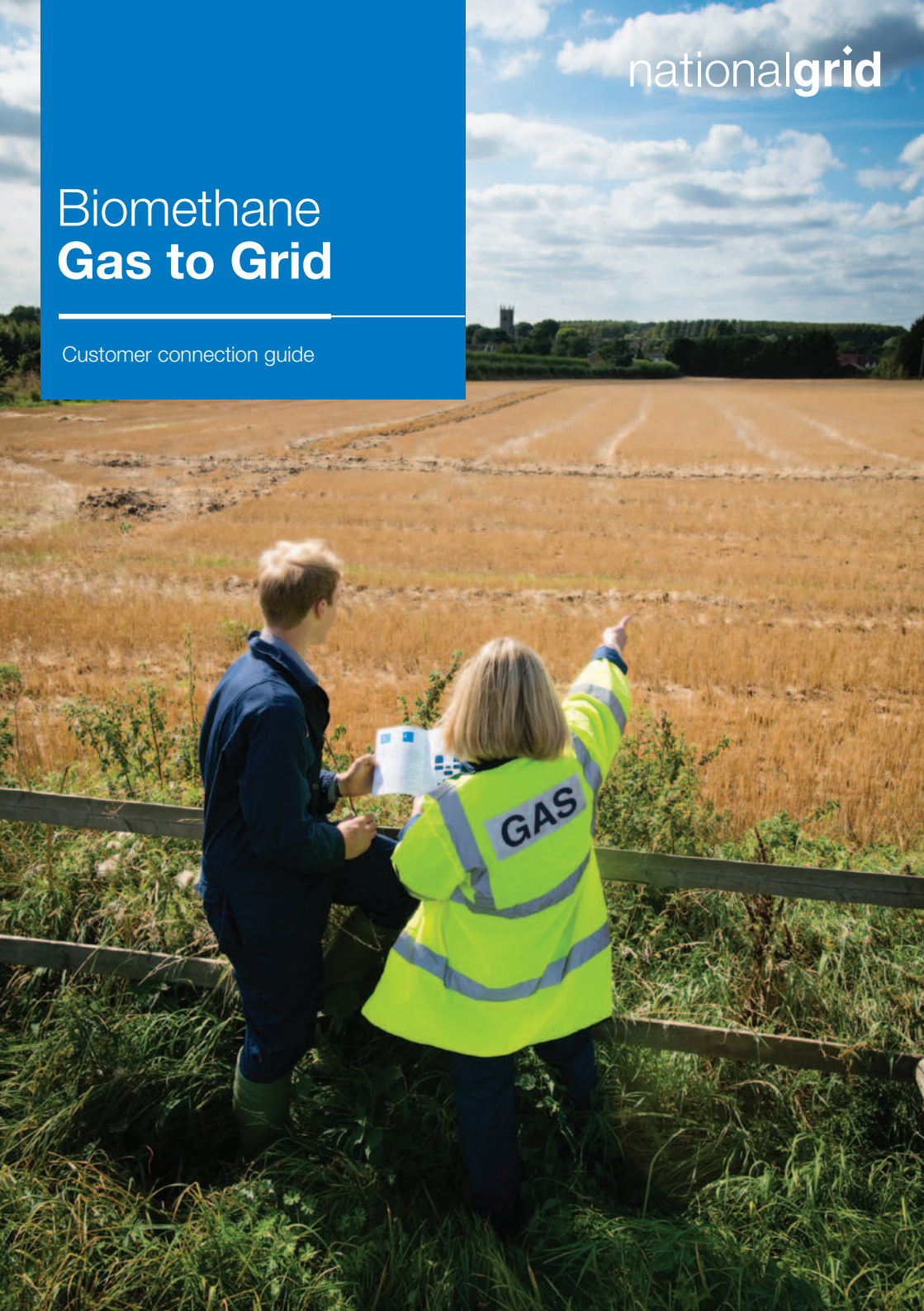


Biomethane Gas to Grid

Customer connection guide



National Grid is focusing on innovative solutions for a sustainable energy future



National Grid overview	4
How does the gas market work?	7
What are the economic benefits?	8
What are the environmental benefits?	8
What's involved?	11
What about the legal issues?	11
Our connection models	12
How do we get you connected?	14
Case studies	20

Our Aim is to facilitate new connections to our gas distribution network that will enable biomethane producers to inject their renewable gas into the pipeline grid network.

The addition of biomethane into the grid will help the UK minimise its carbon footprint and avert from unsustainable fossil fuels, whilst increasing the security and diversity of energy supplies.

NATIONAL GRID – A COMPANY OVERVIEW

National Grid is an international electricity and gas company.

At National Grid our job is to connect people to the energy they use, whether that's to heat and light homes, or to keep factories, shops and businesses going.

We rely on having energy at our fingertips: our society is built on it.

That puts us at the heart of one of the greatest challenges the UK faces – how the country will meet its ambitious low carbon energy targets and connect that new energy supply to communities.

Our gas distribution business owns and operates four networks which distribute gas to approximately 11 million businesses, schools and homes and supplies the largest cities in England.

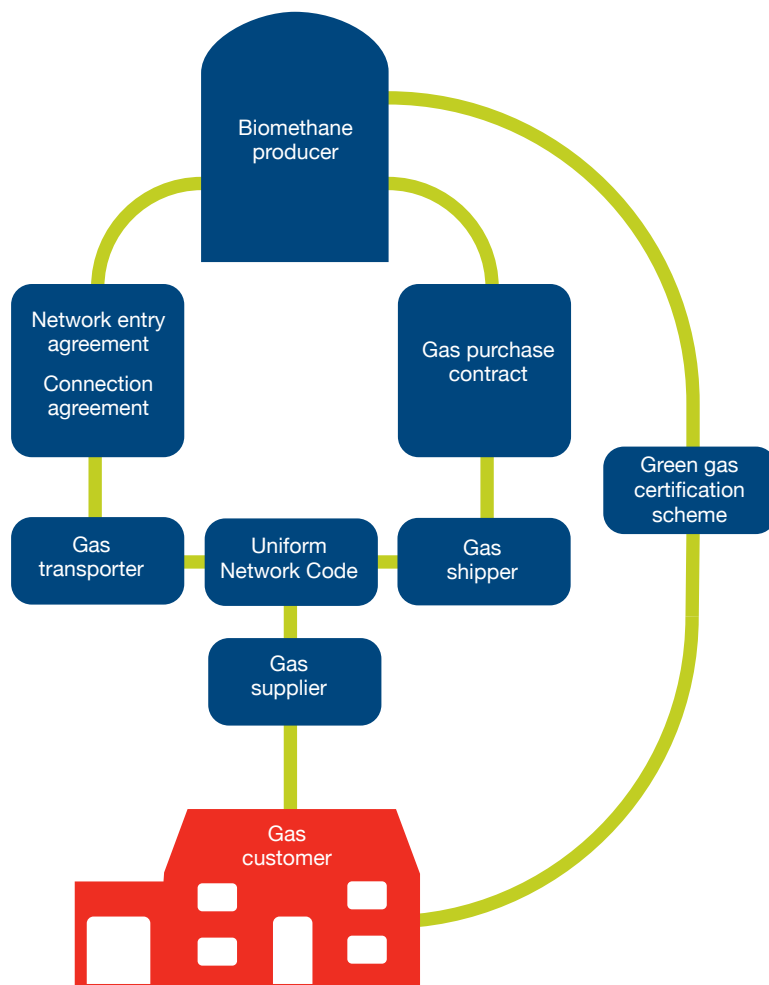
NATIONAL GRID DISTRIBUTION

- we manage 131,000 kilometers of gas distribution pipelines
- operate 24/7 emergency response service and repair teams
- deliver connections to our networks
- carry out repair and maintenance of our assets.

Our networks distribute gas to approximately 11 million businesses, schools and homes in England



Commercial and contractual relationships



HOW DOES THE GAS MARKET WORK?

There are many different groups involved in the biomethane process. The commercial and contractual relationship model shows the flows between the parties.

Producers – are responsible for producing the gas. The gas produced must meet the quality requirements set out in the Gas Safety (Management) Regulations GS(M)R 1996. The producers must secure sales of their gas with a shipper before it can be injected into the grid.

Gas shippers – convey gas in the pipeline network by contracting with gas transporters, such as National Grid. Gas shippers must have a Gas shippers licence before taking part in any gas shipping actions.

Gas transporters – own and operate the gas distribution network, using the infrastructure to transport the gas from producer to end consumer. Transporters may take responsibility for quality testing and gas metering.

Suppliers – are responsible for customer interaction and provide an interface for consumers to purchase their gas. Suppliers must have a Gas retailer licence before engaging in any consumer contracts.

Customers – purchase gas for residential, commercial or industrial use. They contract directly with gas suppliers to secure their gas.

WHAT ARE THE ECONOMIC BENEFITS?

The government is supporting the generation of renewable heat using the new Renewable heat incentive (RHI) tariffs. As the producer of biomethane, you will receive payments based on your heat output. This is currently 7.3p per kWh. Once you start injecting into the grid, this tariff payment is guaranteed for 20 years.

The government has allocated a significant budget to fund the RHI until 2014/15. This is being funded by the treasury and will be paid out by Ofgem, the scheme administrator.

On a national scale, the use of biomethane injection allows the existing gas infrastructure to help meet carbon targets. By contrast, a move to complete dependence on electricity for heating would require very significant investment in flexible generation and network reinforcement.

It also requires no household changes to existing appliances, allowing customers to benefit from this renewable energy without the cost and disruptions of replacing existing appliances.

WHAT ARE THE ENVIRONMENTAL BENEFITS?

Under new EU legislation the UK must reduce its carbon emissions by 34% by 2020.

National Grid is striving to reach its target of an 80% reduction in carbon emissions by 2050.

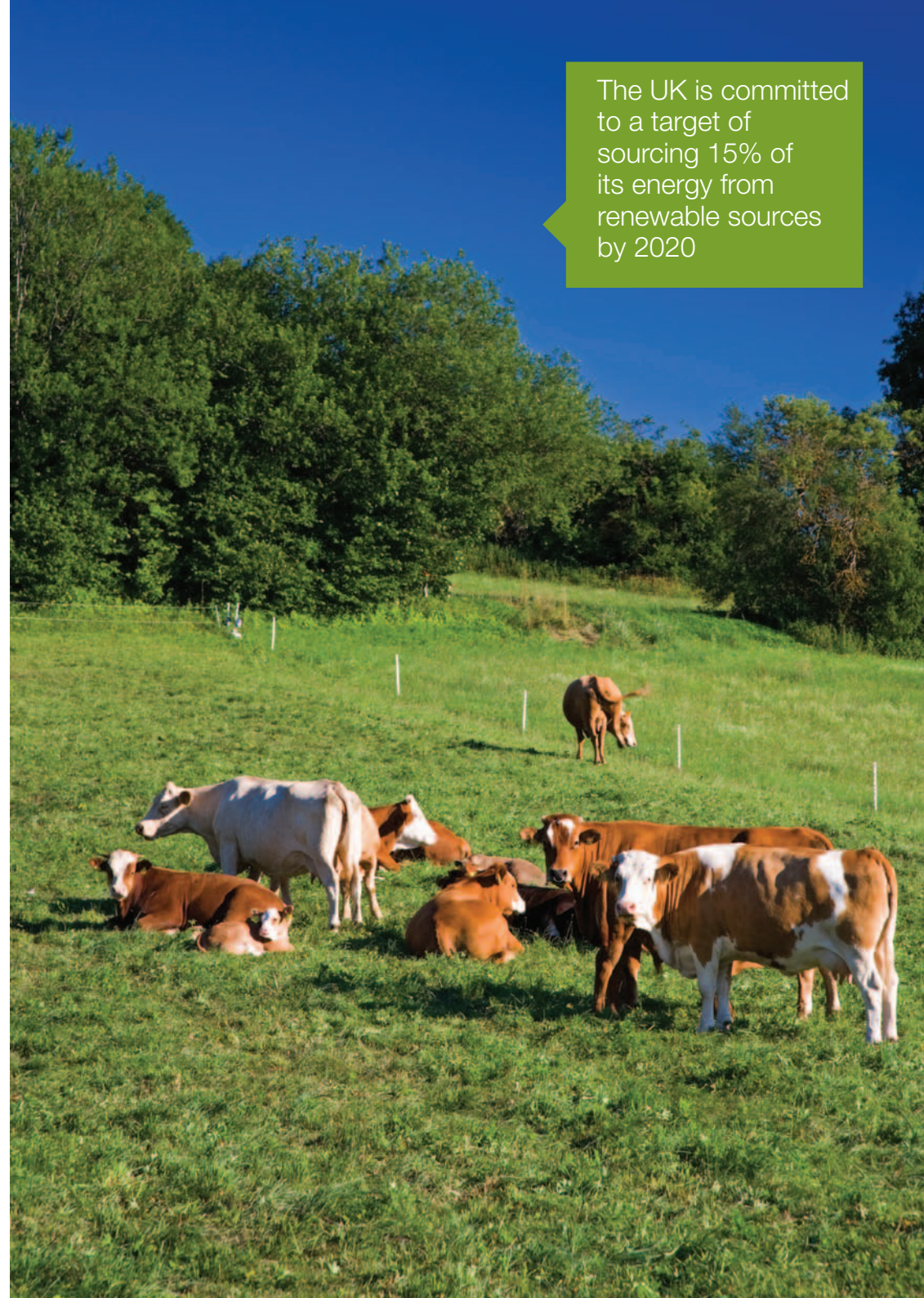
Analysis has shown that biomethane is one of the most prominent routes of providing an economical, secure energy supply whilst reaching these targets.

This is due to biomethane being considered a 'carbon neutral' energy source, as the carbon released originates from organic materials, which have offset emissions during their lifetime.

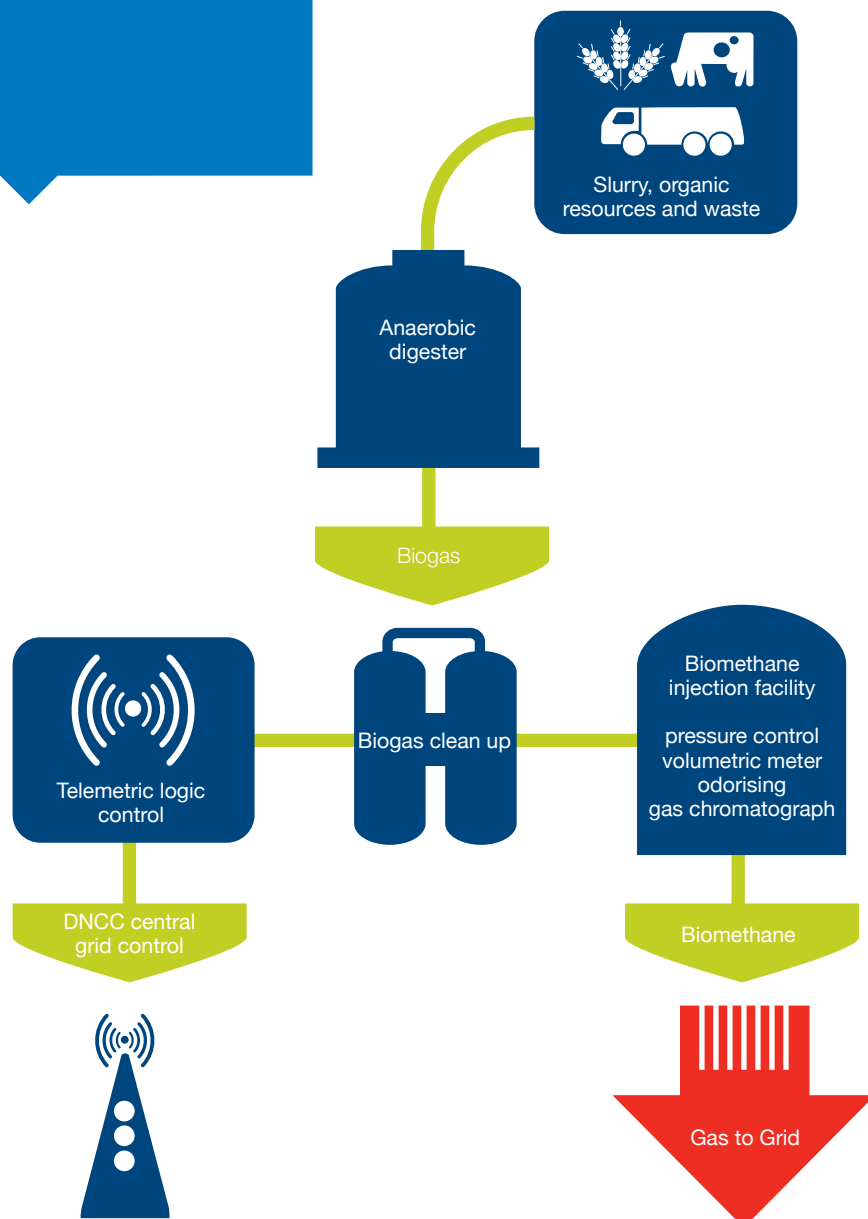
By injecting your biomethane into the grid you are greatly increasing the efficiency of the energy source. Using the gas directly for electrical applications harnesses only 30-35% of the available energy. Whereas used directly in gas applications benefits from 90% or greater efficiencies.

Furthermore, by diverting the waste from landfill, methane, a large contributor to greenhouse gases, is also prevented from being released into the atmosphere.

The UK is committed to a target of sourcing 15% of its energy from renewable sources by 2020



The biomethane production process



WHAT'S INVOLVED?

The production of biogas is performed by the producer, using either the anaerobic digestion or gasification processes. The biogas is then upgraded to a higher quality of biomethane for gas injection.

Propane may be required to be added by the producer to raise the energy content of the gas.

The biomethane must then be sold to a shipper before it is injected into the grid. Ofgem can provide a list of licensed shippers.

Once the biogas has been upgraded to biomethane it will be transferred to National Grid's network entry facility. From here the gas will be metered and the quality monitored. Odorant will also be injected to give the characteristic 'gas' smell.

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

WHAT ABOUT THE LEGAL ISSUES?

As part of National Grid's obligations as a gas transporter, National Grid must offer conditions for gas entry points under section D12 of the Gas Transporter License.

Biomethane is considered a safe source of energy, providing it meets all of the GS(M)R 1996, which stipulate the quality

of the gas that is acceptable. The regulations also state biomethane must be enriched with propane so that target calorific values are met where appropriate. This will be site specific, based on the feedstock and equipment being used. As with natural gas, the supply must be odorised so that leakages can be detected.

There are a number of governmental bodies, who have responsibilities in the gas sector:

The Department of Energy and Climate Change, (DECC) accountable for primary legislation of gas, such as the 1986 and 1995 Gas Act, the Completion Act 1998, the Gas Calculation of Thermal Energy Regulations 1996 and the GS(M)R 1996 mentioned above.

The Office of Gas and Electricity Markets (Ofgem), responsible for economic regulation of the gas market.

The Health and Safety Executive (HSE), responsible for the health and safety of the gas sector.

The Uniform Network Code (UNC) a set of guidelines for all gas industry members that allows for market competitiveness, states that the biomethane producer must enter into a network entry agreement before gas may be injected into the grid.

For more information please see the useful references page at the back of this booklet.

OUR CONNECTION MODELS

We have three different connection models, enabling our customers to choose their level of ownership and responsibility:

Maximum connection model - we will have ownership and responsibility for all equipment contained within the injection facility.

This does not include the activities upstream of the facility such as

- the anaerobic digester
- the biogas clean up plant
- any enhancements to the calorific value (CV)

Minimum connection model - you will take ownership and responsibility of the injection facility which includes

- the metering equipment
- the gas quality monitoring
- the energy content measurement

All activities relating to the installation of the remote operable valve (ROV) and telemetry unit (RTU) will continue to rest with us.

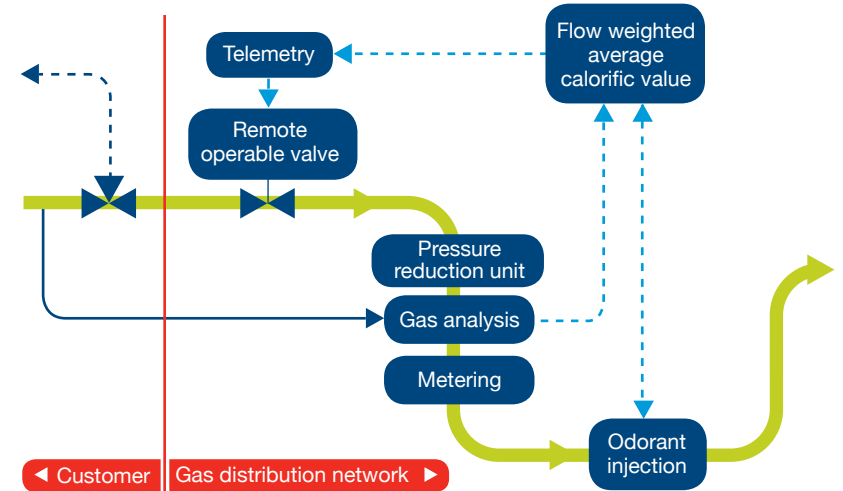
This model supports Utility infrastructure providers (UIP) connections provided the UIP hold the appropriate Gas industry registration scheme (GIRS) accreditation.

Customer procurement connection model (MP/IP only) - to allow you further ownership of the delivery of the connection we can facilitate a self procurement model that offers the same ownership and responsibility as the Minimum connection model with the additional activity of you undertaking the procurement of the ROV and RTU. These items, after commissioning will be owned and operated by National Grid, subject to meeting required specifications/designs.

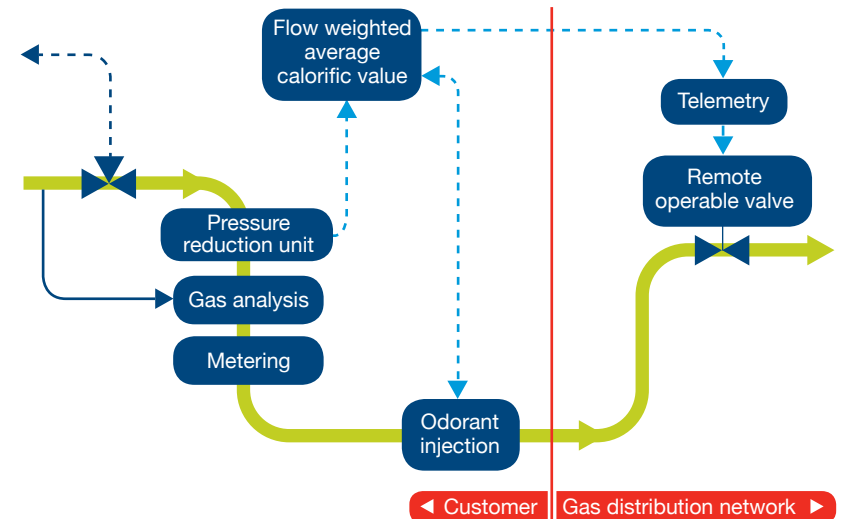


Our three connection models allow you to choose your level of ownership and responsibility for the equipment

Maximum connection model



Minimum connection model



How do we
get you connected?

STEP

1

INITIAL ENQUIRY

You complete our initial enquiry form providing the following key information:

- site location
- postcode
- estimated flow rate – standard cubic meters per hour (scm/h) of biomethane for injection into the pipeline grid network.

We perform a high level network analysis and mapping to assess whether a connection is possible.

There is no charge to you for this activity.

Our initial enquiry form can be found on our website.

TIMESCALE 15 working days

STEP

2

DETAILED ANALYSIS STUDY (DAS)

You complete our detailed analysis study request form. This can be found on our website. We will issue a detailed analysis study agreement to you within seven days of your request.

Following receipt of your signed agreement, you will be invoiced. Once we have received payment the study will be completed and issued within 30 working days.

The study will provide you with the following:

- network entry connection options
- indication of costs to connect
- plant and equipment required to be provided by the customer
- details of proposed site and pipeline route
- network capacity flows, and constraints.

You review the study and provide any feedback to the Sustainable Gas Contract Manager.

TIMESCALE 37 working days

STEP
3

CUSTOMER APPLICATION TO CONNECT

If you want to proceed to connection simply complete and submit an application to connect.

You will find the application form on our website.

We will validate and acknowledge receipt of your application form within two working days.

TIMESCALE Acknowledgement within 2 working days

STEP
4

CONTRACTUAL AGREEMENTS

We will issue an application acceptance letter, providing an estimated date for your connection offer. It can take up to 3 months to provide an offer dependent upon the nature of your request.

For complex connections we may need to undertake a conceptual design study (projects >7bar). To undertake this activity we will issue you with an agreement for your review and signature. The study will provide an engineering plan showing connection technology, scope of connection works and a quote from National Grid to undertake the design works. On receipt of your signed agreement, you will be invoiced. Once payment is received we will start the study, which may take up to 25 weeks to complete.

For all entry connections we will draft and issue a connection offer that sets out both parties obligations for the onsite works associated with the physical entry connection onto the pipeline grid network (valid for 45 days).

You will be issued with a draft network entry agreement for your reference.

TIMESCALE Can take up to a maximum of 3 months for connection offer

Our contract delivery team will make sure you are kept fully informed at every step of the process





TECHNICAL ASSESSMENT AND DESIGN

Following receipt of your signed connection agreement and payment, our technical team will conduct a technical project assessment (risk assessment of gas quality).

We will facilitate your design requirements dependent upon your preferred connection model.

Detailed network investigations are undertaken and the connection route and compound facility location is reviewed.

Hazard on site operability study is performed by our technical personnel.



BUILD AND INSTALLATION

We will draft and issue a final network entry agreement, which sets out the technical and operational conditions for the connection. This is required by the Uniform Network Code and will cover responsibilities for the maintenance and operation of the connection and injection facility.

Commence civil works on site installation of the injection facility.



TESTING AND COMMISSION

We will commence an on site testing programme of the injection facility and associated equipment to ensure it meets GS(M)R 1996.

Commission and validation of the injection facility and telemetry solution.

The injection facility will be ready to inject gas onto our network once we have received a signed network entry agreement.



PROJECT CLOSE OUT

Project financial reconciliation.

Where appropriate project document records registration and handover.

Project close out meeting.

Customer feedback and satisfaction survey.

TIMESCALE Steps 5-7 - dependent on project complexity, estimated 12 months from customer acceptance of connection offer and payment

TIMESCALE 4 weeks

CASE HISTORY FUTURE BIOGAS, DONCASTER

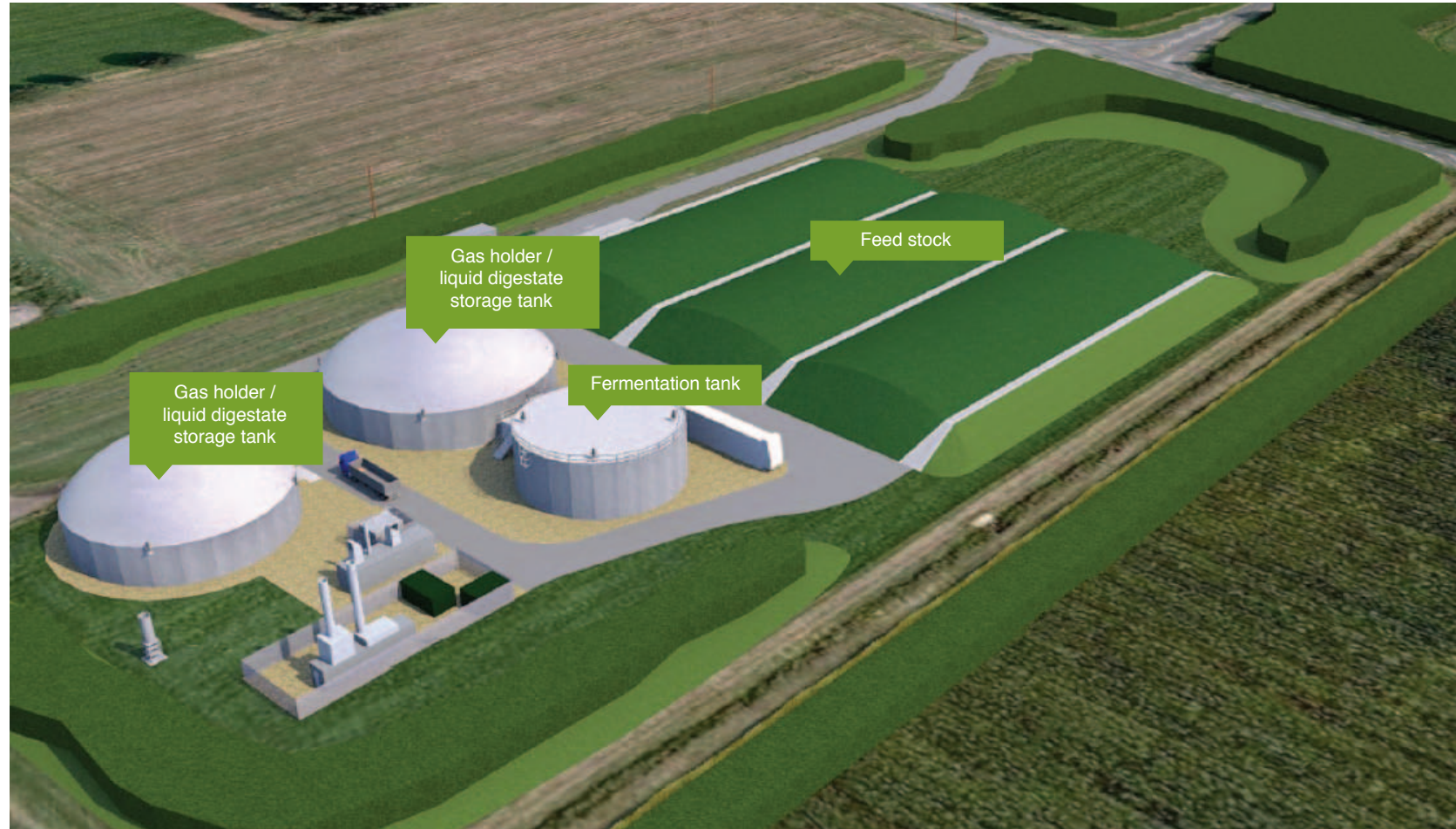
Green gas made from locally grown farming break-crops including maize, grass and other biomass will fuel thousands of homes and businesses across Yorkshire with the region's very first gas to grid project at Lindholme, near Doncaster.

The state of the art facility is the first biomethane plant to be built and operated by Future Biogas, it processes 35,000 tonnes of feedstock, sourced from local farmers every year.

The farm break crops are fermented in an anaerobic digester to produce biogas, which consists of 60% methane. Volume and energy value of the biomethane is then measured to ensure it meets the requirements of the gas network before being injected.

The plant can produce up to 12,000 cubic meters of biogas per day - enough to heat 2500 homes during peak demand in winter.

As a by-product the process also produces a valuable organic fertiliser that will be used by the local farming community.



“We are committed to supporting biogas and this is the first step in our goal to connect 80 such projects across the country over the next eight years”
Jeremy Bending, National Grid

CASE HISTORY ADNAMS BREWERY, SOUTHWOLD

We are committed to safeguarding future generations, and in support of this, our first biomethane gas to grid injection project at Adnams Brewery, in Southwold Suffolk, was delivered.

We received support and funding from the Innovation funding incentive, which is a mechanism introduced by Ofgem to encourage distribution network operators to invest in appropriate research and development activities, that focus on the technical aspects of network design, operation and maintenance. Using the brewery and local food waste the Adnams site can produce 60m³/h of biomethane, which diverts 50,000 tonnes of carbon dioxide (CO₂) per year from landfill.

The Adnams site uses three digesters, which break down a total of 12,500 tonnes of organic material each year.

This project was successfully delivered and confirmed the technical capability for biomethane gas to grid injection.

By optimising the design of the biomethane gas to grid injection facilities, and working closely with the market place, to innovate and develop a cost effective solution, we have led the industry driving down capital costs and reducing lead times for the installation.

We have been proactive in sharing our learning and experiences from these initial projects with key industry stakeholders.

The Adnams project has also demonstrated National Grid's excellence in customer service, working in synergy with Adnams to develop and deliver the project with a sharp focus on the customer's needs.



Useful references

National Grid

Gas to Grid connection enquiries renewables renewablegas.ukd@nationalgrid.com

Governmental bodies

Department of Energy and Climate

www.decc.gov.uk

Ofgem

www.ofgem.gov.uk

Health and Safety Executive

www.hse.gov.uk

Department for Environment,
Food and Rural Affairs

www.defra.gov.uk

Ofgem fact sheet

www.ofgem.gov.uk/ofgem-publications/64019/biomethanearenewablegassourcefs.pdf

Gas Law Legislation

www.legislation.gov.uk/ukpga

Other

AD portal (NNFCC)

www.biogas-info.co.uk

If you would like any further information about the Biomethane to Grid process or have any questions please feel free to contact one of our team below.

Commercial/contractual customer care queries and support

Andrea Godden, Sustainable Gas Contract Manager, Tel 07790 039 502

Nicky Kirk, Sustainable Gas Contract Officer, Tel 07721 647 840

Technical customer care queries and support

Tina McKie, Design Manager, Entry Connections, Tel 07825 676 694