An energy transformation: Positive policy options for Aotearoa

A SUBMISSION TO MBIE ON 'ADVANCING THE ENERGY TRANSITION' | 02/11/23

Executive summary

In Aotearoa New Zealand we have many challenges and opportunities in the economic and societal transitions needed for a net-zero future. While our nation's circumstances are unique, we are well-positioned to learn from international experience in developing the energy policies that best promote a prosperous future.

Clarus is one of New Zealand's largest energy groups. Whether it's transmission, distribution, supply or storage of energy, the companies within the Clarus group service over half a million homes and businesses of all sizes around New Zealand. Clarus was previously known as Firstgas Group.

Principles underpinning the energy transition

The principles that shape our thinking on the energy transition are:

- There are no simple answers for businesses or policy-makers
- The emissions trading scheme does the heavy lifting, but can't do it all
- Affordable electricity is vital for electrification and meeting climate goals
- The high value of retaining options for the transition
- International progress will both hinder and help our transition.

Our key recommendations

Recommendation	Rationale
Government should incentivise a vibrant biogas sector that achieves provincial and national benefits (including avoided emissions) with beneficiaries across the waste, energy and agriculture industries	To close the gap on meeting waste targets, emission targets, create ~6,000 jobs through the regions, improve national productivity and balance of payments, provide energy users choice and a decarbonised competitor to electricity, mitigate market and regulatory failures easily worth more than a billion dollars
Gas Industry Company to oversee progress on renewable gas certificates, including through consultation with other public sector officials	To give purchasers of renewable gas certificates confidence that certificates are available and achieve what they purport to certify
Government should undertake a competitive process to ensure at least one substantial hydrogen hub is established	To act as a research and development testbed for hydrogen, identify issues within the regulatory environment, overcome coordination problems and attract investors
Government should direct MBIE to propose changes to Part 4 of the Commerce Act 1986 to ensure that economic regulation of gas pipeline businesses remains fit for purpose	Part 4 was designed for steady or growing businesses with little or no competition. This is no longer the case for gas pipelines. The Commerce Commission and gas pipeline businesses need new tools to manage risks through the energy transition, including the changing nature of the gas being transported via pipelines

Massive benefits to waste, energy and agriculture from smart use of waste products

We contend that smart use of 24 PJ of organic waste/residue feedstocks would contribute ~6,000 jobs in provincial areas, 23% towards targets to divert waste from landfills, up to 9% of the increase in renewable energy needed to meet the 50% target for total final energy consumption from renewables, up to 24-46% of the reductions in biogenic methane needed to meet the 2050 target. These key statistics are contained in a report from consultants, Blunomy, that we commissioned jointly with Ecogas and Powerco and have submitted along with those organisations.

Hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry

We believe that hydrogen hubs (sites where the production and various uses for hydrogen are co-located) are the best launchpad for a hydrogen industry in Aotearoa. A hub would act as a testbed for hydrogen and flush out issues in the associated regulatory frameworks. In time, storage and pipelines could connect hubs and add value.

Contents

Executive summary **2**

Principles underpinning the energy transition 2

Our key recommendations 2

Massive benefits to waste, energy and agriculture from smart use of waste products 2

Hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry 2

Contents **3**

1. Navigating this submission **5**

2. Who we are **5**

3. Principles underpinning the energy transition **6**

3.1. There are no simple answers for businesses or policy-makers 6

3.2. The emissions trading scheme does the heavy lifting, but can't do it all 6

3.3. Affordable electricity is vital for electrification and meeting climate goals 6

3.4. Criticality of retaining options for the transition 7

3.5. International progress will both hinder and help our transition 7

4. Our vision for the energy transition **8**

4.1. The role of electricity and importance of electrification 8

4.2. The ongoing and new roles of gas in all its forms 8

4.3. The role of network businesses 9

4.4. Key inflection points for energy in Aotearoa 9

5. There are massive benefits to waste, energy and agricultural sectors from smart use of waste products **10**

5.1. Anaerobic digestion has untapped benefits across waste, agriculture and energy 10

5.2. Market and regulatory failures explain why these benefits have not been achieved 13

5.3. Renewable gas certificates are a necessary enabler for biogas to thrive 15

5.4. Government intervention is amply justified to realise the benefits across waste, energy and agriculture 16

6. Hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry **18**

6.1. Developing a hydrogen industry positions Aotearoa to take advantage of opportunities from the 2030s 18

6.2. Durable hydrogen hubs are a foothold to developing a hydrogen industry 19

6.3. Taranaki, Glenbrook and Marsden Point have high potential as hydrogen hubs 19

6.4. Underground hydrogen storage is a critical inflection point for energy in Aotearoa 20

6.5. If underground hydrogen storage is viable, even more value can be unlocked by pipelines connecting producers, users and storage 21

7. Appendix A: Complete list of recommendations 25

Our recommendations 25

8. Appendix B: Responses to the Gas Transition Plan Issues paper 28

8.1. Government should direct MBIE to propose changes to the Commerce Act to make economic regulation of gas pipeline businesses fit for purpose 28

8.2. Government should direct the Commerce Commission to incentivise gas pipeline businesses to undertake cost-effective climate mitigation and adaptation actions 28

8.3. MBIE's statements about gas pipeline linepack and pressure may mislead readers 29

8.4. EECA should prioritise its review of gas appliance efficiency 29

Our responses 30

9. Appendix C: Responses to the Electricity Market Measures paper 34

9.1. Complete the review of regulations governing trees near power lines 34

9.2. Legislative requirements around uneconomic power lines are not leading to rational decisions 34

Our responses to selected questions 34

10. Appendix D: Responses to the Interim Hydrogen Roadmap paper 37

Our responses 37

11. Appendix E: Comments on the Enabling Offshore Renewables paper 39

11.1. We are supportive of the need to develop an enabling regulatory framework for offshore renewables 39

11.2. We believe that consumers' future needs are being under-signalled 39

12. Appendix F: Comments on the Fossil-fuel Baseload Ban paper 40

1. Navigating this submission

This submission responds to the Ministry of Business, Innovation and Employment's (MBIE) suite of energy-related consultations issued in mid-2023. Thank you for your interest in understanding our views!

In sections 3 and 0 of this submission, we set out the principles that underpin our thinking about Aotearoa's energy transition and our vision for the principal ways in which the transition will play out.

In sections 5 and 6, we set out two areas for positive policy options for the transition: smart use of organic wastes and developing a hydrogen industry around hydrogen hubs.

In section 7, we collate all the recommendations we make from throughout this submission.

In sections 8 to 0, we respond to each of MBIE's five consultations. We have only brief comments on the proposed framework for offshore renewables and the proposed ban on fossil-fuelled baseload generation.

We are also a signatory to other submissions. Together with Ecogas and Powerco, we jointly commissioned Blunomy to prepare its report *Vision for biogas in Aotearoa New Zealand*. We have also provided a joint submission with other members of the Gas Infrastructure Futures Working Group: Vector and Powerco. Finally, we are members of GasNZ, the Bioenergy Association, and the Hydrogen Council and broadly support the recommendations made by those industry associations.

This submission contains no confidential information and we consent to its publication.

2. Who we are

Clarus is one of New Zealand's largest energy groups. Whether it's transmission, distribution, supply or storage of energy, the companies within the Clarus group service over half a million homes and businesses of all sizes around New Zealand.

Firstgas connects over 300,000 homes and businesses with natural gas though its gas distribution and high-pressure transmission systems. This essential infrastructure supports New Zealand's economy, so the group is committed to helping customers maximise value from it.

Flexgas provides energy storage services to electricity generators, offering an important source of flexibility to the electricity system and supporting high levels of intermittent wind, hydro and solar generation.

Rockgas is New Zealand's largest LPG retail supplier, providing fast and reliable service through a national network of branches and franchises.

Firstlight Network is the lines company supplying electricity to the Tairāwhiti and Wairoa region, responsible for keeping the lights on across 12,000 square kilometres of the East Coast.

We are also investing in innovative renewable energy solutions such as biomethane and hydrogen, to help New Zealand reach its net zero carbon goals by 2050. Our **First Renewables** business is leading this work, alongside other options that will bring renewable energy to New Zealand homes, businesses and energy-intensive industries in the future.

Clarus was previously known as Firstgas Group.

3. Principles underpinning the energy transition

The following principles inform our thinking throughout this submission:

- There are no simple answers for businesses or policy-makers.
- The emissions trading scheme does the heavy lifting, but can't do it all
- Affordable electricity is vital for electrification and meeting climate goals
- Criticality of retaining options for the transition
- International progress will both hinder and help our transition

3.1. There are no simple answers for businesses or policy-makers

New Zealand's energy mix is already diverse and complex. The drive to decarbonise the economy will need many solutions. The economic, social and physical systems involved are intricate and interdependant. As such, the future is hard to predict. Consumers are best placed to decide on solutions for them, but need good information and efficient price signals.

We support market-based discovery of prices and customer preferences. While imperfect, markets are adaptive and responsive so provide the ultimate test of a decision's value. There appears to be widespread agreement that there are no "silver bullet" solutions to achieving New Zealand's energy sector objectives – which means that high value should be placed on preserving options and ensuring that a range of possible solutions are kept on the table for as long as possible.

3.2. The emissions trading scheme does the heavy lifting, but can't do it all

Government has a critical and difficult role: to create the policy settings to allow the emissions trading scheme (ETS) to efficiently and durably discover the price of climate emissions. The ability to accurately understand the future price path of the ETS enables consumers to make decisions that are right for their circumstances.

Government has an obligation to keep legislation and regulation up to date. For example, the specification that defines the properties of natural gas (the 'gas spec') serves as a barrier to renewable gases. The absence of a regulatory framework for hydrogen creates a barrier against its use.

Government also has a special interest in counteracting significant market and regulatory failures. For example, the market tendency to underinvest in reserarch and development of public goods leads governments to fund R&D. Nascent industries also exhibit particular challenges, which the government is well-placed to help to overcome.

There is a role for government in ensuring that prices and markets support public policy objectives. This will necessitate intervention at times to counteract the effect of market and/ regulatory failures. The ETS cannot be expected to do it all.

3.3. Affordable electricity is vital for electrification and meeting climate goals

Any measures that undermine electricity affordability ultimately work against emissions reductions. The more expensive electricity is in comparison to substitutes, the less likely consumers are to choose electricity. This same substitution can happen with firms making decisions about where in the word to operate. If Aotearoa succeeds at having low-emission, affordable electricity then we are more likely to attract new and expanded electricity usage.

Modelling for *The Future is Electric* showed that the economy achieved more decarbonisation with natural gas playing a peaking role (as comapred to a 100% renewable power system).[1] This is because gas peaking helps the affordability and reliability of electricity, enabling greater electrification of fossil fuels.

[1] On page 12, Boston Consulting Group wrote that "Phasing out thermal generation entirely could also

Similarly, modelling for the Business Energy Council found that economy-wide optiimisation led to a continued role for natural gas fuelling peaking electricity generation.[2]

3.4. Criticality of retaining options for the transition

Through our involvement with the Gas Infrastructure Future Working Group (GIFWG), we have been involved in use of real options analysis (where the use of the word 'real' is to distinguish it from financial options). This style of analysis is an attempt to quantify an underlying principle that braching irreversibly down one path eliminates the possible costs and benefits of other foregone pathways. Real options analysis can expedite the taking of no/low regret decisions and highlight where more research is needed to improve understanding of costs, benefits and their probabilities.

GIFWG are undertaking some real options analysis with respect to the future of gas pipelines. This is an excellent research topic because of the uncertainties, the competiing benefits of the energy trilemma, divergent societal values and the existence of some irreversible decisions. In the complex landscape of New Zealand's energy future, the decision whether to retain or retire gas pipelines and infrastructure is a pivotal choice that carries profound implications for the economy, energy security, environment, and society. In the face of the multifaceted challenges and opportunities within the energy landscape, adopting a no regrets approach of delaying irreversible decisions may be a better and more prudent path. This approach allows for the accumulation of valuable insights, informed decisions, and the maximisation of total value for New Zealand. By preserving flexibility, embracing learning, and assessing the potential of various strategies, we can chart a sustainable and economically sound energy future that ensures lasting benefits for New Zealand.

3.5. International progress will both hinder and help our transition

Climate change is a global problem. While we are physically distant from the rest of the world, our economy is very much intertwined with the global economy. Other countries are making major policy comitments and capital investments in the energy transition, and these will have flow-on impacts in Aotearoa.

The United States of America's Inflation Reduction Act (IRA) is an excellent example. The IRA will be the catalyst for invesment in new and/or improved technologies that we may benefit from. However, the IRA has also attracted alot of investor capital and this coudl reduce the availability of capital and expertise in New Zealand.

The European Union's development of a Carbon Border Adjustment Mechanism (CBAM) also poses a risk and an opportunity for New Zealand exporters. If we decarbonise well compared with our export competitors, the CBAM can make our products more marketable in Europe. Conversely, if we fail to change how we produce and transport goods for export markets then we will become less competitive.

New Zealand will ride the waves caused by large economies' decisions. We cannot control international progress, so we should need to learn how best to respond to the risks and opportunities created by global progress.

pose reliability and resilience risks and inhibit electrification due to the resulting higher prices, leading to lower overall emissions reductions." https://web-assets.bcg.com/b3/79/19665b7f40c8ba52d5b372cf7e6c/the-future-is-electric-full-report-october-2022.pdf

[2] TIMES NZ 2.0 modelling available from https://times.bec.org.nz/sectors/#electricity

4. Our vision for the energy transition

We expect electrification to be the dominant theme of the energy transition, but not the whole picture. The importance of decarbonisation will drive users to seek out a variety of solutions to cost-effectively do so.

While electricity will supply more and more of New Zealanders' energy needs, it will not be the only game in town. Aotearoa will continue to need an energy mix. Renewable gases will grow and come to supply part of the energy mix valued by customers. Fossil fuels will play a transitional role including support for the electricity industry.

4.1. The role of electricity and importance of electrification

Electricity in New Zealand has historically provided less energy than gas, which has in turn provided less energy than liquid fuels. Even so, electricity has been critical to every aspect of the economy.

Solar and wind generation technology are the leading sources for new electricity. The intermittency of these sources will incentivise supply-side and demand-side solutions for meeting peak electricity needs.

The efficiency of electric devices and motors, especially compared to internal combustion engines, will drive productivity improvements. We will get more done, with less energy needed.

If we succeed in decarbonising our electricity supply while retaining affordability and reliability, we will increase the appeal of our export products and attract new businesses (such as data centres) to start up or expand here.

4.2. The ongoing and new roles of gas in all its forms

We see a much greater and near-term potential for biomethane than is presented in the *Gas Transition Plan Issues Paper*. The benefits of biomethane are much broader than just the energy sector or indeed the gas itself. Smart use of organic wastes can reduce landfilling and emissions from the waste sector, provide biomethane, biogenic carbon dioxide, renewable heat and biofertiliser. The benefits acrrue across the waste, energy and agriculture industries. The technology is mature and proven overseas. Important transitional and enduring roles for all forms of gas

Looking beyond the near-term benefits of biomethane, hydrogen will become increasingly important from the mid-2030s. We see roles for hydrogen supporting the electricity system, decarbonising fertilisers and heavy transport such as sustainable aviation fuels. We forsee that hydrogen hubs will provide critical mass for a nascent industry to develop around. Hydrogen hubs will be the foothold from which the industry can scale up and eventually support new low-carbon industries and export products. As use-cases grow, the value of storage and transport will grow as well.

Fossil gas appears likely to continue to play an important role supporting the electricity system and hard-to-abate industries. Modelling for *The Future is Electric* showed that the economy achieved more decarbonisation with natural gas playing a peaking role. This helps the affordability and reliability of electricity, enabling greater electrification of fossil fuelsin other parts of the economy. Natural gas storage is complementary to gas meeting its peaking role. There are hard-to-abate industries who will continue to use fossil gas until they either cease operations or renewable technology options have caught up with their energy needs.

The storability of gas molecules underpins a source of competitive advantage of gas in all its forms. This manifests in various energy security benefits: more resilience, greater diversity of energy mix and supply chains, energy system balancing through gas dispatchability.

4.3. The role of network businesses

As the quote opposite from Te Waihanga highlights, infrastructure lets people share resources. In the case of energy network businesses (electricity lines businesses and gas pipeline businesses), that means connecting users of natural gas, LPG and electricity with large-scale competitive markets to supply them. Network business also allow energy users to access levels of reliability and resilience they would struggle to achieve cost-effectively on their own.

> **[Infrastructure] allows us to share resources so that we can be more connected, healthier, smarter and innovative. In doing so, it improves our lives in many ways and contributes to the wellbeing of all New Zealanders.**
>
> - **Te Waihanga New Zealand Infrastructure Commission**

4.4. Key inflection points for energy in Aotearoa

There are a wide array of uncertainties in the energy transition. Below, we highlight four we see as especially important for determining the future energy mix:

- The viability of underground hydrogen storage. The University of Canterbury received funding to investigate options for underground storage of hydrogen in Taranaki. If depleted oil and gas wells could be repurposed for storing hydrogen. If it is not viable, the cost of above-ground storage will limit the roles that hydrogen can play in future. It is a five-year research topic and could rule out underground hydrogen storage or conclude that there is sufficient promise for more research to be warranted.
- The timing of offshore wind generation. Based on current technology it is difficult to imagine a future where offshore wind isn't *eventually* viable. Whether there will be sufficient incentives to stimulate the development of a multi-gigawatt offshore wind industry by 2035 is the inflection point. Offshore wind benefits significantly from economies of scale and common, supporting infrastructure (such as the ability of ports to handle delivery of wind turbine components).
- The potential departure of major industrial energy users. Methanex and New Zealand Aluminium Smelters are such large energy users that either's decision to cease operations in New Zealand would have market-changing consequences for the energy sector and the broader economy.
- The cost-effectiveness of repurposing natural gas pipelines to transport hydrogen. If repurposing is substantially cheaper, this could provide a useful transition pathway. Initially, volumes of delivered hydrogen could be low and thus enable operation at lower pressure to mitigate risks of steel embrittlement. As the hydrogen economy seeks to scale up, new or refurbished pipelines could be considered.

The breadth and depth of uncertainty highlights the value that research and development contributes to a better future. This is a traditional role of all governments. With pressing needs to decarbonise all aspects of the economy, government should be maintaining or increasing spend on research and development.

We recommend that government should maintain or increase its support for investment in research and development. This applies across the entire economy, though research and development of renewable gases will be especially valuable.

5. There are massive benefits to waste, energy and agricultural sectors from smart use of waste products

In this section, we describe the immense potential to the waste, energy and agriculture sectors if Aotearoa can make smart use of its waste resources by converting them into the valuable, emission-reducing products of biomethane, green carbon dioxide and biofertiliser.

We contend that smart use of ~24 PJ of feedstocks would contribute ~6,000 jobs in provincial areas, 23% towards targets to divert waste from landfills, up to 9% of the increase in renewable energy needed to meet the 50% target for total final energy consumption from renewables, up to 24-46% of the reductions in biogenic methane needed to meet the 2050 target.

Biogas will be one of the few policy areas that span across waste, water, land use and energy in the Emissions Reduction Plan.

- **Ara Ake[3], summarising regulatory themes from their biogas webinar**

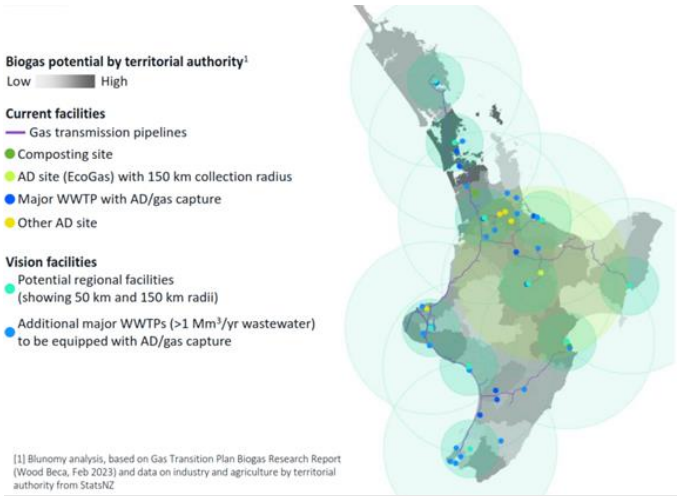
5.1. Anaerobic digestion has untapped benefits across waste, agriculture and energy

Anaerobic digestion is the leading process internationally for the smartest handling of organic wastes (such as food waste and manure) and crop residues. Anaerobic digestion is mature technology with proven success overseas.

Organic wastes and residues are added to a vat where microbes induce chemical reactions. The biogas produced is energy-rich and, after some purification, can be burned to generate electricity or injected into natural gas pipelines as biomethane. Biomethane behaves just like natural gas and can be used for the same applications. Biogas that has been cleaned for use as biomethane also produces biogenic carbon dioxide. This can displace usage of fossil-sourced carbon dioxide. No matter how the biogas is used, solid matter ('digestate') is left behind. This digestate can be used as a biofertiliser which reduces usage of fossil-sourced fertilisers and exposure to international price volatility.

Blunomy's report: A Vision for Biogas in Aotearoa New Zealand

Together with EcoGas and Powerco, we commissioned Blunomy to prepare a report setting out a credible vision for biogas development in Aotearoa. Blunomy's figure (left) illustrates how a comprehensive network of anaerobic digestion facilities would be spread around the North Island.



Blunomy have assessed the impact of the vision for biogas (their 'North Star' scenario) using criteria that align with MBIE's. These are discussed overleaf and we identify some additional benefits.

[3] Page 6 of *Biogas: Opportunities in Organic Waste Streams to Energy in Taranaki Webinar (Summary Report)* available from https://www.araake.co.nz/assets/Uploads/Biogas_Opportunities-in-Organic-Waste-Streams-to-Energy-in-Taranaki-Webinar_Summary-Report.pdf

Supporting the energy transition with waste and emission reductions

Blunomy estimate that the North Star scenario would create a net reduction in waste and climate emissions by:

- Diverting up to 750 kilotonnes of waste from ending up in landfills. This contributes 23% towards waste diversion targets.
- Causing up to a 3.7 megatonne reduction of carbon dioxide equivalent. This contributes up to 24-46% of the reductions in biogenic methane needed to meet the 2050 target.
- Producing 10 PJ of biogas/biomethane in the North Island. This is more than enough to supply every existing residential natural gas customer with a renewable alternative. Nationwide, the North Star scenario contributes up to 9% of the increase in renewable energy needed to meet the 50% target for total final energy consumption from renewables.

A circular economy approach has significant potential to reduce waste emissions in New Zealand and drive the transition to a low-emissions economy by acting as a platform for innovation.

- **New Zealand Productivity Commission[4]**

Economic development and productivity growth

Blunomy estimate 5,500-6,000 jobs would be created in the North Star scenario. These roles would cover a wide variety of professions: drivers, logistics, fabrication, maintenance, engineering support and bio-technologists.

In future, we are keen to estimate the North Star scenario's impact on regional and national gross domestic product, and measures of productivity.

Blunomy note that the North Star scenario would add value by supporting farmers through reduced operating costs, access to biofertiliser, improving international marketability and by creating new revenue opportunities.

Energy supply reliability and resilience

There are a few resilience improvements noted in the Blunomy report. Biofertilisers would reduce reliance on imported fertilisers. Biogenic carbon dioxide would reduce reliance on imported carbon dioxide and reduce manufacturing and agriculture dependence on natural gas production for fossil carbon dioxide.

Supports consumer choice and minimises consumer capital outlay

The North Star scenario gives gas users an alternative decarbonisation path for their energy needs.

In addition, we see an advantage for consumers being able to invest in alternatives. Consumers who are in a position to invest $10,000+ to improve their energy situation might prefer to put that towards an electric vehicle, or a solar array and battery, or improved home insulation. The Gas Infrastructure Future Working Group has previously estimated the indicative cost of replacing all gas consumers' appliances as $7.9 billion. Residential consumers accounted for $2.1 billion of that rough estimate.

Avoids large costs arising from market and regulatory failures

In addition to the above benefits identified in the Blunomy report, there are large potential costs that can be avoided by meeting residential and small commercial gas use with biomethane.

Electrification of residential and small commercial gas demand adds costs (and/or reliability problems) to electricity lines businesses that will be socialised among all electricity users on those networks. We discuss the origins of this market failure in section 0. The effect of it exists because residential gas demand is driven by the same heating needs that drives peaks in electricity use within each day—people need energy when it is cold. Wellington Electricity note that "gas-heated houses typically [have] a very low after diversity maximum demand."[5] Meeting peak demands is challenging and can manifest in different parts of the distribution network (transformer loading, line loading, voltage). Wellington Electricity analysed these three specific impacts and there was a clear relationship between

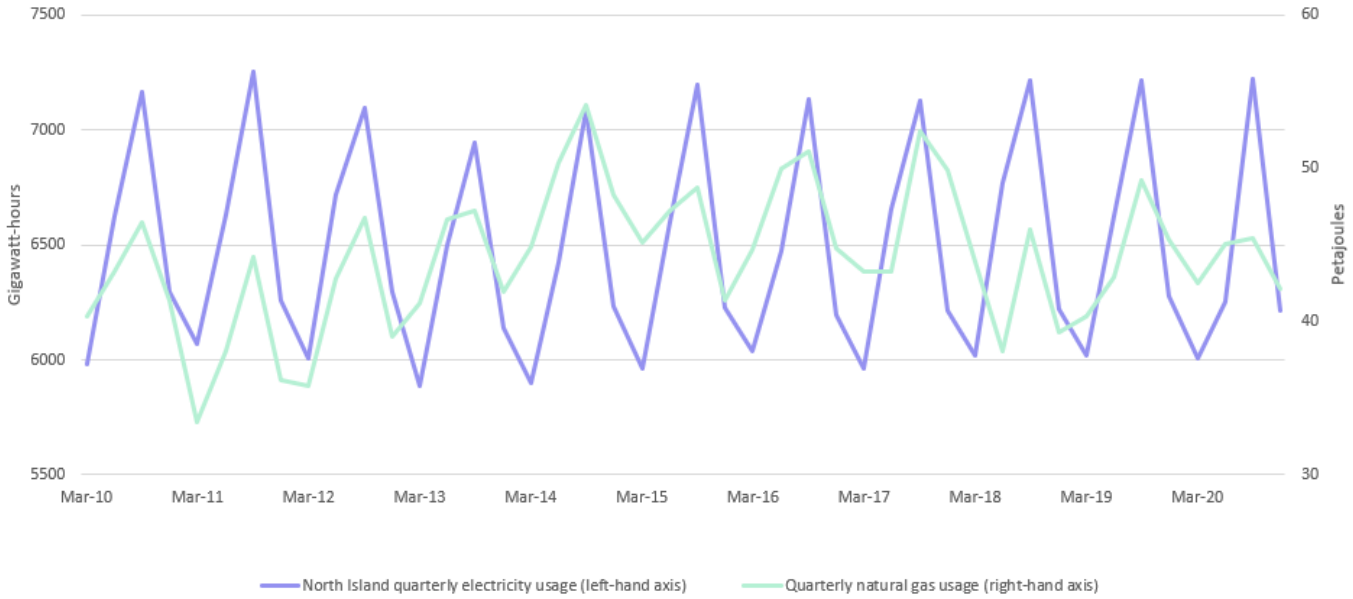
[4] Source: https://www.productivity.govt.nz/inquiries/lowemissions/

[5] Page 10 of Wellington Electricity's *10 Year Asset Management Plan* available from https://www.welectricity.co.nz/disclosures/asset-management-plan/document/318

more electrification of gas demand and electricity reliability impacts.[6] The cost of electrifying gas demand could credibly cost Wellington Electricity customers $780 million by 2050[7] and Vector customers $558 million by 2052.[8]

Electrification of residential and small commercial gas demand adds costs (and/or reliability problems) to the wholesale electricity market that all electricity users have reflected (directly or indirectly) in their pricing. This is because residential gas demand is driven by the same heating needs that drives peaks in electricity use during winter. This relationship is shown in the figure below:

Comparison of quarterly natural gas usage with North Island electricity usage 2010-2020



We have been unable to estimate the additional cost (some combination of the costs of additional generation and additional electricity shortages) from this exacerbation of Aotearoa's 'dry year' problem. Whatever those direct costs are, there is also an especially high opportunity cost during the transition as widespread electrification (such as electrification of imported liquid fossil fuels used in light transport) is forecast to need unprecedented growth in electricity generation.

In addition to the avoidable costs to electricity users, there are avoidable decommissioning costs related to gas pipelines. If widespread electrification of gas demand were to occur, pipeline businesses could become unviable. If that happens, gas network decommissioning would be required.

Over the period to 2050, the full winddown [of natural gas pipelines] has estimated decommissioning costs of $158 million and disconnection costs of $364 million based on rudimentary assumptions.

- **Gas Infrastructure Futures Working Group[9]**

[6] Case study 2, pages 67-68, *Ibid*

[7] Page 10 of Wellington Electricity's 10 Year Asset Management Plan states that all sources of demand growth triggers $2 billion of upgrades. Page 62 says that electrification of gas demand is 260 MW out of the 665 MW total. Source available from https://www.welectricity.co.nz/disclosures/asset-management-plan/document/318

[8] Electriification of gas demand is 9% of demand growth in Vector's disorderly scenario (personal correspondence). Total demand in the discorderly scenario grows from 1,900 MVA to 5,000 MVA at a cost of $2m per MVA. Source available from https://blob-static.vector.co.nz/blob/vector/media/vector-2023/vector-2023-tcfd-report.pdf

[9] GIFWG's Gas Transition Analysis Paper available from 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

The Gas Infrastructure Futures Working Group (GIFWG) has previously noted it is 'unclear' where the liability of decommissioning sits. What is clear is that the regulation of gas pipeline businesses has never permitted gas pipeline businesses to collect revenue for the purposes of widespread end-of-life decommissioning. GIFWG, using rudimentary assumptions, estimated decommissioning and disconnection costs at $522 million.

We encourage interested stakeholders to read an upcoming report by Horizon Power that is expected to summarise the learnings from the decommissioning of the gas network in Esperance, Western Australia.[10]

5.2. Market and regulatory failures explain why these benefits have not been achieved

In light of the above benefits identified by Blunomy's report, it is reasonable to ask why these benefits have not been achieved. Below are our explanations, divided into market failures and regulatory failures.

A few of these failures are now historical only. They help explain why the situation now exists, but are not the basis for government intervention.

The biogas industry in Aotearoa New Zealand is underdeveloped.

- **Climate Change Commission[11]**

Market failures

We have identified the following market failures as contributing to the underdeveloped biogas industry in Aotearoa:

- There are so many decisionmakers and stakeholders: the key ones being local government, waste
- producers, gas purchasers and primary industry (as users of carbon dioxide and fertiliser). Anaerobic digestion projects can have five revenue streams: gate fees, energy (from the biogas), heat, carbon dioxide and biofertiliser. The number and diverse goals of stakeholders multiple revenue streams makes this a nascent sector with coordination challenges. Local government control many of the feedstocks but aren't in the business of selling energy or primary industry products, so it is no surprise they haven't done so.
- Local government are often overly-incentivised to reduce costs and avoid debt such that the infrastructure deficit increases. Waste management contracts are usually insufficiently short to justify construction of assets with a 20+ year economic life.
- There is a self-perpetuating aspect to under-development of any industry. Despite thriving in other countries, New Zealand has few people with expertise in anaerobic digestion technology to advocate for it. There is a continued lack of local know-how despite anaerobic digestion thriving overseas.
- Because residential electricity consumers see only simplified pricing, consumers aren't exposed to the true network costs they create when they electrify gas demand. It is of course utterly impractical for electricity lines businesses to track consumer appliances and attempt to send precise price signals. However, the effect of this limitation is that a gas consumer who electrifies their gas demand gets to privatise the benefit of disconnecting from gas pipelines and socialise the cost of connecting greater peak load to the electricity network. Furthermore, removing the gas demand does little to reduce gas pipeline costs, so the costs get shared among the remaining gas consumers. This is a market failure as it leads to inefficient decision-making.
- Residential and small commercial users of electricity cannot be expected to anticipate the additional costs that using more electricity at peak times creates. The wholesale electricity market attempts to achieve marginal cost pricing and this, to some small extent, will flow through to customer pricing. But marginal cost pricing cannot attempt to send a price signal based on what would happen if 300,000 households expanded their peak electricity usage. The impacts on cost and security of supply of using more electricity and peak times of day and peak times of year cannot be reflected in the simplified pricing that residential

[10] We understand Horizon Power is likely to publish its report in December 2023 on its website https://www.horizonpower.com.au/ . Horizon Power has been awarded $10.5 million AUD to transition the 379 gas customers - https://www.energymagazine.com.au/10-5-million-for-wa-energy-transition-plan/

[11] Page 117 of 2023 Draft advice to inform the strategic direction of the Government's second emissions reduction plan available from https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/advice-for-preparation-of-emissions-reduction-plans/2023-draft-advice-to-inform-the-strategic-direction-of-the-governments-second-emissions-reduction-plan-april-2023/

and small commercial consumers have. This leads to inefficient decision-making that exacerbates the electricity market's challenge meeting peak demand and managing 'dry year' risk.

Regulatory failures

We have identified the following regulatory failures as contributing to the underdeveloped biogas industry in Aotearoa:

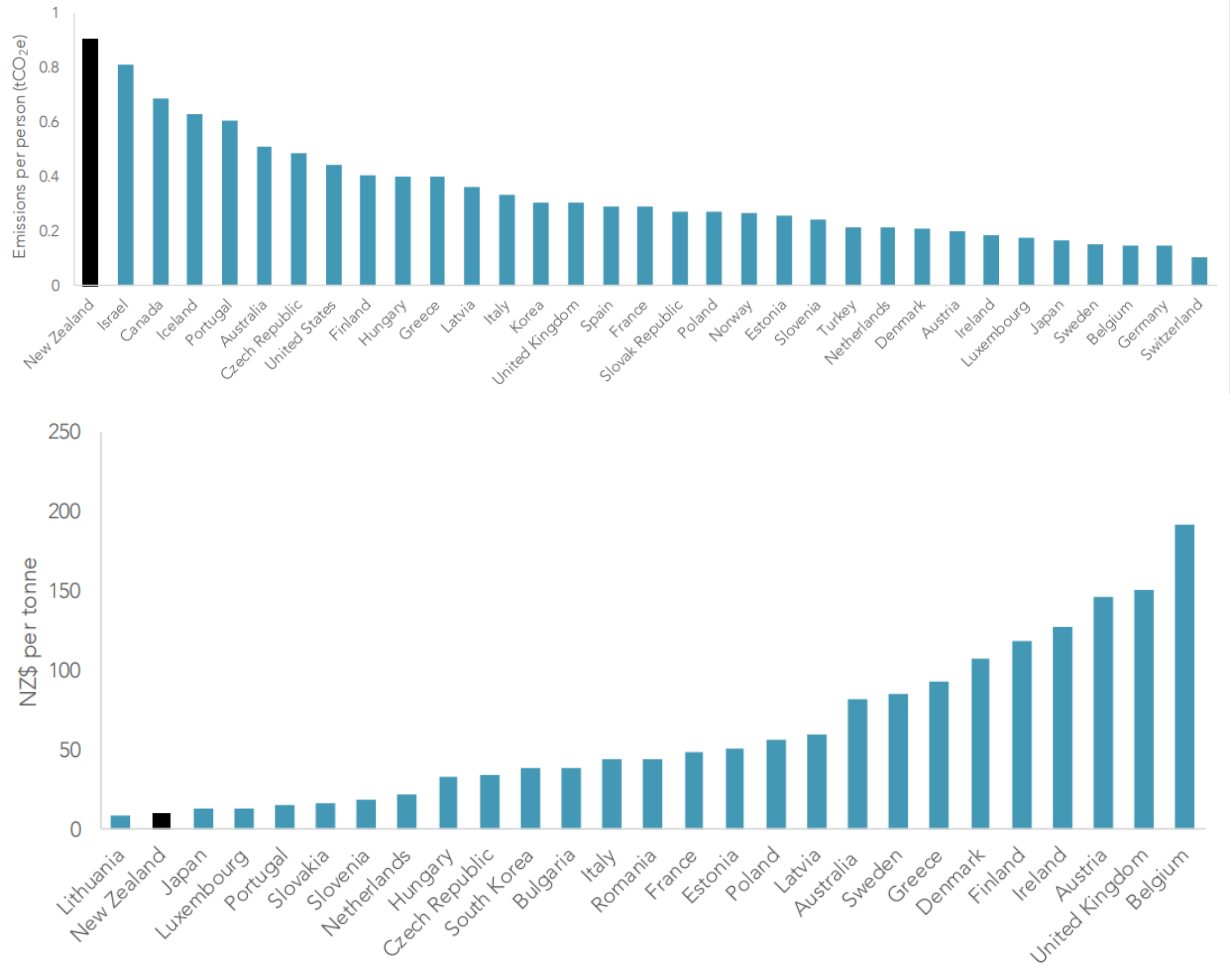
- Historical underpricing of waste. The quote and figures (below) from the Productivity Commission in 2018 highlighted the situation at the time—Aotearoa had the second-lowest waste disposal fees and the highest waste per person. Both datapoints have improved since then and waste disposal levies are due to increase again in July 2024 to $60 per tonne. Under-pricing may still be an issue given the Ministry for the Environment recommended pricing waste at $100 per tonne in 2014.
- Historical underpricing of emissions. For most of our history, New Zealand hadn't put a price on the negative externality of climate pollution. Furthermore, even once the Emissions Trading Scheme began, prices were artifically low and insufficient to induce behavioural change from most parts of the economy. Landfill sites weren't previously included within the ETS.
- Emissions pricing is not economy-wide. It is still the case that the ETS doesn't have full coverage. Trade-exposed firms do not yet face full ETS prices. Waste-water treatment plants do not face ETS prices. Agriculture does not face full ETS prices (or a split gas equivalent).
- Part 4 of the Commerce Act was created to set price and reliability requirements for stable or growing natural monopoly businesses. The legislative and regulatory environment has never provided a mechanism for regulated businesses to set aside funding for widespread decommissioning. Accordingly, there is a decommissioning liability that is growing. Compounding that, there is no method within the regulatory framework to recognise or monetise the fact that significant development of biomethane production serves to defer or avoid that growing liability.

New Zealand has a substantial policy deficit regarding emissions and waste...This has seen New Zealand make minimal progress in reducing emissions, especially in contrast to other developed countries.

- **New Zealand Productivity Commission[12]**

[12] Page 462 of Low Emissions Economy: https://www.productivity.govt.nz/inquiries/lowemissions/

Waste emissions per person (2014) and landfill tax rates (2017)[13]



5.3. Renewable gas certificates are a necessary enabler for biogas to thrive

Renewable gas certificates are a necessary component of a thriving biogas sector in Aotearoa. Certificates are a way of trading the renewable attributes of energy products. They are a long-established feature of New Zealand electricity markets, but are still novel in the gas industry. Internationally, renewable energy certificates are widely used across electricity and gas markets for customers to be able to claim the renewable attributes of the energy and for suppliers to monetise that benefit.

Renewable gas certificates will happen in New Zealand with or without government involvement. However, as the confidence of buyers is party dependent on some degree of sanctioning by government, there is an opportunity for government to formally provide this. This need not be a legislative solution, though other jurisdictions take this approach.

We recommend the Gas Industry Company should ensure its views on what standards renewable gas certificates ought to meet are publicly documented, and that it should consult with other public sector officials when doing so (including MBIE and the Ministry for the Environment).

Parties seeking to trade the first few deals for renewable gas certificates face a first mover disadvantage. In particular, Ecogas has been a pioneer in renewable gas through the development of its facility at Reporoa. Later traders of renewable gas certificates will benefit from Ecogas having to resolve the regulatory and market barriers

[13] Figures 15-4 and 15-6 in the Productivity Commission's *Low Emissions Economy* - https://www.productivity.govt.nz/inquiries/lowemissions/

they have been confronted with. For example, auditing and verification costs are higher for first movers as the process is being created for the first time in Aotearoa.

We recommend that MBIE commission an auditing/verification expert to prepare three separate documents to guide each of: buyers, purchasers and retailers, and other auditors. MBIE should review, improve and publish these documents. This will reduce first mover disadvantage and reduce future barriers to renewable gas certificate trading.

5.4. Government intervention is amply justified to realise the benefits across waste, energy and agriculture

We consider that government intervention is justified, regardless of what factors decision-makers value most highly.

- For someone who values minimising overall cost to consumers, smart processing of organic wastes achieves this by avoiding large costs to electricity consumers, making best use of existing assets, increases productivity, helps to focus electrification efforts on measures that reduce imported fossil fuels and improve national balance of payments, and minimising capital outlay for in-house conversion costs.
- For someone who prizes emissions reductions most highly, intervention would achieve better outcomes than any other option by minimising direct emissions from waste products and maximising avoided emissions by displacing use of fossil-sourced products.
- For someone who wants opportunities to stimulate provincial economic development, intervention would create approximately 6,000 jobs across a variety of locations, augment transition pathways for agriculture, and add to gross domestic product.

Intervention is amply justified because the benefits outweigh the costs and intervention will help to mitigate externalities arising from market and regulatory failures.

Evaluating an intervention like a renewable gas mandate would be welcomed by many parties in the gas sector, including industry group GasNZ.

Investing in organics processing facilities and injecting biomethane into gas networks is also a decision with no regrets and high option value. The principal point of 'no regret' is that an enduring investment in anaerobic digestion facilities is not dependant upon gas pipelines. If gas pipeline businesses were to prove unviable in the interim, gas upgrading equipment (for converting biogas to biomethane) can be replaced at its end of life with electricity generators designed for burning biogas.

An option to preserve additional value could arise from gas appliance manufacturers developing hydrogen-ready appliances. Hydrogen could serve a valuable balancing role within gas distribution networks that primarily deliver biomethane. Hydrogen could help during planned or unplanned outages of biomethane production or peak demand.

Next steps

Blunomy's work is continuing and the next phase is expected to deliver an assessment of options for policy-makers. Accordingly, our recommendations at this stage try to focus on well-principled intervention without prescribing a detailed design. There are many choices for how to achieve policy-maker's aims. Support for intervention is high among the gas and bioenergy sectors. Our recommendations are for the Government to:

- Create a new path of waste levy price increases scheduled beyond the last of the planned increase that is due to take effect in July 2024.
- Incentivise a vibrant biogas sector that achieves provincial and national benefits (including avoided emissions) with beneficiaries across the waste, energy and agriculture industries. If incentivising organic waste/residue processing proceeds, Ministry for the Environment should reconsider the scope of the ETS with respect to medium and large waste water treatment plants.
- Direct MBIE to develop a framework for public private partnerships between local government and private sector for development of regional organic processing facilities.
- Direct EECA to monitor development of gas appliances for a cost-effective opportunity to require that all new gas appliances be capable of handling hydrogen blending.

Options for incentivising organic waste processing and biomethane production

We have kept our recommendation about incentivising organic waste/residue processing generic. Below, we discuss some of the pros and cons of some of the policy tools available to government.

- The Blunomy study highlights that the benefits of smart use of organic wastes is spread across the waste, energy and agricultural sectors. Anaerobic digestion outputs can include energy, carbon dioxide (if biomethane is the energy product), heat and biofertiliser. Accordingly, we expect that a regime that incentivises across this spectrum of outputs will—in principle—be better aligned than an incentive for a single product.
- Members of GasNZ support a renewable gas mandate. Gas NZ proposes evaluating an obligation on gas retailers to procure minimum quantities of certified renewable gases by 2030 and 2035. A focus on renewable gases does simplify the policy-making significantly and leverages gas industry support for such a measure.
- Making gas retailers responsible for meeting a renewable gas mandate has the advantages of drawing them into renewable gas production and being able to consider renewable gases as part of their portfolio and retail offering to customers. In contrast, having the gas pipeline businesses (or one gas pipeline business) responsible for procuring renewable gases and having them injected into pipelines may offer some coordination benefits. There would be fewer parties that local government need to interact with, and a single party responsible for procurement could be more interested in taking an island-wide view of efficient siting and sizing of organic waste processing facilities. The procuring party would tender the gas products and certificates for the best price achievable with net costs being passed through in pipeline network charges.
- The sources of funding should reflect the breadth of the benefits.
    - As waste is priced using the waste levy, this should be considered a source of funding of development of organic waste processing facilities. This is already aligned with the intent and practice of how the waste levy funding is used. The waste levy is shared between central and local government. Central government could choose to assign a set amount of funding, or match local government funding of processing facilities, or increase the proportion that local government receives but attach 'strings' to the funding to ensure it is directed toward processing facilities.
    - Gas users should be a source of funding for an incentive regime. This could take the form of a direct levy on consumers' bills, or be passed on through pipeline network charges, or passed on through retailers' portion of customer charges.
    - Electricity users could be a source of funding given one of the market failures an incentive regime is seeking to overcome relates to pricing of electricity lines services. While there are counterfactual costs (the aforementioned $780 million for Wellington Electricity customers and $558 million for Vector customers), there is no cash flow generated by the absence of network upgrades. So a levy on electricity consumers in the North Island that are connected to networks with significant gas demand could help to target the revenue collection in a way that minimises pricing distortion.
    - Users of carbon dioxide and fertilisers would be beneficiaries of the regime. While MBIE should give the option due consideration, the value of the products these users purchase may not justify a bespoke revenue collection from these users.
    - There are large employment, tax, productivity and gross domestic product benefits arising from the provincial economic development involved in having a fleet of organic waste processing facilities. Kānoa is the Regional Economic Development & Investment Unit within MBIE that administers the Provincial Growth Fund ($3 billion in funding), the infrastructure portion of the COVID-19 Recovery Fund ($700 million), Regional Investment Opportunities ($300 million) and the Regional Strategic Partnership Fund ($200 million). Funding from one of these sources, or a bespoke equivalent, would help regions achieve the benefits of smart use of organic wastes.

In summary, there are a range of options available to policy-makers when designing an incentive regime. We are open-minded about the best design options. We encourage policy-makers to be ambitious and 'not let the perfect be the enemy of the good'.

6. Hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry

In three of its consultation papers, MBIE acknowledges the potential of hydrogen for the energy system and balances this with discussion of the suboptimal paths that ought not to be actively pursued. Broadly, we agree. Given the uncertainty involved, the massive overseas investments to improve efficiencies and the potential benefits, it is an energy vector that has high option value for Aotearoa.

In this section, we argue that hydrogen hubs are the best launchpad for a hydrogen industry in Aotearoa and that storage and pipelines could augment that industry in future.

By harnessing our low-emissions energy resources alongside other complementary technologies like hydrogen, we could treble our annual electricity supply. If we harness these resources, we can attract energy-intensive industries to grow our economy, create higher paying jobs and improve our quality of life. This is good for us and it's good for the planet.

- **Te Waihanga New Zealand Infrastructure Commission**[14]

6.1. Developing a hydrogen industry positions Aotearoa to take advantage of opportunities from the 2030s

MBIE has articulated extremely good reasons to suppose hydrogen will play some roles in the energy mix from the 2030s. Exactly what those uses of hydrogen will be is genuinely unclear and will take time to resolve.

We support continued government involvement in research and development of hydrogen-related opportunities.

We support continued government projects to ensure regulation is fit for a future hydrogen industry. This will be a crucial enabling role that supports small-scale hydrogen applications (including trials/pilots).

We are supportive of government investigating ways to get the first few commercial operations started earlier than would otherwise be the case. Supporting only uses with durable future prospects is critical. Earlier commercialisation of such opportunities can help form a 'critical mass' that provokes associated developments in skills/training industry, regulatory systems and contracting/trading systems. As such, any direct government support for early commercial-scale projects needs to come with obligations on the commercial operator to actively apply their learnings toward augmenting those associated developments.

While commercial opportunities for using hydrogen at scale will be limited, Aotearoa needs to build its workforce expertise, and regulatory and commercial systems to be well-positioned to seize hydrogen-related opportunities as they arise.

To this end, our Firstgas business is partnering with other gas pipeline businesses to conduct a small-scale hydrogen blending trial. This trial delivers gas to fewer than 20 households and does not involve gas transmission pipelines. We aim to build confidence around the ability of existing networks and appliances in Aotearoa to operate with blends of natural gas and hydrogen, and build experience operating with blends of hydrogen within our regulatory regimes. In time, blending hydrogen could play a valuable balancing role within distribution networks that run primarily on

[14] https://tewaihanga.govt.nz/the-strategy/overview

biomethane. The residential trial replicates extensive work undertaken overseas, but tests the New Zealand industry's social license, supply chains, and the legal, contractual, and regulatory frameworks for introducing hydrogen.

We are likely to subsequently run a trial involving hydrogen use in large commercial and/or industrial settings. We are closely following overseas research into gas pipeline repurposing.

6.2. Durable hydrogen hubs are a foothold to developing a hydrogen industry

Internationally, developing hydrogen hubs has been a popular tool among policy-makers. For example, a small selection of hydrogen hubs are:

- The Western Sydney Green Hydrogen Hub. Hubs are a goal of New South Wales' Hydrogen Strategy.
- The Humber Industrial Cluster on England's east coast.
- The United States of Amercia's Regional Clean Hydrogen Hubs programme that encouraged applications from 27 potential hubs and selected seven hubs (see image below) to receive seven billion USD in funding.

The rationale for these policy-makers varies in each case, but generally they are seeking to:

- avoid deindustrialisation of their economies arising from firms closing or moving offshore
- create social value, such as retaining jobs and create new replacement jobs for communities hardest hit by loss of fossil fuel production
- provide options for energy users, especially hard-to-abate industries
- create locations for energy innovation, sharing insights and demonstrating viable options to industrial users
- adding more storage into the energy mix to improve security and reliability
- meeting climate commitments.

6.3. Taranaki, Glenbrook and Marsden Point have high potential as hydrogen hubs

Ideal locations for hydrogen hubs will have all of the following features: potential for large-scale intermittent renewable electricity generation, a long-term industrial usage of hydrogen, good linkages to infrastructure (especially electricity grid, gas grid, roads) and access to labour (preferably with relevant skills and expertise).

There is a strong overlap between these desired features and what Transpower is seeking in Renewable Energy Zones (REZs). As such, there may be synergy in seeking to co-locate REZs and hydrogen hubs.

A considered investigation could identify the best prospects for hydrogen hubs in Aotearoa. In our view, the areas that best meet these desired features are:

- Taranaki
- Glenbrook (at or adjacent to New Zealand Steel's mill)
- Marsden Point (at or adjacent to Channel Infrastructure's fuel import terminal).

Government should pursue development of at least one hydrogen hub

We recommend that Government undertake a competitive process to ensure at least one substantial hydrogen hub is established. The Regional Transitions Plan could be repurposed to give effect to this policy.

The purpose of Government's involvement in a hydrogen hub would be to act as a research and development testbed for hydrogen, identify issues within the regulatory environment, overcome coordination problems and attract investors.

6.4. Underground hydrogen storage is a critical inflection point for energy in Aotearoa

As discussed in section 4.4, we consider that the viability of underground hydrogen storage is a critical inflection point.

If it is viable, this gives energy users and producers valuable options for utilising hydrogen in their industries. It would enhance national energy security and flexibility. It would help to overcome the low volumetric energy density of hydrogen gas.

If it is not viable, Aotearoa's hydrogen industry will be smaller due to fewer viable use-cases. Hydrogen will be more likely to be used in islanded hydrogen hubs and combined with other molecules to make new products.

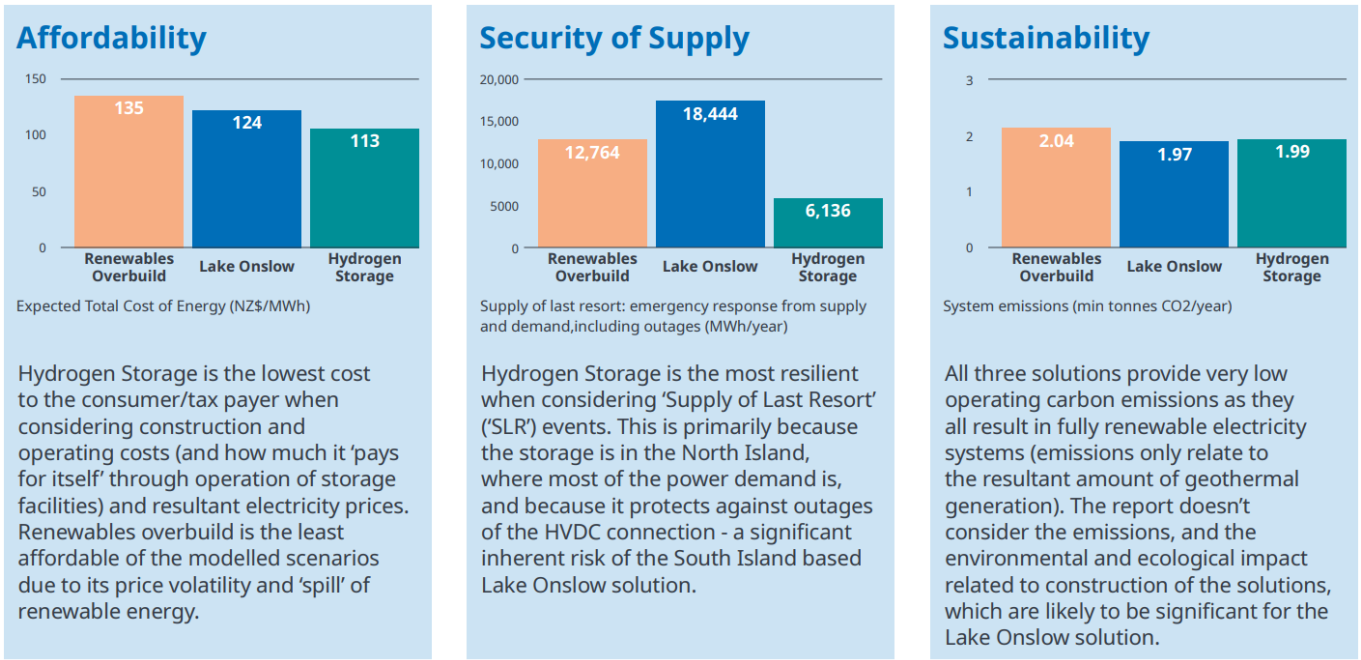
> It's possible to store methane gas underground in the small gaps or pores in rocks. No-one's stored hydrogen in rocks, so we don't know if it's feasible yet, which is why our first priority is to find out if it's possible...We know you have to start these discussions early. Now is the time to start engaging, not in 10 to 15 years' time when something like this could be implemented
>
> - **Professor Andy Nicol, University of Canterbury**[15]

[15] Source: https://www.canterbury.ac.nz/news/2022/we-can-generate-green-hydrogen-but-how-will-we-store-it.html

6.5. If underground hydrogen storage is viable, even more value can be unlocked by pipelines connecting producers, users and storage

The ability to store energy is essential to counteract misalignment between when energy is produced and when it is demanded. This is especially acute in electrical power systems where storage has been an expensive option and the new marginal generation (wind and solar) has intermittent characteristics. Underground storage of natural gas has been important to both the gas and electricity industries.

Underground hydrogen storage will allow a hydrogen industry to maximise benefits from producers and users trading. It would be especially valuable for New Zealand's electricity industry, as converting surplus electricity to hydrogen molecules allows them to be stored over long timeframes and withdrawn at times of electricity shortage. This was highlighted by EnergyLink's November 2022 report *Hydrogen Storage as a Dry-year Solution*. We summarised their findings in the following figure:[16]



EnergyLink compared three options for a 100% renewable electricity market: overbuilding renewables, pumped hydro storage at Lake Onslow, and underground hydrogen storage connected to hydrogen-fired electricity generators. The underground hydrogen option was the clear best option as having the lowest cost, lowest price volatility and highest reliability. All three performed similarly in terms of climate emissions (the primary source of which were geothermal).

As discussed in section 6.3, there are many opportunities for hydrogen use being explored. Channel Infrastructure, Air New Zealand and Fortescue Future Industries are all exploring use of hydrogen to replace imports of liquid fossil fuels. Ballance Agri-nutrients are seeking to make green ammonia for use in fertilisers. Hydrogen is a likely technology path for steel manufacturing to decarbonise around the world.

Genesis Energy have been exploring hydrogen-based options for the Huntly Power Station in the 2030s. Adapting an existing combined cycle gas turbine to burn hydrogen could be significantly cheaper than the new open cycle gas turbines assumed by EnergyLink.

[16] The full report and our summary findings are available from https://firstgas.co.nz/independent-report-finds-hydrogen-storage-best-solution-to-support-a-fully-renewable-electricity-system/

During the year we also had initial discussions on the possibility of using a hydrogen blend or full hydrogen to power Unit 5, the 400 MW combined cycle gas turbine at Huntly Power Station. Unit 5 is New Zealand's largest generation unit and can support around 400,000 households with electricity. The manufacturers are active in the use of hydrogen for these units and could help us adapt Unit 5 for this fuel. We're monitoring hydrogen production in New Zealand with a view out to the 2030's

- **Malcolm Johns, CEO Genesis Energy**

Developers of offshore wind are particularly attuned to the potential benefits of a hydrogen industry that can complement their electricity generation.

We are cooperating with a group of offshore wind developers and Transpower on an Offshore Wind National Impact Study. Transpower's analysis for the group has highlighted that the electricity transmission grid can cope with new offshore wind of up to 1 GW in Taranaki and 2 GW in Waikato/Auckland with a cost of only a few hundreds of millions of dollars. However, it highlighted that to integrate 2 GW of wind offshore from Taranaki into the power system (assuming no new large users within Taranaki) would trigger a billion dollar grid upgrade.

We examined three options for new hydrogen pipelines

EnergyLink's report, for the purposes of the underground hydrogen scenario, assumed that gas pipelines had been converted to transport hydrogen. We have compiled rough estimates for constructing new hydrogen pipelines should this eventuate as a more attractive option. For our estimates, we have utilised estimates in the report *Pipelines vs Powerlines* by GPA Engineering. We thank GPA Engineering and the Australian Pipelines and Gas Association for publishing their report.

GPA Engineering's report included estimates for hydrogen pipelines of 250 km and 500 km in length. Using our existing pipeline easements[17] as the route, a 273 km pipeline would be enough to connect Stratford (as a central Taranaki location close to Transpower's grid exit point) to the Huntly Power Station (as a potential location for hydrogen-fuelled gas turbines). A 549 km pipeline would be enough to connect Stratford, Huntly, Glenbrook and Marsden Point.

To align with EnergyLink's study, we assumed there was 1,000 MW of hydrogen-fuelled open-cycle gas turbines (OCGTs) and sized the capacity of the pipeline to meet the associated peak flow. We assumed all of the OCGTs were located at Huntly or further north (whereas EnergyLink assumed the OCGTs were dispersed around the North Island).

These options are illustrated in the figures below.

[17] This is a simplifying assumption. In northern Taranaki our easements follow a coastal path. In reality, we would investigate alternative paths further inland to mitigate risks associated with coastal erosion.

Indicative locations and costs for new hydrogen pipelines[18]

Pipeline length	Pipeline capacity	Total capex	Annual opex	Annualised cost recovery[19]
273 km	250 TJ/day	$793 m	$13.5 m	$50 m
549 km	250 TJ/day	$1,955 m	$35.5 m	$133 m
549 km	500 TJ/day	$2,857 m	$52 m	$195 m

We emphasise that these are only indicative costs. GPA Engineering reported their results as following the Association for the Advancement of Cost Engineering methodology for a class five engineering estimate. By applying simplified adjustments to GPA Engineering's data, the class five status does not apply to our results.

For the purposes of this analysis, we have only looked at the cost of new hydrogen pipelines. Internationally there is alot of research going into repurposing natural gas pipelines for transporting hydrogen. Repurposing our pipelines remains an option for further investigation.

A pipeline with capacity of 250 TJ/day could supply enough hydrogen for the 1,000 MW OCGTs to run at maximum with a little over 10% spare pipeline capacity. This leaves a small amount of capacity available for inflexible users, though there would be ample capacity for other users if they had sufficient flexibility.

A pipeline with capacity of 500 TJ/day could accommodate many more users (such as steel and efuel manufacturers) and have potential for providing a storage service within the pipeline. We have included indicative

[18] Only 2023 New Zealand dollars are shown, in millions. We converted GPA Engineering's capex and opex data from AUD currency to NZD, increased capex and opex by the consumer price index, increased capex and opex to account for greater pipeline lengths than GPA Engineering's data, and increased the capex component with an adjustment to account for additional geological challenges (relative to Australia).

[19] We have calculated annualised cost recovery as the sum of annual opex and annual capex recovery. We have calculated annual capex recovery by recovering depreciation of the total capex over a 50-year life, recovering a pre-tax nominal weighted average cost of capital (WACC) of 5% each year on the undepreciated capex and averaging the recovery.

costs for a 500 TJ/day pipeline, but only for the longer of the two pipelines as delivering that much capacity solely to Huntly would not be a coherent option.

A hydrogen pipeline from Taranaki northward would enable a larger fleet of wind generation within Taranaki. The pipeline itself enables the energy to get out of the region regardless of any electricity grid constraints. Furthermore, EnergyLink's study highlighted that the presence of flexible electrolyser load in the hydrogen scenario helps to reduce electricity price volatility. In particular, the 2.5 GW of electrolysers in EnergyLink's study tended to put a $30/MWh floor on wholesale electricity prices. This is especially advantageous for the development of new intermittent renewable generation.

A hydrogen pipeline could defer or avoid the need for the aforementioned billion dollar upgrade of the electricity grid. However, they are not mutually exclusive energy transport options and a sufficiently large generation fleet in Taranaki could warrant investment in both.

There are options for derisking hydrogen storage and pipeline investments

While hydrogen storage and pipelines are a sizable investments in their own right, they are a relatively small component of a hydrogen economy. Hydrogen production and demand are able to grow gradually, whereas storage and pipelines are 'lumpy' investments that are effectively impossible to redeploy elsewhere. Their initial design tends to lock in the capacity of the assets over long timeframes. Because of this, the assets will be sized relative to the owner's risk appetite and view of future demand.

Against this background, we note that Part 4 of the Commerce Act may be unsuitable for regulating these potential natural monopolies. Investments perceived as higher risk by investors will only be made if higher returns are credible. The threat of regulation under Part 4 and the Commerce Commission forming a different view of the appropriate return adds to investment risk with no upside.

Some options for derisking investments in hydrogen storage and pipelines are:

- Legislated exclusions from Part 4 of the Commerce Act. This would give an investor confidence about their ability to charge for a higher risk cost of capital, though this may create exactly the sort of unregulated natural monopoly that prompted the creation of Part 4 of the Commerce Act to begin with.
- A dedicated approach to regulation of hydrogen pipelines under Part 4 of the Commerce Act. This can give investors confidence about how the regulator must assess their higher-risk and higher-reward investment.
- Crown guarantees of pipeline revenues such that the Crown takes on some downside risk of demand being lower than forecast and upside benefit of demand being greater than forecast. Shifting these to the Crown could make sense if the Crown wants to grow demand for piped hydrogen and is prepared to use its powers to actively manage that risk.
- Partial Crown ownership through Public Private Partnerships.
- Pricing societal externalities: retention of hard-to-abate industrial businesses and retention of resilience-enhancing industries (such as domestic production of green steel), improving national balance-of-payments (such as efuels reducing reliance on imported fuels) and meeting international climate commitments.

While these derisking options exist, we make no recommendations at this stage. Until the University of Canterbury report back on the viability of underground hydrogen storage, such a recommendation is premature.

7. Appendix A: Complete list of recommendations

The table below sets out the complete list of recommendations we have made throughout this submission. For ease of MBIE readers, we have referenced which consultations our recommendations relate to and provided cross-references to the section in this document that provides full detail.

Our recommendations

Recommendation	Rationale	Importance	Cross-reference	MBIE consultation
Government should maintain or increase support for investment in research and development of nascent energy options. This applies across the entire economy, though research and development of renewable gases will be especially valuable.	This is a traditional, well-justified role for government. With pressing needs to decarbonise all aspects of the economy, government should be maintaining or increasing spend on research and development, particularly in areas where commercial solutions do not yet exist at scale.	Medium	Section 4.4	All
Gas Industry Company should oversee progress on renewable gas certificates, including through consultation with other public sector officials (including MBIE and the Ministry for the Environment).	To give purchasers of renewable gas certificates confidence that certificates are available and achieve what they purport to certify.	Medium	Section 5.3	Gas Transition Plan, Interim Hydrogen Roadmap
MBIE should commission an auditing/verification expert to prepare three separate documents to guide each of: buyers, purchasers/retailers, and other auditors. MBIE should review, improve and publish these documents.	This will reduce first mover disadvantage and reduce future barriers to renewable gas certificate trading.	Medium	Section 5.3	Gas Transition Plan, Interim Hydrogen Roadmap
Government should incentivise a vibrant biogas sector that achieves provincial and national benefits (including avoided emissions) with beneficiaries across the waste, energy and agriculture industries.	This recommendation has a large and broad range of benefits. It would close the gap on meeting waste targets, emission targets, create ~6,000 jobs through the regions, improve national productivity and balance of payments, provide energy users choice and a decarbonised competitor to electricity, mitigate market and regulatory failures easily worth more than a billion dollars.	Very high	Section 5.4	Gas Transition Plan
The waste levy should have a new path of price increases scheduled beyond the last of the planned increase that is due to take effect in July 2024.	A levy is needed to put a price on the externality costs created by waste. New Zealand's waste levy is still low by international comparison, which suggests waste producers make	Medium	Section 5.4	Gas Transition Plan

Recommendation	Rationale	Importance	Cross-reference	MBIE consultation
	inefficient decisions because they can socialise the cost of their actions.			
MBIE to develop a framework for public-private partnerships between local government and private sector for development of organic processing facilities. Such a framework could act as a process to establish model contracts that define recommended approaches to matters like management of financial risks, operational risks, contract duration, regulatory liability and procurement of credible private partners.	Some local government bodies will consider it strategically important to have an ownership and operational role with organic processing facilities. However, selling energy and agricultural products is outside their role. As such, public-private cooperation will be needed. Accordingly, a framework to define the parameters for these partnerships will fast-track their uptake.	High	Section 5.4	Gas Transition Plan
Government should direct EECA to monitor development of gas appliances for a cost-effective opportunity to require that new gas appliances be capable of handling hydrogen blending.	In the long-term, hydrogen blending could play a balancing role managing gas distribution networks that are primarily supplied with biomethane. If hydrogen-ready gas appliances become available at zero or minimal cost to consumers, there is significant option value in mandating their uptake to better enable future blending.	Low	Section 5.4	Gas Transition Plan
Government should undertake a competitive process to ensure at least one substantial hydrogen hub is established. The Regional Transitions Plan could be repurposed to give effect to this policy.	To act as a research and development testbed for hydrogen, identify issues within the regulatory environment, overcome coordination problems and attract investors.	High	Section 6.3	Gas Transition Plan, Interim Hydrogen Roadmap, Offshore Renewables
Government should direct MBIE to propose changes to Part 4 of the Commerce Act 1986 to make economic regulation of gas pipeline businesses fit for purpose.	Part 4 was designed for steady or growing businesses with little or no competition. This is no longer the case. The Commerce Commission and gas pipeline businesses need new tools to manage risks through the energy transition.	Very high	Section 8.1	Gas Transition Plan
Government should direct the Commerce Commission to support decarbonisation investments proposed by electricity distributors and gas pipeline businesses. This could be consistent in form with section 54Q of the Commerce Act, which requires the Commission to promote incentives for energy efficiency.	Society expects and needs infrastructure providers to be forward-looking and playing their part in decarbonisation the economy and minimising climate impacts. Natural monopolies regulated by Part 4 of the Commerce Act are currently not being incentivised toward sensible investments in	Medium	Section 8.2	Gas Transition Plan, Electricity Market Measures

Recommendation	Rationale	Importance	Cross-reference	MBIE consultation
	climate mitigation and adaptation.			
EECA should accelerate its reviews and consider setting higher minimum efficiency ratings for gas appliances.	To reduce emissions if that is cost effective over the lifetime of new gas appliances.	Low	Section 8.4	Gas Transition Plan
Government should direct MBIE to accelerate its review of the Electricity (Hazards from Trees) Regulations 2003.	The Regulations add cost and outages to the management of electricity lines, and prevent some EDBs from achieving the service levels that customers expect.	Medium	Section 9.1	Electricity Market Measures
MBIE should collect data about uneconomic electricity connections and monitor technology development to be able to recommend to some future government what policy should exist to transition these customers to a sustainable, unsubsidised electricity supply.	Current legislative requirements are leading to inefficient cross-subsidies within electricity distribution pricing.	Low	Section 9.2	Electricity Market Measures
MBIE should continue its regulatory work programmes that enable renewable gases.	The existing work programme has important enabling benefits for development of a hydrogen economy.	High	Section 0	Gas Transition Plan, Interim Hydrogen Roadmap
Government should design an auction-based procurement for offshore wind and schedule it for the late 2020s for construction beginning in the early 2030s.	To achieve large-scale investment in new generation at lowest cost to consumers.	High	Section 11.2	Offshore Renewables, Electricity Market Measures

8. Appendix B: Responses to the Gas Transition Plan Issues paper

8.1. Government should direct MBIE to propose changes to the Commerce Act to make economic regulation of gas pipeline businesses fit for purpose

Part 4 of the Commerce Act 1986 sets out policy-makers' approach at the time to regulating natural monopoly business. The Commerce Commission works within the parameters of Part 4 to develop the regulatory regime. While the architects of Part 4 succeeded in creating durable policy, they were (understandably) unable to predict how future circumstances would change.

Part 4 was designed for economic regulation of monopoly businesses that were stable or growing, with little or no prospect of subsitute products providing meaningful competition. For many of the industries governed by Part 4, this is still an apt description. However, for natural gas pipeline businesses this description no longer fits. From a peak of 250 PJ in 2001, total natural gas demand has fallen by more than one third to 145 PJ in 2022. Wholesale natural gas cost $5.30/GJ in 1999 (expressed in 2023 dollars) to $9.59/GJ most recently.[20] On top of wholesale prices for natural gas, emissions pricing has been introduced which currently adds around $4/GJ to the delivered cost. While the efficiency of gas appliances has improved, technologies that compete for customers' gas demand have also improved—most notably heat pumps for space heating.

We contend that for Part 4 to remain fit-for-purpose in regulating gas pipeline businesses, the Commerce Commission and regulated businesses need more tools to manage transition risks.

We recommend that Government should direct MBIE to propose changes to the Commerce Act to make economic regulation of gas pipeline businesses fit for purpose. These changes would recognise the prospect of repurposing existng infrastructure to transport renewable gas (biomethane and hydrogen), and would also acknowlege the uncertainty facing future gas usage and how this should best be managed to continue to attract investment and innovation.

8.2. Government should direct the Commerce Commission to incentivise gas pipeline businesses to undertake cost-effective climate mitigation and adaptation actions

In section 9 of its *Measures for Transition to an Expanded and Highly Renewable Electricity System* paper, MBIE seeks feedback on whether government sustainability goals are adequately reflected in electricity regulators' objectives. There is no equivalent section in the *Gas Transition Plan Issues Paper*.

Society expects and needs infrastructure providers to be forward-looking and playing their part in decarbonisation the economy and minimising climate impacts. A successful transition involves individuals playing their part, but they cannot be expected to change all the systems within which they make decisions. We consider that natural monopolies regulated under Part 4 of the Commerce Act are not being incentivised toward sensible investments in climate mitigation and adaptation.

We recommend that government should direct the Commerce Commission to incentivise all Part 4 price-regulated monopoly businesses to undertake cost-effective climate mitigation and adaptation actions. This could be consistent in form with section 54Q of the Commerce Act, which requires the Commission to promote incentives for energy efficiency. We repeat this recommendation in section 9, where we respond to the electricity-specific questions posed by MBIE.

[20] Average quarterly natural gas prices, from https://www.gasindustry.co.nz/data/gas-pricing/

8.3. MBIE's statements about gas pipeline linepack and pressure may mislead readers

In several places in the issues paper, MBIE makes statements relating to gas pipeline pressure and linepack management that are not correct. MBIE does not appear to rely on any of these statements for any significant decisions that are proposed, but we provide the following clarifying comments to ensure that the issues arouond gas linepack and pressures are better understood. Overall, we believe that pipeline pressures can be maintained through the transition using a mix of operational responses and targeted code and regulatory changes.

MBIE's statement	Our comment
Page 21: "Some gas pipelines function as storage where the network operator varies the pipeline demand in response to changes in demand."	Readers could take this statement to mean that our Firstgas business manages demand. We do not. We use a pipeline's ability to accommodate changes in line pack (the inventory of gas in the pipeline) to buffer differences between supply (producers' gas injections into the pipeline) and demand (consumers' usage). This use of line pack is distinct from gas storage. Our pipeline operating codes discourage mismatches between supply and demand, and do we offer a storage service under existing codes. We take ownership of excess gas left in the pipeline at the end of each day, and sell gas to parties who are left in a short position. Managing such differences creates costs that are ultimately paid for by consumers.
Page 21: "Pipeline pressures can be altered in response to changes in demand, which can considerably reduce operational costs, so operational costs borne by each user do not necessarily increase steeply as they are shared across diminishing numbers of customers, until few customers remain."	There is no overt indication whether the statement is intended to relate to transmission pipelines, distribution pipelines or both. In any of these cases, we have concerns with the accuracy of the comment. Transmission pipelines do have significant operational costs that are affected by pipeline pressure (which is mostly a proxy for compression requirements which is a key source of costs). Lower demand will generallly (but not always) lead to reduced compression requirements. Distribution pipelines do not incur operational costs to maintain pipeline pressure.
Page 23: "reticulated gas networks, which rely on sufficient demand...to operate at minimum pressures"	These statements are similar and inaccurate. The statement on page 26 appears to directly contradict the statement on page 21 (see above). Lower demand will generallly (but not always) lead to reduced compression requirements (and costs) in transmission pipelines. Distribution pipelines do not have operational costs relating to pipeline pressure.
Page 26: "If the number of users drops below a critical level, it could create issues in maintaining minimum pressures and increasingly prohibitive costs for the remaining gas network users"	Lower demand could reduce system costs for two reasons other than compressions costs: • line heaters at delivery points will use less gas as pipeline pressures fall, due to reduced pressure differentials across the regulators which cut pressure prior to gas being delivered • if pipeline pressures do fall it will be easier for producers to inject gas and may improve their ultimate reserves recovery.

8.4. EECA should prioritise its review of gas appliance efficiency

A 2022 report for Energy Networks Australia found that "Raising minimum gas appliance efficiency to 6-Star efficiency rating could reduce total domestic gas use emissions by 2%-5% by 2030 based on typical appliance end of life

replacement rates alone."[21] The report identified opportunities for greater reductions with policy support to accelerate appliance replacement rates.

Increasing prices in New Zealand's Emissions Trading Scheme will increase the cost of all fossil fuels, including natural gas and LPG. Renewable gases are likely to be more expensive than present-day gas. Both of these will tend to increase costs to gas consumers and so push the economics of gas appliances towards greater energy efficiency.

The Energy Efficiency and Conservation Authority (EECA) has two relevant reviews underway.[22] EECA is reviewing the efficiency of residential space heaters and hot water systems. EECA's website reports no progress on these reviews since 2021. We recommend EECA accelerate its reviews and consider setting higher minimum efficiency ratings for gas appliances.

Our responses

MBIE's question	Our response
1. How can New Zealand transition to a smaller gas market over time?	No response
2. What is needed to ensure fossil gas availability over the transition period?	No response
3. What factors do you see driving decisions to invest or wind down fossil gas production?	Major future investment in fossil gas production could be driven by cost decreases in decarbonisation technogies such as CCUS and emerald (where natural gas is split into hydrogen gas and solid carbon by plasma electrolysis) hydrogen. We note that even in a wind down of fossil gas production, some significant investment in maintaining existing fields will likely be justified. However, the biggest factor in a wind down scenario will be declining gas demand, especially from major users.
4. Does the Government have a role in enabling continued investment in the gas sector to meet energy security needs? If yes, what do you see this role being?	Government's role is to represent consumers' genuine, long-term interests. This involves, at a minimum, monitoring energy security.
5. Does the Government have a role in supporting vulnerable residential consumers as network fossil gas use declines? If yes, what do you see this role being?	As per section 5 above, the best support Government can give is supporting biomethane development for injection into pipelines. This helps gas and electricity consumers, especially vulnerable customers. In the event that gas use declines as this question imagines, all consumers are best supported with an orderly, well-signalled winddown.
6. What role do you see for gas in the electricity generation market going forward?	Natural gas will remain an important fuel for electricity generation for some time. At this stage, there is no more cost effective way to fill gaps in supply. Gas provides dispatchable, flexible, storable electricty generation. This is crucial for minimising electricity pricing and affordable electricity underpins decarbonisation. The quantity of gas required to support a highly renewable electricity system will be lower than consumed today, but of higher value. This creates opportunities for biogas and hydrogen.

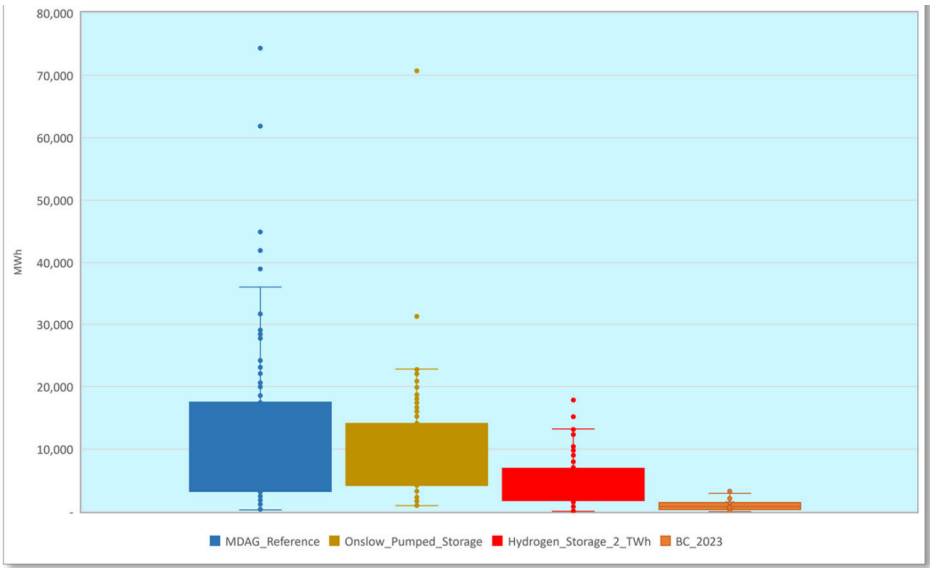
[21] ENEA Consulting's 2030 Emission Reduction Opportunities for Gas Networks available from https://www.energynetworks.com.au/miscellaneous/2030-emission-reduction-opportunities-for-gas-networks-by-eneaconsulting-2022/

[22] Details at https://www.eeca.govt.nz/regulations/regulatory-requirements-under-review/residential-space-heater-labelling/ and https://www.eeca.govt.nz/regulations/regulatory-requirements-under-review/hot-water-systems/

MBIE's question	Our response
	If CCUS and/or emerald hydrogen (where natural gas is split into hydrogen gas and solid carbon by plasma electrolysis), become cost competitive, natural gas' role in electricity generation could expand.
7. What would need to be in place to allow gas to play this role in the electricity market?	This is a continuation of natural gas' existing role, so no action is needed to extend that situation. It is also necessary to have an absence of any policies that hinder that role.
8. Do you think gas can play a role in providing security of supply and/or price stability in the electricity market? Why / Why not?	Yes. Our answer to question six covers this.
9. Do you see alternative technology options offering credible options to replace gas in electricity generation over time? Why / Why not?	Yes. Because there are strong incentives to replace emissions-intensive activities globally, there is alot of investment in improving technologies. As we argue in sections 4.4 and 6, if underground hydrogen storage is feasible and cost effective, this is a strong contender to provides security of supply. Other options may include activating electricity demand response at scale and harnessing battery-to-grid technologies. The key point however is that these technologies are not currently available, and the timeframes for their adoption are not clear. This means that it makes sense to preserve all available options.
10. If you believe additional investment in fossil gas infrastructure is needed, how do you think this should be funded?	This should be funded by the parties that make those investments. A crucial element to trusting that only needed investments are made is confidence that electricity markets (wholesale spot market and its derivatives) reflect the risks of undersupply.
11. On a scale of one to five, how important do you think biogas is for reducing emissions from fossil gas? Why did you give it this rating?	Five, though focussing only on biogas's avoiding emissions from natural gas is to miss the breadth of benefits from biogas. We reject MBIE's conclusions that biomethane is a high cost interim measure and a niche solution. See section 5 for our complete thoughts and recommendations on the must-have benefits of biogas, extending beyond the energy sector into waste management and agriculture.
12. Do you see biogas being used as a substitute for fossil gas? If so, how?	Yes – see section 5.
13. On a scale of one to five, how important do you think hydrogen is for reducing emissions from fossil gas use? Why do you think this?	In the timeframe from now until ~2035, hydrogen will have a smaller role (a score of two). It can credibly be used to displace natural gas in fertiliser manufacturing in this timeframe and we expect that network trials will have been completed to confirm the suitablity of existing infrastructure to convey larger quantities of hydrogen. Beyond ~2035, hydrogen has potential to become more important. As we argue in sections 4.4 and 6, if underground hydrogen storage is feasible and cost effective, then it could be of critical importance (a score of five) to decarbonising gas' role supporting the power system.
14. Do you see hydrogen being used as a substitute for fossil gas? If so, how and when?	Yes. See our answer to question 13.
15. What else can be done to accelerate the replacement of fossil gas with low-emissions alternative gases?	See our recommendations in section 5.
16. On a scale of one to five how important is a renewable gas trading to supporting the uptake	Five. It is a necessary component to allow monetisation of the attributes of renewable gases. While gas certificates are a critical *enabler*, they should not

MBIE's question	Our response
of renewable gases? Why have you given it this rating?	be confused with a measure that stimulates demand for renewable gases. See section 5.3 for our complete thoughts on recommendations on gas certificates.
17. What role do you see for the government in supporting such a scheme?	We see government providing some kind of advice that improves certificate buyers' confidence that the certificates achieve what they claim. See our recommendations in section 5.3.
18. On a scale of one to five how important do you think CCUS is for reducing emissions from fossil gas use? Why did you give it this rating?	We have not undertaken much research into the prospects for CCUS in New Zealand. But its potential is significant with international research and development driving technological improvement.
19. What are the most significant barriers to the use of CCUS in New Zealand?	Its cost effectiveness is clearly an important barrier. There are some regulatory and social acceptance barriers, but these could be resolved so long as the underlying technology is cost effective and delivers the additionality and permanance needed for decarbonisation. We consider that Government should focus on creating the enabling framework for CCUS, by ensuring that carbon removals can be counted under the ETS and providing the right legislative settings to govern any investment in this area.
20. Do you see any risks in the use of CCUS?	No response.
21. In what ways do you think CCUS can be used to reduce emissions from the use of fossil gas?	No response.
22. What role do you see for gas storage as we transition to a low-emissions economy?	Because a low-emissions economy is likely to have far more intermittent renewable electricity generation, this tends to to increase the value of storage solutions (and flexible demand). Gas storage will tend to be justified on the basis of deep, long-term storage but, once built, also able to offer solutions into markets for shorter-term peaking requirements.
23. On a scale of one to five, how important do you think increasing gas storage capacity is for supporting the transition? Why did you give it this rating?	Four. Gas storage will continue to play an important role with electricity security of supply and affordability. We have argued in this submission that the potential for underground hydrogen storage is a critical inflection point for energy in Aotearoa. If underground hydrogen storage is unviable, then the criticality of natural gas storage is increased. This was an unexpected finding from EnergyLink's report *Hydrogen Storage as a Dry-year Solution*. EnergyLink's report compared three future scenarios that produced a 100% renewable electricity system. When they compared the options with respect to unreliability, they included a comparison against a modelled result respresenting the present-day power system. Below is Figure 17 from the report showing unreliability (higher MWh results reflect higher levels of unreliability):[23]

[23] Page 22 of the report - https://firstgas.co.nz/independent-report-finds-hydrogen-storage-best-solution-to-support-a-fully-renewable-electricity-system/

MBIE's question	Our response
	 While the hydrogen storage option (in red) compared well against the other 100% renewable options (in blue and brown, which had average levels of unreliability more than 2.5 times greater than the hydrogen option), all three renewable options were outperformed by the present-day system (in orange) with its access to storable fossil fuels. Given the present-day system partially relies on storable coal stockpiles, gas storage can offer lower levels of climate pollution by displacing coal. Relative to renewable alternatives, gas storage offers better reliability and improves affordability.
24. What should the role for government be in the gas storage market?	Gas storage is an investment with significant upfront costs. The shorter the economic lifetime, the harder that investment will be to justify. Accordingly, one important role for government is engendering confidence that future governments will not 'pull the rug out' from long-term investments. The 100% renewable electricity policy of the previous government provided a clear signal that further investment in gas storage would face the risk of becoming stranded before recovering their cost.
25. Our position is that LNG importation is not a viable option for New Zealand. Do you agree or disagree with this position? If so, why?	No response.
26. What risks do you anticipate if New Zealand gas markets were tethered to the international price of gas?	No response.

9. Appendix C: Responses to the Electricity Market Measures paper

9.1. Complete the review of regulations governing trees near power lines

On 20 August 2015, the then-Government announced it was including a review of the *Electricity (Hazards from Trees) Regulations 2003*. This was welcomed by electricity lines businesses, as vegetation interfering with power lines is the number one cause of outages for most networks. The existing regulations have many opportunities for improvement with benefits to customer reliability and reducing the cost to serve customers. However, over five years later, the review has not sufficiently progressed for legislative changes to be proposed. MBIE has canvassed stakeholders about the issues. Accordingly, we expect benefits from the residual effort needed to deliver this review are amply justified.

The communities served by our Firstlight Network business were hit hard by cyclones and storms in 2023. Firstlight's inability to take all appropriate preventative measures because of the existing regulations directly contributed to the harm experienced by Tairāwhiti customers. **Completing the review of the regulations is the most important electricity policy measure for Firstlight and its customers.**

We recommend that the Government should direct MBIE to accelerate its review of the Electricity (Hazards from Trees) Regulations 2003.

9.2. Legislative requirements around uneconomic power lines are not leading to rational decisions

Electricity lines businesses are subject to 'continuance of supply' legislative obligations. This means that existing customers must be given options for staying connected to the network. Many connections were built at a time where rapid rural electricification was the government's objective. However, a small percentage of those connections were never economically viable to begin with and some have become unviable as equipment ages.

This has led to the situation where these customers have built their homes and livelihoods with the expectation of grid-connected electricity. They pay substantially less than the true cost of supply.

Fortunately, off-grid technology has improved and is becoming a viable option in some situations. The technology continues to improve, which means there is value in policy-makers taking their time to develop durable alternatives to the current situation.

MBIE should aim to collect data about uneconomic connections and monitor technology development to be able to recommend to some future government what policy should exist to transition these customers to a sustainable, unsubsidised electricity supply.

Our responses to selected questions

MBIE's question	Our response
Q1. Are any extra measures need to support new renewable generation during the transition?	Yes, we consider market arrangements will be inadequate to meet the large-scale needs of electrification. We recommend adopting an auction-based approach to procuring offshore wind in the 2030s, similar to the United Kingdom's regime. See section 11.2 for more detail.
Q2. If you think extrra measures are need to support renewable generation, which ones should the government prioritise developing and where and when should they be used? What are the issues and risks that should be considered in relation to such measures?	

MBIE's question	Our response
Q29. Do you agree we have identified the biggest issues with existing regulation of electricity distribution networks?	No. MBIE places too much weight on purported barriers to connection of new demand and distribution pricing reform. Delivering the review of the Electricity (Hazards from Trees) Regulations 2003 should be among the top priorities for regulatory attention. See section 9.1 above for more detail on this matter. The topic of uneconomic power lines does not feature on MBIE's list of issues. See section 9.2 above for more detail on this matter. We do agree that whether incentives are adequate for lines businesses to initiate investments sufficiently in advance of customer needs is a valid concern. The Commerce Commission's choice of the 65th percentile to determine returns and uncertainty about forecasting demand growth (and who bears the risk of under- or over-estimating demand) are the main factors. A higher percentile and some demand adjustment mechanism (such as growth washups or excluding growth capex from the incremental rolling incentive scheme) would be options to counteract this concern.
Q30. Are there pressing issues related to the electricity distribution system where you think new measures should be looked at, aside from those highlighted in this document? How would you prioritise resolving these issues to best enable the energy transition?	Yes, these are highlighted in sections 9.1 and 9.2 above.
Q33. What are your views on the connection costs electricity distributors charge for accessing their networks? Are connection costs unnecessarily high and not reflective of underlying costs, or not? If they are, why do you think this is occurring?	Electricity distributors have made great improvements in their pricing, including how the costs of connecting to networks are allocated. The Electricity Authority's approach of providing both guidance and transparancy of results has prompted substantial l improvements in network pricing. We do not believe that connection costs on our network are unnecessarily high and are in fact reflective of underlying costs.
Q34. If you think there are issues with the cost of connecting to distribution networks, how can government deliver solutions to these issues?	We are not aware of any significant issues.
Q35. Would applying the pricing principles in Part 6 of the Code to new load connections help with any connection challenges faced by public EV chargers and process heat customers? Are there other approaches that could be better?	No. In our experience, network pricing is generally reflective of underlying costs. Prescriptive, one-size-fits-all approachs to setting prices will lead to inefficient outcomes.
Q38. Should the Electricity Authority look at more prescriptive regulation of electricity distributors' pricing? What key things would need to be looked at and included in more prescriptive pricing regulation?	No. Distributors' results under the Electricity Authority's 'scorecard' regime highlight the benefits of a non-regulatory solution. Distributors have improved pricing markedly while retaining flexibility.
Q40. Will the existing statutory objectives of the Electricity Authority and Commerce Commission adequately support key objectives for the energy transition?	We support changes needed for the Commerce Commission to incentivise cost-effective climate mitigation and adaptation by price-regulated natural monopolies. This may require climate objectives to be

MBIE's question	Our response
	explicitly incorporated into the Commission's objectives under Part 4.
Q41. Should the Electricity Authority and/or the Commerce Commission have explicit objectives relating to emissions reduction targets and plans set out in law? If so, • should those objectives be required to have equal weight to their existing objectives set in law? • Why and how might those objectives affect the regulators' activities?	The Government should direct the Commerce Commission to incentivise price-regulated natural monopolies to undertake cost-effective climate mitigation and adaptation. This does not need equal weight in the Commerce Commission's objective as this is in line with producing outcomes consistent with workably competitive markets. This could be consistent in form with section 54Q of the Commerce Act, which requires the Commission to promote incentives for energy efficiency. We also discuss this in section 8.2.

10. Appendix D: Responses to the Interim Hydrogen Roadmap paper

The following table sets out our responses to MBIE's Interim Hydrogen Roadmap paper.

Our responses

MBIE's question	Our response
Are there other issues we should be considering in our assessment of the strategic landscape for hydrogen in New Zealand?	No
Do you agree with our assessment of the most viable use cases of hydrogen in New Zealand's energy transition?	Yes. However, we would like to see greater emphasis and understanding of the role that hydrogen hubs can play in kickstarting a hydrogen industry. This is a feature of hydrogen development pathways in other countries that has not featured in the government work programme to any meaningful extent to date. We also note that if biomethane is usually supplying ~100% of customers' demand in a network area, and fossil gases have ceased production or are in very short supply, blending hydrogen into the network could provide a valuable balancing service. This situation is unlikely to arise prior to 2040.
Do you support some of these uses more than others?	No
What other factors should we be considering when assessing the right roles for hydrogen in New Zealand's energy transition?	No other factors
Do you agree with this assessment of the potential for hydrogen supply and demand in New Zealand?	Yes
Do you agree with the key factors we have set out that are likely to determine how hydrogen deployment could play out?	We agree with the named factors, but would add one more to the list. The viability of underground hydrogen storage is a critical inflection point for the entire energy sector and especially for hydrogen's prospects. We discuss this further in sections 4.4 and 6.4.
What do you think needs to happen to address these factors?	In sections 6.1-6.3, we set out why hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry.
Do you have any evidence to help us build a clearer picture?	We have provided new evidence around the indicative costs of new hydrogen pipelines in the North Island and options for derisking such an investment. There is a potential benefit if investments in hydrogen transmission pipelines, offshore wind and electricity transmission assets can be cooptimised. This is set out in section 6.5.
Do you agree with our findings on the potential for hydrogen to contribute to New Zealand's emissions reduction, energy security and resilience and economic outcomes?	Yes

MBIE's question	Our response
Do you have any insights we should consider on what is needed to make hydrogen commercially viable?	In sections 6.1-6.3, we set out why hydrogen hubs are a practical policy option for facilitating a durable hydrogen industry.
Is there any further evidence you think we should be considering?	EnergyLink's November 2022 report *Hydrogen Storage as a Dry-year Solution* highlighted the benefits underground hydrogen storage could offer the electricity system. It would enable fossil fuel displacement, improve security of supply by providing deep energy storage and incentivise the development of greater levels of intermittent renewables because of the effective price floor caused by flexible electrolyser load.[24]
Do you agree with our policy objectives?	We agree with the stated objectives but would add one more. The policy objectives should encompass innovation and learning benefits. Earlier adoption of hydrogen technology will flush out issues with regulatory systems and develop market mechanisms. Having a hydrogen hub would provide a testbed for innovation, research and development.
Do you agree with our positioning on hydrogen's renewable electricity impacts and export sector?	Yes
Do you agree with the proposed actions and considerations we have made under each focus area?	Yes. In particular, we see the regulatory workstream as critically important. We recommend MBIE should continue its regulatory work programmes that enable renewable gases. The existing work programme has important enabling benefits for development of a hydrogen economy.
Is there any evidence we should be considering to better target actions in the final Hydrogen Roadmap?	No other evidence

[24] The full report and our summary findings are available from https://firstgas.co.nz/independent-report-finds-hydrogen-storage-best-solution-to-support-a-fully-renewable-electricity-system/

11. Appendix E: Comments on the Enabling Offshore Renewables paper

11.1. We are supportive of the need to develop an enabling regulatory framework for offshore renewables

We support the need to develop a regulatory framework to enable development of offshore renewable projects. Given the country's electrification needs, we think it will be highly valuable for large-scale offshore wind development to commence in the 2030s. That requires work on an enabling regulatory framework to start now, to provide the confidence needed to retain investor interest.

We have not formed strong views about the policy options for giving effect to the needed regulatory framework. We expect that prospective developers with overseas experience will have valuable insight for MBIE.

11.2. We believe that consumers' future needs are being under-signalled

We believe existing market mechanisms are not adequate to signal in advance the need for sufficiently more electricity generation. Market forces were sufficient to provoke adequate generation investment in the 2000s. Since 2008, electricity demand has been steady rather than growing. During this period, the market has retired fossil-fuelled baseload thermal generation and added some new renewable generation capacity. Broadly, the market has a solid record for delivering *just enough generation* over the last 25 years.

However, the next 25 years will be highly unlike the previous 25 years. Demand for electricity is expected to grow at much faster rates provided it can be supplied at a reasonable cost. The generation market would need to deliver new capacity to meet this demand in a power system with growing intermittancy and falling dispatchability. Offshore wind is not the very cheapest technology, but it can provide large-scale renewable generation.

The market hasn't needed to be responsive to such long-terms needs, so hasn't required mechanisms to send price signals that consider very long time horizons. The strongest price signals from the spot market tend to be short-term only. Long-dated futures trading and a growing interest in power purcahse agreements (PPAs) have helped to better signal price expectations, but still fall short of the longer timeframes that offshore wind developers are seeking.

Offshore wind investment in Aotearoa is not low risk. Accordingly, an investor willing to take on that risk will be looking for a higher yield than nearer term options. This will tend to delay such projects relative to a de-risked project.

The United Kingdom's auction-based approach to deploying offshore wind has been very successful. Even recent auctions failing to attract bids were a reflection of an adaptive mechanism that doesn't just plough on ahead building more offshore wind, despite supply chains having pushed up costs significantly. The auction process attracts competition and the strike price is set as the higher of the accepted bids in an auction process. The Crown doesn't need to commit any capital. But because of the Crown's involvement, the developer is able to access lower-cost-capital and further derisk the operation.

We recommend that Government design an auction-based procurement for offshore wind and schedule it for the late 2020s for construction beginning in the early 2030s.

12. Appendix F: Comments on the Fossil-fuel Baseload Ban paper

We do not oppose the ban.

We agree there is a vanishingly small chance of fossil-fuelled baseload making a comeback. As such, we suspect the efforts of policy-makers could have been better directed elsewhere (such as making progress on the Electricity (Hazards from Trees) Regulations 2003, reviewing Part 4 of the Commerce Act, or enabling Carbon Capture Use and Storage). It is not clear whether the ban is worth the remaining time from policy-makers and Parliament.