2 November 2023

Advancing New Zealand's energy transition
Ministry of Business, Innovation and Employment
PO Box 1473
Wellington 6140
Via email: gastransition@mbie.govt.nz

Tēnā koe,

Gas Transition Plan – Facilitating Aotearoa to grow to zero

The Gas Transition Plan (GTP) will influence Powerco's investment in Aotearoa's energy future. This is an energy transition issue, not a gas issue, so the energy sector and government need to work together to set a pathway for net zero while providing the reliability and affordability that all New Zealanders are looking for.

Powerco is one of Aotearoa's largest gas and electricity distributors, supplying approx. 356,000 (electricity) and 113,000 (gas) urban and rural homes and businesses in the North Island. We serve close to 1 million kiwis. These energy networks provide essential services and are pivotal to mitigating and adapting to climate change.

Our key message is for the government to work with us, and other key parties, to develop a clear, achievable and equitable plan supporting the energy sector's contribution for Aotearoa to grow to zero. Economic growth is fundamental to funding mitigation and adaptation programmes, and our clean energy system offers relative advantage that we can leverage to grow our economy while still hitting targets. Enabling this is a collaborative work in progress, rather than a consultation and response exercise. So our approach to this submission has been to draw a national GTP picture from a starting point of preserving options (see page 2), identifying key outcomes and activities, providing evidence references and brief discussion (sections 1 to 3) and attaching supporting material – all of which can be built on in the period ahead to develop policy, plans and actions.

Powerco is part of the Gas Infrastructure Futures Working Group (GIFWG) which was established to collaborate with government agencies. We are also a member of the Energy Sector Framework which promotes a partnership between industry and government. We look forward to continuing our work with you. If you have any questions regarding this submission please contact Irene Clarke (Irene.Clarke@powerco.co.nz).

Nāku noa, nā,

Stuart Dickson
General Manager, Customer
POWERCO

Gas Transition Plan Issues Paper

Submission

2 November 2023

POWERCO

Overview figure: Focusing Aotearoa's gas transition activities and timing

2025

Gas infrastructure

Certainty of ongoing investment, options preserved:

- Real options analysis
- Right sizing analysis tests criteria & outcomes
- Review regulatory frameworks - decarbonisation objectives & to align with GTP
- Review funding approach for networks & consumers including decommissioning
- Energy system modelling & planning
- Consumer research

Renewable gas

Non-network biogas projects in place, network blending trials, policy support:

- Cross government/industry development group
- Targets established to incentivise biogas production, waste diversion & highest value use
- Endorsed renewable gas trading scheme
- Review appropriate carbon accounting (incl through ETS) for biogas & waste
- Consumer research & education
- Cultural research
- Review safety/technical standards
- Further modelling price/demand scenarios

Natural gas use

Energy Strategy + communications preserve options:

- Understanding interactions of gas-electricity-resilience-emissions-cost (links to Real Options work)
- Reduce industrial & electricity generation use (through ETS + targeted programmes)
- Consumer research
- Workforce plan

2030

Gas infrastructure

Right sizing, repurposing, monitoring:

- Confirming future infrastructure options
- Decisions to optimize network
- Consumer energy source choice
- Complementary government funding if needed for networks & consumers
- DPP4 ensures ongoing economic sustainability of GPBs
- Review regulatory frameworks - RAB for biogas assets, IMs fit for purpose

Renewable gas

Network injection, waste diversion:

- Biogas market established and monitored
- Production increasing (up to 1.5 PJ)
- Regulated assets include biogas plant.
- Align waste management targets, pricing, regulation
- Hydrogen trials
- Review price/demand modelling
- Monitor & adjust targets

Natural gas use

Reducing industrial use, developing alternatives for residential/commercial:

- Focus on transport emissions reduction
- Focus on industrial emissions reduction
- Energy security with gas peakers (but not baseload)
- Regional planning (all energy sources)
- Framework for other emissions reduction or storage options (eg CCUS)

2035

Gas infrastructure

New state emerging, monitoring:

- Right sizing & repurposing for biogas complete
- Complementary government funding if needed for networks & consumers
- Review regulatory frameworks fit for purpose including IMs

Renewable gas

Targets in place, monitoring market:

- 1.5 PJ+ production achieved & growing
- Feedstock market provides increasing supply through waste pricing
- Hydrogen in targeted uses
- Monitor & adjust targets

Natural gas use

Reducing industrial use, developing alternatives for residential/commercial:

- Industrial use reducing
- Reduced residential/commercial use of natural gas through renewable gas options
- CCUS & continued reduction in industrial emissions

2040

Gas infrastructure

Monitoring, review:

- Review right sizing
- Review funding
- Steady state in new infrastructure setting

Renewable gas

Ongoing biogas development:

- Production up to 7 PJ achieved & growing
- Biogas use in industy growing
- Future feedstock levels more certain
- Hydrogen growth

Natural gas use

Reducing overall use:

- Industrial use reduced to hard-to-abate uses (eg high temp processheat)
- Switching of residual industrial load to a commercial-level load in most cases
- Residential use reducing through increasing use of alternatives

2050

Gas infrastructure

- Steady state in new infrastructure setting

Renewable gas

- 100% renewable gas in residential achieved

Natural gas use

- Overall use continues to reduce

Contents

1. Transitioning *gas networks* for Aotearoa's low carbon future

Outcomes for the GTP:

- *The GTP is part of a **whole of energy system approach**. The Energy Strategy addresses the interaction between gas, electricity and other fuels providing policy **certainty for investment** and **government direction across agencies***
- *Gas network **options are preserved** to enable a managed transition which balances security, resilience, affordability, and emissions reduction. Clarity on next steps for learnings and options assessment*
- *Transparency on **cost/benefit trade-offs** of any preferred pathways and how affordability for consumers will be managed*
- *Existing gas network **infrastructure is optimised through right-sizing and repurposing** for renewable gas*
- ***Revenue and allowances** for gas network operators and/or complementary government funding is sufficient to support secure, reliable and safe gas infrastructure services while they continue to be provided (as well as future gas infrastructure services)*
- *Regulatory frameworks and supporting measures **address funding gap** for both networks and consumers as a result of the GTP enabling continued investment in gas pipeline infrastructure to meet energy security needs*

Priority actions

- ***Full options analysis** including filling knowledge gaps and cost/benefit of gas transition options to inform future policy and funding/investment for networks and consumers (Real Options work progressed)*
- *Whole of energy **system modelling** to determine electricity (and other fuels) capacity constraints/ opportunities/interactions to focus gas transition priorities*
- ***Review regulatory framework or provide policy statements** - Regulator objectives to explicitly include decarbonisation, input methodologies and financial mechanisms to incentivise appropriate investment, regulated asset settings for new technology such as biomethane purification assets, funding mechanism for decommissioning costs*
- ***Consumer research** to understand gas preferences and **targeted communication** for gas consumers as part of Energy Strategy (providing transparency on trade-offs and costs)*

Other actions

- ***Right sizing analysis and implementation** to assess/test economic, emissions, social, and equity impacts, and coordination responsibilities, to inform future right sizing decisions*
- ***DPP4** (review starting 2025) ensures economic sustainability of gas pipeline businesses and ongoing secure and safe infrastructure services. The need for **complementary funding** to be considered (eg backstop for potential decommissioning, and to reconcile the public benefit/private cost of keeping networks operational in the transition)*
- *Identify and support regions where **regional energy planning** and coordination will assist*

1.1 Evidence references

Table 1 summarises key references, information and evidence forming our view on the gas transition outcomes and actions for gas networks.

Table 1 Gas networks references

Notation	Name	Comment
1a	Powerco Gas Asset Management Plan 2023	Relevant excerpts in Attachment 2. AMP available here: https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/disclosures/gas-disclosures/1-gas-asset-management-plans/2023-gas-asset-management-plan.pdf
1b	GIFWG Gas Transition Analysis Paper, June 2023	Assesses financial impact (for consumer and infrastructure providers) and emissions impact for various scenarios. Some excerpts provided in Attachment 4. All GIFWG reports provided with the joint submission from Powerco, Firstgas and Vector. This report also available here: https://comcom.govt.nz/__data/assets/pdf_file/0012/323130/Gas-Infrastructure-Working-Group-GIFWG-Attachment_-Gas-Transition-Analysis-Paper-13-June-2023-Submission-on-IM-Review-2023-Draft-Decisions-19-July-2023.pdf
1c	GIFWG Solutions Scoping Paper, November 2021	Section 3 of the report identifies an extensive range of options across different aspects of gas infrastructure transition. All GIFWG reports provided with the joint submission from Powerco, Firstgas and Vector
1d	GIFWG Network Right Sizing Progress Report, August 2023	This Progress Report provides initial analysis and insights with a focus on economic implications. Implementing right sizing involves a number of other considerations and section 6 of the report identifies areas of further work. Appendix A outlines international decommissioning case studies including the Esperance, Western Australia transition of a small community off a reticulated gas network – the key elements, costs and learnings of the programme. All GIFWG reports provided with the joint submission from Powerco, Firstgas and Vector
1e	Powerco assessment of right sizing	Described in Attachment 3
1f	Linkages and impacts for other energy sources	Described in Attachment 4
1g	Consumer preferences research	Information from some consumer research by Powerco, Consumer Research Australia and Victorian State Government is provided in Attachment 5
1h	GIFWG work on 'Real Options' analysis	This work is in development. From the phase 1 work to date, an example of the decision tree and process in a 'real options' valuation approach is provided in Attachment 6.
1i	Australian Energy Regulator decision on AusNet distribution arrangement, June 2023	This is the AER decision for the 1 July 2023 to 30 June 2028 period. https://www.aer.gov.au/system/files/AER%20-%20AusNet%202023-28%20-%20Final%20Decision%20-%20Overview%20-%20June%202023.pdf
1j	GIFWG Findings Report, August 2021	Section 6.3 of the report contains data on demographics and vulnerability of residential gas consumers. All GIFWG reports provided with the joint submission from Powerco, Firstgas and Vector
1k	Joint submission on this MBIE consultation from Powerco, Firstgas and Vector	Sets out measures for a two part strategy to secure gas pipeline infrastructure and explore the potential for re-purposing. Collates and attaches all referenced GIFWG reports.

1.2 What is the expected pace of change?

The period to 2035 will be critical in steering the direction of the gas transition. But the transition for gas networks is expected to be a 30 year journey through to 2050 and beyond. While the necessary actions progress and the nature and affordability and risks with the transition becomes clearer, a long transition is recommended with all options preserved.

We are comfortable with the length of the transition being flexible, and prefer a GTP that identifies key targets and activities, and monitors progress over a long transition (see page 2 figure). A longer and well-informed transition is our best opportunity to maintain economic development and avoid industrial decline.

We have seen a recent reduction in new customer connections and gas use (since 2020) reflecting a slower economy post the COVID-19 response and corresponding reduction in building consents, and demand from industrial and large commercial customers has been reducing. We are forecasting a levelling off in customers connections, reducing industrial demand and reduced but steady capital and operating expenditure through to 2035. Appendix 2 contains information from our Gas Asset Management Plan 2023 showing the trends and forecasts[1].

1.3 Do we actually understand the options?

The Issues Paper acknowledges there are many ways that the gas sector can reduce emissions while maintaining its critical role, and proposes that the GTP will establish an optimal pathway. The Issues Paper does not actually assess options and does not describe how an optimal pathway will be established.

While a level of certainty is important, it is even more important that options for a lower carbon future are not discounted or removed before an options analysis has fully assessed options. This means clearly identifying what we don't know but need to know, completing work in response to uncertainties or questions, and reviewing what gas supply and infrastructure options have the most value. Multiple options may be relevant for a considerable time until learnings and value of options is progressed. Making pathway decisions too soon removes the ability to be flexible and adapt our energy system in response to learnings, potentially creating inefficiency and also removing value from the New Zealand economy. For example, there is a point at which a wind down decision cannot be reversed and that decision prevents a potentially higher value option of repurposing networks for renewable gas or using networks in response to emergency events.

The GIFWG has undertaken a number of studies referenced throughout this submission to provide learnings on aspects of gas infrastructure options and transition. Examples of current gaps to fill include consumer preferences, industrial investment decisions, capacity of electricity as an alternative to gas, regulatory changes, and incentives. The GIWG has commenced a 'Real Options' framework[2] to describe the real option value of New Zealand's gas infrastructure. We recommend that this work be progressed as a joint initiative with government.

[1] Evidence reference 1a

[2] Evidence reference 1h

With an objective of keeping the gas network available through the transition while options are assessed and then progressed in a managed way, it must be accepted that this is option itself has costs. Retaining the network brings public benefits for NZ Inc (energy security, resilience, renewable alternatives) but the costs are faced by gas pipeline businesses and their customers, Funding and financing options should be considered to reconcile this public/private cost and benefit.

1.4 Is there a risk of gas pipeline businesses becoming economically unsustainable?

Our gas network assets are regulated. The regulatory principles for our sector must form a baseline in considering gas transition decisions and their impact for gas pipeline businesses and New Zealand. Regulation and funding to invest in energy systems need to work together.

The GIFWG modelling[3] of gas transition options suggests that there is a real risk that gas pipeline businesses will not be economically sustainable if wound down by 2050 without intervention by Government. An unmanaged winddown would risk the ability of those businesses to make the investment needed to keep the networks operational, secure and safe through the transition. It is critical that Government policy settings are designed to manage the risk of chaotic shutdowns based on investor reaction to change[4] and disorderly and high consumer impact.

Regulation and other measures need to continue to incentivise investments in the gas networks as well as incentivise new technology for our future gas infrastructure system. These investments are expected to include investments in asset replacements, new connections or system growth to provide gas to consumers who will benefit from the use of gas during the transition. These investments will involve expenditure to maintain the reliability and safety of existing systems. We support continuation of the current accelerated depreciation settings as this acknowledges and supports reduction in gas use, changing investment in gas networks, a future with both renewable gas and some natural gas, and the benefit of reducing the cost of any future backstop measures. It would be appropriate to reassess accelerated depreciation settings by 2035 taking account of gas transition options and progress at that time.

Regulation change can also facilitate investment in assets for our future gas infrastructure system such as biomethane purification plant (scrubbers) and related equipment to process biomethane to the technical standard required and inject it into the gas network (see section 2.3).

Australian gas networks are facing similar transition scenarios. In the recent AER decision for the AusNet five-year term, the AER noted the uncertainty for the five year term ahead and "in the longer term it may be that the gas access arrangement review process is not enough, or not the best avenue, to deal with the related safety and equity issues that may arise. There is an important role for Governments to continue to set clear policy direction on the future use of gas in order to facilitate a safe, reliable and affordable transition."[5]

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[3] Evidence reference 1b

[4] Director's duties in making investment decisions are one factor that could drive decisions towards shutdown in the absence of supportive regulatory settings.

[5] Evidence reference 1i

Similarly in New Zealand economic regulation, there is a need for flexibility in regulation implementation for the transition and ability to adapt as the transition direction becomes clearer. As part of this, regulatory clarity is required on who is responsible for pipeline decommissioning costs with right-sizing or a winddown, how these costs are recovered, and if complementary funding or financing mechanisms will be provided for decommissioning costs.

As part of the broader Energy Strategy work, but also specific to gas transition, a decarbonisation objective confirmed in the Commerce Act (or a government policy statement) will provide for our regulators to consider the value of infrastructure investment in a transition environment.

An extensive number of solutions have been identified in the GIFWG Solutions Scoping Paper[6] and many of these relate to gas pipeline business viability. The Joint gas submission by Powerco, Firstgas and Vector also sets out measures to maximise the option value of gas pipeline infrastructure as a future platform[7].

1.5 Will right-sizing[8] make a difference?

Optimising use of the existing network is efficient both economically and for emissions reduction. Our gas network represents significant investment, but also has ongoing value. Powerco has adopted a Volume to Value Strategy to promote 'right asset-right time-right place'. We have also done some analysis at a Gas Gate level of possible locations for right sizing investigation and have provided comment on this in Attachment 3[9]. The GIFWG has undertaken a study[10] on right sizing which looks at how future decisions could be made to decommission segments of existing gas infrastructure where it is economic to do so. This also considers how consumer demand could be transferred from reticulated gas to other energy systems.

From an economic perspective, right sizing fits in the no regrets category as a strategy where the cost of ongoing supply exceeds the likely benefits of a network service. Powerco is comfortable to make right sizing decisions for our network, noting that social and environmental impacts and benefits would not be the primary consideration.

Right sizing will need to be planned and undertaken over an extended period (likely several years) working with the consumers affected to transition to alternative energy sources. During this process, gas pipeline businesses will continue to incur operating and capital expenditure to continue to support reliable and safe services.

1.6 Do we have the electricity capacity and understand the whole-of-system response?

A whole of system response is needed. This requires an understanding of the impact on electricity networks, as well as understanding the complexities of the interaction between natural gas, biogas, electricity, and other fuels

[6] Evidence reference 1c
[7] Evidence reference 1k
[8] The 'right sizing' of networks is sometimes referred to as 'tactical decommissioning' or 'partial decommissioning'
[9] Evidence reference 1e
[10] Evidence reference 1d

in the energy transition. Energy alternatives and conversions all have trade-offs in targets, solutions, and impacts. Initially, having confidence in electricity capacity and security is critical. This is a knowledge gap which is a priority for MBIE to advance in developing the New Zealand Energy Strategy[11].

Powerco's strategic planning is already taking a multi-energy approach. New Zealand needs a full energy strategy not an independent gas strategy. We urge that a full energy system understanding is developed to underpin the proposed NZ Energy Strategy and related government policy decisions.

A regional planning approach to electricity, gas, biogas and other energy demand/use could assist to coordinate investment and funding across generation, transmission, distribution and across energy types. The regional energy transition accelerator[12], renewable energy zones[13], local government regional planning[14] are all examples to build on.

1.7 What do consumers want?

Consumers currently have a number of energy options and retaining consumer choice is a key element for a transition that provides equity and reliability. Understanding consumer preferences is a critical input to considering gas transition pathway options. This includes views on electricity vs gas vs other options, consumers' current situation and opportunity for changing energy options, pricing points for switching, and understanding about renewable gas options. There is a gap in knowledge for the government to fill as part of gas transition policy development, to understand consumer preferences, opportunities and willingness to pay.

Powerco regularly surveys our customers including targeted research of gas customers. This provides insight from a small sample (approx. 300) about customers preferences and switching price points. In Australia, state and federal government agencies have undertaken detailed consumer research which has informed gas transition policy. Further information about consumer research is in Attachment 5.

The current regulatory settings mean that a winddown of gas pipelines exposes the remaining consumers to price increases. At a point of decommissioning, consumers are required to invest in alternative appliances and other changes within their premises. The GIFWG[15] estimates the conversion costs across all gas consumers could be $7.9 billion if full winddown occurs by 2050. This analysis is preliminary and further work is needed to refine modelling. Full understanding of the cost of options is required alongside consumer willingness to pay. The government will need to be prepared to have a role in supporting a smooth and efficient conversion processes for consumers, particularly the costs for more vulnerable New Zealanders. GIFWG[16] found that residential gas consumers skew towards higher income groups, young families, and families with stretched budgets, with over 140,000 (19%) residential consumers served by gas in areas within deciles 8 – 10 of EHINZ's deprivation index.

[11] Evidence reference 1f and Attachment 4
[12] EECA's programme
[13] Identified in the MBIE market measures paper and previous work by Transpower.
[14] Spatial planning, future development planning or growth area planning.
[15] Evidence reference 1b
[16] Evidence reference 1j

As part of the final New Zealand Energy Strategy, it will be a priority for the government to lead targeted and planned communication with consumers so all consumers are aware of the strategy, actions, trade-offs and costs involved in the Strategy, including the gas transition.

1.8 Are there technical constraints or operational savings for the network with changes in demand?

The Issues Paper suggests that distribution networks have technical constraints on the level of demand they can operate at, indicating a potential issue if demand drops. The Powerco gas network can retain pressure through regulators and other equipment to ensure it can continue operating at the designed pressure range, despite changes in demand. Some replacement of regulator components or other equipment may be required if there is significant reduction in demand. If demand drops unevenly across the network, or through decommissioning a part of the network, this is more complex but there are technical equipment solutions.

The Issues Paper also suggests reduced demand and pipeline pressure would reduce operational costs across the customer base. Our assessment is that a reduction in demand does not necessarily reduce operational costs. If we retain the same pressure in the network, then the same standards and equipment and costs would apply. If demand reduces evenly across the network and we reduce pipeline pressure significantly, then there may be a reduction in operational costs through downgrading equipment (eg reducing number of stations) therefore lower level of maintenance. This is expected to be a minimal change in opex, and would also have a necessary capex spend for changing that equipment.

2. *Renewable gas* is part of Aotearoa's renewable energy future

Outcomes for the GTP:

- ***Targets*** *for renewable gas production (and/or waste diversion) support increasing use by the residential/commercial sectors over time and increasing diversion of organic waste to biogas production*
- ***A credible pathway for biogas*** *in our energy future is confirmed providing confidence to build the industry during the transition*
- *The value of a biogas industry for both the* ***energy sector and the waste sector*** *is established with linkages across both for policy, market and government direction (including targets/pricing that incentivise both organic waste diversion to biogas and energy outcomes)*
- *Clear carbon accounting settings for the biogas production chain through* ***ETS*** *including consistency for* ***waste facilities****, and treatment of biological* ***CO_2 emissions from waste***

Priority actions

- *Establish a coordinating mechanism between government departments, agencies and local government responsible for environmental, energy, industrial, agriculture policy and implementation. For example a* ***cross-agency working group*** *for biogas development to work with industry*
- *Endorse a* ***tradeable renewable gas certification scheme*** *linking to renewable gas* ***policy & targets***
- ***Review regulatory frameworks*** *to align with GTP eg regulated asset settings for new technology such as biomethane purification plant to be included in RAB, ETS/carbon pricing*
- *Review* ***safety and technical standards*** *to be fit for purpose for renewable gas production and blending*
- *Analyse the link to waste sector outcomes. Review ETS application to wastewater facilities and* ***waste levy*** *regulations and/or use of the levy to provide targeted funding supporting development of the biogas industry*

Other actions

- ***Biogas plants*** *established*
- ***Blending trials*** *provide learnings for biogas options, followed by biogas injection into network*
- *As part of whole of energy* ***system modelling****, further model price/demand of blended biogas as part of overall system scenarios*
- ***Consumer research and education*** *to understand gas preferences and provide messaging bout the role of biogas (consistent with GTP)*
- ***Cultural research*** *to identify opportunities/concerns and policy or market responses*
- ***Monitor biogas market****, feedstock supply, waste outcomes, and biomethane production, for possible longer term and broader responses.* ***Monitor and adjust targets*** *as market develops.*

2.1 Evidence references

Table 2 summarises key references, information and evidence forming our view on the gas transition outcomes and actions for renewable gas.

Table 2 Renewable gas references

Notation	Name	Comment
2a	Powerco renewable gas roadmap	Our renewable gas roadmap is provided in Attachment 7
2b	Biogas integration study for Powerco, Advisian, November 2022	Excerpts of findings on biogas potential near Powerco network provided in Attachment 8 The WoodBeca paper published in support of the GTP Issues Paper also identifies biogas potential and reports the 2021 national gas consumption data compared to biogas potential.
2c	GIFWG Gas Transition Analysis Paper June 2023	Section 4.3 compares consumer annual charges for biomethane blending with other scenarios. Section 4.5 compares emissions projections of different options including biomethane at 20% blending. Some excerpts included in Attachment 4. All GIFWG reports provided with the joint submission from Powerco, Firstgas and Vector.
2d	Green Gas Certification Scheme Research, PWC report for GIC, September 2020	https://www.gasindustry.co.nz/assets/WorkProgrammeDocuments/PWC-Report-v2.pdf This 2020 report pre-dates the Certified Energy pilot for gas.
2e	Gas resilience value	Powerco data on fuel diversity, network reliability and a case study from Cyclone Gabrielle is in Attachment 9.
2f	Biogas industry vision for New Zealand, Blunomy work in progress	Powerco is working with other gas infrastructure and biogas businesses to develop a vision for the biogas industry in New Zealand. This is a work in progress and phase 1 scopes potential supply, link to targets for waste and energy, barriers and actions. A key purpose is to look at the potential for a biogas industry to support emissions reduction targets (both energy and waste), economic development, energy equity and energy security. The phase 1 report is in Attachment 10.

2.2 Is biogas a feasible substitute to reduce energy and waste emissions?

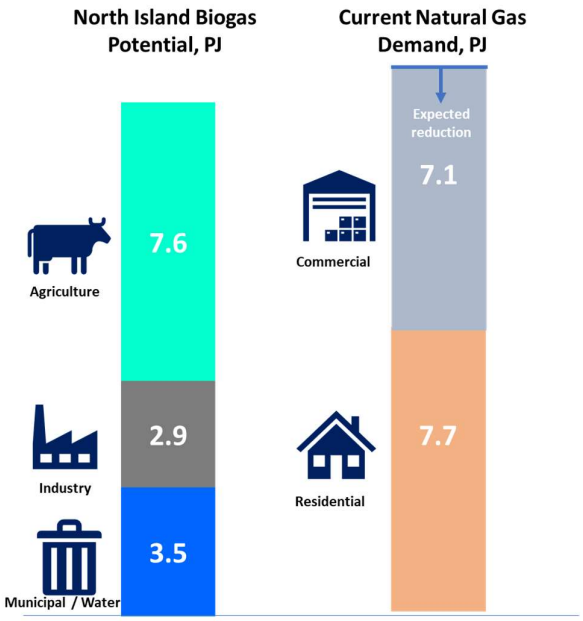
There is sufficient availability for biogas to be used in place of some existing natural gas uses and show a credible path for biogas development and use in New Zealand. Our work shows there is 1 – 1.5 PJ per annum potential 'site-ready' biogas from key sites accessible to the Powerco network footprint[17]. This is equivalent to around 30% of our current residential gas demand. Looking wider than the Powerco network area, a significant proportion of the 4.9 PJ of current biogas produced is flared with no beneficial use, and there is a further 11 PJ/year of untapped potential in the North Island and 8 PJ/year is the South Island[18]. This compares to 2021 national use of natural gas of 7.2 PJ and LPG of 3.8 PJ by the residential sector (MBIE data).

[17] Evidence reference 2b

[18] Evidence reference 2f. This potential biogas production compares to 2021 natural gas use of 7.5 PJ for residential and 7.7 PJ for commercial (MBIE data). Some of this potential is more economically viable.

The 14 PJ biogas potential in the North Island[19] compared to the current residential and commercial sectors demand for natural gas is illustrated in the figure below. Noting that gas demand is reducing (particularly for commercial), we are confident that it is viable for biogas to replace natural gas for the current residential sector and potentially all of the commercial sector as well.

Biogas potential and current natural gas demand



An application of the technology is already in place in New Zealand, along with many overseas. We see this as a critical option in New Zealand's transition. While biogas may not fully replace natural gas or electricity, we see a credible pathway for biogas having a significant role.

Studies have shown that wastewater treatment, landfill gas and meat processing facilities can produce more affordable biogas now (less than $20/GJ) but processes and cost comparisons will improve over time with further trials, technology development, and as the relative cost environment changes (for example costs for landfill disposal of waste, alternative energy sources). We consider that biogas is viable and will be a cost-effective low carbon option, including as a blended gas.

Use of biogas or blended gas in our current network will not require reinforcement or replacement of pipelines, therefore providing for best use of significant existing infrastructure asset. This outcome aligns with the challenge from the Infrastructure Commission to use existing infrastructure more efficiently.[20] There is an action required to review technical standards to ensure consistent purification and safe delivery to customers.

[19] Evidence reference 2f

[20] Energy | New Zealand Infrastructure Commission, Te Waihanga

We welcome the link made in the Issues Paper between renewable gas and waste policy. Biogas production and use is not only a solution in reducing emissions in the energy sector, but can contribute to New Zealand Waste Strategy objectives through reducing waste emissions, increasing landfill gas capture for beneficial use, and diverting more organic waste from landfill. An ambitious biogas development path could achieve approximately 0.8 Mt reduction of waste to landfill by 2050 (28% of waste target) and 3.8 Mt CO2-e emissions reduction (11% of biogenic CH_4 target)[21]. Similar to waste management targets supporting waste emissions reduction (eg diversion from landfill), targets for organic waste diverted for emissions reducing treatment options such as biogas production could support both waste and energy emissions reduction.

As part of the energy strategy work, we recommend reviewing the waste levy pricing and use as there is a valid opportunity to incentivise biogas project development through targeted availability of the waste fund. The waste levy provides a pricing tool to apply cost-reflective pricing to waste management in a similar way to energy.

2.3 What is needed to build a biogas industry?

Powerco is committed to achieving renewable gas targets and delivering this though our gas network. We have developed our own roadmap to illustrate Powerco's ambitious journey to 100% renewable gas in households[22]. To develop the biogas industry, a number of actions are required sooner rather than later and our diagram on page 2 sets out key activities working up to 2050, which shows necessary emphasis on activities in the short term. Actions should be focused on facilitating the highest value and most environmentally responsible use of renewable gas. For example, producing biogas for the purpose of displacing natural gas use rather than displacing renewable electricity, and producing biogas to reduce gross emissions rather than promote environmental projects.

We do not consider government funding of biogas projects is required for the industry to be viable. However, there are government actions that will facilitate progress and incentivise actions sooner. As noted in section 2.2 above, there is opportunity for incentives and funding (eg in how the waste levy is applied to organic waste) as well as coordinating mechanisms and/or demonstration projects for the multiple parties likely to be involved in these projects. We encourage government facilitation in developing a viable biogas industry which is not totally reliant on consumer funding.

Risks in aspects of biogas development and distribution can be reduced through government processes and programmes such as streamlined consenting, consumer research and awareness[23], and endorsement of a renewable gas certification scheme. We are also aware of the gap in cultural research and endorse the government to lead work to investigate and develop responses in this area.

Regulatory review to clarify that biogas assets (eg used for purification and injection into network) are part of the Regulated Asset Base (RAB) will provide investment incentive for regulated gas pipeline businesses. Including this in RAB enables costs of investment to be recovered over time and over those who benefit from the investment,

[21] Evidence reference 2f and Attachment 10

[22] Evidence reference 2a

[23] Consumer research across the gas transition is a critical gap. We have commented on this in section 1.7 and Attachment 5

therefore creating an incentive for investors. It also promotes public visibility of investment through the disclosure regime.

Clearer carbon accounting settings should be provided for the biogas production chain through the ETS. As a primary tool to incentivise emissions reduction, the ETS should be reviewed to clarify a consistent approach in waste emissions. For example, wastewater treatment plants could be subject to the ETS in the same way that class 1 landfills are as a driver for treatment providers to assess their emissions and account for options in business planning for treatment processes.

As part of the broader Energy Strategy work, but also specific to gas transition, a decarbonisation objective confirmed in the Commerce Act (or a government policy statement) will provide for our regulators to consider the value of infrastructure investment beyond just economic efficiency.

In our view, a target for a production levels of biogas or a target for organic waste diverted into alternative treatment processes (to lower emissions), will best drive both biogas industry development and highest value use for biogas. Targets that facilitate solutions across both energy and waste sectors would provide for broad partnerships. Initially, targets for production levels are preferred while the market and renewable gas certification system is established. Production targets could align with the level of targets that have been discussed within industry such as aiming for 20% of residential demand (being around 1.5 PJ) by 2035 would be a good starting point. Targets should be monitored and adjusted as the industry develops in the next period.

Both biogas producers and retailers could be subject to disclosing their renewable gas production, blending or trading, to provide good information about industry and market progress. One method to facilitate retailers involvement would be to include a requirement for trading of renewable gas in the default agreement between distributors and retailers, however this is suggested to be considered at a later time following further monitoring of the market.

2.4 How important is a renewable gas trading certification scheme?

A certification scheme is an important early enabler and should be established as a priority. Government doesn't need to run the scheme if a scheme has independent governance and independent verification of gas information, however a tacit endorsement would provide credibility. There may also be a role to assist in testing or supporting the process for the first mover(s) to obtain certification.

A scheme needs to be driven by what the purchasers of certificates actually need (ie linking to a regulation or strategy or target). For example the UK scheme is not regulated but designed to facilitate compliance with regulations. An existing scheme is in place which could be adapted to be fit for purpose[24] and research has previously been completed[25] on options around certification schemes. The international renewable energy

[24] https://www.certifiedenergy.co.nz/renewable-gas

[25] Evidence reference 2d

certification standard for renewable gas has recently been approved for an issuer to bring the renewable gas standard to Australia using a code developed for biogas and biomethane.[26]

2.5 What does it mean for consumers?

All gas transition options involve either benefits or costs for consumers. We know our residential and commercial customers love gas for space heating, water heating and cooking. It is an efficient and resilient energy option. Providing new fuel options through renewable gas and/or blending gases enables consumers to keep the benefits of gas for home energy while also playing a part in contributing towards both emissions and waste reduction targets. Renewable gas also offers potential emissions and cost savings for industrial consumers, particularly where high temperature process heat means electricity is not a straightforward or cost effective alternative.

Blending biomethane may help reduce or avoid the risk of increased consumer energy prices, although further work is needed to better understand what demand and cost may look like under different biogas blending scenarios over time (and compared to costs for natural gas, electricity, and other energy alternatives)[27].

The biogas option also has the potential to save significant conversion costs, both individually and in aggregate. As outlined in section 1.7, if the option of natural gas, biogas or blended gas is available, consumers will avoid the need to invest in alternative appliances and other related modifications to their premises (eg with different hot water systems). The GIFWG[28] estimates the conversion costs across all gas consumers could be $7.9 billion if full winddown occurs by 2050, with costs estimated as $10-20,000 per residential or small commercial consumer. This analysis is preliminary and further work would be needed to refine costs.

Renewable gas offers ongoing choice for consumers, however a better national understanding of consumer preferences[29], attitudes to biogas and willingness to pay, is a key action for government to inform gas transition options analysis.

2.6 How could a viable biogas industry support economic growth?

The development of the biogas industry shows potential value in both energy and waste targets, including emissions reduction, waste diversion and more. It also offers significant opportunity for emissions reduction in the agriculture sector. There is also an important economic development dimension. The preliminary Blunomy work has identified the potential for creation of up to 6000 jobs in regional communities, reducing operational costs for farmers, reducing emissions / waste costs in the agri-food industry, and providing the time to enable more efficient electrification[30].

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[26] https://www.irecstandard.org/news/the-i-rec-standard-foundation-and-local-issuer-oakley-greenwood-announce-mou-for-biomethane-tracking/

[27] Evidence reference 2c

[28] Evidence reference 2c

[29] Refer section 1.7 and Attachment 5

[30] Evidence reference 2f and Attachment 10

3. Reduced *natural gas supply and use* based on full understanding of implications and trade-offs

Outcomes for the GTP:

- *The **ETS** is the primary means of driving to a smaller gas market*
- *Acknowledging the role of gas in **energy security and resilience** – both for electricity generation/firming, and for natural hazard resilience*
- ***Best emissions reduction opportunities are prioritised** and supported to accelerate the transition – industry and transport*
- *The Government's role in **supporting vulnerable New Zealander's** is confirmed with support measures managed separately to energy market measures*

Priority actions

- *Continue to support an accelerated transition through **targeted decarbonisation programmes** such as industry support, regional energy transition coordination, streamlined consenting. Programmes to align with GTP and target best emissions reduction opportunities.*

Other actions

- *Undertake **consumer research** to understand gas preferences*
- *Identify and support regions where **regional energy planning** and coordination will assist*
- *Prepare and implement an **energy workforce plan** including a targeted plan for the current and future gas workforce*
- ***Implementing a communication strategy** for the Energy Strategy to provide transparency to consumers on the security/affordability/emissions trade-offs and where costs fall for transition pathways*

3.1 Evidence references

Table 3 summarises key references, information and evidence forming our view on the gas transition outcomes and actions for gas supply.

Table 3 Natural gas supply and use references

Notation	Name	Comment
3a	Powerco submission to EA: Ensuring an orderly thermal transition	https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2023/powerco-submission--ea-ensuring-an-orderly-thermal-transition-21-july-2023.pdf
3b	Aotearoa New Zealand's first Emissions Reduction Plan, 2022	https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reduction-plan/ The sector action plans identify focus areas and actions for a lower emissions economy
3c	Fuel diversity data, network reliability data and Cyclone Gabrielle case study	Contained in Attachment 9

3.2 How does New Zealand reduce the gas supply market?

The ETS is the primary tool to influence supply and demand. Decisions made by gas consumers and supply chain participants in response to ETS pricing will drive changes in the size of the gas market. Options assessment for gas pathways will need to assess the risks of a reduced gas market becoming less flexible, unpredictable and unreliable. While market tools can influence the size of the gas market, outcomes will be unacceptable if these tools are relied on alone. A managed transition is required to ensure New Zealand's energy supply is secure, reliable, safe, and affordable (refer section 1 above). A full understanding of the costs, benefits and trade-offs with a reduced gas market is needed before decisions are made that cut-off future options. We do not yet have this understanding.

To accelerate the reduction of emissions, it is most efficient to focus on those sectors and energy uses that have the best opportunity to reduce emissions, rather than targeting certain fuels or a blanket approach to reduce the size of the gas market. Aotearoa New Zealand's first Emissions Reduction Plan[31] identifies key emissions-intensive industries and sectors that are the focus of actions under the ERP including transport, electricity generation, industry, waste infrastructure and landfill gas capture.

Alternatives such as renewable gas, other emissions reduction technologies and/or gas storage all have a role in reducing the volume of natural gas in the gas market.

3.3 How do we achieve reliable capacity in the transition?

A well-managed transition is critical for Powerco and our customers: this includes entry and exit of baseload generation plant and peaking capacity. The right level of generation capacity and stored energy will support reliability, emissions reduction and equity. While upstream gas supply and infrastructure is not our core business, there is a critical reliability interdependency with upstream and downstream gas infrastructure. We support the conclusion that there is an ongoing role for gas in providing peaking capacity for some time to come.

Energy reliability and resilience requires gas. Powerco has 113,000 homes and businesses relying on gas for energy supply. Retaining the reliability and fuel diversity benefits of natural gas, and low-carbon gas in the future, has significant value in resilience to climate impacts or other shocks. The value of the gas network for community resilience was clearly demonstrated during Cyclone Gabrielle. Further information about resilience value and a Hawke's Bay case study are in Attachment 9. The Blunomy work has identified the potential for biogas to provide reliability and security as an outcome[32].

As part of the final New Zealand Energy Strategy, it will be a priority for the government to lead targeted and planned communication with consumers, so all consumers are aware of the strategy, actions, trade-offs and costs involved in the Strategy, including implications for energy resilience.

[31] Evidence reference 3b

[32] Evidence reference 2f and Attachment 10

3.4 What does it mean for our energy workforce?

All gas transition and future energy options have implications for the energy workforce. This is an area that requires further investigation and planning. We support government coordinating workforce planning as part of developing the Energy Strategy. There will be specific considerations for the gas workforce within that plan. We have noted in section 2.6 that a vibrant renewable gas industry has the potential to create up to 6,000 regional jobs.

Attachment 1 – Information about Powerco and our network

Providing an essential service

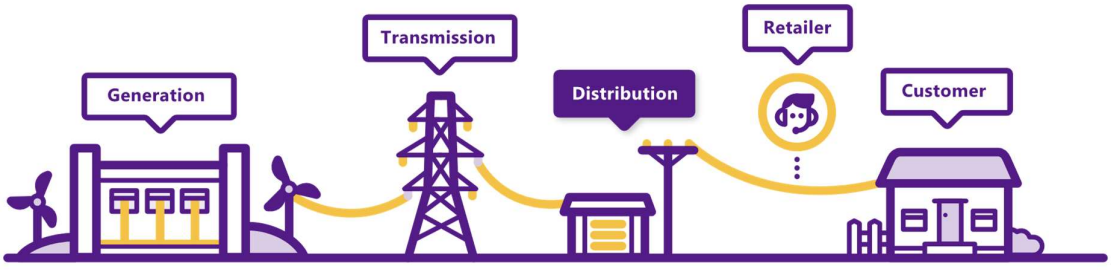
We bring electricity and gas to around 1million customers across the North Island. We're one part of the energy supply chain. We own and maintain the local lines, cables and pipes that deliver energy to the people and businesses who use it. Our networks extend across the North Island, serving urban and rural homes, businesses, and major industrial and commercial sites. We are also a lifeline utility. This means that we have a duty to maintain operations 24/7, including in the case of a major event like an earthquake or a flood.

The cost of operating our business is not dependent on the amount of gas or electricity we distribute in our networks. These costs reflect the need to maintain the safe operation of the network and are mostly driven by compliance with safety regulations. This includes replacing assets when they reach their end of life. Additional costs to grow the size or the capacity of the network are often met by customers requiring the upgrade or new connection.

Under Part 4 of the Commerce Act, Powerco's revenue and expenditure are set by the Commerce Commission as part of monopoly regulation. We are also subject to significant information disclosure requirements, publicly publishing our investment plans, technical and financial performance, and prices. The regulatory regime allows us to recover the value of our asset base using a regulated cost of capital (WACC) set by the Commission, and a forecast of our expenditure. Every five years, the Commission reviews its forecasts and resets our allowable revenue. This process is designed to ensure the costs paid by customers for us to manage and operate our network is efficient given we are a monopoly and an essential service.

Our electricity customers

Powerco is New Zealand's largest electricity utility by the area we serve. Our electricity networks are in Western Bay of Plenty, Thames, Coromandel, Eastern and Southern Waikato, Taranaki, Whanganui, Rangitikei, Manawatu and Wairarapa. We have 28,441 km of electricity lines and cables connecting approximately 356,000 homes and businesses. Our place in the electricity sector is illustrated below.

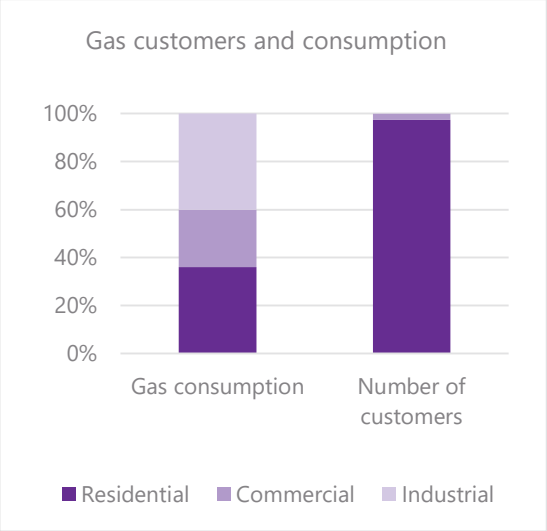


Our network contains a range of urban and rural areas, although is predominantly rural. Geographic, demographic, and load characteristics vary significantly across our supply area. Our development as a utility included several mergers and acquisitions that have led to a wide range of legacy asset types and architecture across the network.

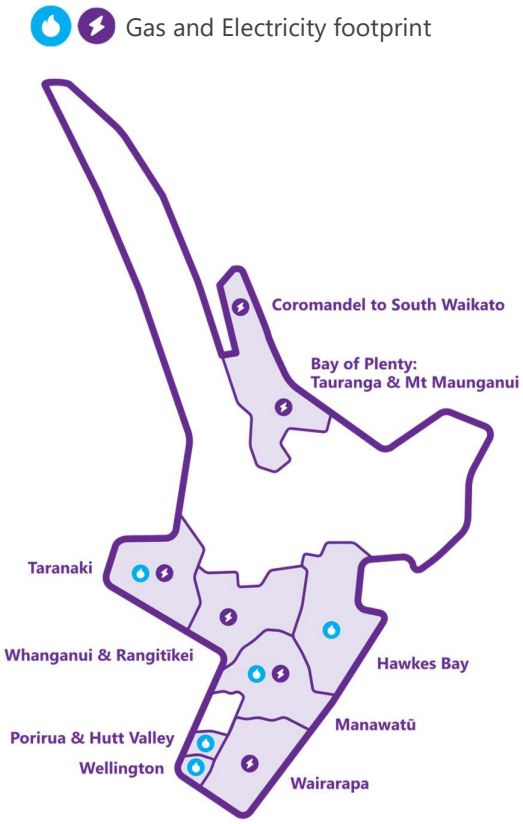
Powerco is one of 29 electricity distribution companies. Our customers represent around 13% of electricity consumption (similar in magnitude to the Tiwai aluminium smelter) and around 14% of system demand. Powerco's network is almost three times the size of Transpower's in terms of circuit length. The peak demand on our combined networks (2022) was 986 MW, with an energy throughput of 5,266 GWh.

Our gas customers

Powerco is New Zealand's largest gas distribution utility. Our gas pipeline networks are in Taranaki, Hutt Valley, Porirua, Wellington, Horowhenua, Manawatu and Hawke's Bay. We have 6,100 km of gas pipes connecting more than 113,000 homes and businesses to gas. Our customers consume around 8.6 PJ of gas per year.



Our industrial customers are less than 1% of our customer base and consume approx. 40% of gas on our network. Our residential customers are 97% of our customer base and consume approx. 35% of gas on our network. The remaining 25% of gas is consumed by our commercial customers. Around 30% of our larger customers are in the food processing sector, around 20% in the manufacturing sector and around 10% in the healthcare sector.



Our network footprint

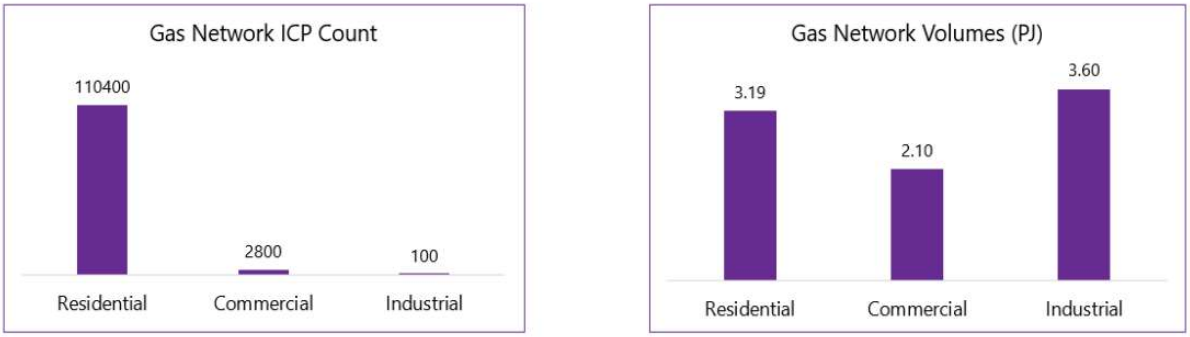
Our network represents 46% of the gas connections and 16% of the electricity connections in New Zealand. We operate assets within six regions and across 29 district or city council areas.

Attachment 2 – Powerco Gas Asset Management Plan 2023[33]

The following excerpts are from the Asset Management Plan (AMP) Section 1 (Executive Summary), AMP Section 4 (Asset Management), AMP Section 6 (Network Strategies), and AMP Section 7 (detailed forecasts).

Our current **customer numbers and gas use** show that while our residential customer numbers dominate, the highest demand (and emissions) is from a small number of our industrial customers followed by commercial customers (as shown in Figure 2.7). Demand from industrial and large commercial customers will continue to reduce as these sectors execute their plans for decarbonisation, and a managed transition to biogas offers a more acceptable lower carbon solution for the high number of residential customers.

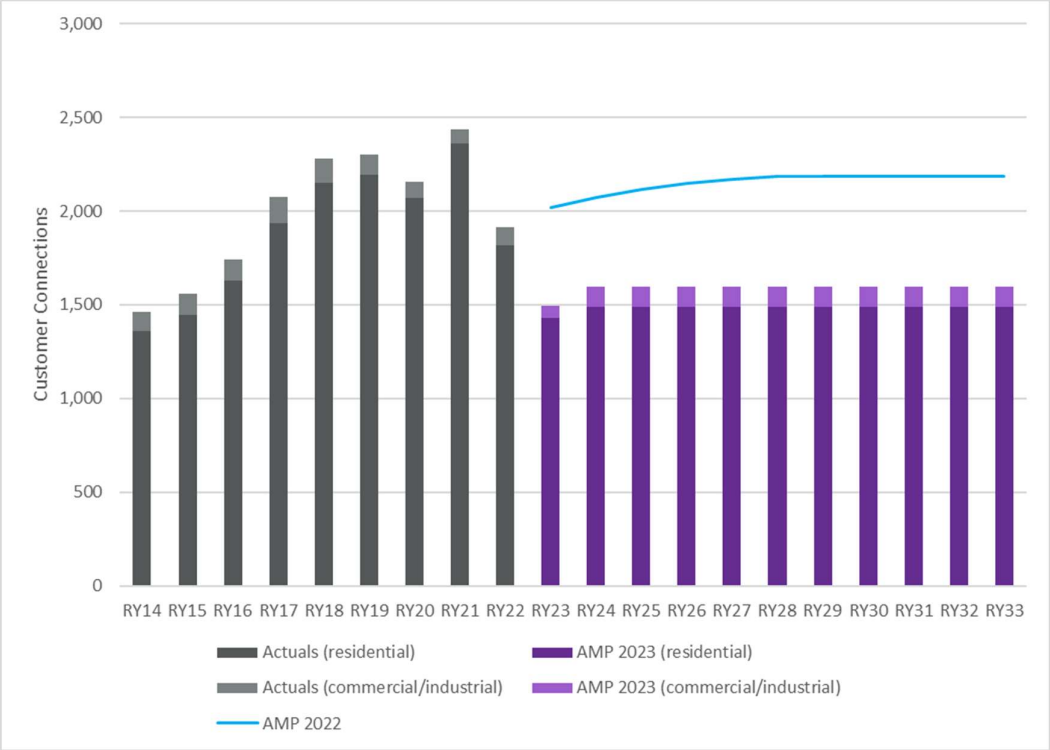
Figure 2.7: Our gas customer category numbers and use of gas on our network



Our projected new **customer connection numbers** per annum are shown in Figure 6.1. Given the pathway towards a low carbon future is focused on a transition to biogas and hydrogen, we forecast residential connections and disconnections will align to historical averages prior to the 2018-19 new housing boom and COVID-19, but with a lower consistent growth trend. Commercial gas volumes are forecast to reduce through the transition period to 2050.

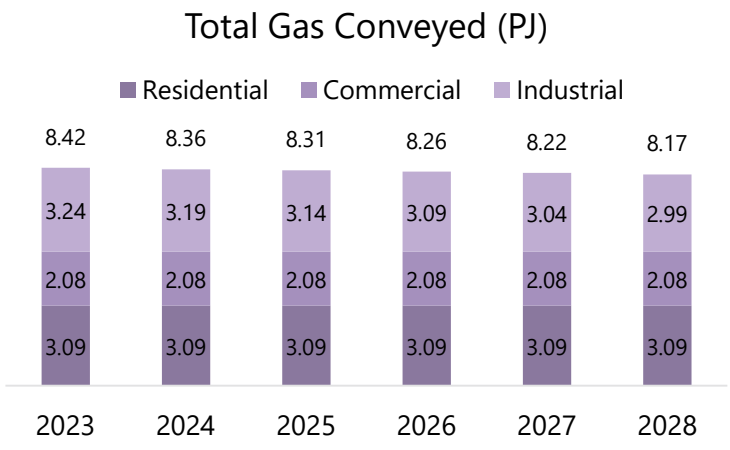
[33] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/disclosures/gas-disclosures/1-gas-asset-management-plans/2023-gas-asset-management-plan.pdf

Figure 6.1: Customer connection numbers actual v forecast per annum



AMP Schedule 12c provides our 5 year forecast for gas demand, including consumer connections, maximum load and total gas conveyed. The forecast reduction in total gas conveyed (GJ per annum) is illustrated in the following chart.

Data from Schedule 12c: Forecast total gas delivered

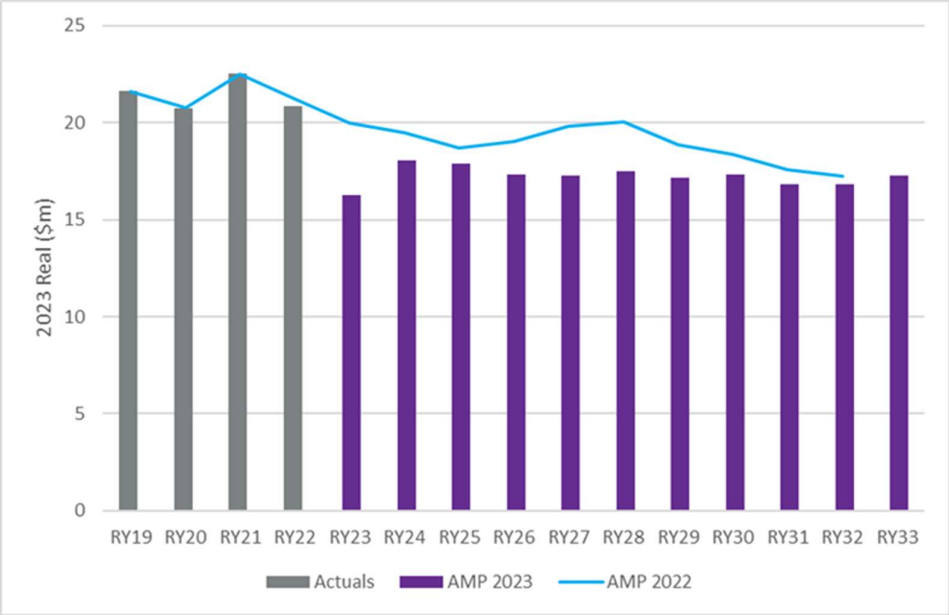


The forecast 10-year **capital expenditure** base case trend is shown in Figure 1.2. Our planned capital investments for the 2023-2033 period are set out in Chapter 7. The forecast reflects:

- A reduction in new residential connection numbers, predicting growth will slow down to pre-COVID-19 levels.

- A reduction in growth and capacity investment as electrification of process heat frees up network capacity.
- Investment to support integration of renewable gas partially offsets the drop in connection and growth, creating a shift in expenditure from subdivisions to connection of renewable gas production sources.
- Increased investment in our asset replacement and renewal ($2 million per year) has been forecast at a constant level for climate adaptation and resilience plans. This will support any resilience work required for the relocation of pipe on bridge crossings or holding spares etc, as well as managing our leak detection vehicle programme and potential short-term uplift in leaks detected on the network.
- Optimisation of our support functions though non-network capital expenditure, such as IT systems and improvements.

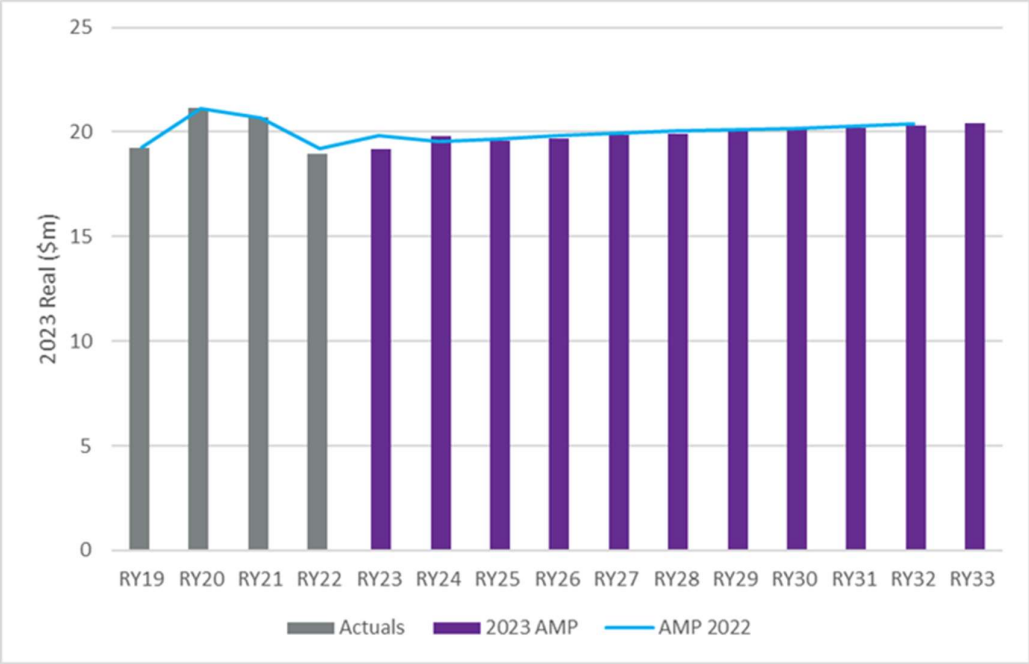
Figure 1.2: Forecast capital expenditure (AMP base case)



The focus for **operational expenditure** during the planning period is set out in detail in Chapter 7. Our updated forecast operational expenditure for the AMP planning period, as shown in Figure 1.3, signals a stable trend, in line with current levels. This reflects:

- A reduction in system operations network support because of the reallocation of customer team resource from gas to shared business support.
- An increase to business support related to digital solutions, including cloud services.
- Steady asset replacement and renewal across the period.
- Consistent routine and corrective maintenance.

Figure 1.3: Forecast operating expenditure



Attachment 3 – Considering right sizing on the Powerco network

At a gas gate level Powerco has done some analysis of customer type, asset cost/revenue (both current + where future stress is known) to investigate possible candidates for right sizing. This analysis is based on commercial risk / benefit only, and does not factor in consumer implications and decommissioning costs.

Both the GIFWG right sizing report and our gas gate analysis identifies selected assets which are candidates for further analysis. More detailed assessment would be needed to look at implications including costs of electricity network or other alternatives (eg biogas as an alternative), gas network implications, and specific capex forecasts that indicate timing to review potential decommissioning.

The purpose of the GIFWG right sizing work was to better understand the potential for network right sizing, and to use examples to identify potential enablers or barriers or considerations in right sizing. The key themes from analysis to date is that selecting right sizing candidates is complex, and will become more so when factors beyond economics come into account. Some key insights are:

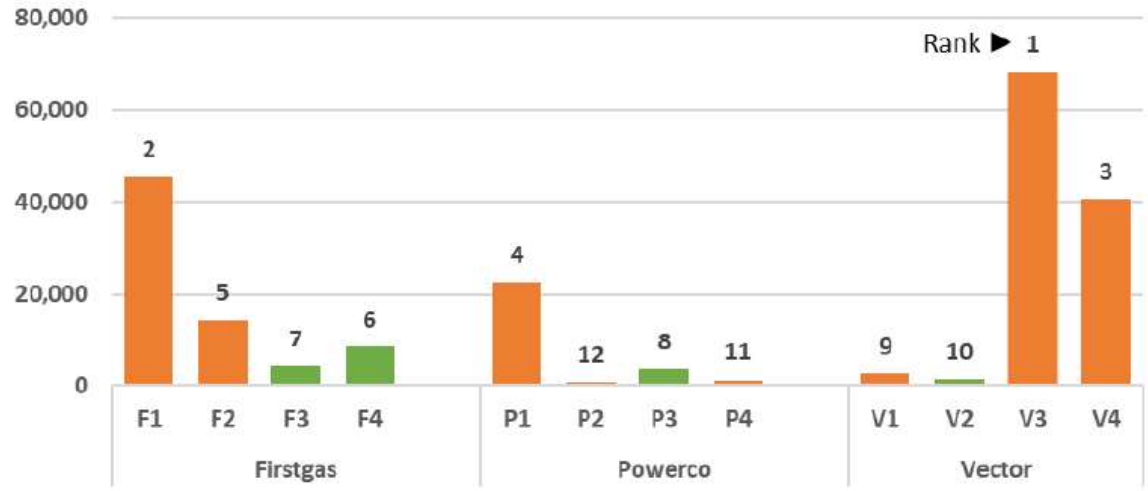
- Consumer impacts and conversion processes will need to be carefully managed and would likely require central government involvement for rightsizing at scale.
- Decommissioning would be a medium or long term proposition. Short term deployment is more difficult due to lack of standard or consistent processes for site selection, planning and roll out, and the consumer impacts requiring more time to implement changes
- Sites with a positive NPV for decommissioning either have a small customer base and/or high projected capital investment in the near term
- There is legal and regulatory uncertainty which presents barriers eg the status of decommissioned pipelines, the right to disconnect customers, how to treat existing unrecovered costs or future costs, how to provide flexibility on opex/capex cost which may rise higher than forecast due to decommissioning (and would not have been allowed for in revenue and price allowances and does not fit the category for wash-up)
- Decommissioning costs could be significant. Appliance conversion is more than $10,000 per residential site and $20,000 per commercial site[34] and does not include coordination costs or savings for a mass conversion programme, meter removal and capping to make the network safe, or additional costs for electricity network or alternative fuels requiring reinforcement or other works.

The four Powerco sites in the Right Sizing report each had low number of connections (1 – 3), however only one of the four sites (P3) had a positive NPV from decommissioning, which correlated to current gas use and anticipated capital expenditure in the near term.[35] This illustrates that opportunity for right-sizing is not as clear as may be assumed.

[34] GIFWG Right sizing progress report page 23-24. This cost is based on estimated appliance replacement and make good work (like repairs for walls and flues).

[35] Right Sizing report page 27

FIGURE 4.3: SITE RISK SCORE (GREEN = POSITIVE NPV, ORANGE = NEGATIVE NPV)



Assessment at a gas gate level provides the opportunity to identify geographical areas where there are wider parts of the network to assess. A collaboration between a gas pipeline business and government to undertake a detailed assessment (and potentially a trial) for at least one site would provide invaluable learnings across commercial, social, and consumer factors. Further work could inform development of a framework for consistent assumptions, decommissioning costs and customer inputs for future right sizing projects.

While some sites in our analysis may not be priorities for economic decommissioning, they could be identified as strong candidates for biogas as a replacement due to their location close to biogas feedstock. For example two of the Powerco sites in the Right Sizing report have low number of customers and moderate demand and are located in areas of regional aggregation opportunity in the Advisian report on biogas on the Powerco network (refer Attachment 8).

Attachment 4 – Interconnections across energy sources

Reduced gas use relies on increased electricity availability

A pathway for reduced gas use needs to consider the alternative energy sources and the cost and emissions of those alternatives. Powerco has undertaken some initial analysis in Taranaki and Manawatu where Powerco has customers provided with both gas and electricity (approximately 40,000 dual ICPs).

In a full winddown scenario, analysis to date at a GXP level indicates a significant increase in electricity coincident demand of more than 10% at some GXP. Findings indicate a particular impact on morning and evening peak demand. On average, residential conversion was found to create the largest change in peak demand. GXP level covers a lot of customers and there will be a range of impacts and constraints at the feeder and transformer level within each GXP. For example at a feeder level, it appears that while the majority of feeders will experience up to 5% increase in peak demand compared to existing, some feeders will have more than 40% increase in a full winddown. We are undertaking further modelling to assess potential impacts on our network.

Wellington Electricity also has an example in the Wellington region:[36]

- Powerco has over 65,000 gas customers on the Wellington Electricity network.
- Wellington Electricity forecast a 260MW (52%) increase in current demand (at 98 percentile of demand) if current gas customers convert to electricity on their network.
- This is the largest forecast impact on the Wellington Electricity network demand, increasing rapidly from the late 2030s to 2052 with gas conversions making up 40% of the forecast increase in demand
- The forecast capital investment to deliver the capacity required by the ERP (both transport and gas substitution) for Wellington Electricity is forecast at approximately $1 billion over the next 10 years and $2 billion over 30 years to 2052. This is network capacity costs only, not accounting for other conversion costs.

Cost and emissions of alternatives

The Gas Infrastructure Future Working Group report on the Gas Transition[37], looked at impacts of potential scenarios (business as usual, 20% biogas blending, LPG conversion, full winddown). Impacts modelled were cost impacts for consumers, cost impacts for infrastructure owners, and emissions.

The emissions analysis shows that emissions are expected to reduce under all scenarios due to reductions in consumption, with the largest contributor coming from reductions in consumption by transmission connected customers. An electricity alternative still creates emissions, with higher emissions intensity in the short term, and this reduces over time as renewable generation increases. The report identifies a benefit for more detailed modelling, including comparing projected emissions reductions to the financial implications for both gas consumers, distributors, and also the wider economy.

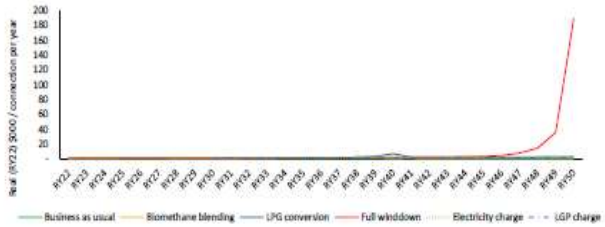
[36] Wellington Electricity Asset Management Plan 2023, page 21. 318 (welectricity.co.nz)
[37] Gas Transition Analysis Paper June 2023 – section 4.5

The report also contains modelling of cost implications for consumer types. The results are in the figure below.

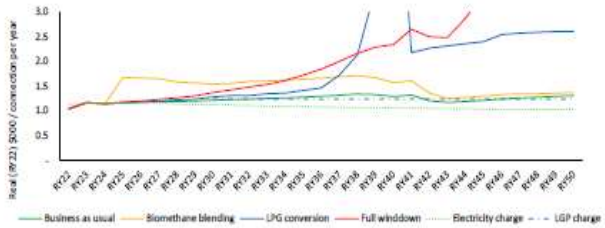
FIGURE 4.6: ANNUAL CHARGES PER CONSUMER BY TYPE

Residential

Unconstrained vertical axis

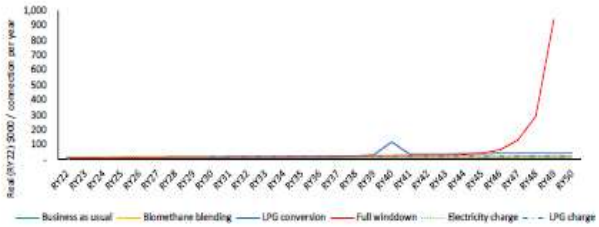


Truncated vertical axis with alternative enery prices

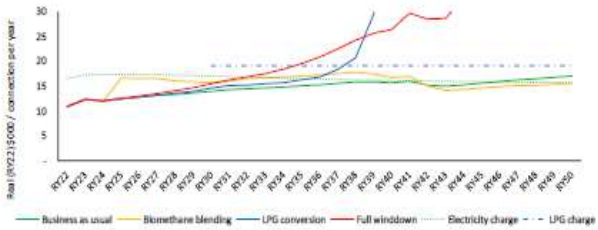


Commercial

Unconstrained vertical axis

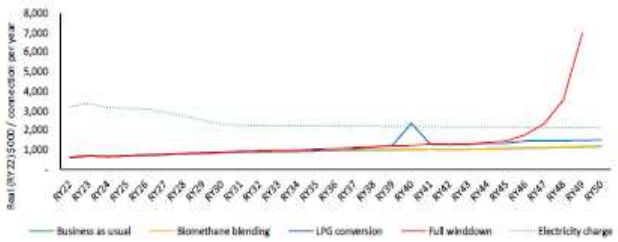


Truncated vertical axis with alternative enery prices

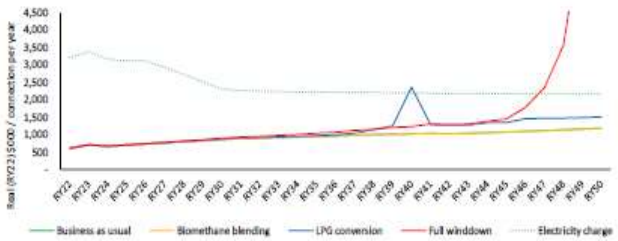


Industrial

Unconstrained vertical axis



Truncated vertical axis with alternative enery prices



The initial analysis suggests that a winddown of regulated gas pipelines exposes the gas consumers that remain at any point in time to meaningful price increases as other consumers defect. Consistent with the Working Group's earlier analysis, the pace of the winddown will clearly affect that risk – with a faster winddown leading to a faster price increase, which will in turn encourage more rapid defection of consumers through the winddown. Blending biomethane may help reduce or avoid that risk, although further work is needed to better understand what demand

may look like under such a scenario (e.g., to assess how biomethane and natural gas costs compare). Changes to regulatory settings or government support will also affect the price risk faced by gas consumers.

A 2023 report for Business New Zealand Energy Council[38] undertook detailed sensitivity modelling of the TIMES-NZ models and concluded that

> *Removing fuel options from decision-makers will almost certainly increase the cost of meeting New Zealand's emissions budgets, unless low emissions options are made available (and decision-makers are confident of their availability) at a similar cost. Hence, improving resilience, meeting emissions budgets, and keeping downward pressure on costs in the face of a changing world will benefit from greater choices of, and confidence in the availability of, cost-effective, low-emissions fuel options.*
>
> …

Biogas as an alternative

Biogas is a credible alternative, particularly where electricity capacity is constrained, and gas consumers are located close to biogas source opportunities. Powerco has commissioned a study to assess the biogas potential relative to our network and the findings are summarised in Attachment 8.

Resilience from fuel diversity

There is a link between decarbonisation policy, emissions reduction targets, consumer costs and resilience which needs careful analysis. The resilience value is discussed further in Attachment 9. We endorse a systems approach to strengthening resilience that recognises the value of fuel diversity for resilience. A systems approach will not only improve coordination of dependencies and interdependencies but will also recognise the resilience value of a broad interdependent system. The interdependencies between fuels is complex and we encourage modelling for resilience analysis across relevant government reviews, with those related to fuel optionality and the energy system a priority.

The consultation document released in June 2023 by Department of Prime Minister and Cabinet *Strengthening the resilience of Aotearoa New Zealand's critical infrastructure system*[39], also emphasises that resilience is about the critical infrastructure *system* and its strategic capability. The document highlights the dependencies and interdependencies across the critical infrastructure system, taking up the recommendation from Te Waihanga in the New Zealand Infrastructure Strategy[40] for a coordinated approach to managing risks across those dependencies and interdependencies.

Fuel diversity does not mean ongoing use of natural gas as it has been for the last fifty years. Powerco is committed to supporting an appropriate transition to lower carbon energy including development of renewable gas.

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[38] Energy-Strategy-Deep-Dive-Using-TIMES-NZ.pdf (bec.org.nz)
[39] Critical Infrastructure Phase 1 Consultation - Department of the Prime Minister and Cabinet - Citizen Space (dpmc.govt.nz)
[40] Rautaki Hanganga o Aotearoa New Zealand Infrastructure Strategy, section 6.4: Strategy | Strengthening resilience to shocks and stresses (tewaihanga.govt.nz)

Attachment 5 – Consumer research

Powerco customer research survey 2022

The Powerco customer perception survey 2022 included questions to test customer perceptions and switching points. The results show that gas is a high preference for current gas customers and a lot of customers did not have a position on aspects of cost and value of gas. The findings do not provide strong results or trends demonstrating the need for more research to better understand consumer perceptions and potential implications of gas transition options in the New Zealand context.

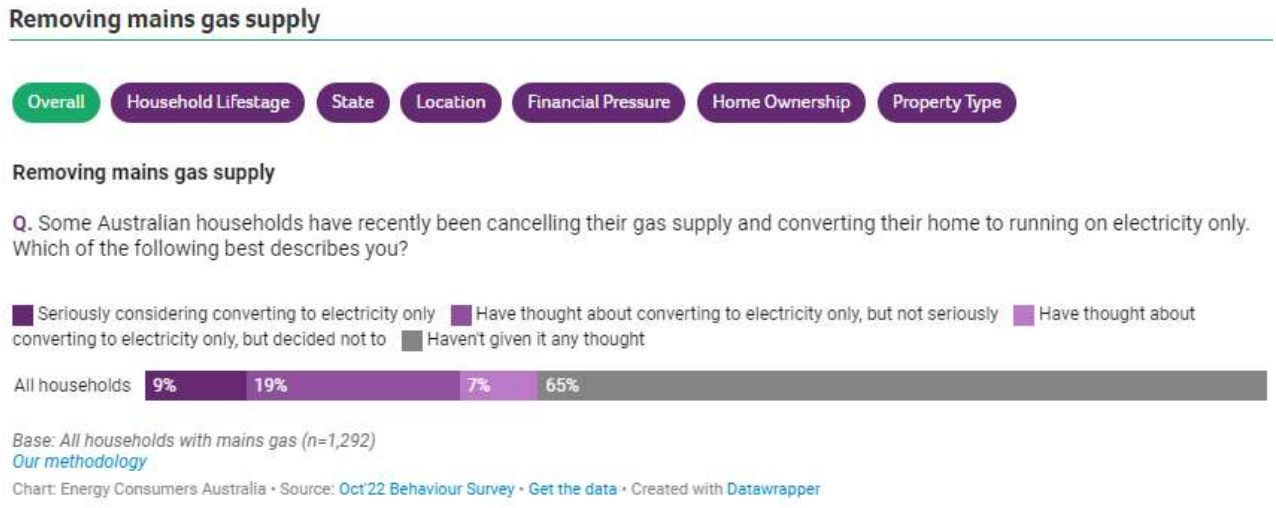
Some results were:

- Customers may be triggered to switch if gas price increases (around half of customers surveyed at a 20% price increase), if alternatives were cheaper (61%), or if appliances needed upgrading (35%).
- Capital cost is a barrier to shifting away from gas, however once customers have decided to consider a switch, the majority are prepared to switch even with a cost premium of up to $2500
- Environmental considerations are an important factor in the majority of responses but not a strong factor when choosing an energy solution.

Australian consumer research

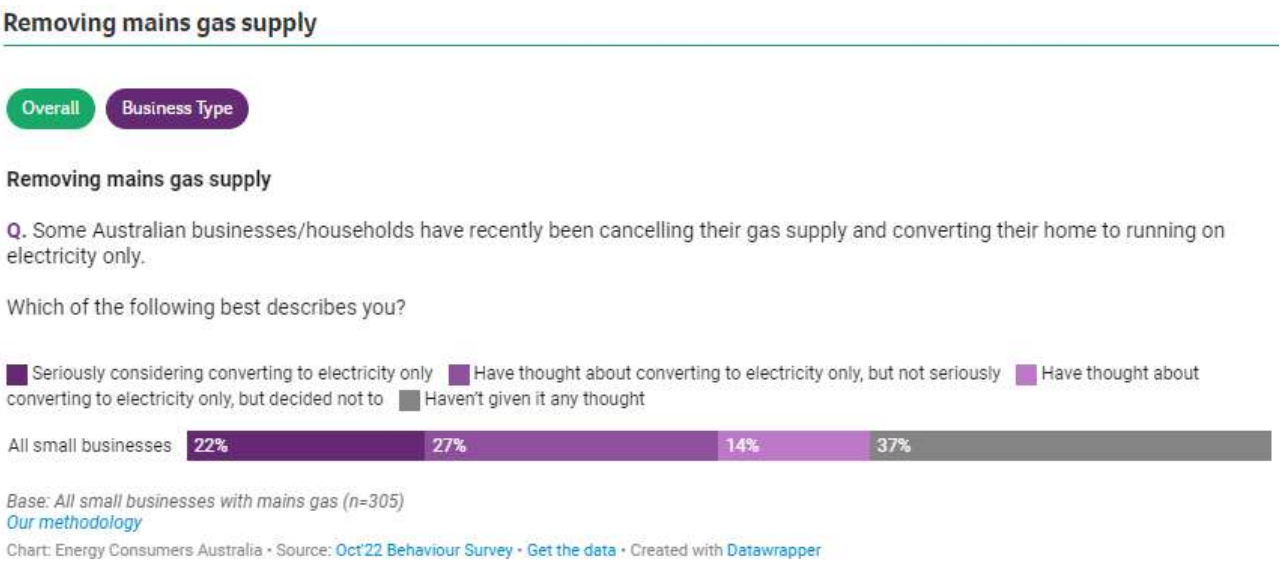
Energy Consumer Australia undertakes regular consumer surveys including detailed questions about appliance use and energy preferences (across electricity and gas). Their latest Australian consumer behaviour survey (October 2022)[41] included questions about cancelling gas supply and converting gas appliances.

Households



[41] https://ecss.energyconsumersaustralia.com.au/behaviour-survey-oct-2022/

Small businesses



Households anticipated future changes

By comparison, the Consumer Advocacy Council New Zealand sentiment survey[42] has some questions about attitudes in replacing coal and gas at a sector level, but no questions about consumer preferences, switching behaviour or appliances.

[42] https://www.cac.org.nz/assets/Documents/New-Zealand-small-electricity-consumer-sentiment-survey-2023-Full-report.pdf

Energy Consumer Australia also produced a report in November 2022 on "Risks to gas consumers of declining demand"[43] which provided desktop analysis drawing on research for consumer behaviour, costs/benefits driving switching behaviour, some customers being particularly vulnerable (renters, low-income households, apartments, some businesses) and these vulnerable consumers being at greatest risk of increasing gas supply costs. This report identified a number of policy options to manage risks:

- Awareness building with gas customers
- Subsidies for upfront cost of conversion (most likely assist middle income households
- Subsidies for continued gas use where there are barriers to switching (and as gas prices increase)
- Subsidies for gas networks for ongoing supply and decommissioning (where facing financial distress).
- Once renewable gas becomes viable and there are switching options, governments may find themselves in a situation where they are subsiding both switching and renewable gas use options
- Subsidies per customer to increase in final stages of transition to help those who have found it hardest to switch
- Review abolishment costs. Look at how to reduce this cost eg alternatives to pipe removal, incentives to reduce the cost
- Regulate approach to partial decommissioning eg minimum notice periods, consumer assistance
- New developments – new connections not mandated or could be banned. Note that fully removing choice may not be best for consumers as full decarb is years away and renewable gas is still a potential option. Councils are incentivising developers to go all electric
- Supply chain management potential future problem – monitor appliance stock and installer training
- More energy efficient housing stock will improve cost/benefit of electric space heating. Need incentives/ disincentives for both new and existing buildings especially rentals eg tax deductibility for energy efficiency improvements.

Victorian state research in 2021 "Household Energy Preferences Consumer survey"[44] informed the State Government's gas substitution roadmap included findings about appliances, plans to replace then, types of appliances, perceptions on types of appliances, whether increased knowledge on alternatives influenced views, and how rebates would influence choices. The report provides detailed results. For example 63% of home owners have gas hot water systems, 35% of those would replace it with a gas hot water system and 28% would replace it with a solar system. People aged 18 to 34 have a significantly higher preference for solar hot water. 34% of home owners have never heard of hot water heat pumps and 48% of those eligible for a government rebate are likely to install a heat pump of solar system.

[43] https://energyconsumersaustralia.com.au/wp-content/uploads/230109_Report_Risks-to-gas-consumers-of-declining-gas-demand_final.pdf

[44] Available as a supporting document on this page: https://www.energy.vic.gov.au/renewable-energy/victorias-gas-substitution-roadmap

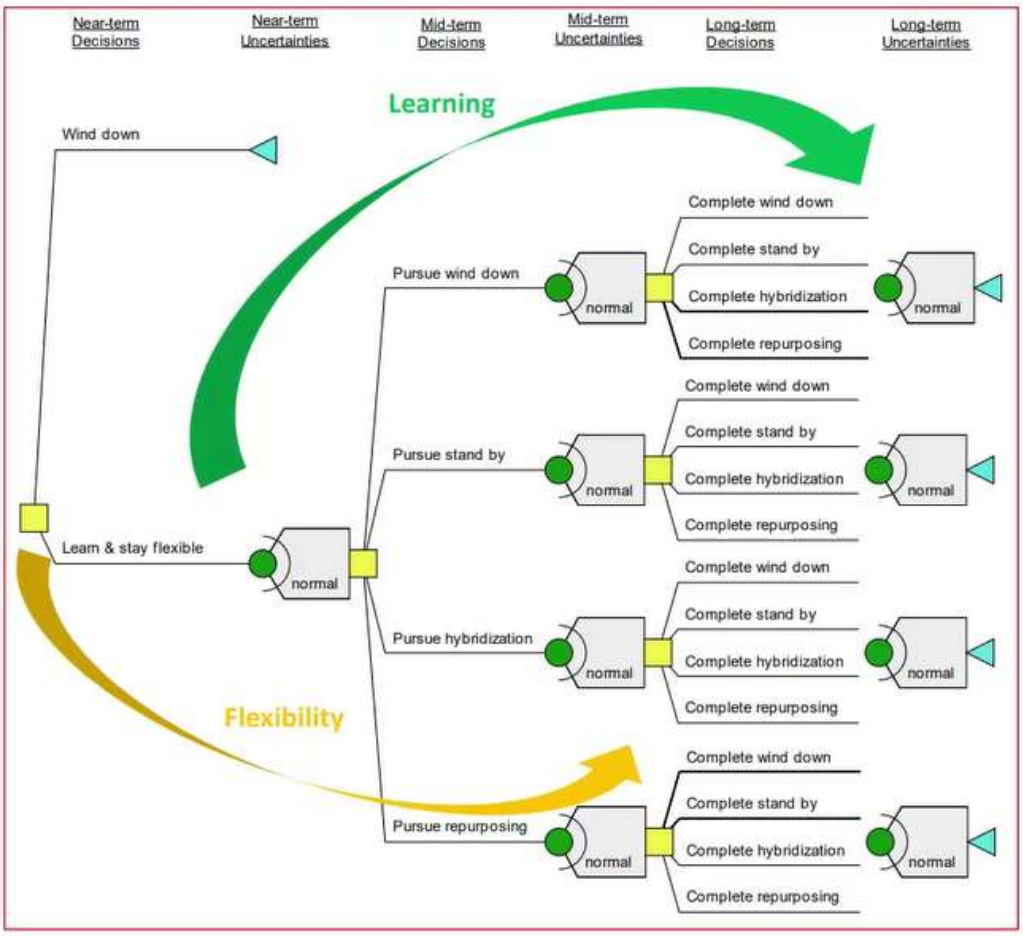
Attachment 6 – Real Options framework

The GIFWG has commissioned Adam Borison (an expert in Real Options Analysis) to undertake phase 1 of a Real Options investigation on making decisions about the future of gas infrastructure. This is work in progress with Phase 1 expected to be available later in 2023.

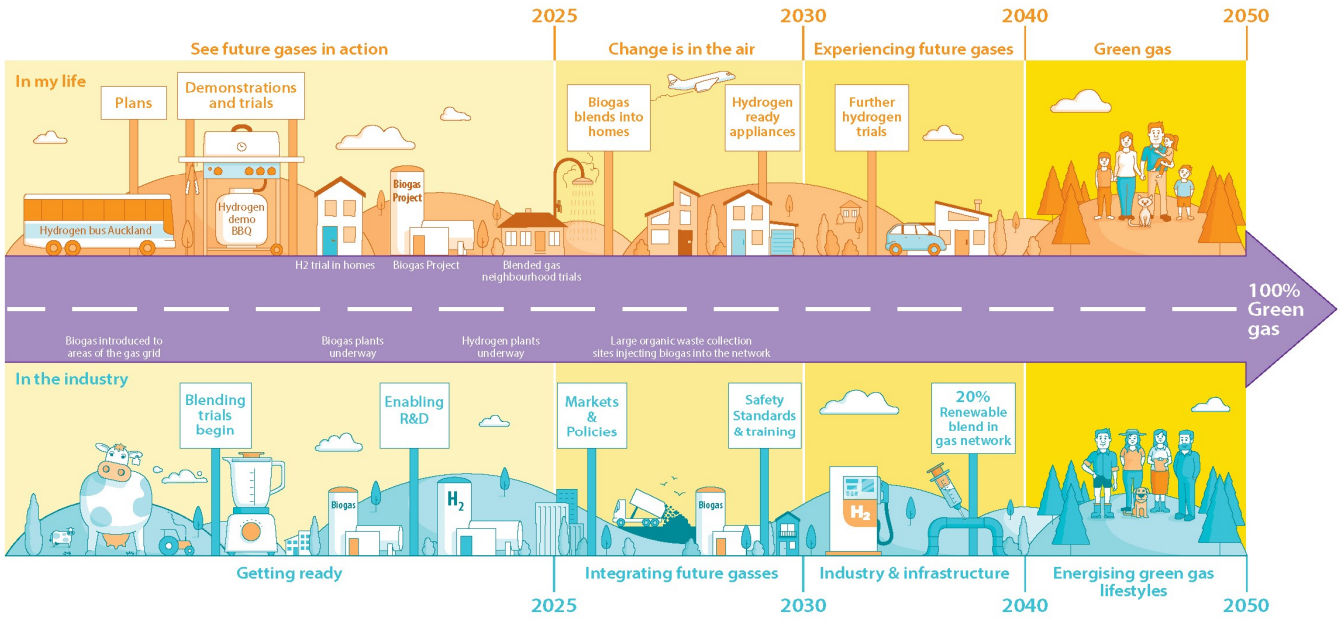
Phase 1 sets up the real options conceptual framework to describe the real option value of New Zealand's gas infrastructure. It is intended to build awareness of alternatives associated with future gas infrastructure, and provide a Real Options decision structure for developing qualitative and quantitative insights for a path forward. A key outcome will be identifying the 'learnings' areas, decision points and how best to preserve options until the optimal decision point. A draft decision structure example is provided below to illustrate the Real Options approach.

We would welcome the opportunity to work with MBIE in progressing the work and considering how a phase 2 study could assist.

Real Options framework example

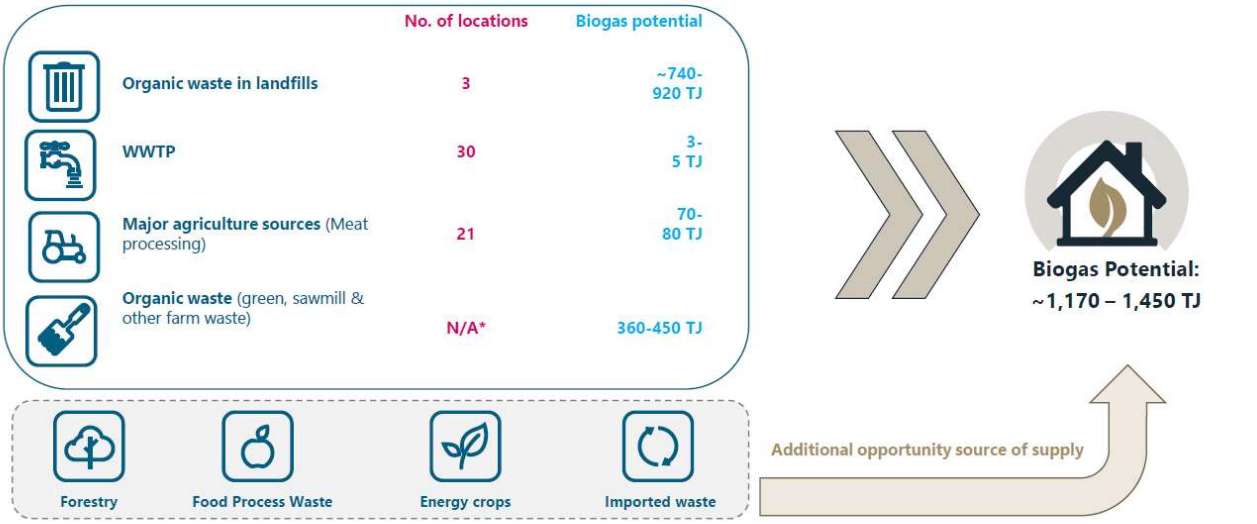


Attachment 7 – Powerco renewable gas roadmap



Attachment 8 – Biogas opportunity on the Powerco network, Advisian 2022

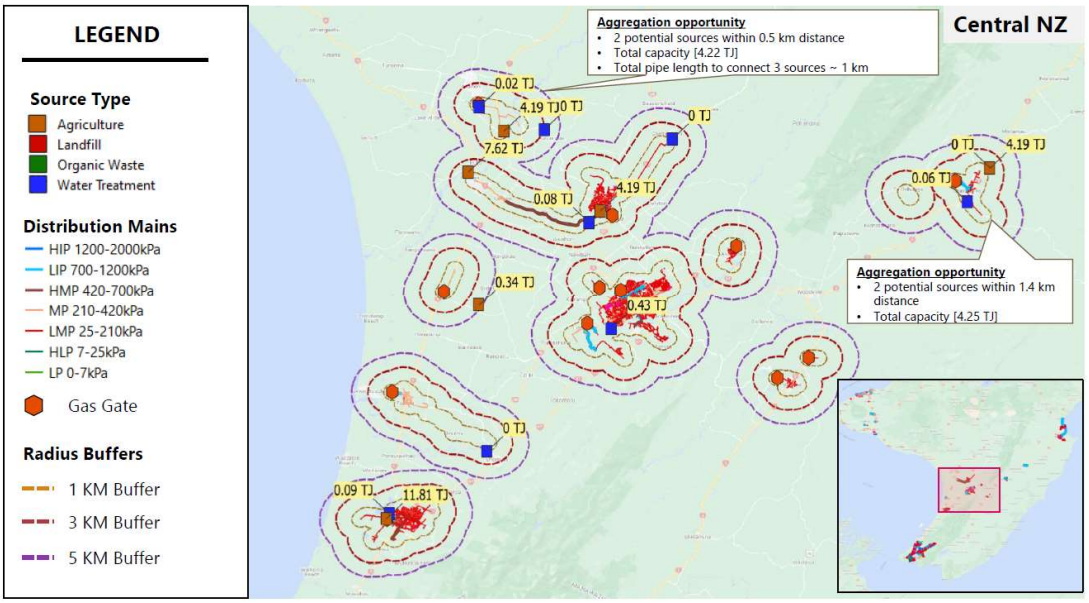
Powerco commissioned Advisian to investigate the biogas potential on the Powerco network. The investigation, completed in November 2022 provided an initial high level estimate of 1,100 – 1,450 TJ of biogas potential across organic waste in landfills, waste water treatment, major agriculture sources (meat processing) and organic waste in green waste , sawmill and other farm waste. Additional opportunity exists (eg in forestry and energy crops) but was not considered as part of initial supply estimates. The findings are summarised in the diagram below.

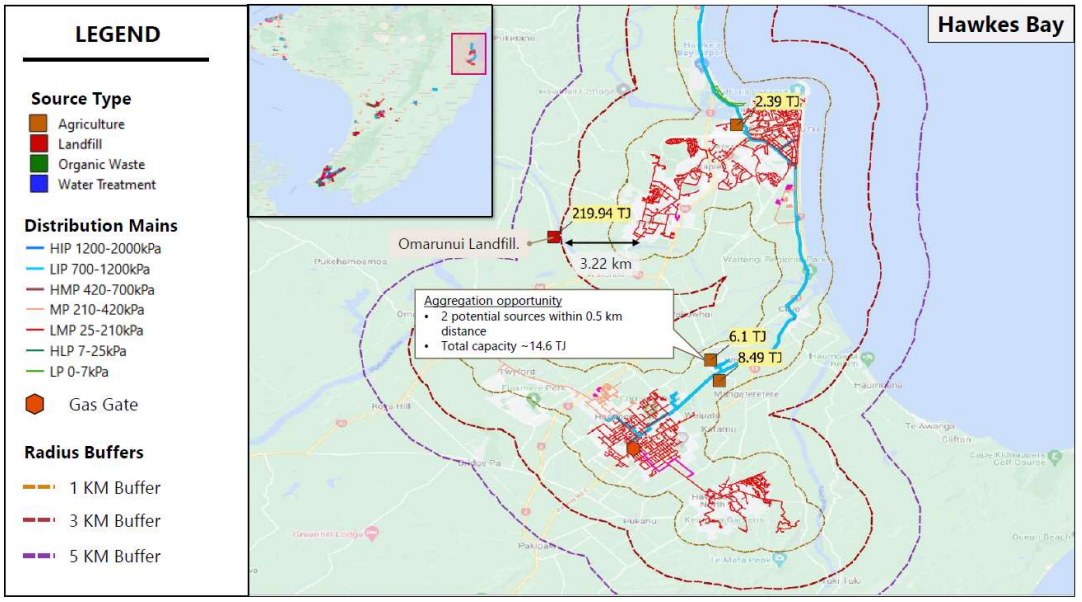


* Organic waste represents a highly fragmented opportunity with a high number of sources

Powerco - Biogas Integration Supply Study

The study found 24 sources within 1km of the existing Powerco network, 33 within a 3km radius. The largest opportunities were found to exist in landfills, which may be further from the network but still efficient due to size. There are a number of locations with particular aggregation opportunities, with two examples provided below.


LEGEND
Source Type
Agriculture
Landfill
Organic Waste
Water Treatment
Distribution Mains
HIP 1200-2000kPa
LIP 700-1200kPa
HMP 420-700kPa
MP 210-420kPa
LMP 25-210kPa
HLP 7-25kPa
LP 0-7kPa
Gas Gate
Radius Buffers
1 KM Buffer
3 KM Buffer
5 KM Buffer
Central NZ
Aggregation opportunity
2 potential sources within 0.5 km distance
Total capacity [4.22 TJ]
Total pipe length to connect 3 sources ~ 1 km
0.02 TJ
4.19 TJ
0 TJ
0 TJ
7.62 TJ
0.08 TJ
4.19 TJ
0 TJ
4.19 TJ
0.06 TJ
Aggregation opportunity
2 potential sources within 1.4 km distance
Total capacity [4.25 TJ]
0.34 TJ
0.43 TJ
0 TJ
0.09 TJ
11.81 TJ

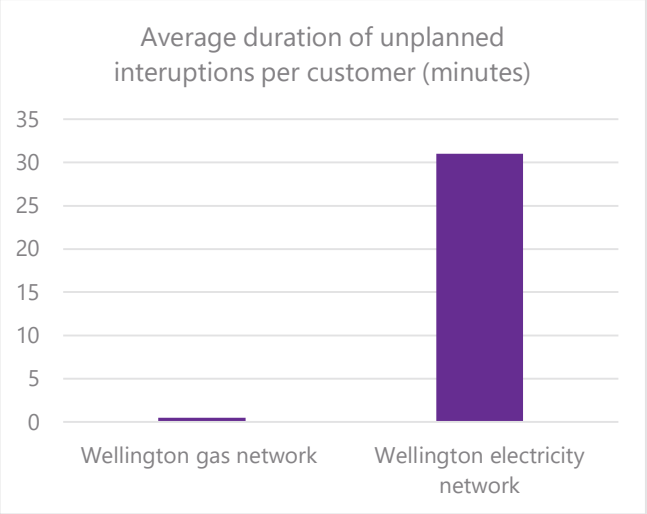

LEGEND
Source Type
Agriculture
Landfill
Organic Waste
Water Treatment
Distribution Mains
HIP 1200-2000kPa
LIP 700-1200kPa
HMP 420-700kPa
MP 210-420kPa
LMP 25-210kPa
HLP 7-25kPa
LP 0-7kPa
Gas Gate
Radius Buffers
1 KM Buffer
3 KM Buffer
5 KM Buffer
Hawkes Bay
2.39 TJ
219.94 TJ
Omarunui Landfill.
3.22 km
Aggregation opportunity
2 potential sources within 0.5 km distance
Total capacity ~14.6 TJ
6.1 TJ
8.49 TJ

Attachment 9 – The resilience value of gas

There is a link between decarbonisation policy, emissions reduction targets, consumer costs and resilience which needs careful analysis. Fuel diversity is necessary to provide resilience today, through to 2030 and beyond. The reliability and fuel diversity benefits of natural gas, and low-carbon gas in the future, have significant resilience value. The value of the gas network for community resilience was demonstrated during Cyclone Gabrielle (refer case study below).

In general, gas networks demonstrate high reliability compared to electricity networks due to the different risks faced by each of them. Using the Powerco 'Lower' gas network and the Wellington Electricity network for comparison the average minutes of disruption per customer in the 2022 reporting year[45] are shown in the Figure below illustrating a vast difference in the duration of unplanned interruptions. We have used this data for comparison noting that duration data is a priority measure for the Commerce Commission.

Network reliability reported for Wellington gas and electricity networks 2022



Fuel diversity offers essential resilience for homes throughout New Zealand, beyond piped gas. For example 33.3% of New Zealand homes use a wood burner for heating, 6.3% portable gas heaters and 11.7% fixed gas heaters. In the South Island, 44.1% of homes use wood for heating while only 10% use gas heating.[46]

Fuel diversity offers critical back-up for essential services in times of energy outages. For example, from 2026 the new Wellington Wastewater sludge minimisation facility[47] will use a more resilient approach on a space-limited site to reduce sludge dumped to landfill. Anaerobic digestion will break down sludge, produce biogas, and that biogas will produce heat and electricity to process the waste. A gas connection is a critical part of that system to ensure a continued process in the event of an on-site fuel issue. This example shows the complex interdependencies between waste treatment, fuel use, infrastructure, and resilience in real-life situations. Fuel diversity and back up options for essential services or industries, or at community level will may involve diesel generators being a higher emissions resilience option which is not an outcome sought.

[45] Source: 2022 reporting year information disclosure schedule 10, Powerco gas Master - 2022 GDB ID schedules 1-10 (excl. 5f-5g).xlsx (powerco.co.nz) and Wellington Electricity 292 (welectricity.co.nz).
[46] Census 2018 data from StatsNZ. Summary data on heating at *Environmental Health Intelligence New Zealand (*19446-Types-of-Heating-FA2 .pdf (ehinz.ac.nz)) and *Figure NZ (*Main types of heating used in New Zealand homes – Figure.NZ)
[47] Projects - Moa Point sludge minimisation facility - Wellington City Council

Case study: The value of a resilient energy option – Cyclone Gabrielle in Hawke's Bay

In February 2023, Cyclone Gabrielle caused unprecedented devastation across the North Island. More than 107,000 of our electricity customers were affected by power loss (33% of our network). There was significant damage to our electricity network across Coromandel, South Waikato, eastern Bay of Plenty, Taranaki, Manawatū, and the Wairarapa. The damage and impact to Unison Network's electricity network in Hawke's Bay was even more significant, with some customers losing electricity supply for four weeks.

Powerco's gas network in Hawke's Bay proved resilient and an essential lifeline for customers without electricity. While our gas pipeline crossing the Ngaruroro River bridge in Napier sustained damage when it was pulled away from the supporting structures because of flooding and slash, its integrity was maintained, and gas supply was not interrupted. All other bridge crossings and underground pipes remained undamaged and there was no loss of gas supply throughout our Hawke's Bay network. Gas supply for cooking and hot water provided an essential lifeline for many Hawke's Bay residents when electricity was not available.

While the architecture and design of our networks presents a strong basis for reliability and resilience, Cyclone Gabrielle also tested our operational and response capability. Field crews worked in difficult conditions over several days to check and confirm the integrity and accessibility of our gas critical network assets, ensuring they remained safe and operational. Our emergency contingency plans supported this process.

Lessons learned:

- We will relocate the pipeline at the Ngaruroro site to the opposite side of the bridge where it will be less susceptible to flood damage. This will help make this part of the network even more resilient to future events.
- Our resilience and reliability planning in relation to our network and gas supply needs to continue as a core focus.
- Gas supply to community hubs and points of refuge proved invaluable for those who required shelter, warmth and food.
- Learnings from this event will inform our asset management planning and our climate adaptation planning.

Key take aways:

- Natural gas networks are resilient in the face of natural hazards and can continue to provide a critical energy option when electricity reinstatement may take some time.
- The event highlighted that the value of resilience is much more than the economic cost of not having an energy supply.
- There are societal costs and community impacts when there are long extended periods without energy amidst the other devastating consequences faced by residents during and after such an event.

Attachment 10 – A vision for biogas in Aotearoa New Zealand, Blunomy October 2023

Vision for biogas in Aotearoa New Zealand

Final report document

October 30, 2023

blunomy®

Executive summary

Biogas is a readily-available solution that can help New Zealand now to reach its commitments across energy, waste, and agriculture

Current context

New Zealand has committed to a range of targets across emissions, waste, energy – and to a lesser extent in agriculture, but **the path to meeting those targets is not yet explicit** and **efforts are fragmented between sectors** with different sets of objectives.

Without rapid and decisive action, **New Zealand will face a target gap of 3.3 Mt waste to landfill and 14-28 $MtCO_2$-e emissions in 2050** (excluding emissions offset) across the waste, energy, and agriculture sectors.

Biogas potential

As a readily-available solution with a track record of success overseas, **biogas can offer crucial support to narrow these gaps**, providing a means of diverting waste away from landfill, supplying reliable renewable energy, and creating value for businesses across industry and agriculture.

Currently **around 4.9 PJ of biogas is produced in New Zealand**, a significant proportion of which is flared with no beneficial use, since the focus is on waste processing rather than energy supply. There is a further **11 PJ/yr of untapped potential in the North Island**, and **8 PJ/yr in the South Island** (set against a total 2022 natural gas supply of 143 PJ).

This study considered one possible option for the development of biogas in NZ, **a 'North Star' scenario realising New Zealand's 24 PJ/yr biogas potential,** with a network of regional facilities in the North Island producing biomethane that is injected into the gas distribution network, upgrades to existing facilities to make beneficial use of biogas already being produced, and maximizing local capture and use in the South Island.

North Star benefits

The North Star scenario explored demonstrates **biogas and biomethane can make a significant contribution to achieving the suite of targets to which New Zealand has committed** – and can create additional value at the same time:

- The North Star could deliver a **3.7 $MtCO_2$-e reduction** in emissions by 2050, **13-27% of the gap** between New Zealand's reduction commitments and the Emissions Reduction Plan baseline scenario (excluding emissions offsets), and go **46% of the way to meeting the lower limit of the 2050 target for biogenic methane** (24% for the higher limit)
- Anaerobic digestion could provide **23% of the needed reduction in waste to landfill by 2030**, while producing high-quality, nutrient-rich digestate, **reducing dependence on fertiliser imports and exposure to price volatility**.
- The biomethane produced could bridge **9% of the gap to the target of 50% energy consumption from renewables by 2035**, while providing stable, reliable output and **supporting consumers and industries less able to electrify** due to cost or technical difficulty.
- Using un-tapped manure and crop residue feedstocks to produce biogas could **improve farmers' business resilience** (reducing operating costs and diversifying revenue) and **strengthen the viability and global appeal of New Zealand food exports,** by boosting their environmental credentials though **reduced on-farm emissions, decarbonised electricity generation** and **use of digestate use** in place of synthetic fertilisers.

We need to act now to secure the benefits biogas can bring, by building confidence and capability

Barriers and actions

Historically **low landfill costs and natural gas prices** have weakened business cases in the past and created an unfavourable environment for biogas developments. **This is compounded by additional practical barriers**: limited capacity for delivery in a nascent industry, potentially cumbersome permitting pathways, regulatory gaps around digestate use, and a lack of experienced investors.

There are **four key areas of action** to be explored to support the development of biogas in New Zealand:

- **Feedstock:** improve access to feedstocks by incentivising their diversion to biogas production rather than landfill, composting, or other uses – for example by continuing to increase the waste disposal levy or by ending disposal of organic waste in landfill.
- **Demand:** explicitly recognise biogas's potential value in policy, providing long-term confidence for investors, and develop support mechanism to trigger demand for biogas and by-products (renewable gas mandate, mandate for replacement of synthetic fertilizer, etc).
- **Supply:** explore policy mechanisms to shorten project payback periods (FiT, grants, etc) and streamline the development process for biogas facilities.
- **Awareness:** explicitly build biogas into New Zealand emissions and wastes reduction plans, highlighting its benefits and opportunities, in parallel of sharing knowledge across stakeholder groups (investors, farmers, industry players, local communities, etc).

Next steps

The time to act on biogas is now: waiting may make it more difficult to fully realise the benefits as simpler but less beneficial solutions to waste management and emissions reduction take up available capital, and the gas infrastructure and expertise needed to exploit biomethane production becomes less available.

Going forward, two key avenues have been identified to **further explore the different actions** and **secure the benefits of biogas for New Zealand:**

- **Ensure co-ordination** at the national level between departments responsible for environmental, energy, industrial, and agricultural policy, as well as with local government, **to centrally pilot the exploration of the different identified actions** – for example by establishing a cross-agency working group that can coordinate the Government's response to biogas development.
- **Consider biogas** as one of the key levers to achieve New Zealand's commitments and deliver wider value, and **explicitly building it into strategies** for emissions reduction, energy transition, and waste management.

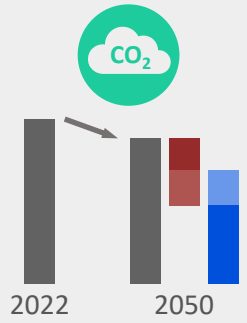
2

North Star scenario one pager

The challenge

The situation today and projections to 2050 if no action is taken vs targets.

63.6 $MtCO_2$-e emissions[2] today

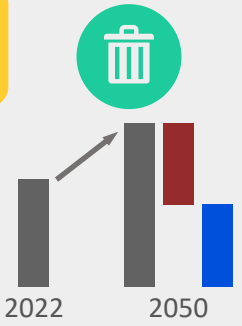


57 $MtCO_2$-e emissions in 2050

vs a target of **29-43 $MtCO_2$-e**

In 2019 New Zealand ranked as the **third worst on the Global Waste Index**[1]

3.8 Mt of waste to landfill today



5.8 Mt of waste to landfill in 2050

vs a target of **2.5 Mt**

Effort needed

reduction in emissions of **14-28 $MtCO_2$-e** needed by 2050

reduction in waste to landfill of **3.3 Mt** needed by 2050

North Star scenario

Regional facilities for biomethane in North Island; local biogas use in South Island

Biogas offers a **readily-available solution with a track record of success overseas** to help **close the gaps** between New Zealand's commitments and its current trajectory.

A North Star scenario is **implementable today** and can make a significant contribution to these targets while **delivering wider benefits** for the transition, economic development, energy equity, and security of supply.

Now is the time to act to secure these benefits. Delay risks missing the 'greenfield opportunity' and seeing critical expertise fade.

North Star benefits

Support NZ energy transition/targets

addressing multiple commitments across multiple sectors through a single initiative:

- **13-27% of emissions cuts needed**, incl. 24-46% of those for biogenic methane
- **23% of the committed reductions in waste** to municipal landfill
- **9% of the increase in renewable energy** needed to reach 50% of consumption

Support NZ economic development

- **creating c.5,500 to 6,000 biogas jobs**
- cutting farmers' **operating costs** by **avoiding emissions charges, supplying fertiliser**, and **generating power and heat**
- **reducing disposal costs** for organic waste from NZ's agri-food industry while making it greener, **improving marketability**

Provide energy equity for customers

- providing **additional decarbonised energy options** to consumers and industries with hard-to-abate gas uses.
- improving energy affordability and access, by **reducing the pressure** on households to spend on electrification

Provide a reliable energy supply

- producing enough biomethane to meet up to **36% of 2022 industrial demand**
- providing a **buffer for increasingly uncertain fossil gas** production
- ensuring a **renewable option for electricity generation** from gas to meet peak demand

[1] in 2018 New Zealand had the highest waste emission per person of all OECD members; [2] Emissions from Waste, Agricultural and the Energy & Industrial sectors;

Sources: Low-emissions economy, New Zealand Productivity Commission 2018, Aotearoa New Zealand's First Emissions Reduction Plan, 2022; Gas Transition Biogas Research Report, 2023; Sensoneo Global Waste Index; Energy in New Zealand 2023

Core of the report

- Context and objectives
- Key findings from literature review
- The North Star and counterfactual scenarios
- Key barriers and recommendations
- Next steps

Evaluating the potential of a vibrant biogas industry in Aotearoa New Zealand

Context

New Zealand has committed to a suite of targets and objectives around net emissions, biogenic methane, energy, and waste, building a sustainable future and playing its part in limiting global warming. The Paris Agreement, the Zero Carbon Act, the First Emissions Reduction Plan, and the Waste Strategy all specify targets, although the path to meeting them is not yet explicitly set out.

Previous studies[1] have shown that New Zealand has a biogas potential of up to 24 PJ per year. However, there is a lack of alignment and common incentives for the industries and sectors of New Zealand's economy to support the development of a local biogas economy.

Firstgas, Powerco, and EcoGas are keen to develop a vision for the energy, agriculture and waste sectors to illustrate the potential benefits biogas can deliver for New Zealand and help policy-makers to take concrete steps to secure them.

Blunomy has prepared this report on behalf of Firstgas, Powerco, and EcoGas to further that aim. Blunomy is an independent strategy consultancy with extensive expertise in bioenergy in Australia and Europe. Blunomy has a track record capturing and communicating the state of the industry as well as our clients' perspectives through multiple publications on the topic.

Objectives

The primary objective of this study is to develop a comprehensive vision for the biogas industry, across three key sectors – energy, agriculture and waste. This includes providing recommendations for policy objectives and strategic directions for the Gas Transition Plan and National Energy Strategy.

The study takes as its inputs two central assumptions from Firstgas, Powerco and EcoGas to develop this vision:

- A theoretical biogas potential based on an existing assessment of 24 PJ per year across, North and South Island[1].
- For the realisation of that potential, a scenario including a network of regional facilities to produce biomethane for injection into the gas distribution network.

[1] Gas Transition Plan – Biogas Research Report, Wood Beca, Feb 2023

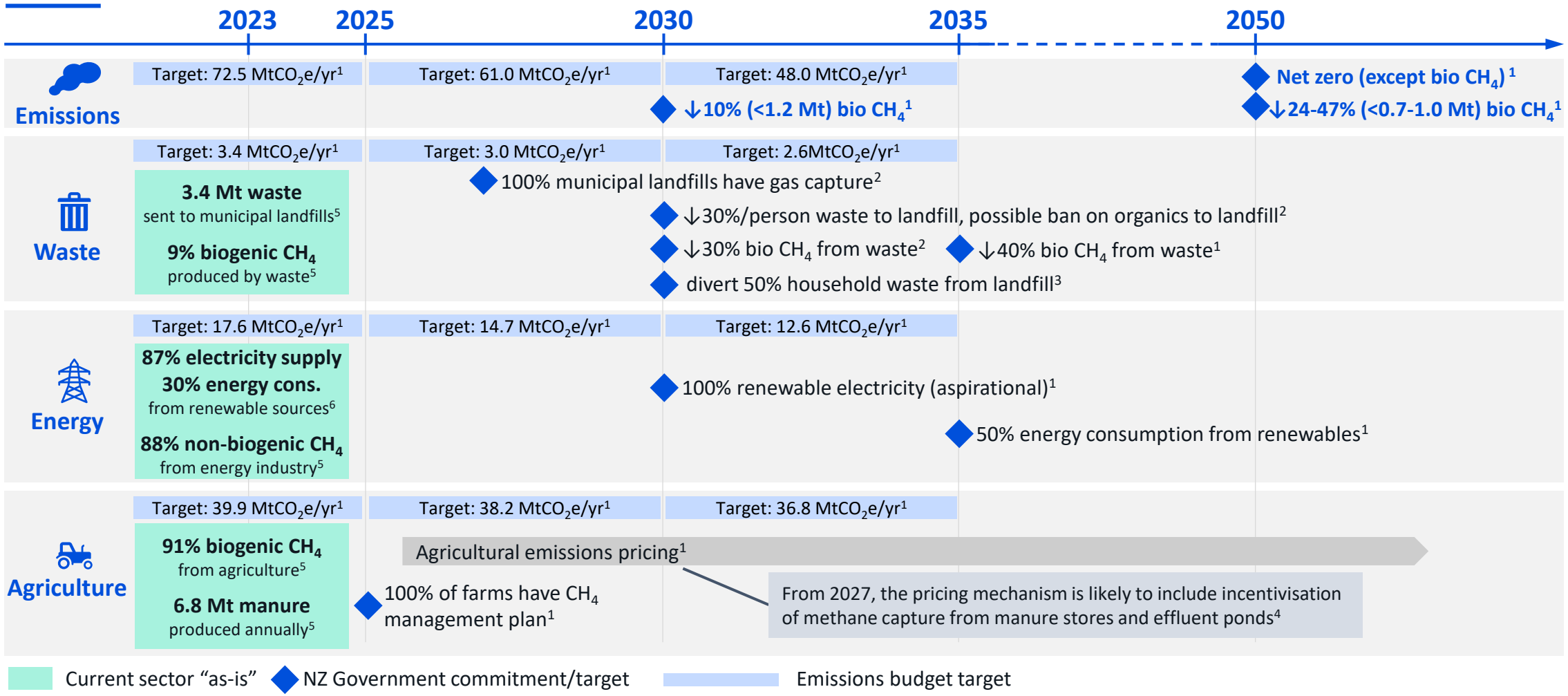
New Zealand's current policies and targets to decrease emissions are primarily targeting the waste industry

Plan/program	Main target/policy description	Energy	Waste	Agriculture
Global Methane Pledge	Reduce 30% of total emissions in NZ compared to 2020 levels by 2030	✓	✓	✓
Aotearoa New Zealand's first emissions reduction plan	50% of NZ's total final energy consumption to come from renewable sources by 2035	✓	✓	✓
	Require all municipal (Class 1) landfills to have LFG capture systems by 31 December 2026		✓	
	• Reduce 40% of biogenic methane in the waste sector compared to 2017 levels by 2035		✓	

	• Reduce biogenic methane emissions to
	  • 10% below 2017 levels by 2030
	  • 24-47% below 2017 levels by 2050
	  • Elimination of non-biogenic methane emissions by 2050
			✓	✓

	All NZ farms to have a plan in place to measure and manage their emissions by 2025			✓
Waste Disposal Levy	Increase waste disposal levy for municipal waste from 50 NZD/tonne to 60 NZD/tonne as of 1 July 2024 with willingness from authorities to continue increasing levies post 2024		✓	
Te Rautaki Para – Waste Strategy	• *Goal 2*: Infrastructure – Develop a comprehensive national network of facilities that supports the collection and circular management of products and materials by 2030		✓	
	• *Goal 6*: Recovering value – Look for ways to recover any remaining value from residual waste, sustainably and without increasing emissions, before final disposal by 2030		✓	
	• *Goal 7.1*: Create less organic waste by 2030 • *Goal 7.2*: Recycle organic material instead of sending it to landfills by 2030		✓	
He Waka Eke Noa Recommendations Report	Introduce a pricing mechanism that provide incentives for the implementation of emissions reduction systems, including effluent methane capture, for agricultural emissions • Simple pricing mechanism by 2025 based on emissions and methane calculated through a single 'stage 1' centralised calculator • Detailed pricing mechanism by 2027 looking into the management of emissions across full farm-level, taking into account emission reduction systems			✓

New Zealand has committed to a range of targets across emissions, waste, energy, and agriculture

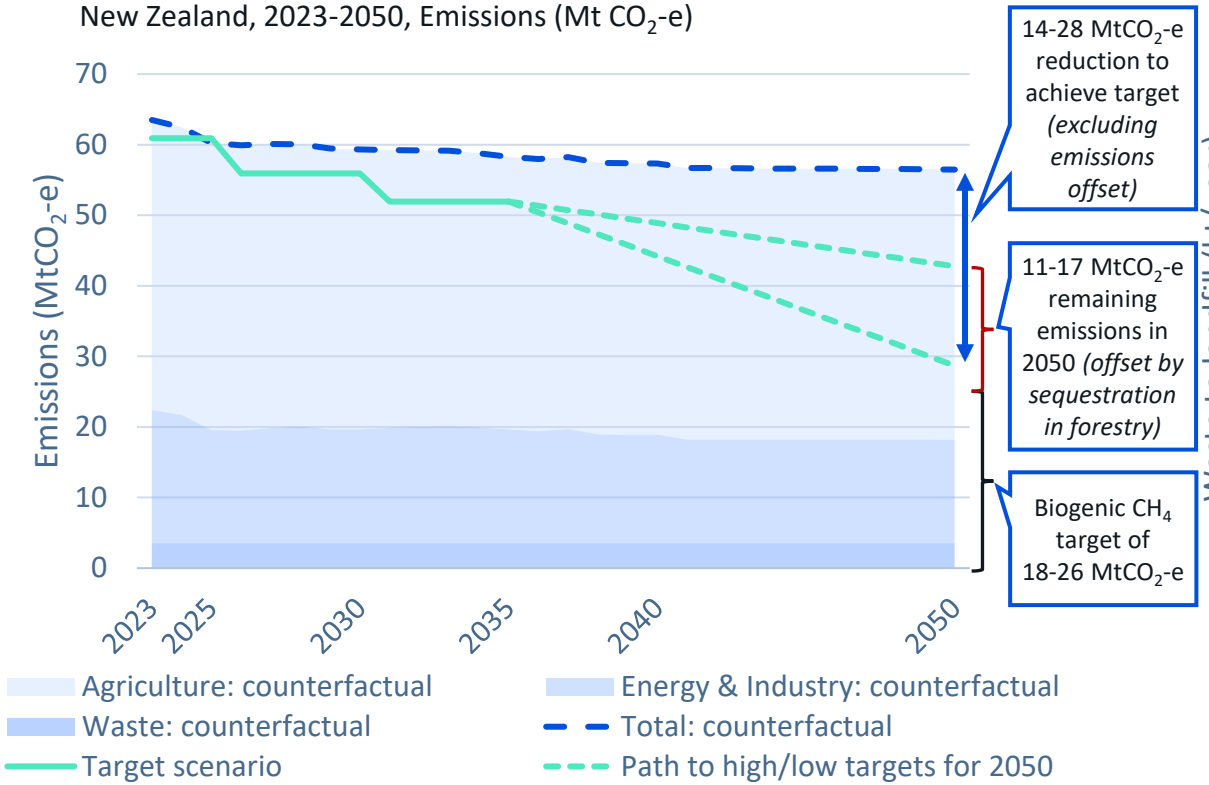


[1] Aotearoa New Zealand's first emissions reduction plan, NZ MfE, May 2022. The 2050 net zero target covers all greenhouse gas emissions except biogenic methane. Reductions in biogenic CH_4 are relative to 2017 levels; [2] Te Rautaki Para – Waste Strategy, NZ MfE, Mar 2023; [3] Improving household recycling and food scrap collections, NZ MfE, Mar 2023; [4] Recommendations for pricing agricultural emissions, He Waka Eke Noa, May 2022; [5] New Zealand Greenhouse Gas Inventory 1990-2020, NZ MfE, Apr 2022; [6] Energy in New Zealand 2023, NZ MBIE, Aug 2023

Without action, New Zealand will face a target gap of 3.3 Mt waste and 14-28 $MtCO_2$-e in 2050 across waste, energy, and agriculture sectors

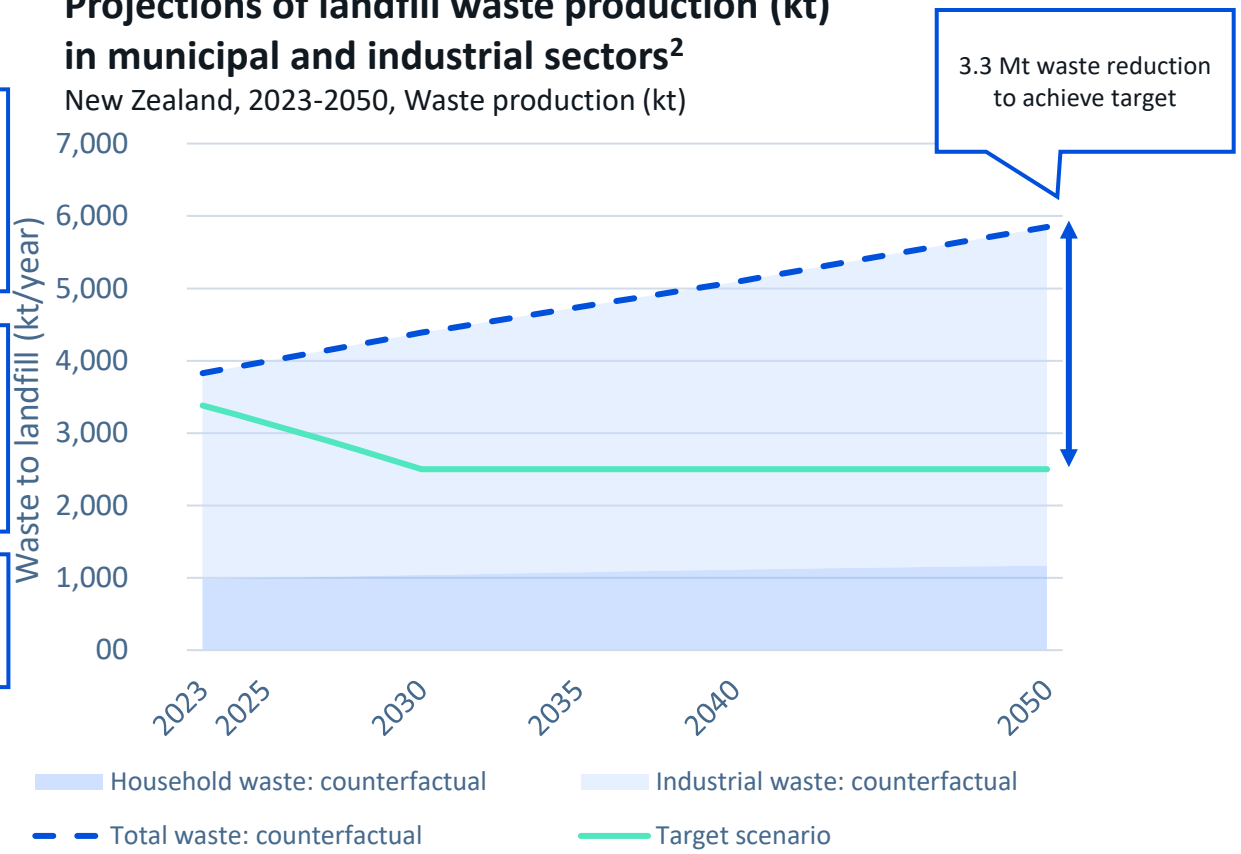
Projections of CO_2 emissions (equivalent) across the waste, energy and industry, and agriculture sectors[1]

New Zealand, 2023-2050, Emissions (Mt CO_2-e)



Projections of landfill waste production (kt) in municipal and industrial sectors[2]

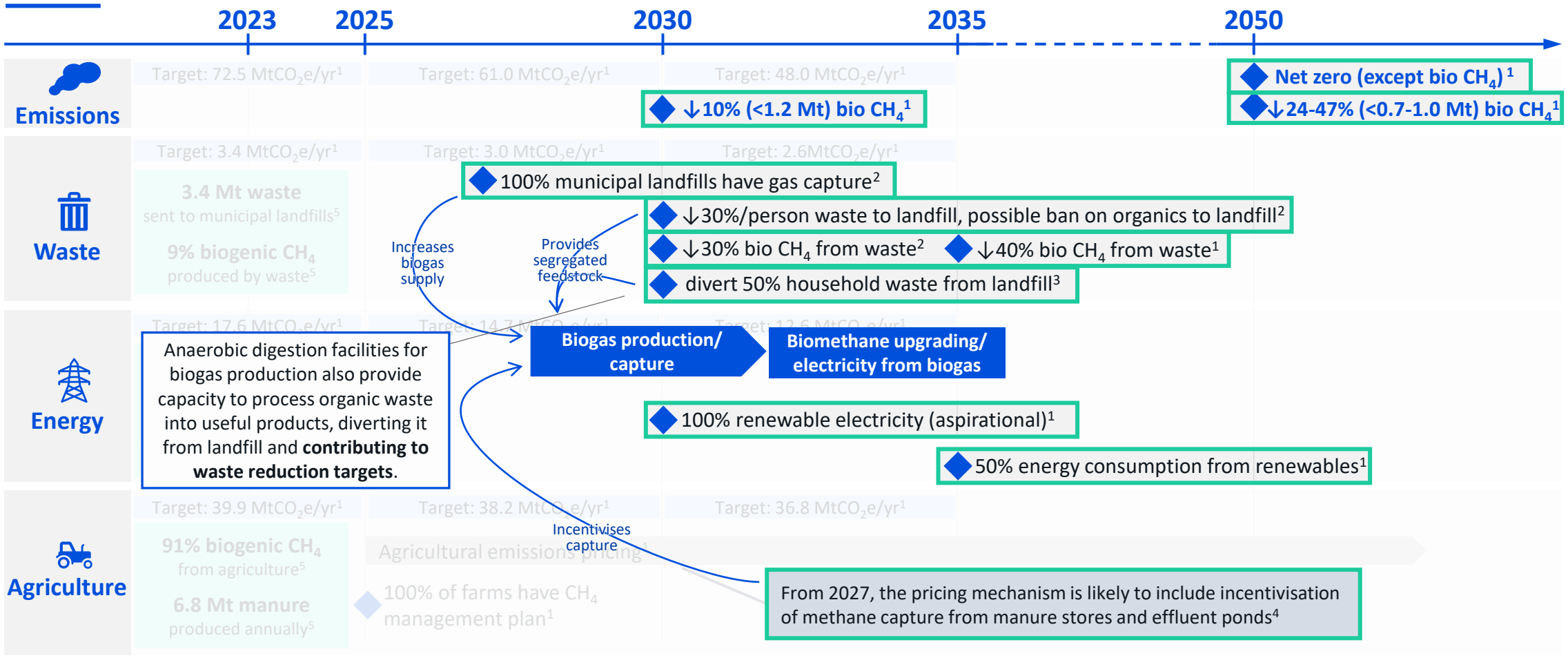
New Zealand, 2023-2050, Waste production (kt)



Notes: [1] Targets for 2050 taken from Inaia Tonu Nei headwinds/tailwinds scenarios for paths to net zero, together with the 24-47% biogenic CH_4 reduction target: emissions in these sectors are offset by negative emissions from the forestry sector to achieve net zero. [2] Projections for counterfactual scenarios regarding municipal and industrial landfill waste were derived using population and GDP growth rate respectively. A flat trajectory for target waste was assumed post 2030 for the target scenario, foreseeing further, more ambitious targets.

Sources: New Zealand's First Emissions Reduction Plan, MfE 2022; Gas Transition Plan - Biogas Research Report, Wood Beca 2022; New Zealand's Greenhouse Gas Inventory, MfE 2020

Biogas is a key lever to support New Zealand reaching its targets, creating value from waste streams and linking across sectors (1/3)



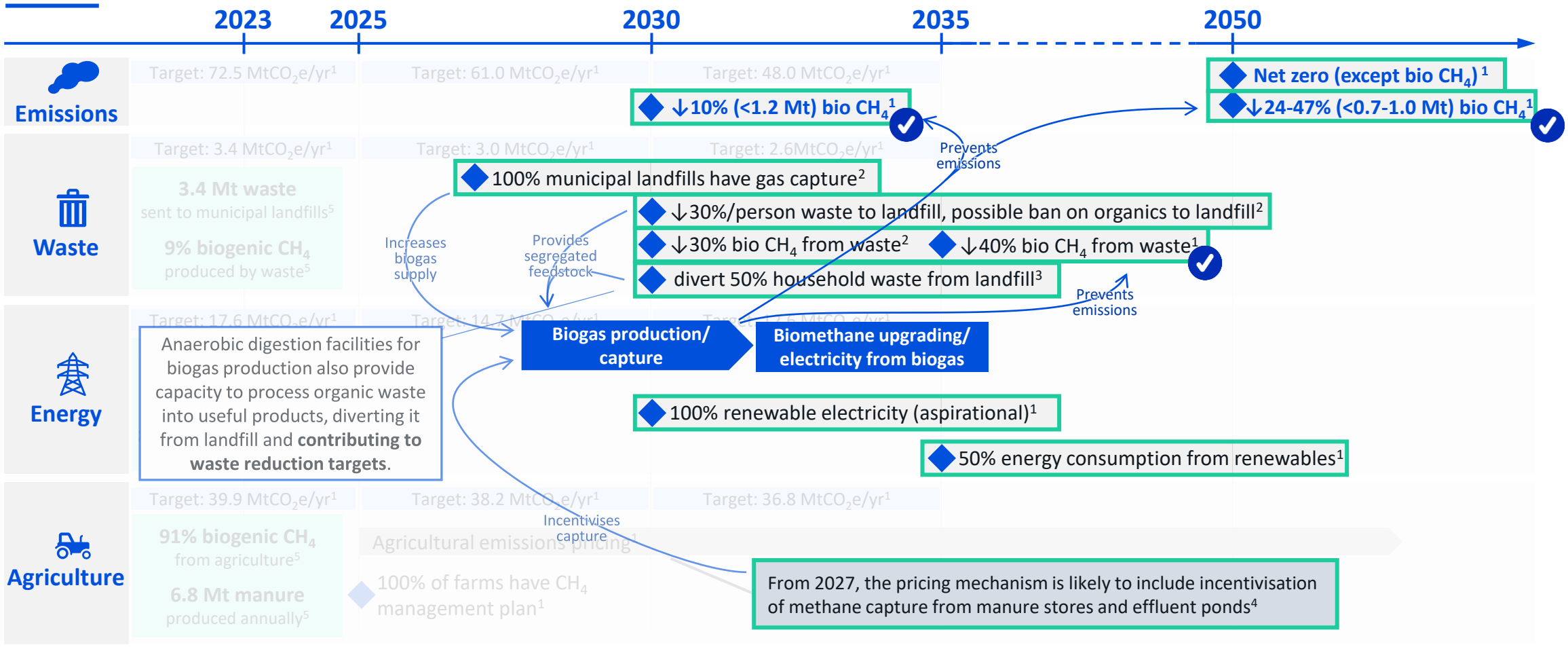
Biogas can support the NZ commitment/target

Link between biogas initiatives

xxx Biogas value chain

Source: Blunomy analysis

Biogas is a key lever to support New Zealand reaching its targets, creating value from waste streams and linking across sectors (2/3)



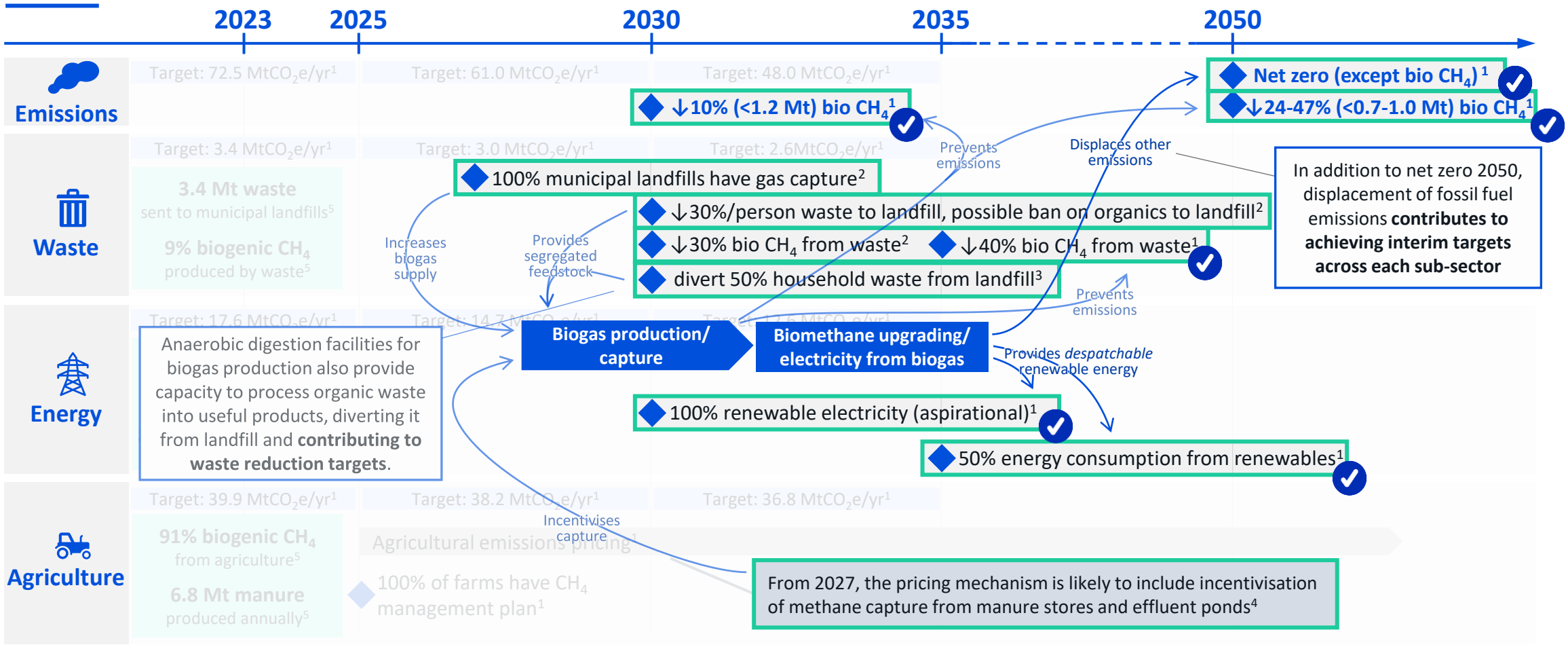
Biogas can support the NZ commitment/target

Link between biogas initiatives

xxx Biogas value chain

Source: Blunomy analysis

Biogas is a key lever to support New Zealand reaching its targets, creating value from waste streams and linking across sectors (3/3)



Biogas can support the NZ commitment/target

Link between biogas initiatives

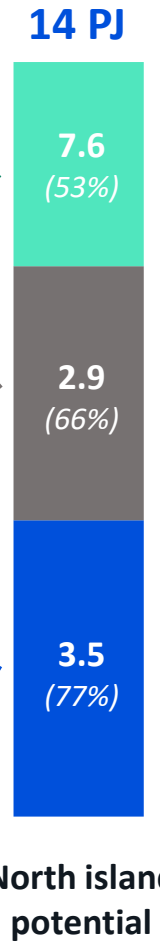
xxx Biogas value chain

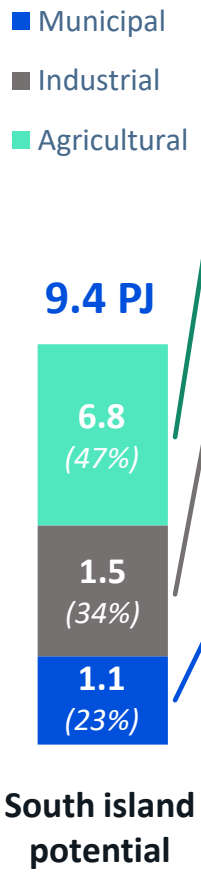
Source: Blunomy analysis

Currently ~4.9 PJ of biogas is produced in NZ, with a further ~11 PJ of untapped theoretical potential in the North Island alone

Current biogas production – *North Island*

Agricultural • 1 piggery digesting manure	**<0.01 PJ**
Industrial - wastewater • 1 dairy processing site (Tirau dairy site, but decommissioned)	-
Industrial – solid waste *Large part collected into landfills*	**~0.6 PJ**[2] *arising from industry*
Municipal - solid waste • 1 purpose-built organic waste digestion facility (not yet fully operational) • 9 landfill sites are currently capturing gas[1]	**~2.0 PJ** *arising from landfill*
Municipal – wastewater • 10 WWTP currently utilising anaerobic treatment processes	**~0.8 PJ**





Current biogas production – *South Island*

<0.01 PJ	**Agricultural** • 1 dairy farm digesting manure
<0.1 PJ	**Industrial – wastewater** • 1 site digesting cream cheese whey
~0.3 PJ[2] *arising from industry*	**Industrial – solid waste** *Large part collected into landfills*
~0.9 PJ *arising from landfill*	**Municipal – solid waste** • 8 landfill sites are currently capturing gas[1]
~0.2 PJ	**Municipal – wastewater** • 5 WWTP currently utilising anaerobic treatment processes

Notes: [1] out of 47 sites listed in the *Gas Transition Plan – Biogas Research Report* [2] Total industrial biogas is 0.9 PJ in NZ. Split between North Island and South Island based on population

Sources: Gas Transition Plan – Biogas Research Report, Wood Beca; Biogas and Biomethane in New Zealand, EECA, Beca, Fonterra & Firstgas Group

Current biogas production realises only a small part of the potential, and is almost exclusively focussed on waste processing

Biogas potential by territorial authority[1]

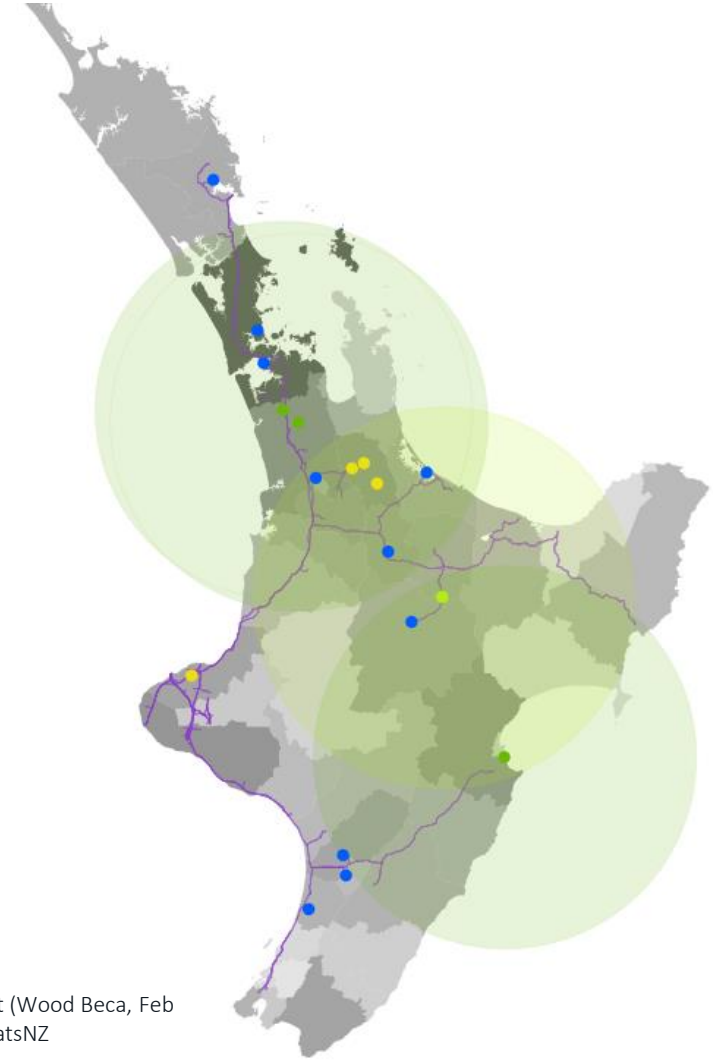
Low — High

Current facilities[2]

- Gas transmission pipelines
- Composting site
- AD site (EcoGas)

With policy-defined 150km collection radius

- Major WWTP with AD/gas capture
- Other AD site



Key considerations

Existing facilities are linked to waste treatment: organic waste to composting and AD, and WWTPs.

[1] Blunomy analysis, based on Gas Transition Plan Biogas Research Report (Wood Beca, Feb 2023) and data on industry and agriculture by territorial authority from StatsNZ

[2] Sources: Firstgas, WaterNZ, Alzbeta Bouskova, MfE

North Star scenario: a network of regional facilities, covering a large proportion of the North Island to capture the untapped potential

Biogas potential by territorial authority[1]

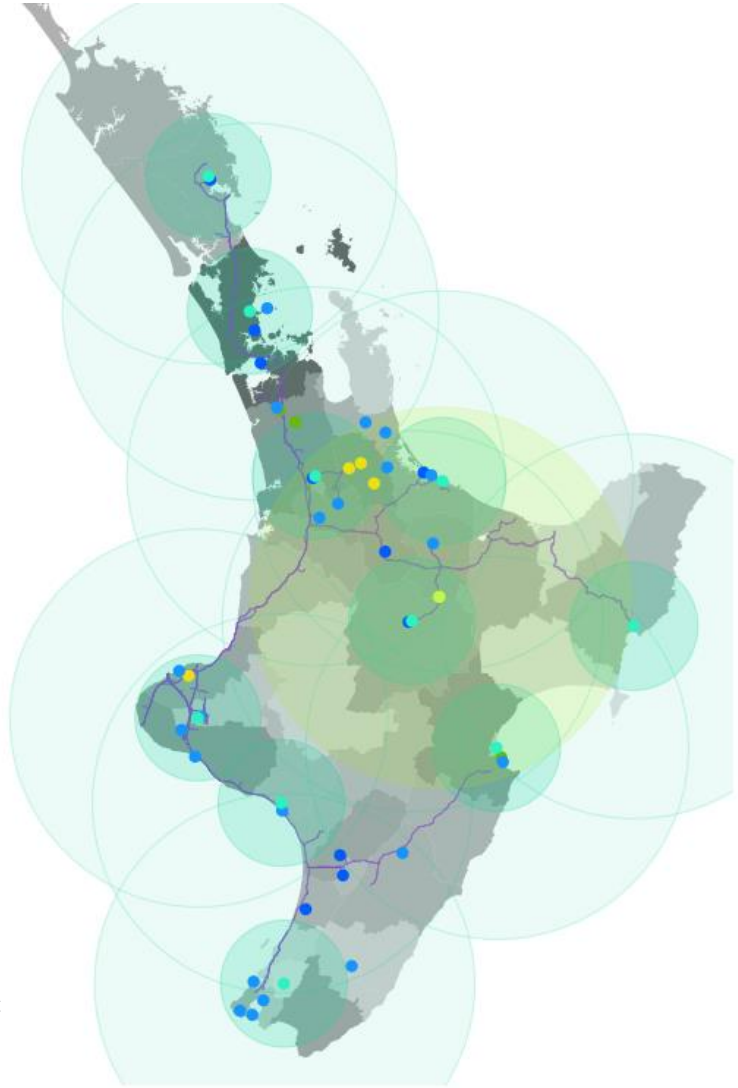
Low — High

Current facilities

- Gas transmission pipelines
- Composting site
- AD site (EcoGas) with 150 km collection radius
- Major WWTP with AD/gas capture
- Other AD site

Vision facilities

- Potential regional facilities (showing 50 km and 150 km radii)
- Additional major WWTPs (>1 Mm^3/yr wastewater) to be equipped with AD/gas capture



Key considerations

Assumption: maximising biogas upgrading to biomethane for gas grid injection

Corollary: facilities must be within reach (~1km) of the gas distribution network.

Selecting locations to maximise coverage of:

- areas of high population density, based on 150 km policy-defined radius for organic waste (assumption: AD is preferable to composting for highly methanogenic waste)
- industrial feedstock sources (industrial solid and liquid waste)
- areas of high livestock density (swine in Taranaki; cattle in Manawatu, Northland, and Bay of Plenty), based on 50 km estimated economic radius for manure transport
- areas of high arable farming density (maize in Gisborne and Waikato), based on 150 km estimated economic radius for crop residue

Unmapped:

- Landfill sites

[1] Blunomy analysis, based on Gas Transition Plan Biogas Research Report (Wood Beca, Feb 2023) and data on industry and agriculture by territorial authority from StatsNZ

The dimensions being explored in the Gas Transition Plan consultation have been translated into criteria for assessment of the North Star's impact

MBIE[1] Criteria

Assessment criteria

	1 Support NZ energy transition					2 Eco. Development / Production growth			3 Energy supply	4 Energy equity
	Biogas/biomethane (PJ)				Waste to landfill *(kt)*	Net effect on emissions *(CO2 eq)*	Required investment *(NZD)*	Economic dev. *(# of jobs)*	Value added	Resilience	
	Regional facilities	Landfill	BTM	Flared						Security of supply	Customer choice
North Star scenario											
Counterfac-tual											
Net impacts											

Criteria assessment

[1] : Ministry of Business, Innovation and Employment

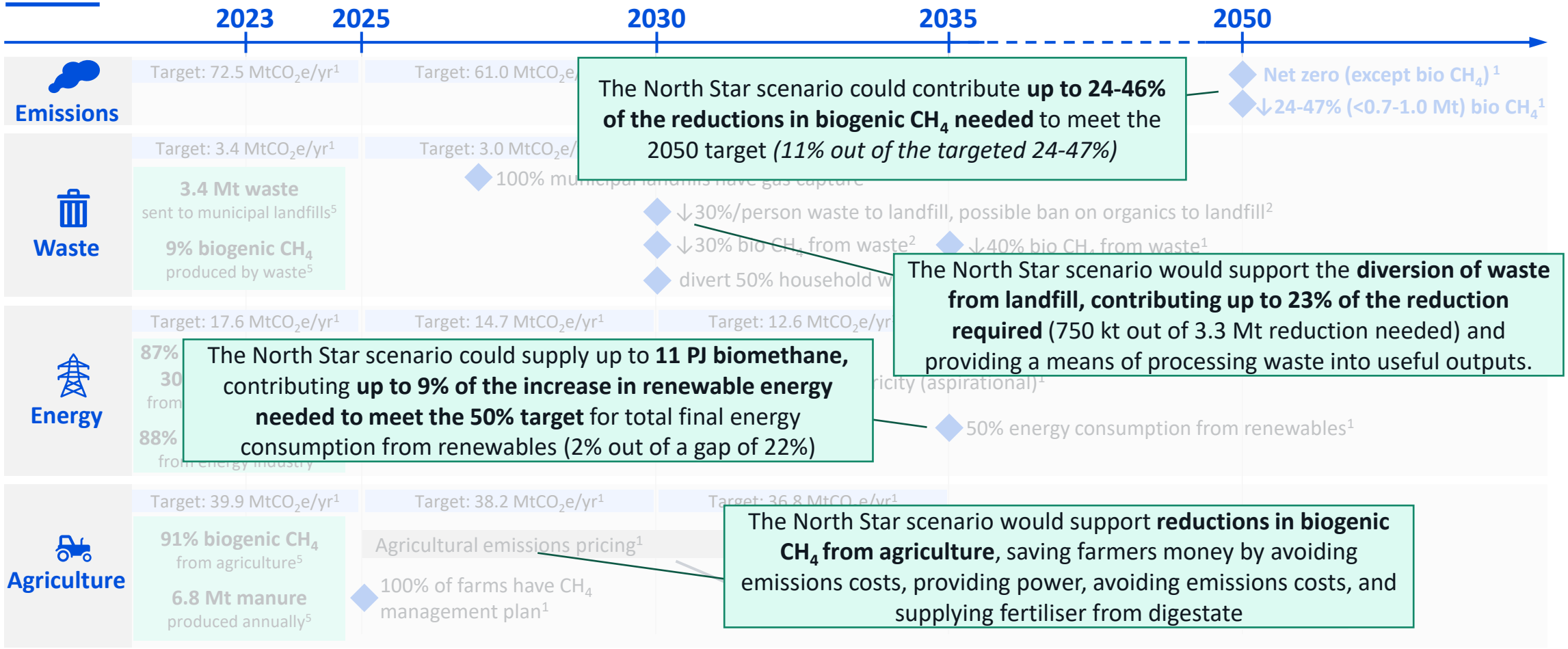
The North Star scenario has a strong impact against the criteria, with variation between high and low scenarios

		Biogas/biomethane (PJ)									Waste to landfill (kt)[1]	Net effect on emissions ($ktCO_2e$)[2]	Required investment (NZD)	Economic development (no. of jobs)	Value added	Resilience	
		North Island					South Island									Security of supply	Customer choice
		Regional facilities	Landfill	WWTPs	BTM use	Flared	Landfill	WWTPs	BTM use	Flared							
Counterfactual scenario (2050)		0.0	2.0	0.8	0.0	0.7	0.7	0.3	0.0	0.2	1,010	3,470	-	-	-	-	-
North Star	High Scenario	8.9	0.9	1.2 $bioCH_4$	1.9	0.0	0.3	0.4	9.8	0.0	260	-260 *(owing to displaced emissions)*	~2.4-3.2B	Creation of ~5,500 to 6,000 jobs	Supports farmers by reducing operating costs, supplying more bio-available / less emissive organic fertiliser / increasing revenue; Supports waste targets by creating capacity to treat organic waste streams from the agri-food industries	Improves security of supply: biomethane can meet 36% of 2022 industrial demand[3] in high scenario (22% in low scenario) Reduces dependency on synthetic N fertilisers Provides a green and NZ-produced source of CO_2	Provides additional decarbonised energy options to end-customers, beyond electrification
	Net impact	**+8.9**	**-1.1**	**+0.4**	**+3.0**	**-0.7**	**-0.4**	**+0.1**	**+9.8**	**-0.2**	**-750**	**-3730**					
	Low Scenario	6.4 $bioCH_4$	0.9	1.2	4.4	0.0	0.3	0.4	9.8	0.0	270	-80 *(owing to displaced emissions)*					
	Net impact	**+6.4**	**-1.1**	**+0.4**	**+4.4**	**-0.7**	**-0.4**	**+0.1**	**+9.8**	**-0.2**	**-740**	**-3550**					

$bioCH_4$ Biogas upgraded to biomethane and injected into the gas distribution network

[1] 'Waste to landfill' reflects the weight of the total potential feedstock material is sent for final disposal in landfill, including biosolids from wastewater treatment. [2] Net effect on emissions characterises the overall contribution of the feedstock material to NZ emissions, including displaced emissions from electricity generation or natural gas use and biogenic methane capture, but excludes potentially-displaced emissions from digestate use. [3] Source for demand: Gas Supply and Demand Projections 2022, Concept Consulting, Jul 2022.

The North Star scenario would make a significant contribution towards meeting NZ's ambitious targets

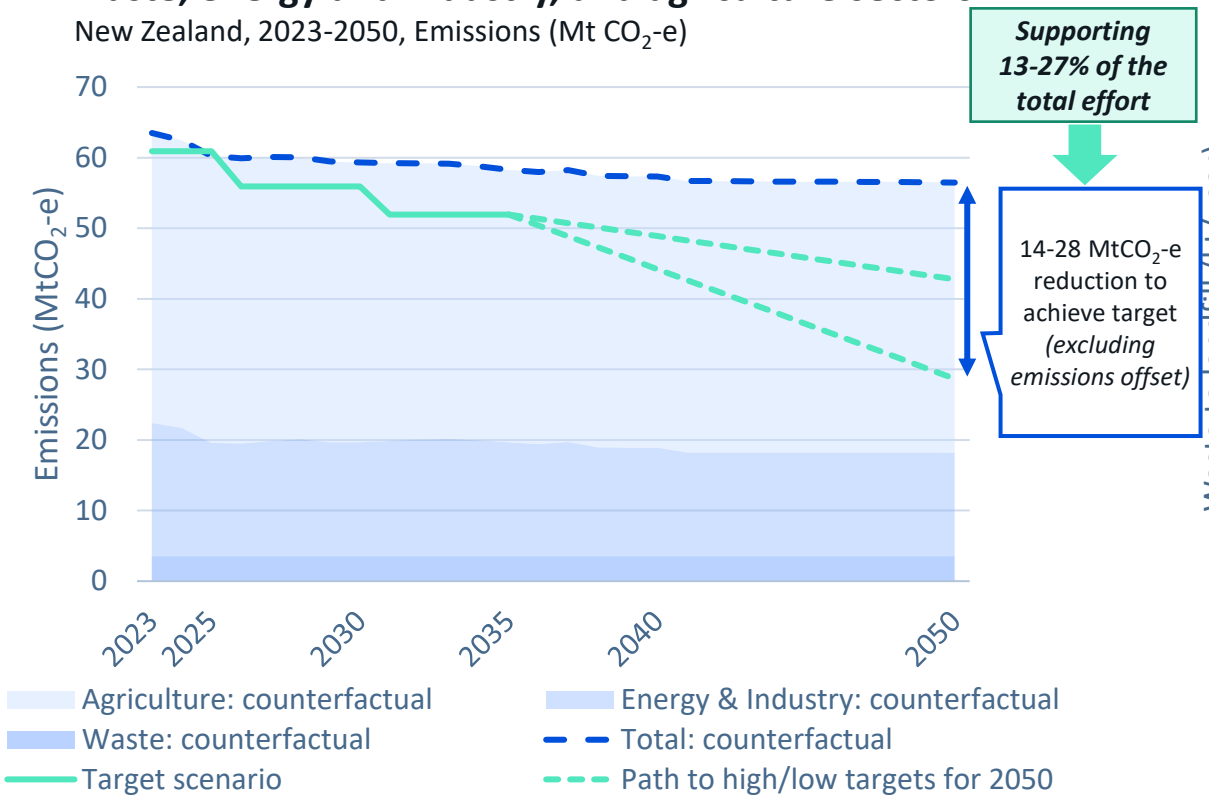


Sources: Blunomy analysis

The North Star scenario could support addressing up to 27% of efforts for emissions reduction and 23% of efforts for wastes reduction

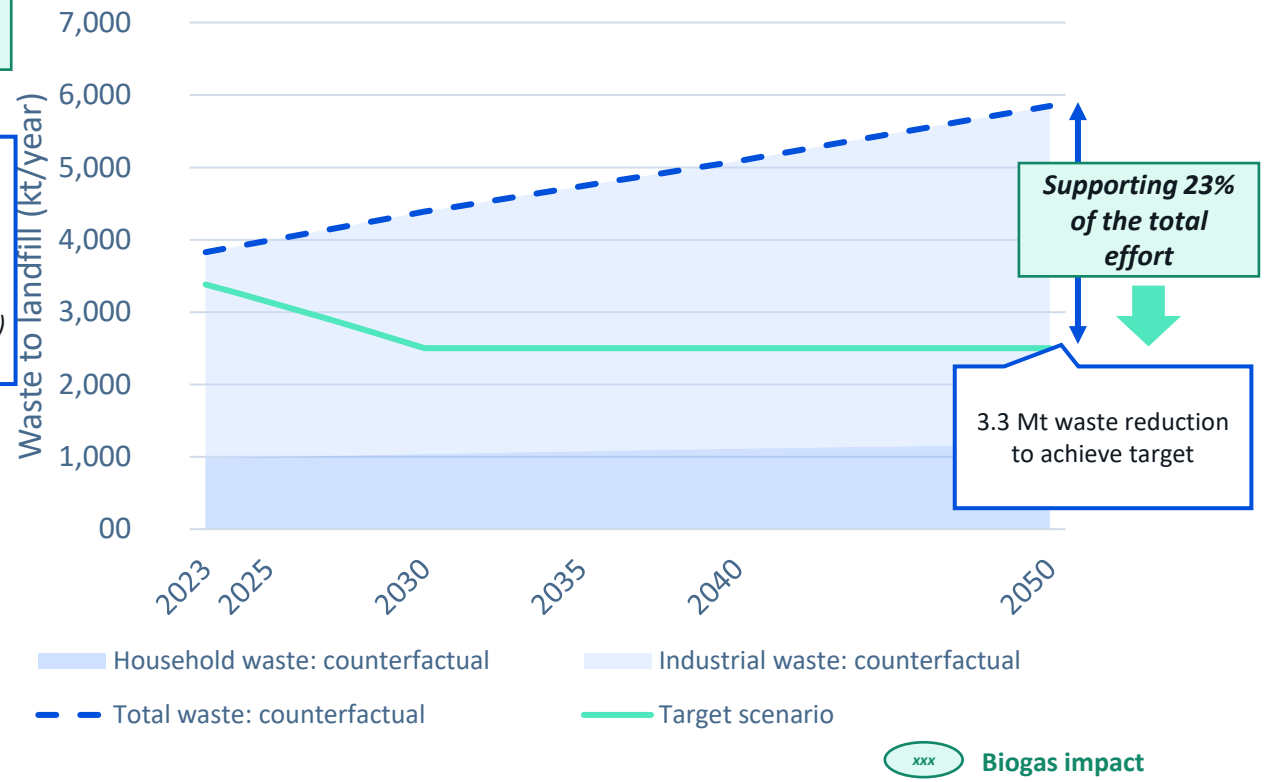
Projections of CO_2 emissions (equivalent) across the waste, energy and industry, and agriculture sectors[1]

New Zealand, 2023-2050, Emissions (Mt CO_2-e)



Projections of landfill waste production (kt) in municipal and industrial sectors[2]

New Zealand, 2023-2050, Waste production (kt)



Notes: [1] Targets for 2050 taken from Inaia Tonu Nei headwinds/tailwinds scenarios for paths to net zero, together with the 24-47% biogenic CH_4 reduction target: emissions in these sectors are offset by negative emissions from the forestry sector to achieve net zero. [2] Projections for counterfactual scenarios regarding municipal and industrial landfill waste were derived using population and GDP growth rate respectively. A flat trajectory for target waste was assumed post 2030 for the target scenario, foreseeing further, more ambitious targets.

Sources: New Zealand's First Emissions Reduction Plan, MfE 2022; Gas Transition Plan - Biogas Research Report, Wood Beca 2022; New Zealand's Greenhouse Gas Inventory, MfE 2020

10 key challenges are hindering the development of the North Star scenario in New Zealand

		Key challenges and barriers	Sector		
			Energy	*Waste*	*Agriculture*
Across all subsectors	1	**Nascent biogas/biomethane industry in NZ**: limited biogas/biomethane infrastructure and supply chain in place for feedstock sourcing (including feedstock assessment, feedstocks suppliers, etc.)	✓	✓	✓
	2	**High upfront costs combined with inexperienced investors can be perceived as high risk:** the uncertainty surrounding feedstock supply and complexities across the value chain can increase costs involved in biogas development in order to manage potential risks	✓	✓	✓
	3	**Low wholesale price of natural gas:** can deter a move towards the uptake of biogas	✓	✓	✓
	4	**Lack of knowledge and visibility regarding existing opportunities:** minimal knowledge sharing across stakeholder groups (i.e. farmers, investors, local communities, etc) of the biogas real benefits, including the associated carbon footprint, preventing the rapid emergence of the sector	✓	✓	✓
Specific to one subsector	5	**No explicit willingness to use biogas to support renewable energy targets in New Zealand:** the Government has not yet provided a clear commitment on the role biogas has in the renewable energy mix	✓		
	6	**Regulatory barriers:** lack of regulation regarding the use of digestate and uncertainties surrounding existing technical standards may delay or impact the progress of biogas projects	✓		✓
	7	**Lack of national policy/actions to support waste reduction targets :** despite an ambitious reduction of waste target, there are limited national initiatives in place to support the various stakeholders in achieving the target.		✓	
	8	**Low landfill levies:** discourages initiatives and actions to be taken to reduce waste sent to landfill		✓	
	9	**Uncertainty around regulation for digestate:** lack of clarify of specific regulation supporting the uptake of the digestate in New Zealand (e.g. certification, mandate for replacement of synthetic fertilizer, etc)		✓	✓
	10	**No clear direction for the agricultural sector in relation with the biogas adoption:** no specific guidance has been announced for the agriculture sector in terms of the production and uptake of biogas			✓

We have identified 4 key areas of actions to be further explored to support the development of the North Star scenario

Areas	Key actions to be further explored
Feedstock 	• Assess ways to **incentivise feedstocks "owners"** (i.e. farmers, industrial players, etc) to leverage their wastes to produce **biogas and biomethane** • Identify opportunities to **align the national regulation for waste and "operationalise" the NZ commitments** (going beyond NZ commitments, detailing national classification, collection and recycling) • Assess the needs to have more **detailed feedstock assessment at national level** to better characterise the biogas potential both North and South Island within economic radius
Demand 	• Maximise the opportunities for biogas/biomethane to be **an explicit lever for NZ energy targets and commitments** • Assess the relevance of **possible policy mechanisms to support the uptake of biogas** from a demand perspective (e.g. renewable gas mandate, certification schemes such as Guarantee of Origin, etc) • Explore the **opportunities to support the local uptake of biogas/biomethane by-products, such as digestate and biogenic CO2** (i.e. favor market conditions with certification, mandate for replacement of synthetic fertilizer)
Supply 	• Assess the relevance of **possible mechanisms to support the development of biogas/biomethane projects** (e.g., electricity FiT, biogas FiT, grants for project capex) • Further evaluate the **expected benefits from the North Star scenario at regional level for New Zealand** (i.e. jobs created at regional level, expected development impact, etc) • Identify the needs to **streamline the current development process** for biogas/biomethane projects (e.g. length of approval process, administrative burden, etc)
Awareness 	• Explore different communication **pathways and channels to share knowledge about the biogas/biomethane sectors** across different stakeholder groups to highlight opportunities and benefits • Evaluate the requirements to advance the bioenergy industry in New Zealand, **highlighting and mapping current capability and skills compared to future needs**

To support exploring further the different actions, two main avenues have been identified for next steps

Areas	Key actions to be further explored
Feedstock	• Assess ways to **incentivise feedstocks "owners"** (i.e. farmers, industrial players, etc) to leverage their wastes to produce **biogas and biomethane** • Identify opportunities to **align the national regulation for waste and "operationalise" the NZ commitments** (going beyond NZ commitments, detailing national classification, collection and recycling) • Assess the needs to have more **detailed feedstock assessment at national level** to better characterise the biogas potential both North and South Island within economic radius
Demand	• Maximise the opportunities for biogas/biomethane to be **an explicit lever for NZ energy targets and commitments** • Assess the relevance of **possible policy mechanisms to support the uptake of biogas** from a demand perspective (e.g. renewable gas mandate, certification schemes such as Guarantee of Origin, etc) • Explore the **opportunities to support the local uptake of biogas/biomethane by-products, such as digestate and biogenic CO2** (i.e. favor market conditions with certification, mandate for replacement of synthetic fertilizer)
Supply	• Assess the relevance of **possible mechanisms to support the development of biogas/biomethane projects** (e.g., electricity FiT, biogas FiT, grants for project capex) • Further evaluate the **expected benefits from the North Star scenario at regional level for New Zealand** (i.e. jobs created at regional level, expected development impact, etc) • Identify the needs to **streamline the current development process** for biogas/biomethane projects (e.g. length of approval process, administrative burden, etc)
Awareness	• Explore different communication **pathways and channels to share knowledge about the biogas/biomethane sectors** across different stakeholder groups to highlight opportunities and benefits • Evaluate the requirements to advance the bioenergy industry in New Zealand, **highlighting and mapping current capability and skills compared to future needs**

List of actions to be further explored the North Star scenario

Ensure co-ordination at the national level between departments responsible for environmental, energy, industrial, and agricultural policy, as well as with local government, to **centrally pilot the exploration of the different actions** to support the development of the North Star scenario.

For example, by establishing a **cross-agency working group that can coordinate the Government's response** to biogas development.

Consider biogas as one of the key levers to achieve **New Zealand's commitments and deliver wider value**, and **explicitly build biogas** into New Zealand strategies for emissions reduction, energy transition, and waste management.

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