Biogas upgrade Facility

First Renewables®

APGA Presentation
October 2025

Part of Clarus

NZ Electrical Targets

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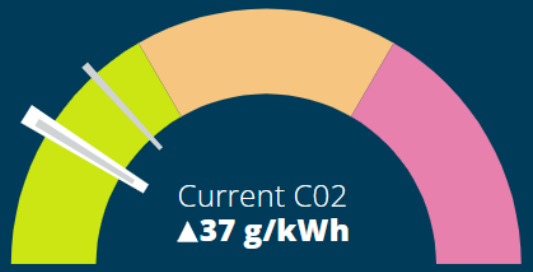
Carbon Emissions (g/kWh)
Last updated 20:00 NZST 26/09/2025



2025 Average	September Average
101 g/kWh	68 g/kWh

Renewable Energy Generation
95%

New Zealand within reach of a 100% green power generation

88% OF NEW ZEALAND'S ELECTRICITY WAS RENEWABLE IN 2023 BUT ELECTRICITY MADE UP JUST 26% OF THE COUNTRY'S TOTAL ENERGY CONSUMPTION.

NZ's Energy System

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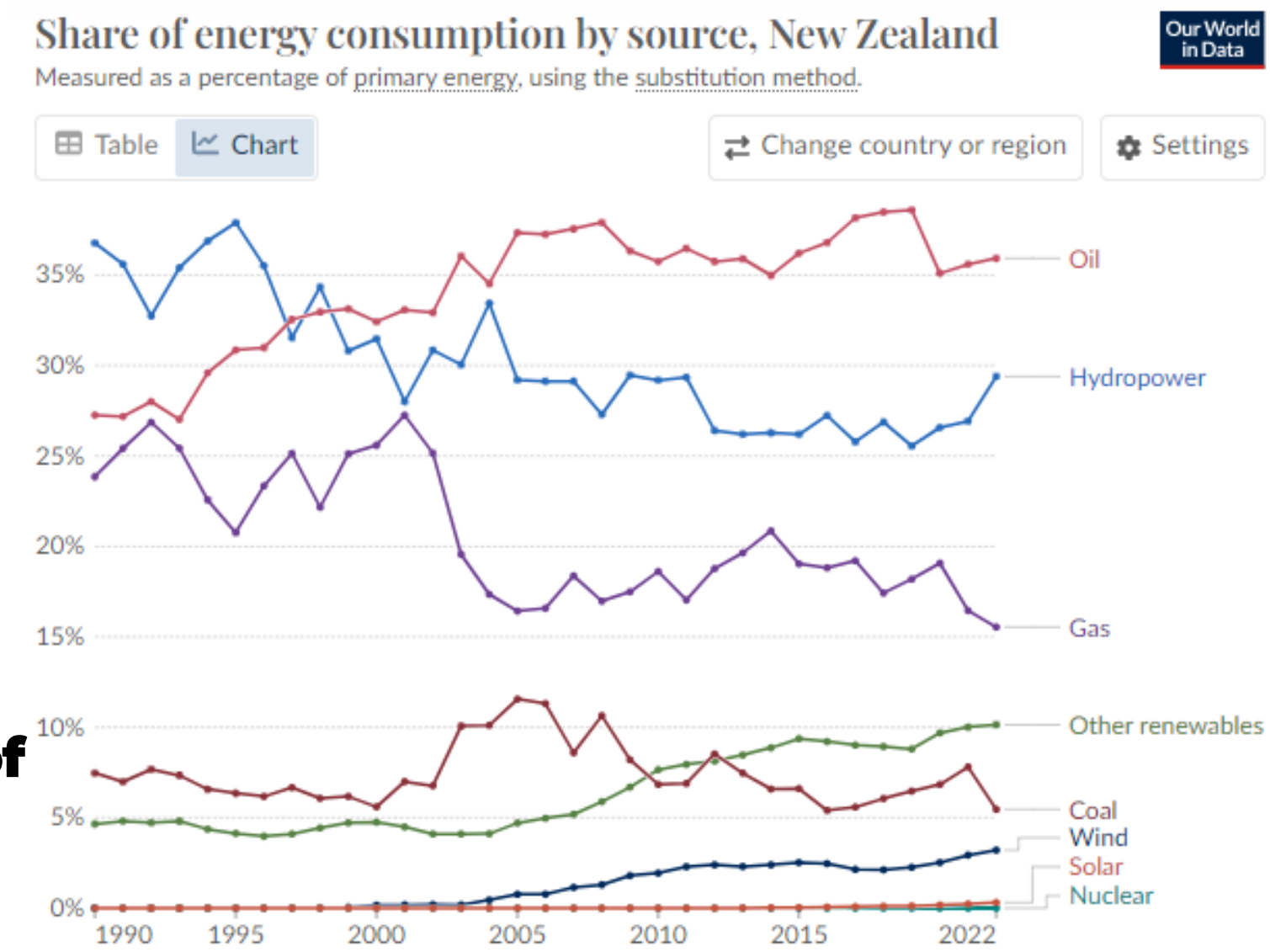
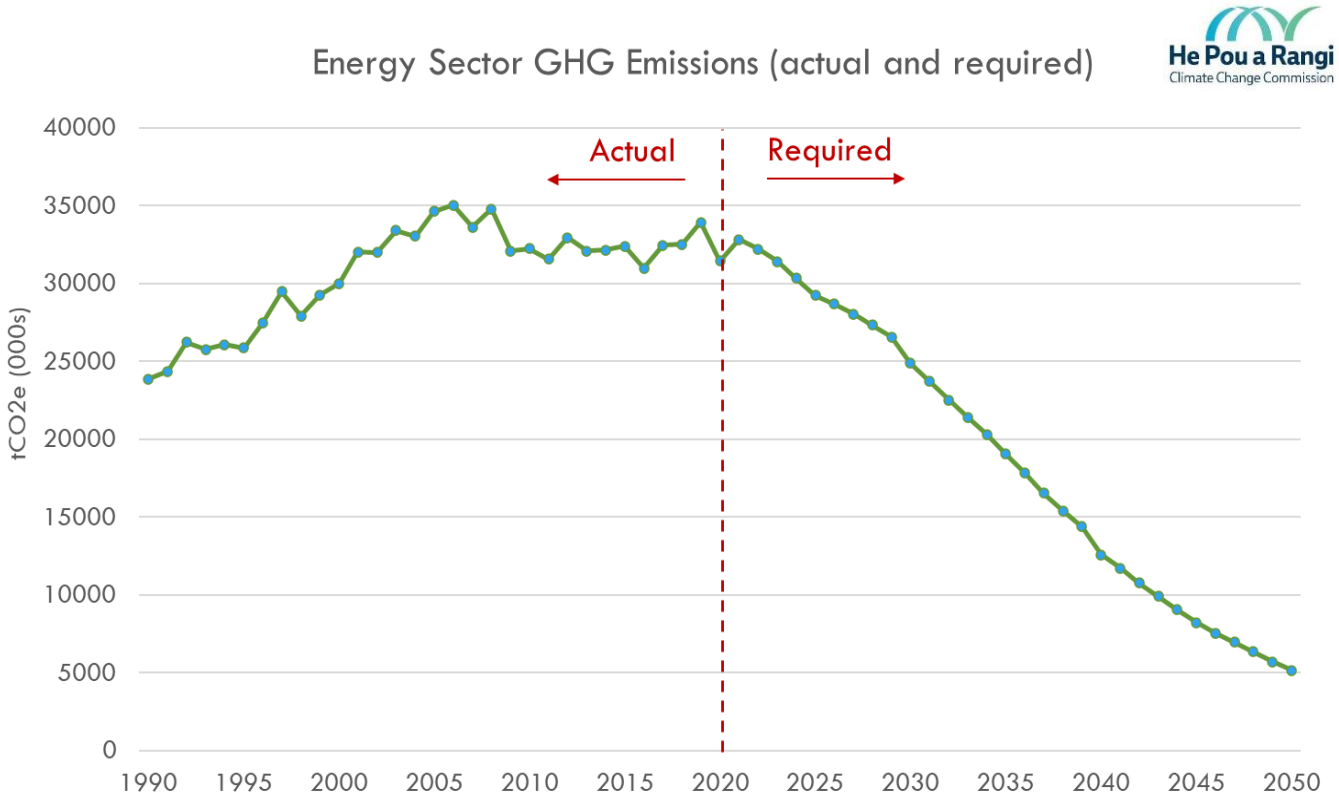
- **3 of the top 5 (>50%) energy sources are fossil fuels**
- **Gas supplies ~15% of the energy market**
- **NZ Gas reserves are running out quicker then anticipacted.**
- **Gas is still a critical part of the NZ electrical grid**



.... Will need to look different in the future

- **Change is clearly needed to achieve net zero by 2050**
- **This will involve some mix of:**
  - **Reducing demand**
  - **Switching fuels**
  - **Decarbonising networks**
  - **Increasing renewables**
- **Utilising networks we have that are a reliable and safe way to transport energy**



Clarus Group of Companies

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Clarus

Firstgas	Firstgas owns and operates New Zealand's gas transmission network (over 2,500km of pipelines) and over 4,900km of natural gas distribution networks across the North Island
rockgas	Rockgas is New Zealand's largest LPG retailer serving over 142,000 customers from 10 branches and a network of 25 franchises throughout the country
Flexgas	Flexgas owns and operates the Ahuroa gas storage facility located in Taranaki, New Zealand's only natural gas storage facility
Firstlightnetwork	Firstlight Network owns and operates the electricity distribution network in the Gisborne and Wairoa regions of New Zealand
First Renewables	First Renewables is developing renewable gas and other sustainable energy opportunities. We are providing biogas upgrading and injection for Ecogas and have entered a joint venture with Harmony Energy to develop and own Tauhei Solar Farm

How Renewable Gas is made

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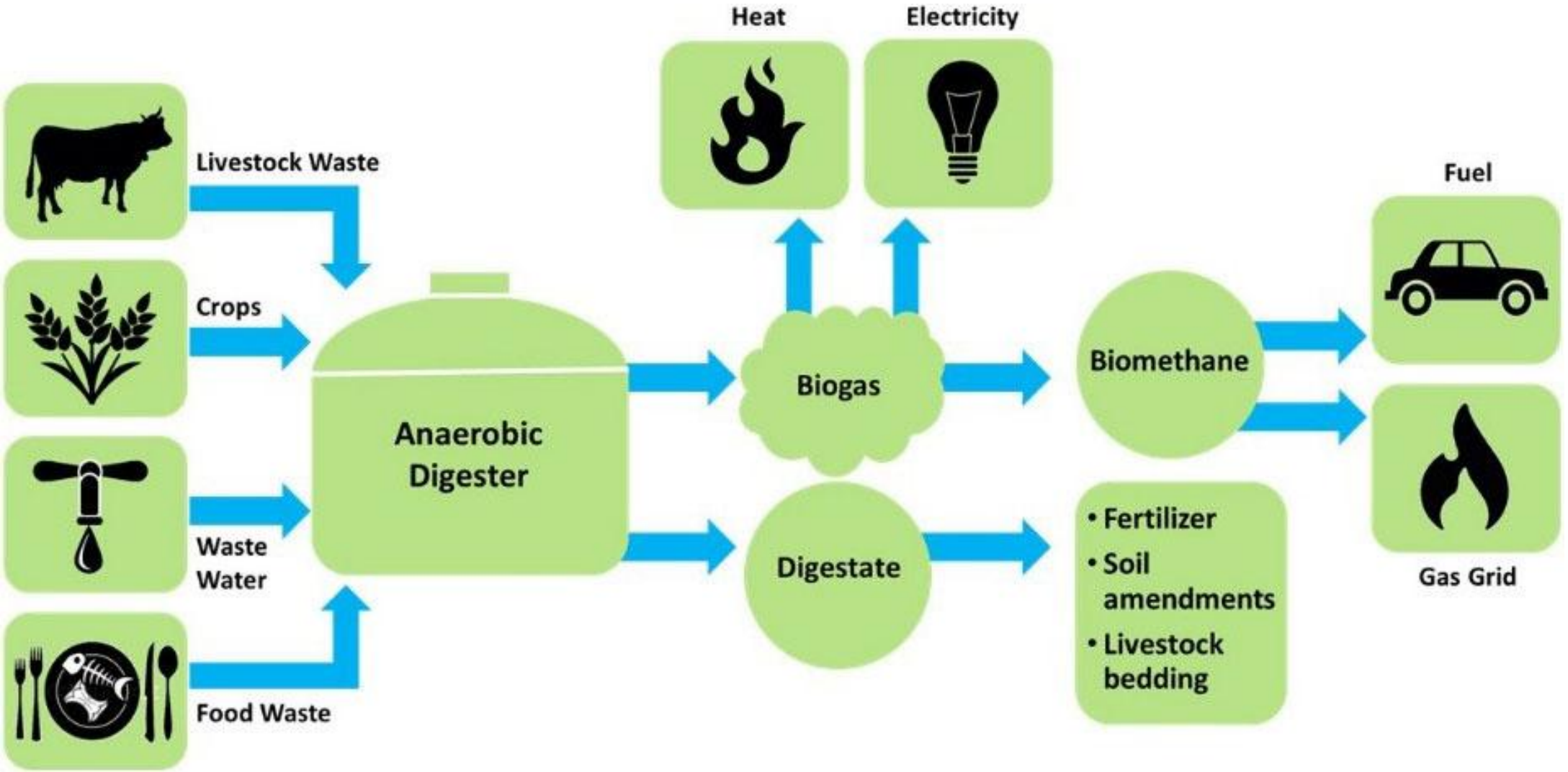
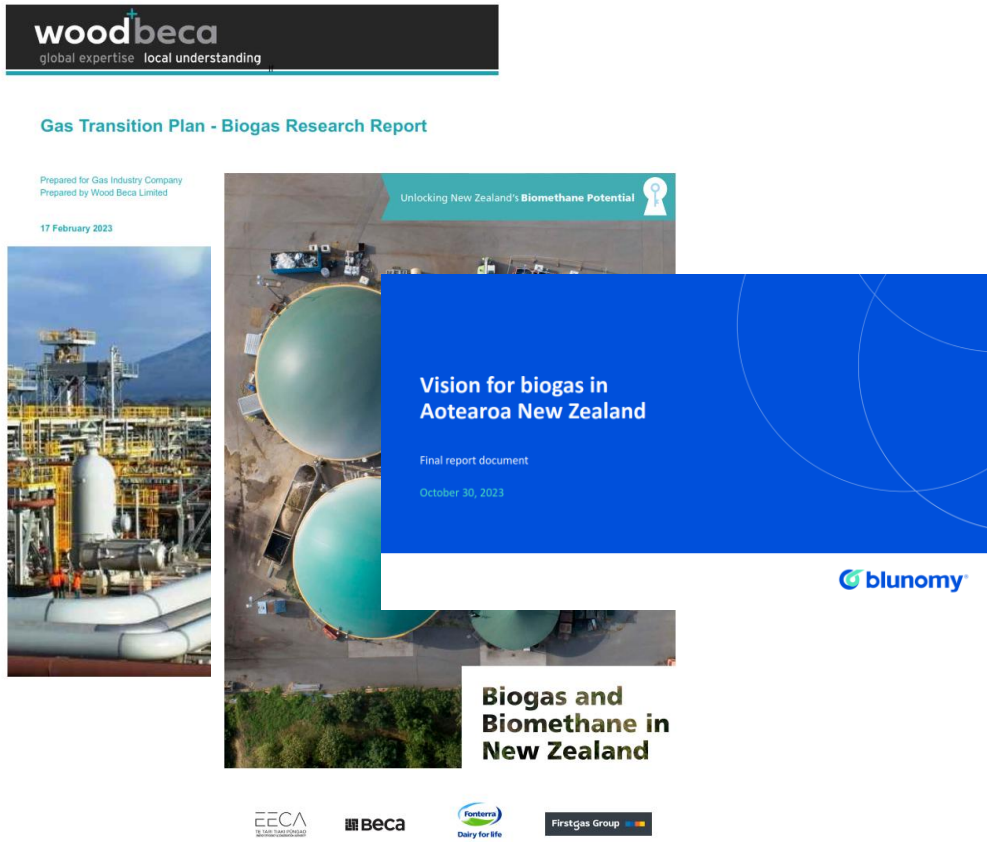
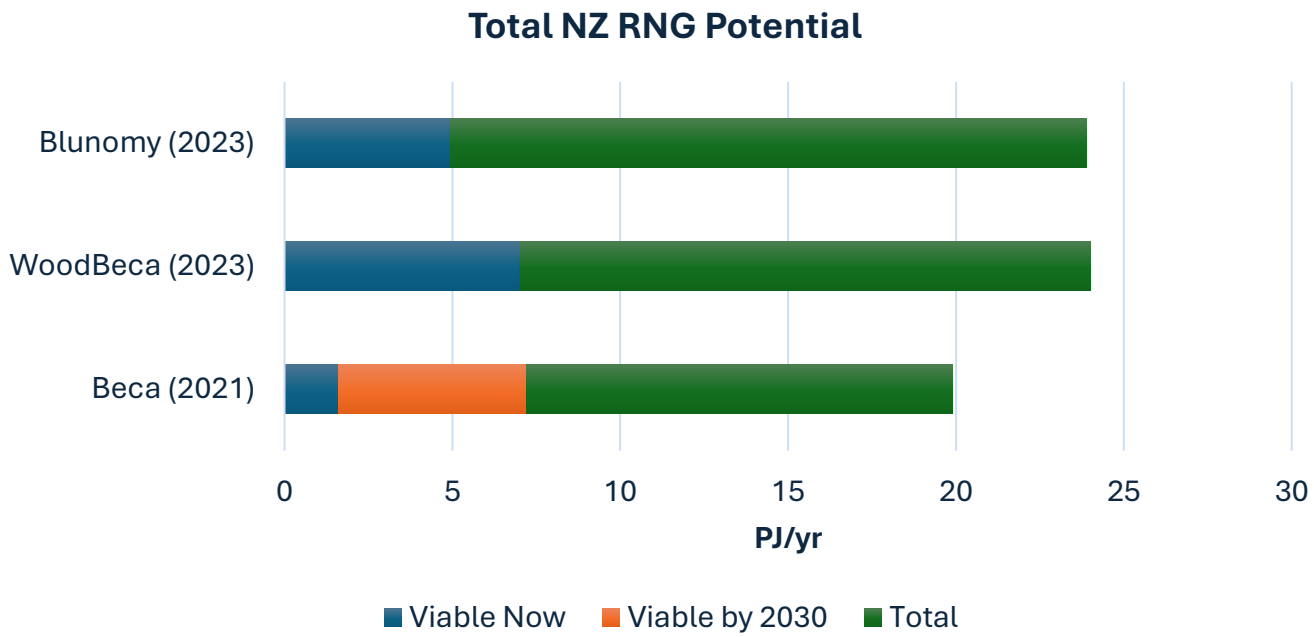


Biogas Potential in NZ





The Ecogas Opportunity

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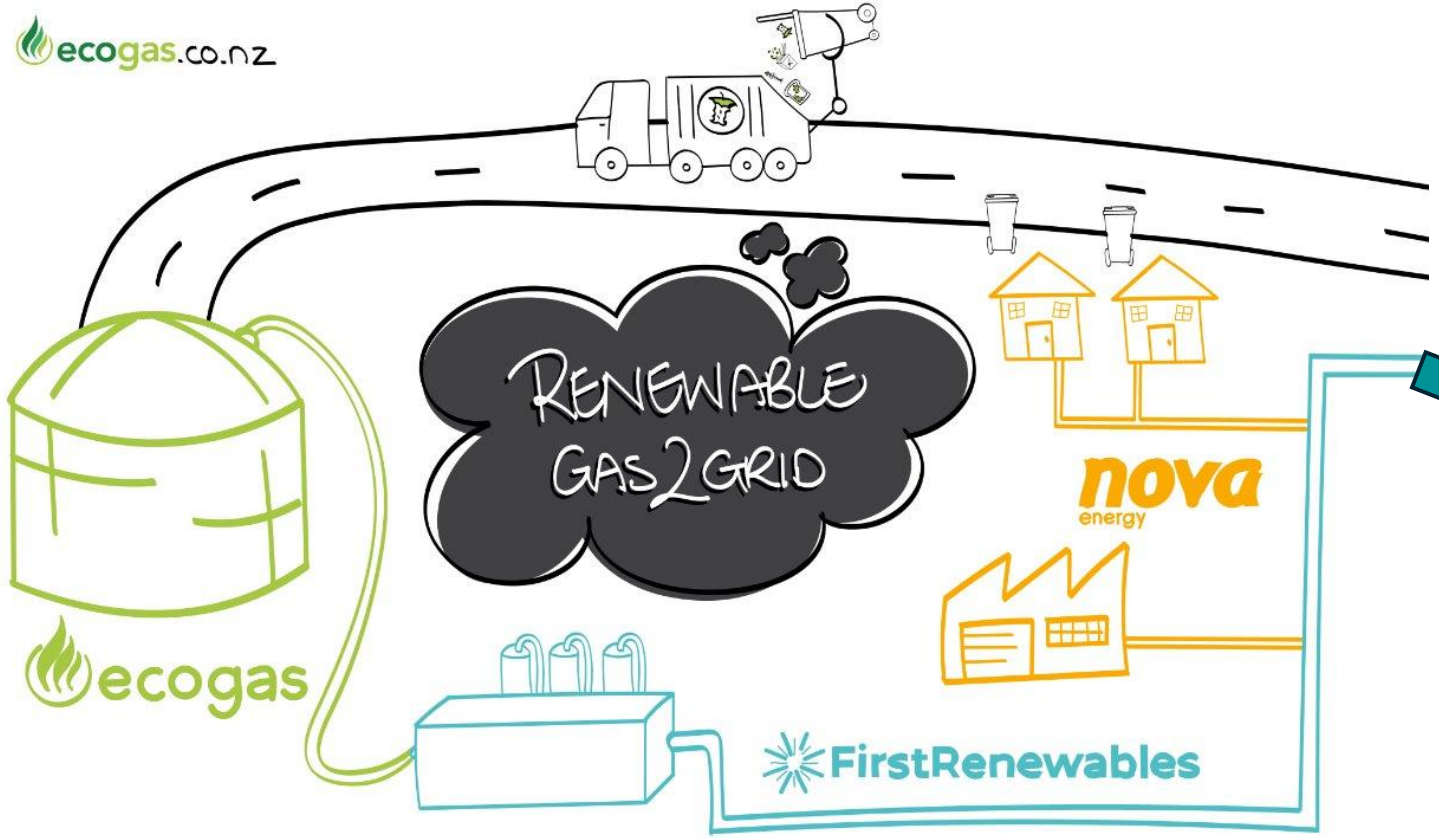

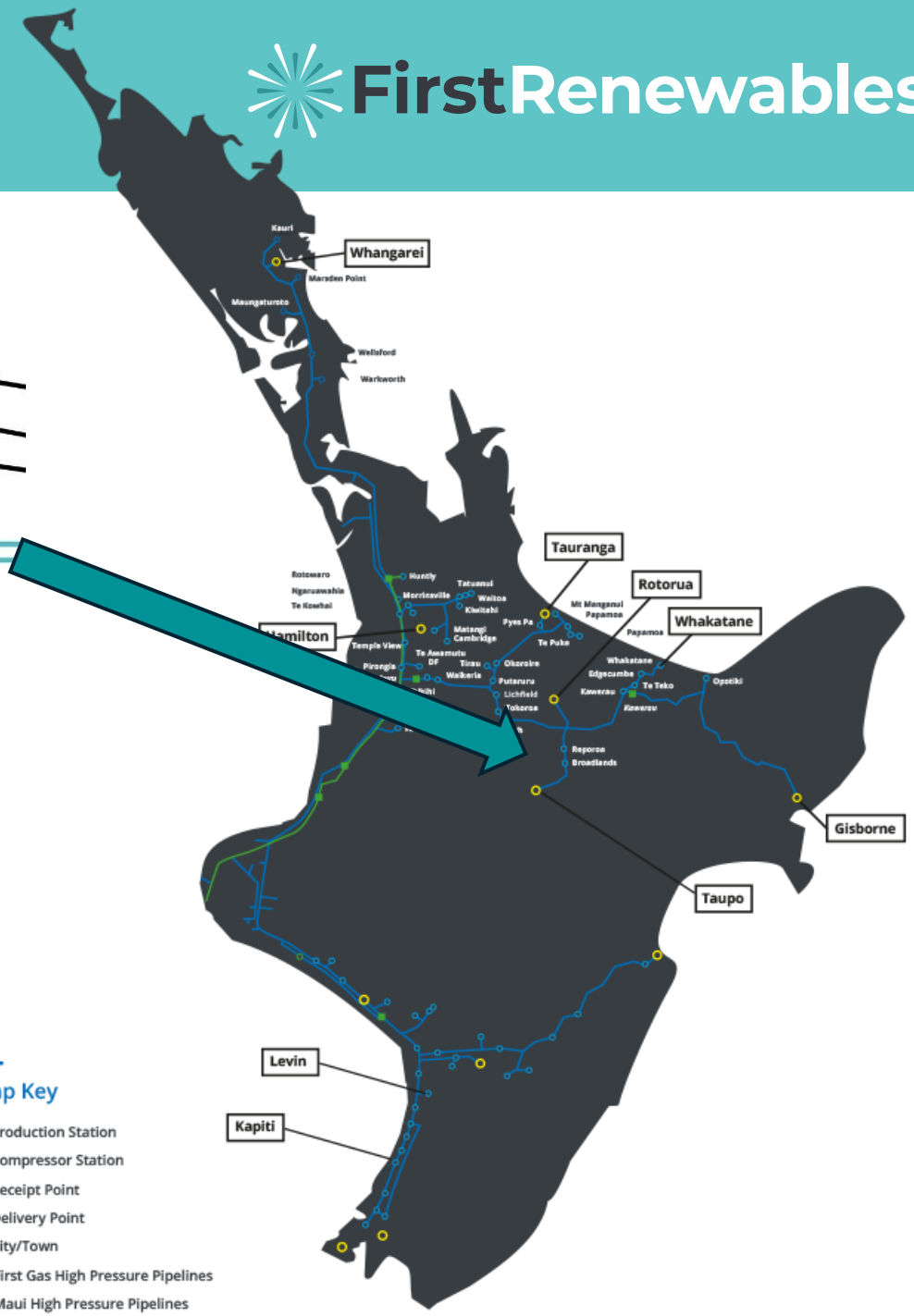

The Ecogas Opportunity

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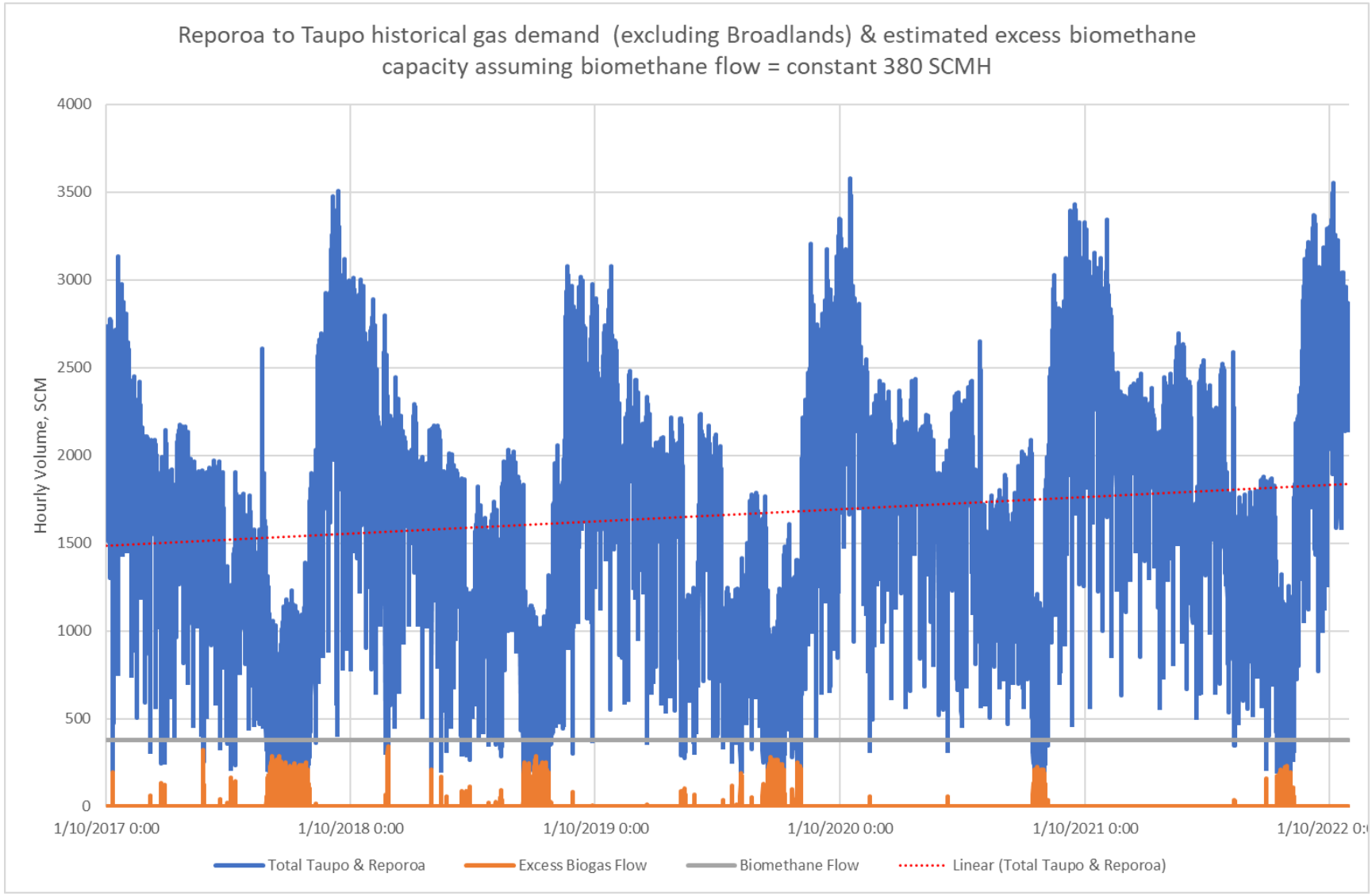
The Goldilocks Zone

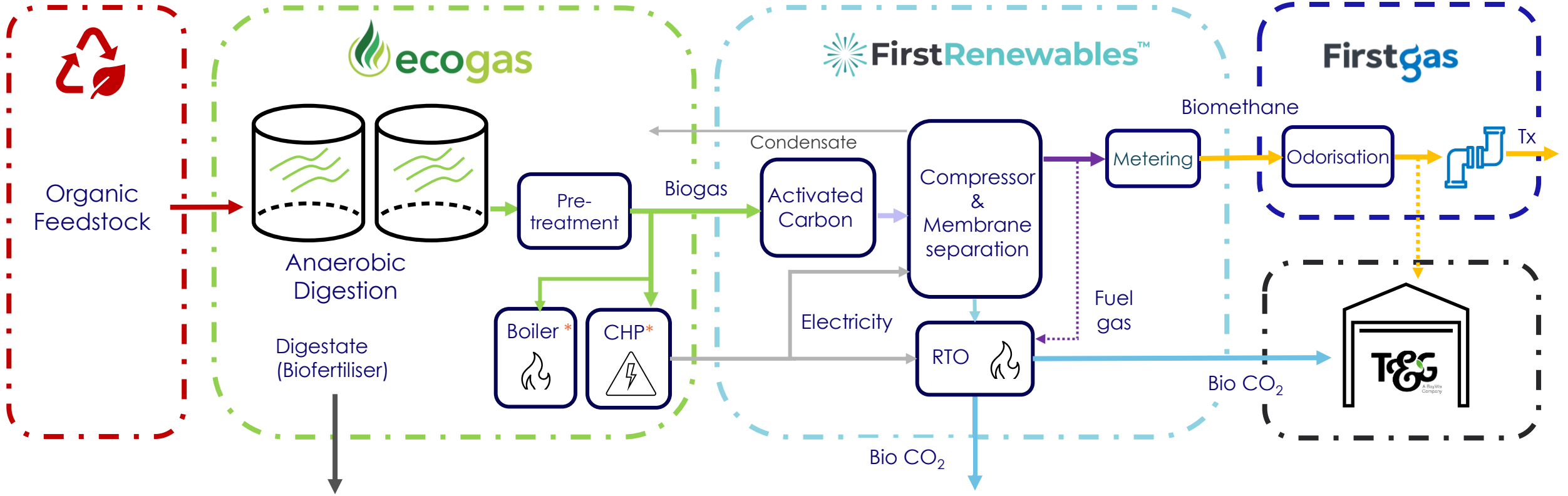


Historical gas flows on Taupo Lateral – Blue

Biomethane production between greg lines

Orange showing times where supply might exceed demand – dealt with by allowing the Tx line to float between 10-16barg utilising ~5000smc of line pack.

Simplified Process Diagram



Facilitating change

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Changes to NZS5442 were needed to facilitate putting biomethane into the pipeline network

Characteristics and components	Limit
Wobbe Index	Minimum.....46.0 MJ/m³ Maximum.....52.0 MJ/m³
Relative density	Maximum.....0.80
Oxygen – for gas to be transported through medium and low pressure systems only – in all other cases	Maximum.....1.0 mol% Maximum.....0.1 mol%
Hydrogen	Maximum.....0.1 mol%
Hydrogen sulphide	Maximum.....5 mg/m³
Total sulphur (as S)	Maximum.....50 mg/m³
Water	Maximum.....100 mg/m³
Total halogens (as Cl)	Maximum.....25 mg/m³
Hydrocarbon dewpoint temperature	Maximum.....2 °C at 5 MPa
Temperature	Minimum.....2 °C Maximum.....40 °C

NOTE –

(1) Standard conditions apply for the measurement of all gas properties listed in this table except hydrocarbon dewpoint temperature.

(2) The limit for total sulphur applies after odorant addition.

(3) The Wobbe Index and relative density limits in this specification imply a calorific value range of 35.2 MJ/m³ – 46.5 MJ/m³.

(4) The total halogen test is required only for non petroleum-based gases.

(5) Suitable test methods are given in Appendix B.

Characteristics and components	Limit	
Wobbe index	Minimum Maximum	46.0 MJ/m³ 52.0 MJ/m³
Relative density	Maximum	0.80
Oxygen For network pressures ≤ 38 barg For network pressures > 38 barg	 Maximum Maximum	 1.0 mol % 0.1 mol %
Hydrogen	Maximum	0.1 mol %
Hydrogen sulphide	Maximum	5 mg/m³
Total sulphur (as S)	Maximum	50 mg/m³
Water	Maximum	65 mg/m³
Hydrocarbon dew point temperature	Maximum	2°C at 5 MPa
Temperature	Minimum Maximum	2°C 40°C

NOTE –

(1) Standard conditions apply for the measurement of all gas properties listed in thi dew point temperature.

(2) The limit for total sulphur applies after odorant addition.

(3) The Wobbe index and relative density limits in this specification imply a calorific – 46.5 MJ/m³.

(4) Suitable test methods are given in Appendix C.

(5) Oxygen concentrations may be acceptable at up to 1% for pressures above 38 ba risk review by the network owner, considering the extent of the network affe ongoing monitoring systems to measure free water in the network affected.

Updated section

Updated section

New biomethane contaminant requirements

Appendix B - Biomethane
(Normative)

B1 General
Table B1 shows the maximum limit values of contaminants that apply to the biomethane at the point of injection.

Table B1.1 - Additional specification limits for non - petroleum - based gases (biomethane)

Contaminant	*Gas Quality Limit*	*Initial Sample Test Frequency and method*	*Target Sample Test Frequency and method*
Ammonia	*10mg/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*
Heavy Metals: *Mercury* *Arsenic*	 *0.001mg/m3* *0.05mg/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*
Volatile Organic Compounds (VOC): *Toluene* *Xylene*	 *188 mg/m3* *217 mg/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*
Semi Volatile Organic Compounds (SVOC): *Limonene*	 *100mg/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*
Halocarbons *Fluorine* *Chlorine*	 *5mg/m3* *1.5mg/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*
Siloxanes	*0.23mg Si/m3*	*Note 1 Batch testing*	*Note 2 Batch testing*

Economics

Biogas projects can work because of the multiple revenue streams:

- **Gate fees from waste – instead of paying to landfill, waste producers pay to divert.**
- **Sale of biomethane to the gas grid or industry**
- **Sale of digestate fertiliser**
- **Sale of captured CO_2**

And in some cases, heat or power from residual biogas.

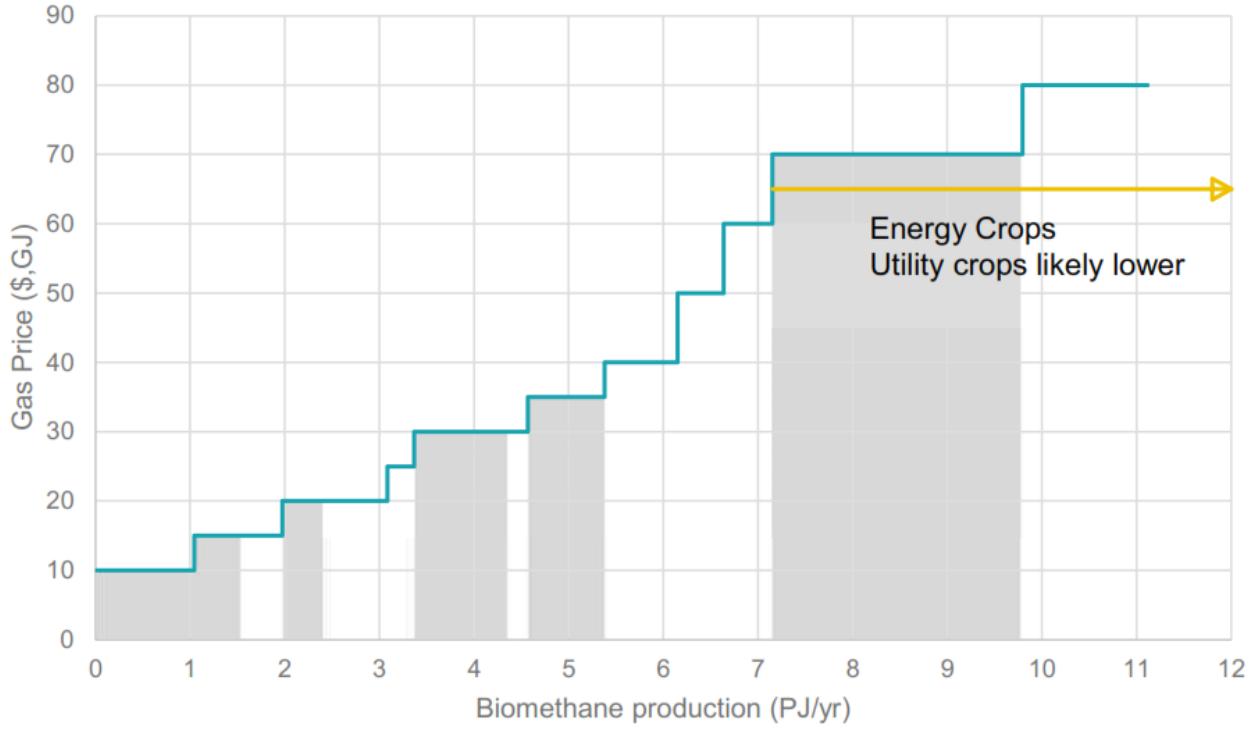


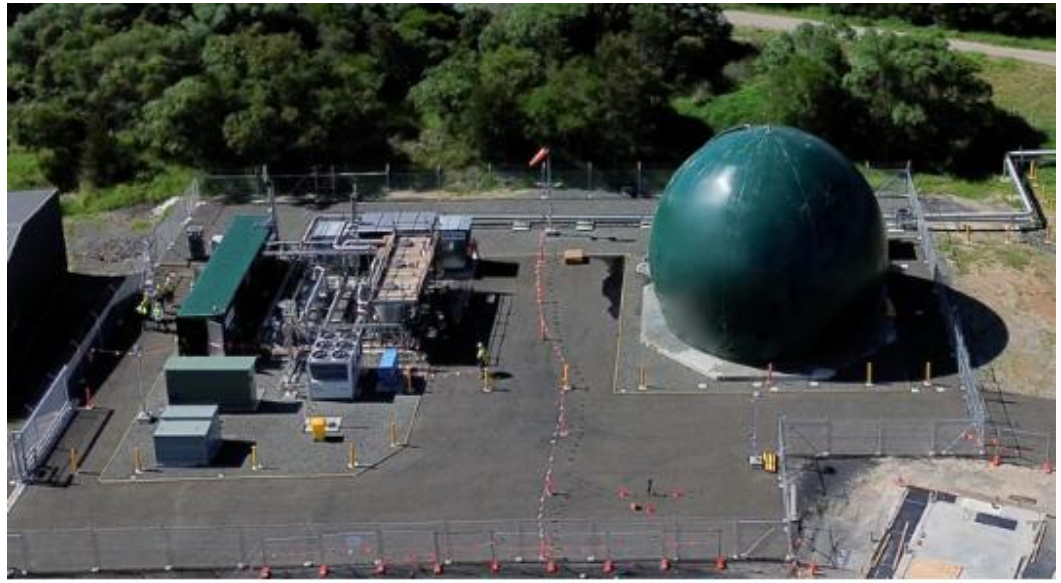
Figure 9-2: Price Stack for Biomethane (grey columns indicated the quantities based on the case studies)

Australian opportunity

frontier economics

Blue Gum Renewable Gas Project – Business Case

A report for Jemena Gas Networks | June 2024



- **Biomethane production for $15-23 / GJ**
- **Benefit Cost Ratio of 1.5**
- **Energy security**
- **Starts to decarbonise an industry and gives existing assets life**
- **Commissioned project**

Denmark: Proof of what can be achieved

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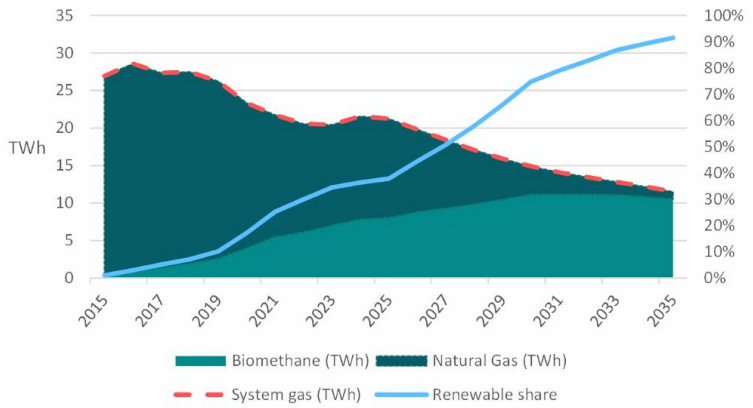
Food & Bio Cluster Denmark

A 100% green gas grid by 2027?

Decline in use of gas, increase in biomethane production

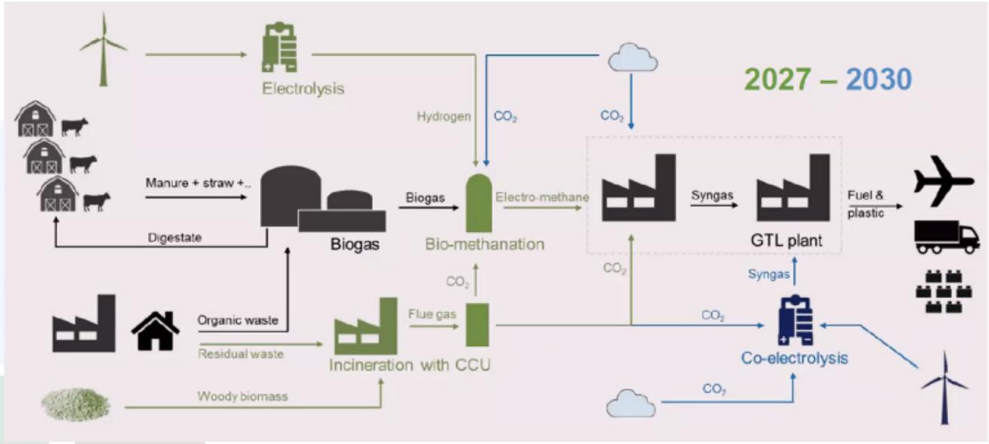


Source: Danish Energy Agency

Food & Bio Cluster Denmark

What does the future hold?

Cross sector synergies: Increased use of CO_2



1. Farm based combined heat and power plant
2. Decentralized combined heat and power biogas plants
3. Large scale biomethane for the grid
4. Large scale co-digestion + methanation ($CO_2 + H_2 = CH_4$)

10.000 tons feedstock/plant/year → 1.000.000 tons

70ties | 80ties | 90ties | 00s | 10s | 20ties | Near future

Renewable Gas – momentum is building

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In March 2024, Powerco announced two projects it is progressing on its network in the Manawatu.

New Christchurch organics plant gets final consent

Tina Law | THE PRESS

August 18, 2025 Comment (1) Share

Ecogas awarded consent and commences construction for new FOGO AD plant in Christchurch

Challenges

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- **Gas quality requirements**
- **Feedstock contamination**
- **Capital investment**
- **Supportive policy**
- **Scale**
- **Certification schemes for products**

New Zealand to fast-track biogas development in the face of a looming gas crunch

New Zealand has embarked on a whole-of-government approach to unlocking the potential of biogas, to both head off a looming gas crunch and meet multiple environmental and economic challenges.

The country has unveiled its biogas action plan ahead of an anticipated gas crunch and in support of its emissions reduction targets and commitment to developing a circular economy.

NEWS | GAS SUPPLY

Govt backs biogas, Watts tells sector

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Thanks and Questions

Part of Clarus