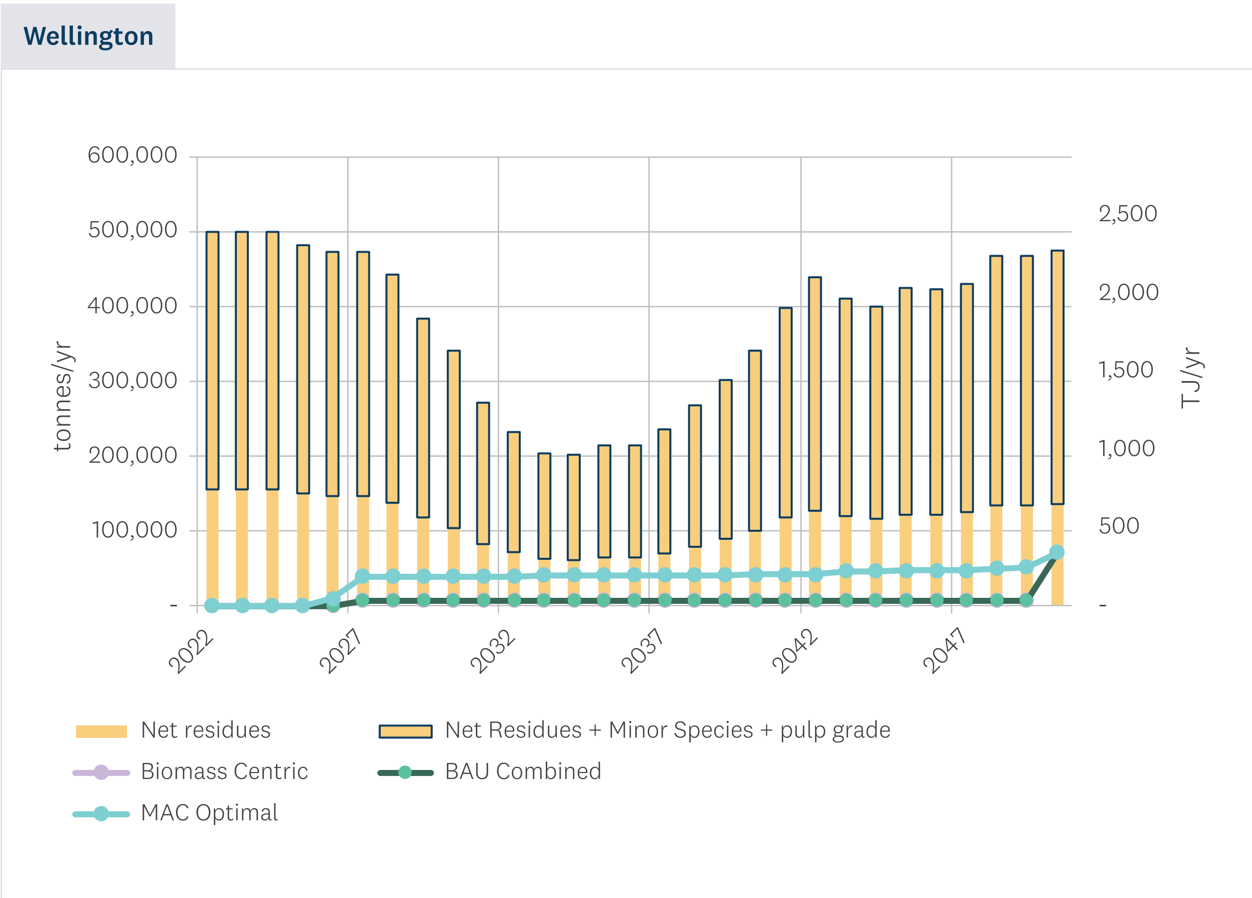
Export grade K and A logs have been retained in the analysis to represent 'scarcity values' if our scenario analysis indicates that other more plausible and sustainable sources of bioenergy are insufficient. However, we do not believe these are sustainable or practical sources of bioenergy.

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 fuel-switching pathways against the expected available residues (net of existing demand, Figure 12).

The modelling shows that net residues will be sufficient to meet biomass demand in the MAC Optimal pathway over the entire analysis period. The degree to which these resources are used is a commercial decision, which would include a comparison with alternatives in terms of cost and feasibility, as noted earlier.

Figure 12 – Potential growth in biomass demand and available residues.



East by West Ferries. Credit: WellingtonNZ

7 Electricity – network capacity and costs

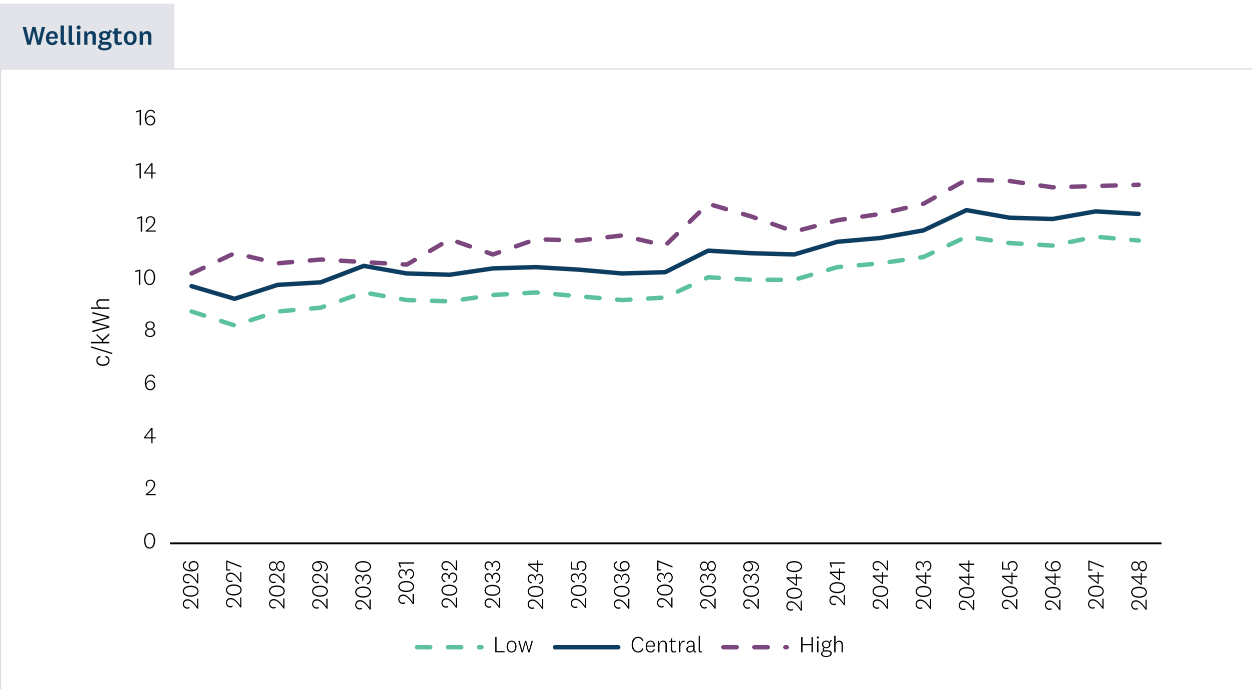
The availability of electricity to meet the demand from process heat users is largely determined at a national 'wholesale' level. Supply is delivered to an individual site through electricity networks – a transmission network owned by Transpower, and a distribution network, owned by electricity distribution 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 Wellington region – Powerco, Wellington Electricity (WE*) and Electra.

The price paid for electricity by a process heat user comprises two main components plus a range of smaller components including metering and regulatory levies. The main components are:

- 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 11.2c/kWh in 2026 to 12.9c/kWh in 2040 under a 'central' scenario. However, different scenarios could see retail prices higher or lower than that level.

Figure 13 – Forecast annual average electricity price for large commercial and industrial demand in the Wellington region (real $2025). Source: EnergyLink



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 5. These are based on each of the EDB's announced prices for the 2025/2026 year. This is the first year of the 2025-2030 regulatory control period (RCP) for price-quality regulated EDBs, including Powerco and WE*. In our modelling, we have assumed increases of around 60% in the total charge over the five year period to 2030.

Table 5 – Estimated and normalised network charges for Wellington large industrial process heat consumers, by EDB; $/MVA per annum.

EDB	Approximate distribution charge $/MVA per year	Approximate transmission charge $/MVA per year	Total Charge $/MVA per year
Electra	$133,000	$9,000	$142,000
Powerco	$73,000	$62,000	$135,000
WE*	$63,000	$21,000	$84,000

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 due to continued population and business growth, distributed generation, and the electrification of transport and process heat. While this RETA analysis only examines demand from process heat electrification, this broader context of potentially rapid growth in demand is important to understand the challenges associated with accommodating new load. 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.
- 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 most sites in Wellington considering electrification the 'as designed' electrical system can likely connect the site with minor distribution level changes without the need for substantial infrastructure upgrades. For these sites, indicative connection costs are under $300,000 and connection lead times may be less than six months.

More substantial upgrades to the distribution network are required for five of the sites, with indicative costs in the range of $1m-$18m and longer lead times (up to 36 months).

Three sites may require major distribution and transmission upgrades to provide N-1 security, with indicative costs in the order of $3m-$12m. These upgrades would take up to 36 months to execute

Figure 14 shows each site's connection costs expressed in per MW terms, i.e. relative to the capacity of the proposed boiler. It shows that there are 37 sites which are likely to have connection costs that are very low and that for a small number of Powerco and Electra sites, the N security option is substantially lower cost than N-1. Whether that is an acceptable level of security will be an agreement between the process heat user, the relevant EDB, and potentially Transpower.

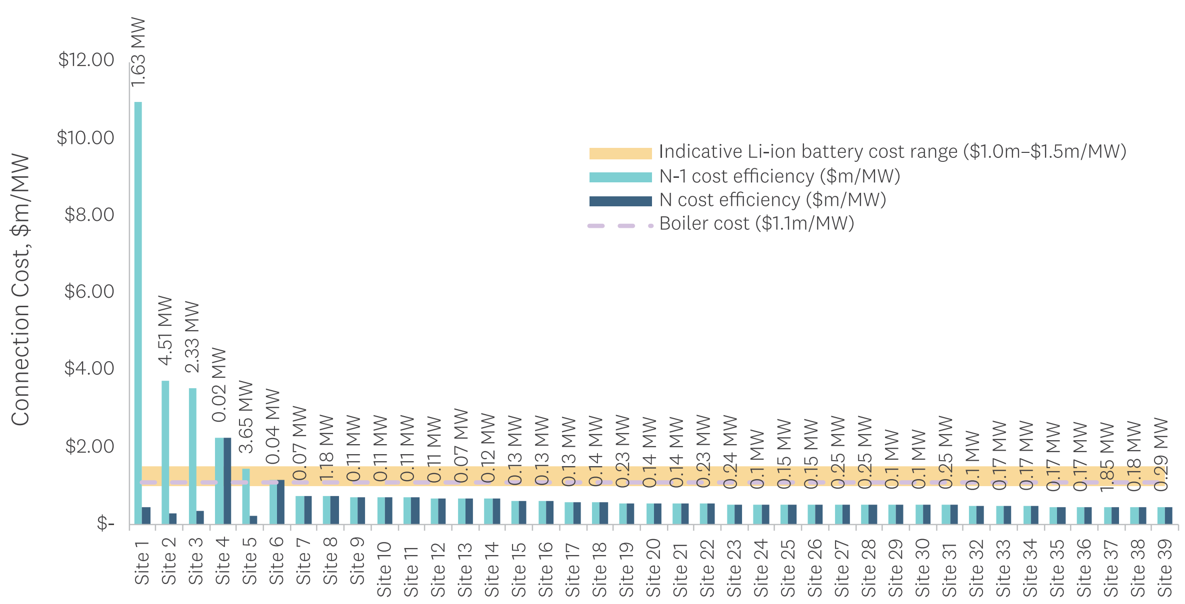
Note that the configuration of the WE* distribution network means that security between the GXP and WE* zone substations is N-1 (ie. N security option is not applicable). These sites are shown in Figure 14 by having the same cost for both N and N-1 options.

Figure 14 – Normalised cost of network connection vs boiler cost, Wellington RETA sites. Source: Ergo, EECA.

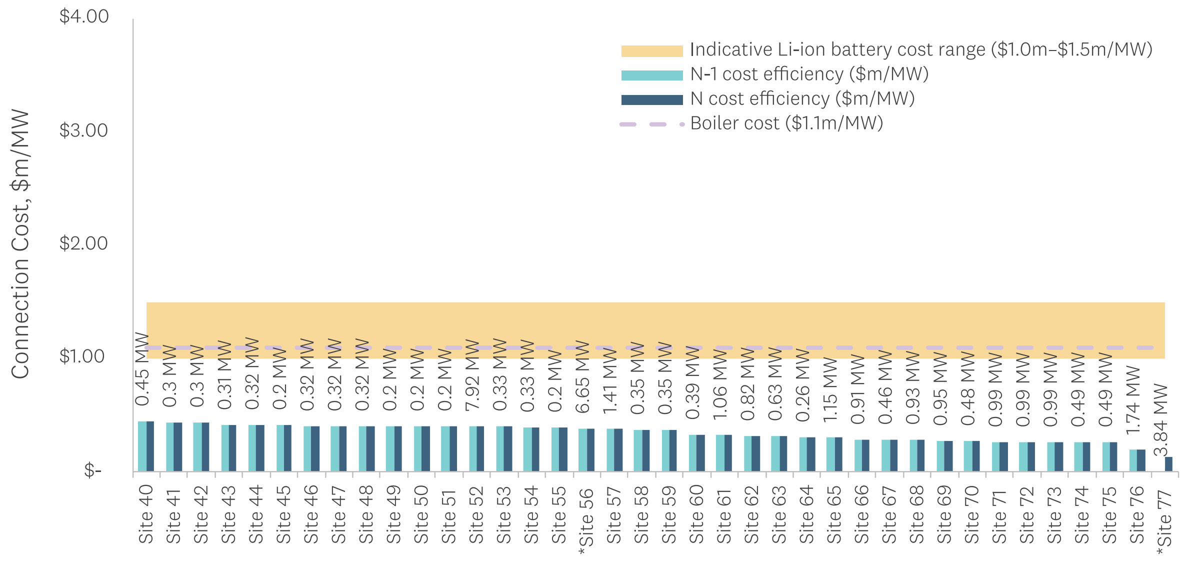
Note: (1) boiler capacity in MW shown in labels

(2) For sites on the WE distribution network, the same cost is shown for both N and N-1 options, given the configuration of that network*

Wellington



Wellington



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

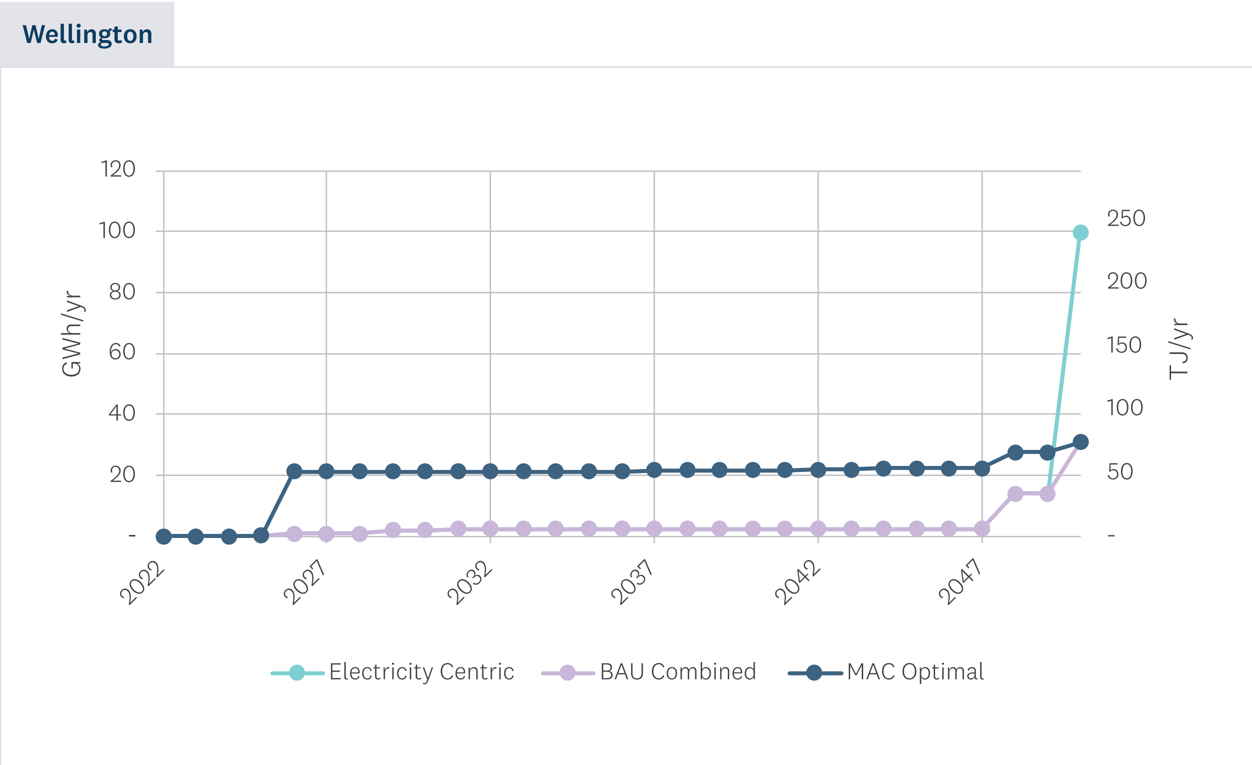
The costs provided above are indicative and appropriate for a screening analysis. They should be further refined in discussion with network owners, and the final costs in some situations will depend on the collective decisions of a number of sites who may require access to similar parts of the network.

Makara Wind Farm

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.



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. Figure 15 shows this occurring in 2050, as that is the assumption made in the pathway, but in reality it is unlikely to occur all at once. In the more commercially realistic MAC Optimal pathway, additional investment in electricity occurs significantly in 2026 and after 2047.

EDB 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 under fuel-switching pathways.

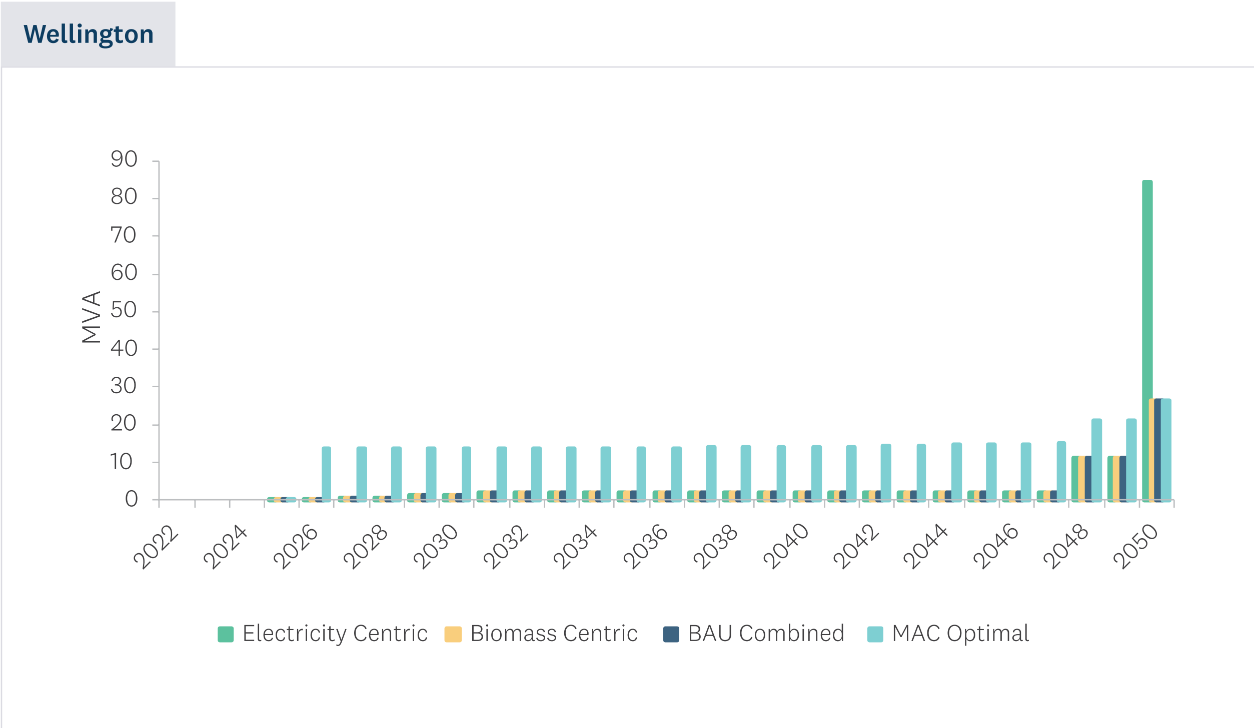


Figure 16 shows that should all unconfirmed process heat users in Wellington convert to electricity (the Electricity Centric pathway), the increase in peak demand could be up to 84 MVA by 2050 (an increase of 11% compared to today's peak demand) assuming all electricity projects are at peak usage at the same time.[8] However, in the MAC Optimal pathway, the increase would only be 13 MVA (2% of todays peak demand), most of which would occur by 2026.

EDBs are responsible for any upgrades required to accommodate process heat users who electrify, but the costs may be shared between the EDB and user. For this analysis, we assumed that 50% of the capital costs of connection would be paid by the process heat user. Table 6 breaks down these costs under the two pathways.

Table 6 – New connections (MW) and customer-driven connection costs under Electricity Centric and MAC Optimal pathways.

EDB	New connections — Electricity Centric pathway		New connections — MAC Optimal pathway	
	Connection capacity (MVA)	Connection cost ($m)	Connection capacity (MVA)	Connection cost ($m)
Powerco	8.3	$0.4	-	$0.0
WE*	74.3	$21.8	25.9	$2.4
Electra	1.6	$0.0	0.6	$0.0
Total	**84.2**	**$22.2**	**26.5**	**$2.4**

$22m would be spent connecting new process heat plant to the local networks in the BAU pathway. The more commercially realistic MAC Optimal pathway would see around $2.4m spent.

The costs presented in Table 6 are indicative total construction costs associated with network upgrade costs, based on the assumptions outlined in the full report. These costs also exclude the ongoing network charges paid by each process heat user that electrifies their process heat.

8 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.

7.2 Opportunity to reduce electricity-related costs through flexibility

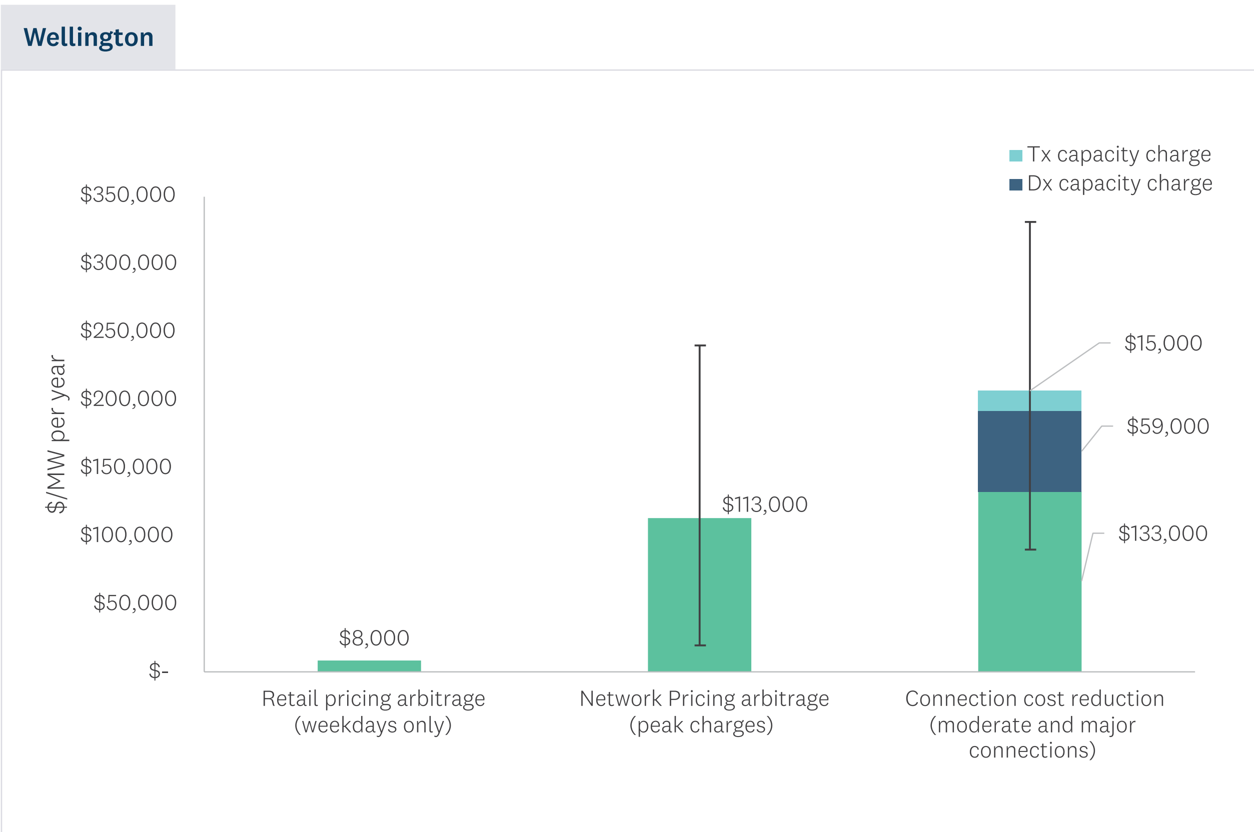
Process heat flexibility can improve system resilience and reduce both electricity system costs and process heat electricity-related costs.

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

As shown in Figure 17, Wellington process heat users could potentially reduce their electricity procurement costs by up to $121,000 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, both the investment required in the physical connection and any network charges from the relevant EDB that relate to the size of the connection.

Figure 17 - Estimates of the value of flexibility in Wellington RETA.

Note: the error bars indicate that 10th and 90th percentile values calculated across different projects.



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.

8 Recommendations

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

Recommendations to improve the use of biomass for process heat:

- Refine the understanding of residue costs, volumes, energy content, contamination levels, economics of recovery and alternative methods of recovering harvesting residues.
- Work should be undertaken with forest owners to understand the logistics, space and equipment required for recovering 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 residue 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.
- 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.
- 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.

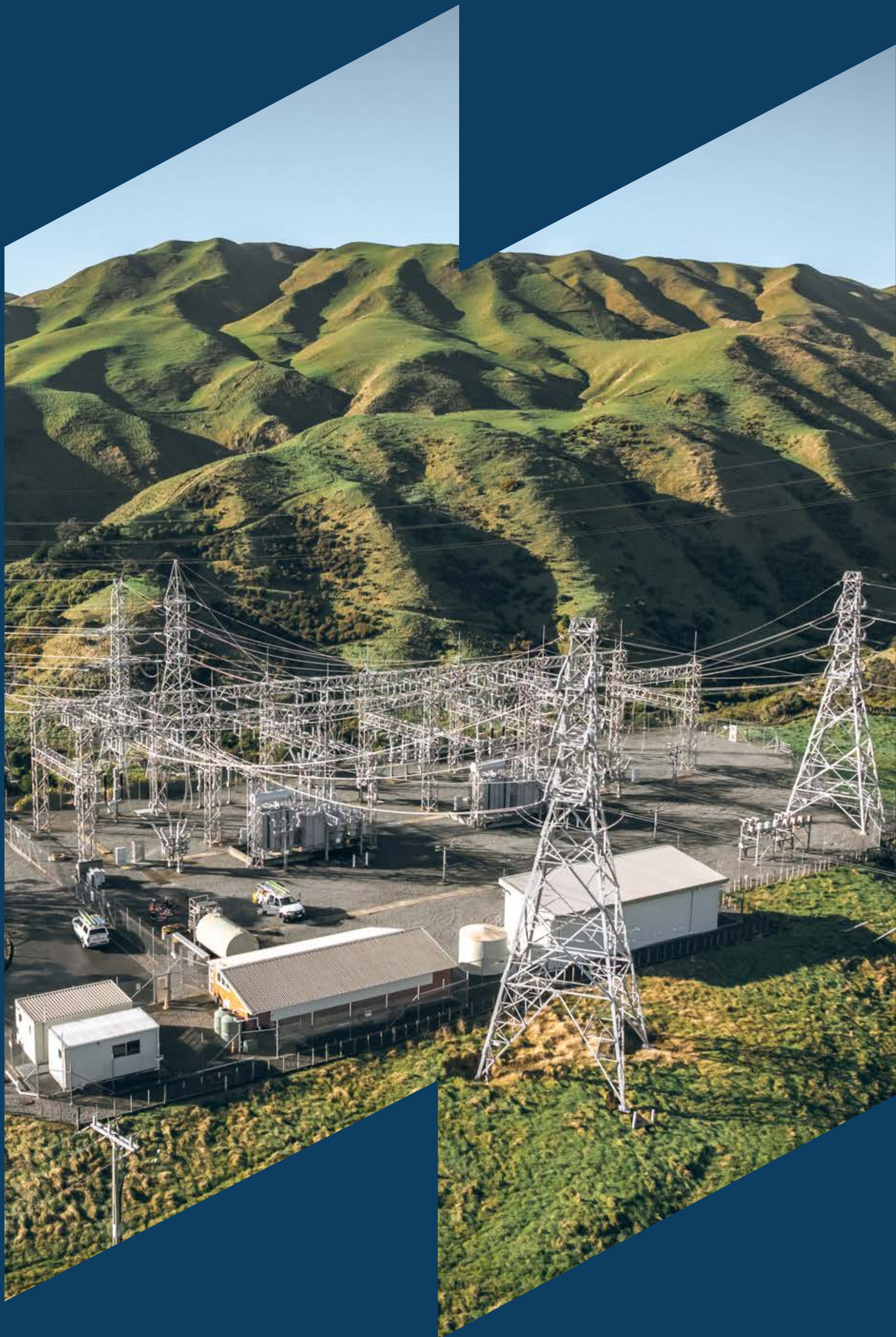
Recommendations to improve the use of electricity for process heat:

- 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.
- Process heat users to proactively engage with EDBs, keeping them abreast of their plans with respect to fuel-switching, 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, 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 to work with process heat users to better understand the value and operability associated with batteries that are integrated into their electrification plans.

Recommendations to assist process heat users with their fuel-switching decisions:

- EECA to work with the Treasury and Ministries 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.



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