Gas Networks Ireland

RENEWABLE GAS

Biomethane

Biomethane direct connection to the distribution network

Customer technical information booklet

1. Ireland's gas network

Gas Networks Ireland operates and maintains Ireland's €3 billion, 14,725 km national gas network, which is considered one of the safest and most modern renewables-ready gas networks in the world. Almost 725,000 Irish homes and businesses trust Ireland's gas network to provide efficient and reliable energy to meet their heating, cooking, manufacturing and transport needs. The gas network is the cornerstone of Ireland's energy system, securely supplying more than 30% of Ireland's total energy and over 40% of the country's electricity generation.

2. Customer technical information

This customer technical guide covers early-stage information that should be useful for a delivery facility operator (DFO) to ensure that their facility integrates with Gas Networks Ireland's biomethane network entry facility (BNEF). Some of the technical information and requirements of the BNEF are provided in this guide to support the DFO with the preliminary design of its facility and the planning process.

Key design parameters such as flow rates, pressures and temperatures and other requirements such as access and parking requirements are identified in this document and should be allowed for by the DFO. The intention of this guide is to provide support for early-stage planning and/or design work.

Definitions and abbreviations are provided at the end of this document. Gas Networks Ireland reserves the right to amend any aspect of the BNEF customer technical guidance document.

Please note: A separate customer connection guide addresses the more specific process of renewable gas connection contracting.

3. Biomethane network entry facility

Connections of existing and new DFO facilities located on or close to the distribution (Dx) gas network can be facilitated through a Dx direct connection BNEF. This facility is the connection and entry point between the DFO and the gas network. Gas Networks Ireland will design, build, own and operate the BNEF.

Contained within the BNEF, is a range of instruments and equipment which verify that the biomethane is compliant with all required standards and regulations before it enters the gas network. It contains automated valves to stop the flow of gas to the grid and return it to the DFO if out of specification gas is detected. Additionally, for safety a distinctive odour is added to the gas. A summary of the assets within the BNEF is shown in Figure 1, which also shows the interface points with the DFO.

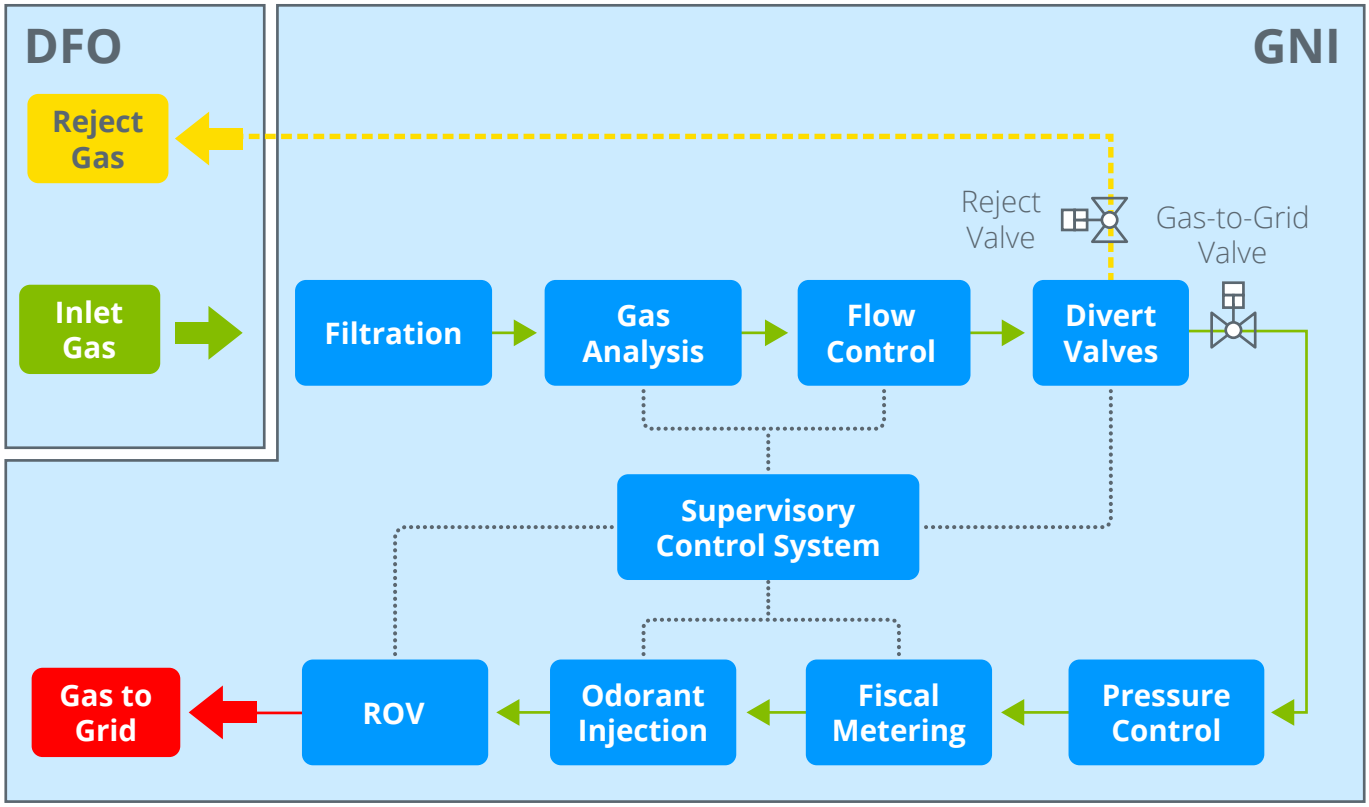

Figure 1. BNEF Assets and DFO interface

Gas Networks Ireland's BNEF site will consist of a single building the BNEF within a secure fence line. Relevant planning information such as building sizes can be found in Appendix 1 – Drawings.

The operation of the anaerobic digestor (AD) plant and the upgrading facility will be managed by the DFO, and as such the following items are outside the scope of the BNEF and this guide:

- Biogas production.
- Biogas upgrading.
- Biomethane compression.
- Propane (LPG) injection related to control of calorific value (CV).

Unless otherwise agreed the demarcation and separation between assets owned by Gas Networks Ireland and the DFO are as Figure 1.

4. Connection costs and contributions

For renewable gas connections, whether they are connected to the transmission or distribution network, the customer contribution in relation to a connection includes two components:

- A standard 30% contribution.
- A supplemental "economic test" contribution.

The economic appraisal will consider the projected revenues recovered over 10 years, together with the forecast of capital costs (excluding the 30% mandatory contribution) and any ongoing operational costs, in order to ascertain whether a project returns a positive or negative net present value (NPV) in aggregate.

The details of this are further summarized in the customer connection booklet and your Gas Networks Ireland sales team representative will provide the details as part of the connection contracting process.

5. Standard design requirements for connection

Standard design requirements have been developed to permit safe, efficient, and fit-for purpose grid injection of quality compliant biomethane into the gas network.

This technical guide sets out some of the high-level network specifications for a BNEF connection to the distribution network (direct connection). Any party seeking to inject biomethane into Gas Networks Ireland's gas distribution system from their delivery facility must comply with these requirements. Please note this guidance is intended to provide only preliminary design guidance to inform early-stage project planning. Should a project progress to a connection agreement then further details as part of a detailed design process will be developed.

5.1. Flow capacities of standard designs

Standard designs have been developed for BNEFs with small, medium and large flow capacities. These three designs are expected to cover the majority of DFO facilities. Apart from the maximum flowrate all other design criteria, as listed in Table 1, are the same for the three capacities.

Table 1. BNEF design criteria

Parameter	BNEF connection design value
Inlet design pressure	16 barg
Outlet design pressure	4 barg
Inlet operating pressure	5.5 – 12 barg
Outlet operating pressure	2 – 4 barg
Minimum flowrate	0 scmh
Inlet operating temperature	5 – 20 °C
Outlet operating temperature	0 – 20 °C
Design flowrates	Small: 800 SCMH. Medium: 2,000 SCMH. Large: 3,400 SCMH.
Gas entry to BNEF Kiosk	Biomethane enters the injection site through below ground pipework from the DFO installation.

Note: Future capacity expansion of the DFO facility may require the development of an additional BNEF on site.

6. Delivery Facility Operator (DFO) responsibilities

6.1. Provision of suitable gas

The design of the DFO facility should include measures to confirm that biomethane supplied to the BNEF is within specification. The DFO is responsible for providing gas in line with Table 2 and the BNEF will be the primary verification method.

Table 2. Gas Quality Requirements

Parameter	Units	Limit value	Notes
Hydrogen sulphide content	mg/m3	≤5	As per Gas Networks Ireland Code of Operations
Total sulphur content (including H2S)	mg/m3	≤50	As per Gas Networks Ireland Code of Operations
Hydrogen content	% mol/mol	<0.1	As per Gas Networks Ireland Code of Operations
Oxygen content	% mol/mol	≤1.0	As per Gas Networks Ireland Code of Operations
Hydrocarbon dew point	°C	≤-2	As per Gas Networks Ireland Code of Operations (up to 85 barg)
Water (Moisture) content	mg/m3	≤50	As per Gas Networks Ireland Code of Operations
Wobbe index (high limit)	MJ/m3	51.41	As per Gas Networks Ireland Code of Operations
Wobbe index (low limit)	MJ/m3	47.2	As per Gas Networks Ireland Code of Operations 46.5 currently under consideration through Code Mod forum (following changes to GS(M)R).
Incomplete combustion factor	-	<0.48	As per Gas Networks Ireland Code of Operations
Sooting index	-	<0.60	As per Gas Networks Ireland Code of Operations
Gross calorific value (high limit)	MJ/m3	42.3	As per Gas Networks Ireland Code of Operations
Gross calorific value (low limit)	MJ/m3	36.9	As per Gas Networks Ireland Code of Operations
Carbon dioxide content	% mol/mol	<2.5	As per Gas Networks Ireland Code of Operations.
Organo-halides	mg/m3	<1.5	As per Gas Networks Ireland Code of Operations
Radioactivity	Becquerels/g	<5	As per Gas Networks Ireland Code of Operations
Ethane	% mol/mol	<12	As per Gas Networks Ireland Code of Operations
Nitrogen	% mol/mol	≤5	As per Gas Networks Ireland Code of Operations
Relative Density	-	≤0.7	Currently under consideration through Code Mod forum (following changes to GS(M)R).
Total Inerts	% mol/mol	8%	As per Gas Networks Ireland Code of Operations
Contaminants & Odour	-	-	As per Gas Networks Ireland Code of Operations
Siloxanes content (as Si)	mg/m3	0.3	This is the lower limit value of a range of values cited in EN 16723-1.
Ammonia	mg/m3	10	This is the value cited in EN 16723-1.
Amines	mg/m3	10	This is the value cited in EN 16723-1. Compliance is dependent on the type of amine present.
Carbon monoxide	% mol/mol	0.1	This is the value cited in EN 16723-1, which in turn is that required to ensure that conveyed gas does not exceed the limit value in the CLP Regulation (EC) 1272/2008 and hence require place an obligation on gas transporters to produce a safety data sheet on any toxic component that exceeds 0.1 % mol/mol.

Certain contaminants that may be found in biomethane are not amenable to detection using process instrumentation, therefore periodic spot sampling and laborartory analysis are required. Table 3 states whether continuous monitoring, sport sampling or both applies to a gas quality component.

Table 3. Gas Quality Component Monitoring Method

Component	Continuous Monitoring	Spot Sampling
Hydrocarbon Composition C1 to C6+ composition	✓	✓
Oxygen	✓	✓
Carbon Dioxide	✓	✓
Hydrogen Sulphide	✓	✓
Water (Moisture) Content	✓	✓
Gross Calorific Value	✓	✓
Wobbe Index	✓	✓
Incomplete Combustion Factor	✓	✓
Sooting Index	✓	✓
Nitrogen	✓	✓
Relative Density	✓	✓
Total Inerts	✓	✓
Hydrogen		✓
Hydrocarbon Dewpoint		✓
Total Sulphur		✓
Higher Hydrocarbons - including benzene, toluene, xylenes and ethybenzene		✓
VOCs - organohalides, ammonia, amines, hydrogen-chloride, hydrogen-fluoride and siloxanes,		✓
Odour (Injection)	✓	✓

The DFO may be required to participate in a measurement risk assessment (MRA) in accordance with Gas Networks Ireland requirements to determine which parameters must be monitored, the frequency of measurement and the speed of response of the measurement system. Following the MRA, the gas component limit values in Table 2 and 3 may be amended accordingly. A subsequent measurement risk assessment may be required in the event of a significant change in operations including any change in:

- Feedstock to the AD plant.
- The AD process.
- The upgrading process.
- Regulation or Network Code of Operations.

In the event of one or more such changes, the MRA must be reviewed. Where a particular parameter shows increased risk then a change in the monitoring scheme may be appropriate.

6.2. Provision of a suitable site

The preferred BNEF site location shall be agreed with Gas Networks Ireland, and Gas Networks Ireland require ownership of the site and the agreement of various easements such as rights of way from the site to the public road and wayleaves over certain pipelines.

Some sites will include an Environmental Protection Agency (EPA) license activity or may be located adjacent to an EPA licensed site or activity. The EPA license is always a redline delineation similar to that of a planning application red line delineation and it is recommended that the BNEF is located outside of the EPA redline license boundary as this will avoid significant additional EPA license administration for the DFO. Gas Networks Ireland recommends that if this point appears relevant to their site then the proposed AD developer should consult with the EPA on this point.

Additionally, the site shall:

- Have sub soil capable of bearing a pressure of 150kN/m² minimum. Gas Networks Ireland is to be supplied with an appropriate verifying geo-technical report.
- Consist of a flat area sized to accommodate the standard BNEF.
- Be free of buried or above ground services.
- Be located in a safe location with respect to site hazards, including hazardous areas. Consideration shall be given to known hazard distances such as those published in I.S. EN ISO 24252.

6.3. Planning permission

As the BNEF is typically located within the DFOs site boundary, it is expected that the DFO will submit a planning application that includes for development of the BNEF and therefore there will be no direct involvement for Gas Networks Ireland in the planning process.

The majority of information which the DFO needs to include the BNEF in their planning application is included in this guide, any additional details or site-specific requirements can be developed via consultation with the Gas Networks Ireland Customer Connection Sales representative.

The BNEF location and site dimensions as included in the planning application shall be as agreed with Gas Networks Ireland, drawings with the necessary detail for the three flow rate ranges are included in Appendix 1.

If an independent entrance from the public road is required drawings detailing the scale and layout of the proposed entrance (i.e., sightlines) should be submitted.

The specification of noise levels may be required and noise levels from the BNEF will be limited to 50dB(A) at 1m from the enclosure.

Additionally, Gas Networks Ireland will provide the DFO with a preliminary pipe route from the BNEF to the existing gas network. This pipe route shall be considered in the environmental assessments necessary for planning permission for the BNEF e.g. EIAR, AA and screening assessments, but will require separate consent under Section 39A of the Gas Act 1976 (unless exempt), which Gas Networks Ireland will apply for where required. Please note: that Gas Networks Ireland may apply for Section 39A consent for (and ultimately construct) a different pipe route to the preliminary pipe route due to changes as part of detailed design work. Gas Networks Ireland will require access to the various planning and environmental documents as part its detailed design work and to support its statutory Section 39A pipeline consent.

6.4. Civil works

The DFO will be required to complete civil works to support the development of the BNEF site and these are identified below:

- Construction of site entrance, access roadway and parking.
- Site drainage works, including soak pits if required.
- Open cut drains to be installed outside of site boundary as required.
- Installation of boundary fences.
- A duct running from the DFO facility to the BNEF, to facilitate telemetry link between BNEF and biomethane upgrader.
- A duct running from the BNEF to the site boundary to facilitate a broadband connection.
- A duct running from the BNEF to the site boundary to facilitate an electrical connection.

6.5. Communication provision

The DFO shall provide telemetry system signals from the biomethane upgrader. This shall include a suitable communication link from the biomethane upgrader to the BNEF.

6.6. Supply and return pipework

The DFO shall be responsible for design, construction (including testing), commissioning, operation (including emergency plans), maintenance and taking permanently out of service of the supply and return pipework. This pipework shall comply with I.S EN 15001-1, including requirements for materials, design, welding, NDT, pressure testing and corrosion protection. Some additional requirements apply to this pipework within Gas Networks Ireland's fence line and these can be agreed during detailed design. Design parameters for pipework are identified in Table 4.

Table 4. Supply and return pipework design parameters

Component	Design Pressure (Barg)	MOP (barg)	Rating	Design Temp °C	
				Max	Min
Inlet pipework	16	12	PN16	+50	-10
Reject pipework	16	12	PN16	+50	-10

6.7. Lightning protection study and protection measures

The DFO shall carry out a risk assessment in accordance with I.S. EN 62305 to determine what suitable measures shall be taken to protect physical structures and technical equipment against lightning. Where the BNEF is installed within the vicinity of the biomethane production plant, the risk assessment should cover the BNEF and DFO facility, a joint risk assessment can be considered.

6.8. Compliance with applicable standards

- The DFO facility, AD and upgrader facilities, shall be designed, constructed and tested in accordance with I.S. EN ISO 24252 Biogas systems - Non-household and non-gasification (ISO 24252:2021).

The following mandatory requirements are noted:

The requirement to develop an Explosion Protection Document (EPD) as per 7.3, including lightning protection study. Gas Networks Ireland's BNEF shall not be located within a hazardous area.

- Over-pressure protection of pipework as per 8.3. Supply to Gas Networks Ireland's BNEF shall be adequately protected from high pressure.

Additionally, the following recommended measures shall be undertaken:

- HAZOP/HAZID as per 7.2.2. Which shall demonstrate Gas Networks Ireland's BNEF is adequately protected from process risks.
- Application of safety distances as per 8.4. Noting the requirement for calculations for flow rates above 500Nm3/h and specific mandatory distances. Gas Networks Ireland's BNEF shall be located with due consideration to safety distances.

6.9. Additional DFO responsibilities

Additional requirements will be agreed as part of the detailed design process. They will include items such as the development of:

- Local operating procedures for site access arrangements.
- The Connection Systems Agreement (CSA).

7. Summary

This Customer Technical Guide covers early-stage information that should be useful for the DFO to ensure that their facility integrates with Gas Networks Ireland's BNEF. Given that the developer will progress planning permission applications before the design of the BNEF progresses, the high-level information here is given to try to ensure that there are no material issues during the design phase of the connection. If there is any additional information needed, please direct your queries to a Gas Networks Ireland sales representative.

Gas Networks Ireland

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