



transitioning to *net zero* carbon

Biomethane Connection Guide



This guide has been prepared to assist owners and/or developers of biomethane production facilities to connect to the firmus energy gas distribution network.





About firmus energy

firmus energy was established in March 2005 when it was awarded a licence to develop the natural gas distribution network in ten key towns and cities across Northern Ireland. Our network now extends to 35 cities, towns and villages across Northern Ireland. We have already invested over £200 million in developing our network, which now comprises 2,200 km of pipeline. This network currently serves 70,000 customers, consuming over 65 million therms per annum.

firmus energy is committed to a net zero carbon future and our ambitions are underpinned by the development of biomethane production in Northern Ireland.

Biomethane Production and Injection into the Distribution Network

Production

- 🌀 Biomethane is created from the upgrading of biogas which has been produced using the anaerobic digestion process.
- 🌀 The input or 'feedstock' can be any organic material such as food waste, farm and livestock waste.
- 🌀 Following cleaning and upgrading of the biogas the resultant biomethane may need to be enriched (with propane or bio propane) to increase the energy content to a suitable level, as measured by the calorific value (CV). The biomethane producer is responsible for ensuring that the gas meets the appropriate gas quality requirements, as set out in the Network Connection Agreement (NCA) and Network Entry Agreement (NEA).
See Appendix 1 for further details regarding gas entry conditions.
- 🌀 Biomethane is now ready to be injected to the grid.

Injection

- 🌀 The biomethane is then injected into the firmus energy network via a **Biomethane Network Entry Facility (BNEF)**.
- 🌀 The BNEF is where the gas will be metered, quality monitored and injected with odorant to give the characteristic 'gas' smell.

Delivery

- 🌀 Once this is complete the gas can be injected into the distribution network for transportation along the delivery pipeline.
- 🌀 In order for a producer to inject gas into the gas network they will require a contract with a gas supplier. The gas supplier must have a licence to supply gas within the firmus energy distribution network area, have acceded to the distribution network code and completed the appropriate market assurance processes.

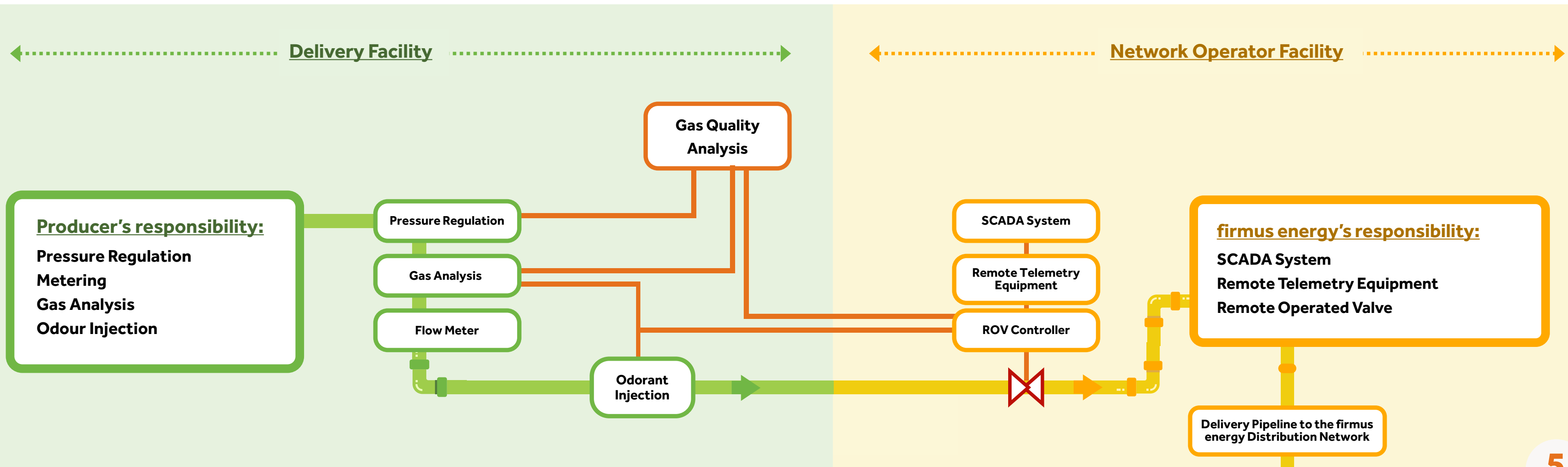
Biomethane Network Entry Facilities (BNEFs)

The BNEF or grid entry unit is the interface between the producer's site and firmus energy's distribution network. The specification for the BNEF is set out in the BIO/2 document available on request from firmus energy.



The responsibility for operation & maintenance of the facility by the producer/site owner & firmus energy is demarked by separate compartments within the unit. The producer will be responsible for building the BNEF to the required specification (BIO/2). Firmus energy will then adopt (transfer ownership from the producer to firmus energy) the Network Operator Facility (as set out in the diagram below).

The producer must ensure that the site and the BNEF can be accessed by firmus energy and our contractor on a 24/7/365 basis.



The Biomethane Injection Process – Contractual & Commercial Arrangements - Overview

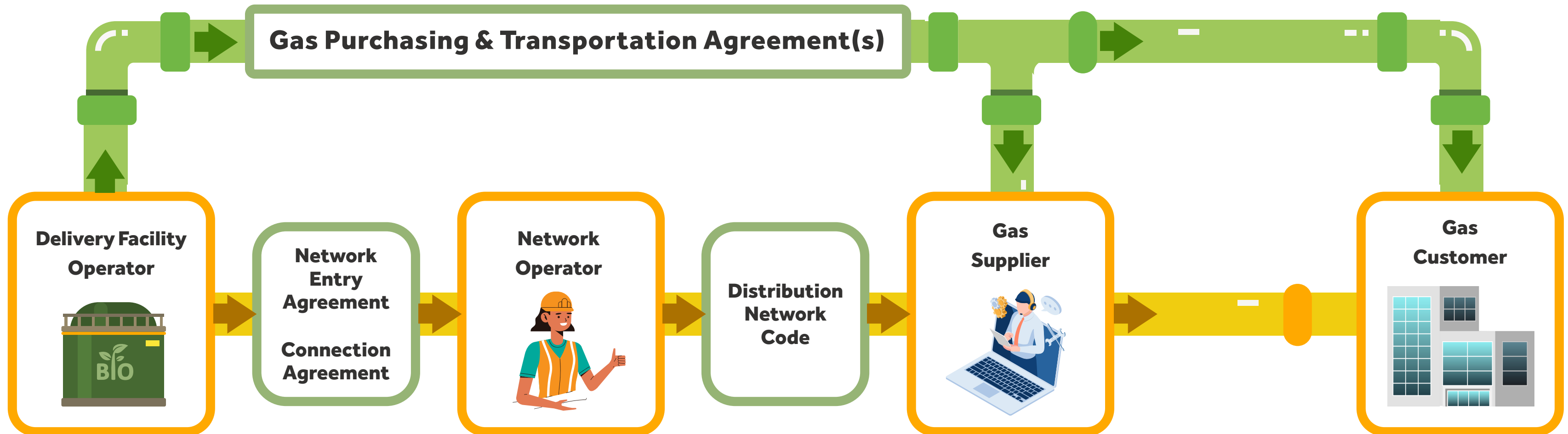
To connect with the firmus energy distribution network the producer will be required to have the necessary commercial and contractual arrangements, the diagram below illustrates the arrangements and parties involved.

The biomethane producer must have entered into a Network Connection and Network Entry agreement with firmus energy (yellow pipe in diagram below).

They will also require a contract with a gas supplier before biomethane is injected into the gas network (green pipe in diagram below).

Biomethane is injected into firmus energy's network via a Biomethane Network Entry Facility (BNEF).

Once these stages have been completed, the gas can be injected into the distribution network for transportation along the delivery pipeline.



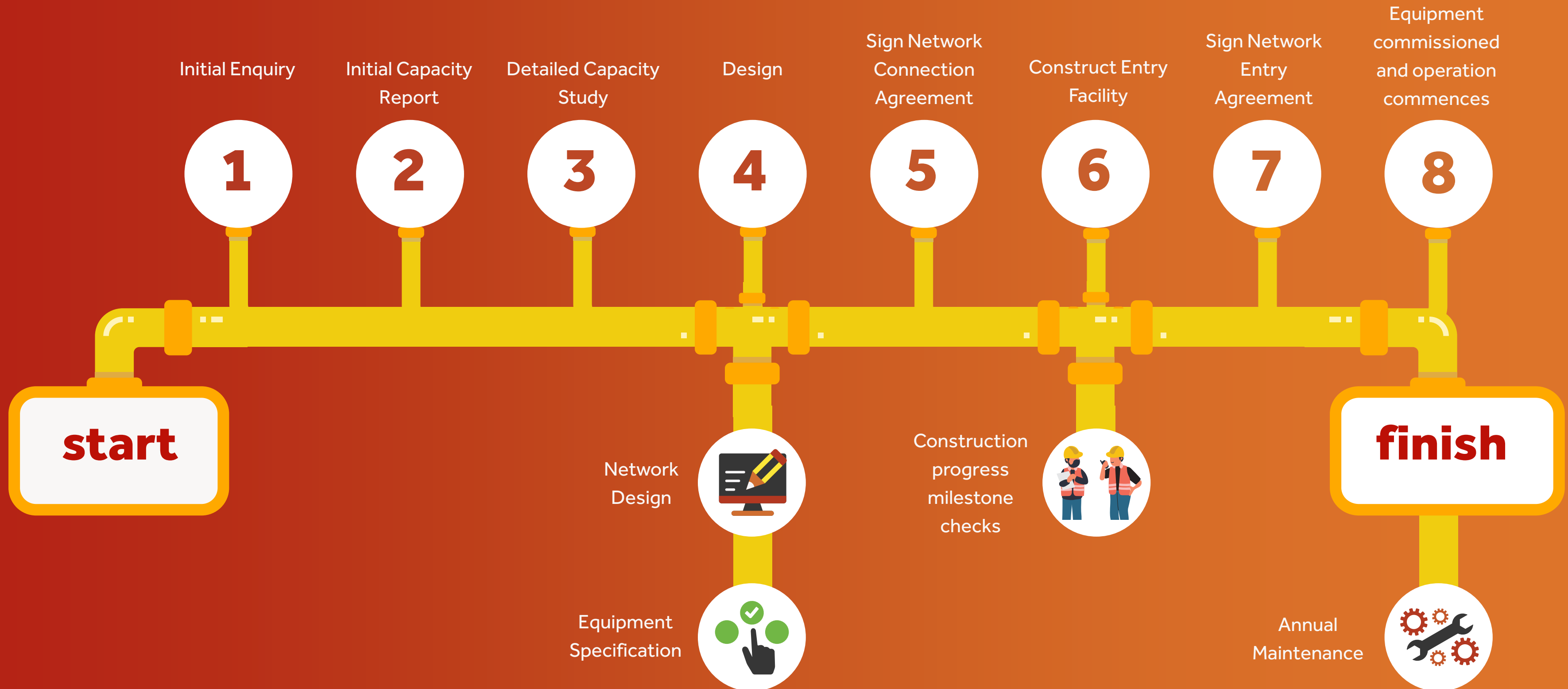
The Biomethane Injection Process – Who is involved

Role	Description
Producers/ Delivery Facility Operator (DFO)	Responsible for producing the biomethane gas. The gas produced must meet the quality requirements set out in the Gas Safety (Management) Regulations (Northern Ireland) - GS(M)R (NI) 1997. These standards are specified in the network entry and connection agreements. The biomethane producer must secure the conveyance of their biomethane with a gas supplier before it can be injected into the network.
Gas distribution network operator (firmus energy , Phoenix Energy & Evolve)	Owns and operates the distribution pipeline network, using the infrastructure to transport the gas from biomethane producer to end consumer.
Gas transmission network operators (GNI UK & Mutual Energy)	Owns and operates the high-pressure transmission network in Northern Ireland, taking gas from entry points such as interconnectors and transporting it to network offtakes, including the distribution network areas in Northern Ireland.
Gas Network Operator (GMO NI)	Operates the gas transmission market for Northern Ireland, managing the commercial rules and all trading and transactional aspects of the gas transmission market in Northern Ireland on behalf of the transmission system operators.
Gas Suppliers	Responsible for the commercial arrangements for the conveyance of gas through the distribution networks in Northern Ireland. They are also responsible for customer interaction and providing an interface for consumers to purchase their gas. The biomethane producer must secure the conveyance of their biomethane with a gas supplier before it can be injected into the network. Suppliers must have a licence for the supply of gas in Northern Ireland, granted by the Utility Regulator before engaging in any consumer contracts. A list of licensed gas suppliers is available on the Utility Regulator Northern Ireland website: https://www.uregni.gov.uk/gas-licences

Role	Description
Utility Regulator for Northern Ireland	Responsible for approving the charges for use of the gas network in Northern Ireland. They issue network operator and supplier licences to the relevant market participants as well as ensuring customer interests are protected through licence obligation adherence and by approving regulated policies.
Customers/Gas Consumer	Purchase gas for end use, including for commercial and transportation purposes.



The Connection Process - Overview



The Connection Process - Steps 1-4

1

INITIAL ENQUIRY

To begin the process the biomethane producer should register their interest and complete a biomethane entry enquiry form.

This document will contain details such as:

- Contact details
- Site location
- AD Plant feedstock
- Expected gas volumes
- Estimated gas on date

2

INITIAL CAPACITY REVIEW

Following an initial enquiry, we will discuss the project and determine whether the connection is possible. The producer will receive an initial capacity report which will include:

- The location and pressure of the main in relation to the site
- The suitability of the main to accept the volume of distributed gas.
- A high-level estimation of costs (indicative capital and operational costs)

If the initial capacity report indicates the project is feasible and the producer wishes to proceed, the next step will be to carry out a detailed capacity study

3

DETAILED CAPACITY STUDY

Following instruction from the producer to progress the enquiry, a more detailed analysis will be completed. This will provide the producer with an in-depth network analysis detailing any constraints that might apply alongside more detailed costings.

The detailed capacity study is chargeable.

The cost is typically £2,500; however, the final cost will be confirmed prior to commencing any work.

4

DESIGN

Following receipt of the detailed capacity study and subsequent confirmation that the producer wishes to progress the project, our engineers will work up a detailed design for the delivery pipeline, outlining the route this will take and highlighting requirements to lay through private land or known difficult crossing obstacles such as rivers & bridges. The design phase will also consider the location of the BNEF.

This design will provide equipment specifications and detailed costings.

It will be the responsibility of the producer to secure any easements required for the pipeline.

The Connection Process - Steps 5-8

5

NETWORK CONNECTION AGREEMENT

The signing of the Network Connection Agreement by the producer and firmus energy initiates the formal start date of capacity reservation, enabling the producer to commence the construction stage.

This document sets out the obligations for the producer and firmus energy for the installation, validation and commissioning of the BNEF before biomethane can be injected into the gas distribution network.

This agreement will reserve capacity for 24 months, subject to progress milestones being achieved.

6

CONSTRUCT ENTRY FACILITY

Once the Network Connection Agreement has been signed, the producer should commence construction work on the BNEF. Firmus energy will agree a number of milestones along this journey which will need to be achieved to ensure the facility is completed and the 24 month capacity reservation period is retained.

firmus energy will engage regularly with the producer to monitor and support progress toward the milestones.

7

NETWORK ENTRY AGREEMENT

The Network Entry Agreement must be signed a minimum of 30 days prior to the commencement of biomethane being injected to the grid.

This contract will detail the conditions regarding biomethane injection.

8

EQUIPMENT COMMISSIONED AND OPERATIONS COMMENCED

Following completion of all construction and final inspections injection of biomethane into the firmus energy network can commence.

Overview of Costs to Connect to the Network

Once an enquiry is received, an initial capacity review will give an outline of indicative costs. These costs will be further refined once the detailed capacity study has been completed.

Type	Category	What does this include?
Upfront Costs	Detailed Capacity Study	Assessment of the proposed biomethane injection on current network loads, pressures, network parameters and relevant flows from other known or imminent biomethane injection sites.
Capital Costs	Delivery Pipeline	Site specific design and construction of the connection pipeline
Capital Costs	Network Connection Charge	<p>This one-off charge covers, ongoing support services supporting:</p> <ul style="list-style-type: none"> • Network related requirements regarding the design, development and installation of the BNEF • associated workshops (Gas quality / HAZOP) • Factory and Site Acceptance Tests • work execution / project management (e.g. weekly co-ordination meetings). • Procurement of site telemetry / communications equipment and installation of SCADA into the Gas Control Centre. • Fully commissioning the BNEF's connection to the distribution network.
Operational Costs	Operational, Maintenance and Emergency Charge	<p>This annual charge covers:</p> <ul style="list-style-type: none"> • 24-7/365 management and monitoring of SCADA. • Daily reporting, including any associated alarm activation (flow, out of specification gas / pressure control / high or low calorific value). • 24-7/365 emergency response to the Network Operator Facility (containing the remotely operated valve and associated telemetry). • Annual maintenance of the remotely operated valve.
Equipment Replacement Costs	Replacement of Site Monitoring Equipment	This charge covers the replacement of the site's monitoring equipment every 7-10 years.



For more information please contact:



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Appendix 1 – Gas Entry Conditions (extract from Network Entry Agreement)

1 GAS ENTRY CONDITIONS

- 1.1** The Gas Safety (Management) Regulations (Northern Ireland) 1997, specifically Schedule 3 shall apply to these Gas Entry Conditions in relation to the System Entry Point.
- 1.2** The gas will comply with the System’s statutory safety requirements, failing which the Network Operator shall be entitled to isolate the System Entry Point from the System.
- 1.3** Gas delivered to the System at the System Entry Point shall not contain any solid, liquid or gaseous material which would interfere with the integrity or operation of the System or any pipeline connected to such System or any appliance which a consumer might reasonably be expected to have connected to the System. In addition, all gas delivered to the System at the System Entry Points shall be in accordance with the following values:-

- | | |
|---|---|
| (a) Hydrogen Sulphide | less than or equal to 5 mg/CM. |
| (b) Total Sulphur | less than or equal to 50 mg/CM. |
| (c) Hydrogen Content | less than or equal to 0.1% (molar). |
| (d) Oxygen Content | less than or equal to 1% (molar) (subject always to HSENI consent), this may be modified by individual project exemption as agreed with HSENI |
| (e) Hydrocarbon Dewpoint | not more than minus two degrees Celsius (-2°C) at any pressure up to the delivery pressure provided in paragraph (o). |
| (f) Water Content | The Water Dewpoint to be no more than minus ten degrees Celsius (-10°C) at [insert pressure] |
| (g) Wobbe Number | shall be between 47.20 MJ/CM, and 51.41 MJ/CM. |
| (h) Incomplete Combustion Factor (ICF) | less than or equal to 0.48 (currently subject to an exemption granted by HSENI) |
| (i) Soot Index (SI) | less than or equal to 0.60 (currently subject to an exemption granted by HSENI) |
| (j) Odour | gas delivered to the System shall be odourised with odorant NB (80% tertiarybutyl mercaptan, 20% dimethyl sulphide), and the odorant injection rate will be 7 mg/scm and may be varied at the Network Operator’s written request between 4 mg/scm and 8mg/scm |
| (k) Carbon Dioxide | less than or equal to 2.5% (molar). |

Appendix 2 – Gas Entry Conditions (extract from Network Entry Agreement)

(m) Gross Calorific Value shall:-

be within the Acceptable CV Tolerance;

For the purpose of this paragraph (m) the Acceptable CV Tolerance shall be:

(i) a default value of plus or minus (0.5) MJ/CM around the Target CV;

(ii) where necessary revised and notified to the DFO by the Operator [no later than D-1]; and

(iii) in any event, no lower than 36.9MJ/CM nor higher than 42.4 MJ/CM.

For the purposes of this paragraph (m), the Target CV shall mean the calorific value of gas (the calculation of which shall be determined by the Network Operator) which the Network Operator reasonably estimates it will be accepting for delivery into the Network from the System Entry Point on the relevant Day; as from time to time notified by the Network Operator to the DFO as set out below, it being acknowledged that the Network Operator shall not have any liability whatsoever to the DFO, the Delivery Facility owners or any other person should its estimates above prove to be incorrect.

The Network Operator shall inform the DFO not later than the last Business Day of each calendar month of the Target CV that the DFO must achieve during each Gas Day in the following month unless otherwise requested at shorter notice by the Network Operator in accordance with the remainder of this paragraph (m).

In the event that the Network Operator does not inform the DFO of a Target CV on the last Working Day of the prevailing calendar month then the Target CV for that prevailing month shall be deemed to apply to the subsequent calendar month.

If the Network Operator or the DFO wishes to change the Target CV in respect of the Gas Day D between 18:00 on D-1 Gas Day and 04:00 hours on Gas Day D then it shall be by agreement by both Parties. If the DFO believes that it cannot meet the Target CV (whether before or during the Gas Day) it shall inform the Network Operator immediately.

(n) Delivery Temperature shall be between zero and twenty degrees Celsius (0°C and 20°C).

(o) Pressure shall be that required to deliver gas into the System taking account of the back pressure as the same shall vary from time to time. The delivery pressure shall be not less than [insert pressure and value references].

Incomplete combustion factor (ICF) and Soot Index (SI) have meanings as defined in Part 1 of schedule 3 of the Gas Safety (Management) Regulations (Northern Ireland) 1997.

Appendix 3 – Gas Entry Conditions (extract from Network Entry Agreement)

1.4 In order to meet the calibration ranges for typical analysis equipment, unless agreed otherwise by the Parties (such agreement not to be unreasonably withheld or delayed), the concentration ranges of the following components in the gas delivered shall be as follows:-

Component	% (molar)	
	Low	High
Nitrogen	0.00	10.00
Carbon Dioxide	0.00	2.50
Methane	78.00	100.00
Ethane	0.00	18.00
Propane	0.00	7.00
i-Butane	0.00	1.00
n-Butane	0.00	1.00
Neo-Pentane	0.00	0.35
i-Pentane	0.00	0.35
n-Pentane	0.00	0.35
2 Methyl-Pentane	0.35	0.35
N-Hexane	0.00	0.35

1.5 The Parties acknowledge that the Network Operator will require the approval of the Health and Safety Executive for Northern Ireland (HSENI) prior to being able to agree to any change to the concentration ranges referred to above, and the Network Operator will act reasonably in seeking approval from HSENI in an expedient manner, but the Network Operator confirms that it will not otherwise unreasonably withhold or delay its agreement to any such change.

Appendix 4 – Gas Entry Conditions (extract from Network Entry Agreement)

1.6 Biogas contains compounds not found in Gas. In addition, biogas has a higher level of Oxygen than the limit prescribed by the Gas Safety (Management) Regulations (Northern Ireland) 1997 (GSMR) which requires an exemption from the HSENI in order to be injected into the System (see paragraph 1.3 (d) above). The limits for these additional compounds are contained in the table below:

- (a) Siloxanes** less than or equal to 0.5 mg/CM.
- (b) Volatile Organic Compounds** less than or equal to 30 mg/CM.