

Biomethane Gas to Grid



Cadent is focusing on innovative solutions for a sustainable energy future



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

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

CADENT A COMPANY OVERVIEW

At Cadent 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.

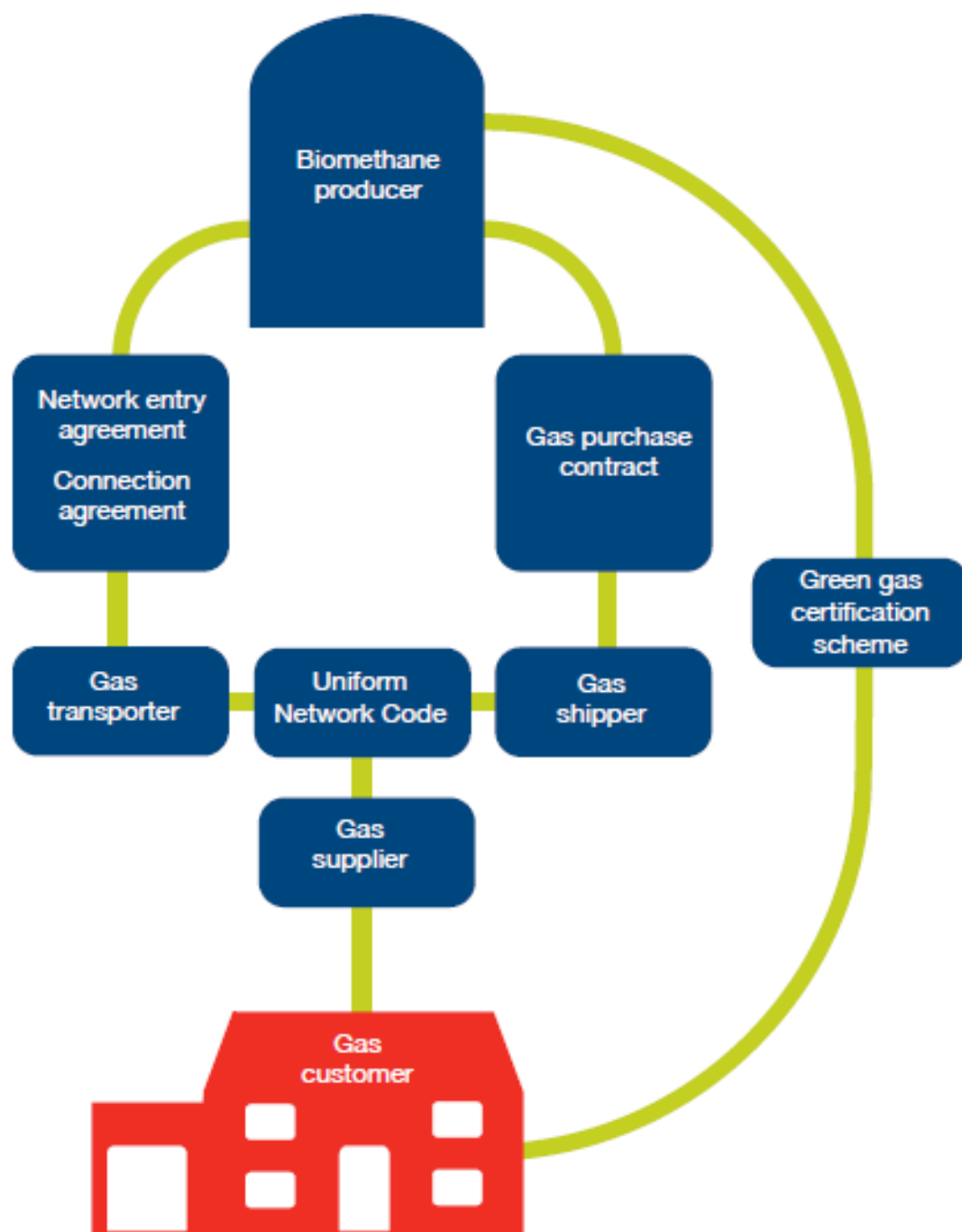
CADENT

- We manage 131,000 kilometres of gas distribution pipeline
- Operate 24/7 emergency response service and repair teams
- Deliver and facilitate 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 the gas transporters, such as Cadent. 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.

On a national scale, the use of biomethane injection allows the existing gas infrastructure to help meet carbon targets.

Household changes to existing appliances are not required, allowing customers to benefit from this renewable energy without the cost and disruption of replacing existing appliances.

By contrast, a move to complete dependence on electricity for heating would require very significant investment in flexible generation and network reinforcement.

WHAT ARE THE ENVIRONMENTAL BENEFITS?

Under EU legislation the UK must reduce its carbon emissions by 80% by 2050.

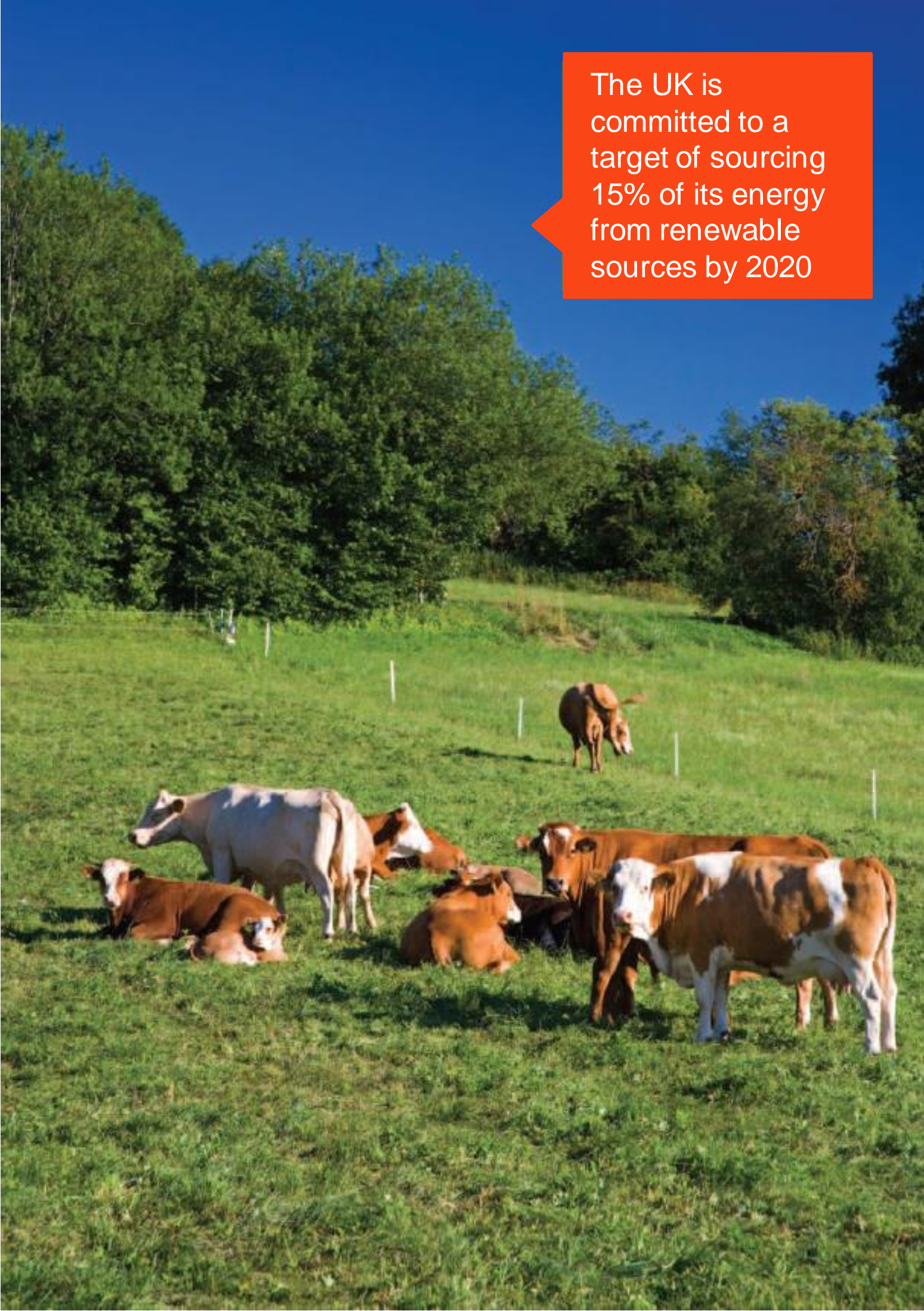
Cadent is well on its way to meeting its ambition of reducing its greenhouse gas emissions by 45% by 2020.

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

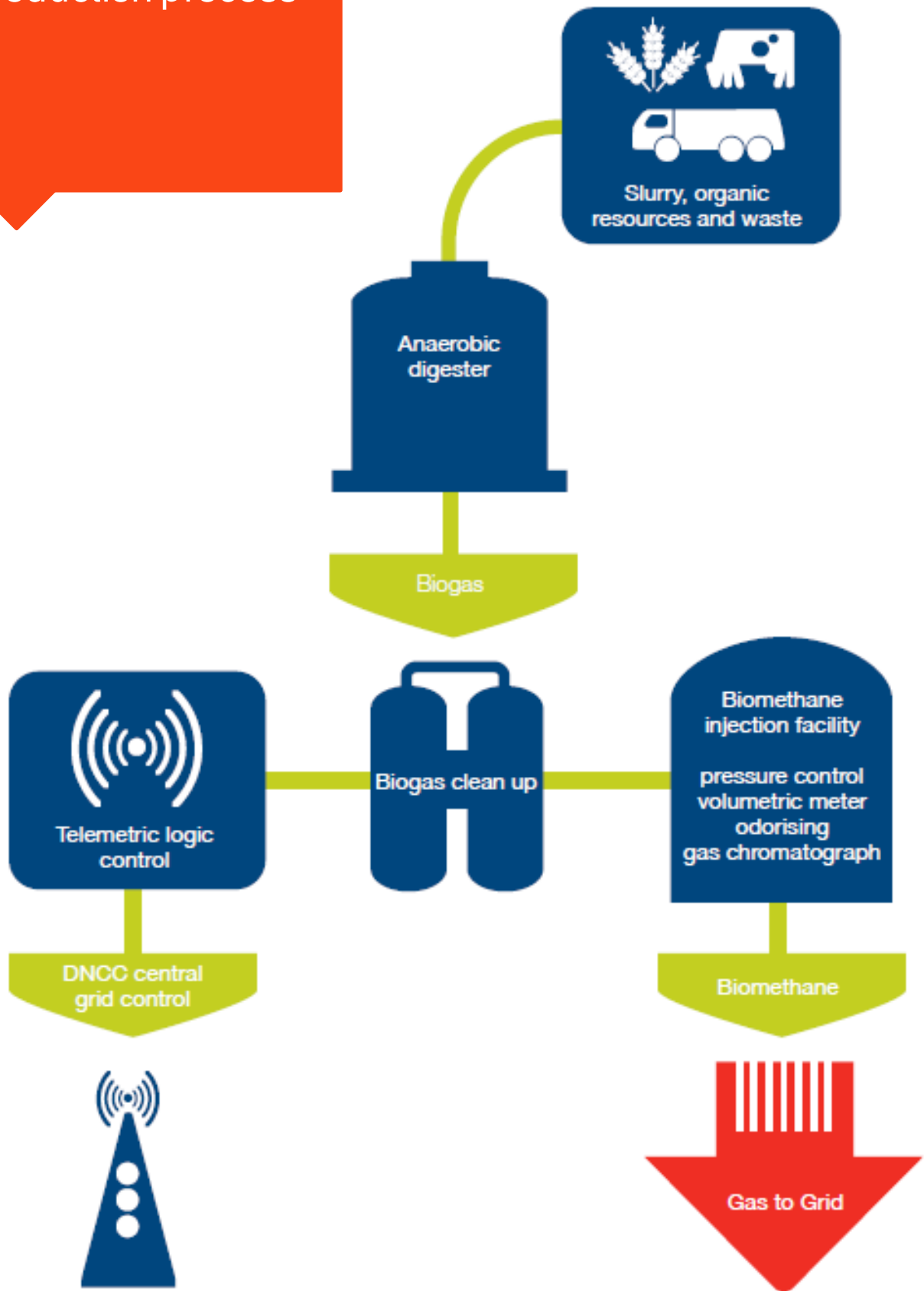
This is due to biomethane being considered a 'carbon neutral' energy source, as the carbon released originates from organic materials, which have offset emissions during their lifetime.

By injecting your biomethane into the gas grid you are greatly increasing the efficiency of the energy source by at least 90%, whereas using the gas directly for electrical applications harnesses only 30-35% of the available energy. 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 Cadent'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 Cadent's obligations as a gas transporter, Cadent 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 the Gas Safety (Management) Regulations 1996 – GS(M)R, which stipulate the quality of the gas 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 for Business, Energy & Industrial Strategy (BEIS) accountable for primary legislation of gas, such as the 1986 and 1995 Gas Act, the Competition Act 1998, the Gas Calculations 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 two 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)

For delivery of the project

- we will procure and install the injection facility as well as constructing and connecting the pipeline to our gas distribution network

Minimum connection model – you will take ownership and responsibility of the injection facility which include

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

For delivery of the project you can either ask us to:

- procure and install the remote operable valve (ROV) and telemetry unit (RTU), and
- construct and connect the pipeline to our gas distribution network.

Or

- You can procure and install the remote operable valve (ROV) and telemetry unit (RTU), and
- construct and connect the pipeline to our gas distribution network.

This latter delivery model supports both Utility Infrastructure Providers (UIP) and third party connections provided that these companies hold either the appropriate Gas Industry Registration Scheme (GIRS) accreditation or are suitably qualified and competent to carry out construction and connection to our higher pressure pipelines.

In all cases after commissioning Cadent will own and operate the:

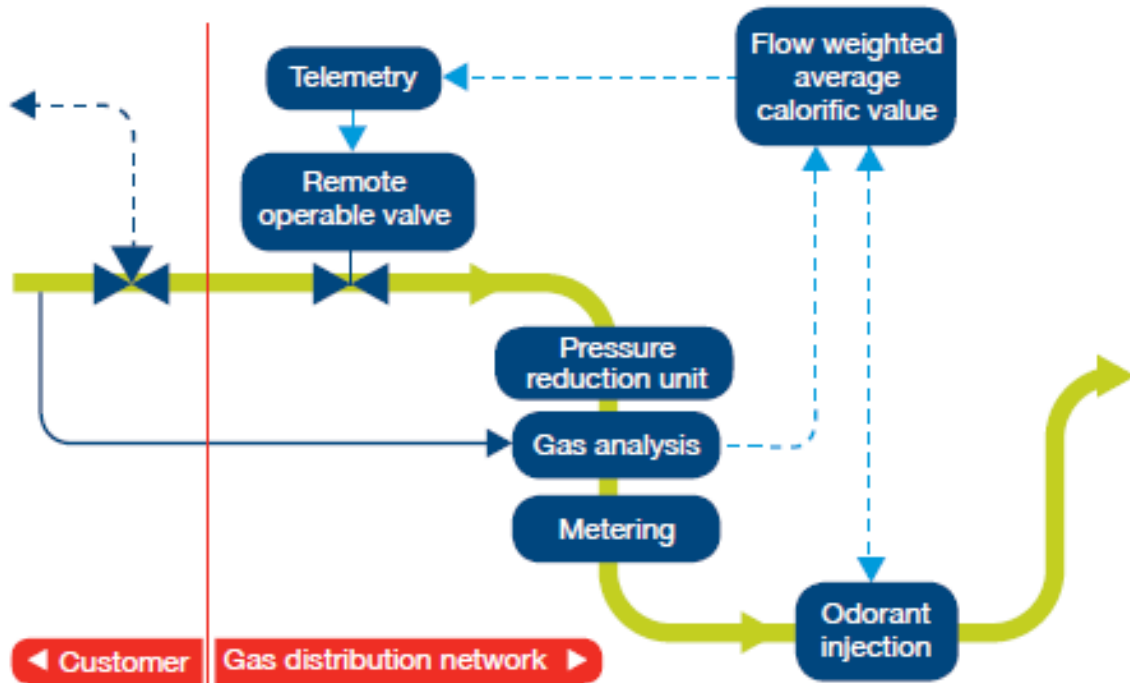
- Remote Operable Valve
- Remote Telemetry Unit
- The pipeline from the ROV to the Cadent network,

subject to approval of the required specifications/designs and final adoption.

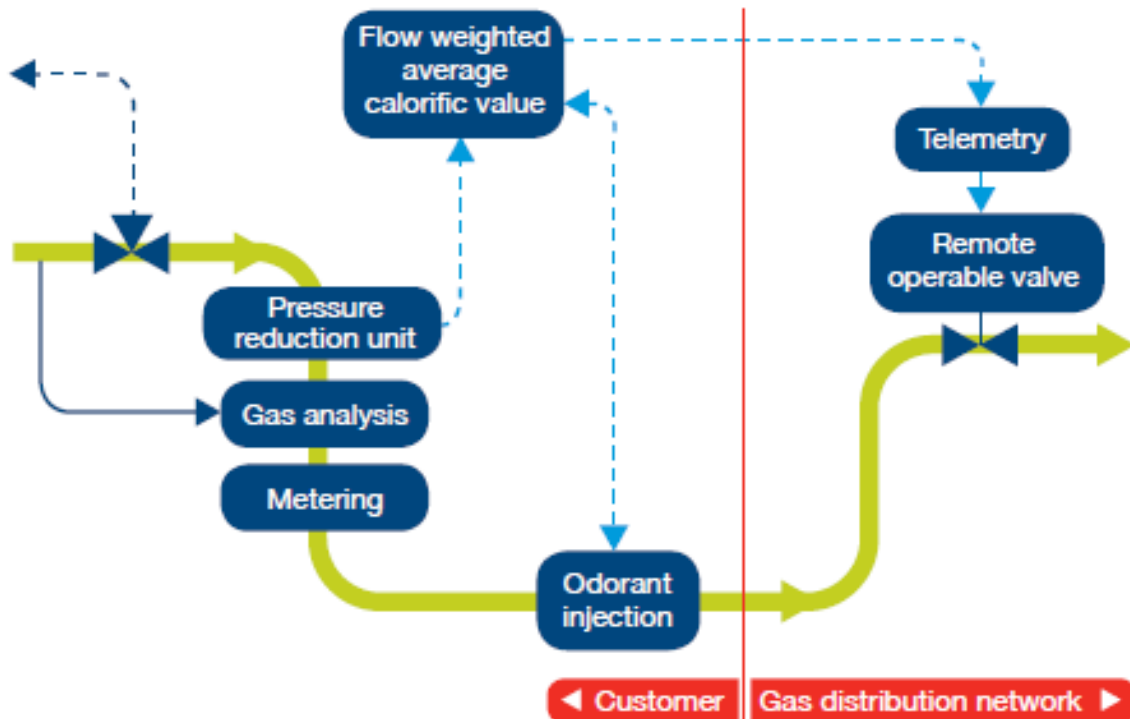


Our three connection models allow you to choose your level of ownership and responsibility for the equipment

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 metres 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

<http://cadentgas.com/Business-with-us/Biomethane>

In some instances, e.g where there are no engineering difficulties, it may be possible for you to proceed directly to connection offer stage. Once we have carried out your Initial Enquiry we can advise you on the next steps.

TIMESCALE: 15 Working days

STEP

2

DETAILED ANALYSIS STUDY (DAS)

You complete our detailed analysis study request form and read our terms and conditions. These can be found together on our website.

<http://cadentgas.com/Business-with-us/Biomethane/Biomethane-get-connected/Biomethane-Capacity-Enquiry>

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

There are 2 types of study.

Capacity Only study

This study will provide you with:

- Network entry connection options
- Network capacity flows and constraints

Standard study

This study includes the points outlined above as well as:

- Indication of costs for Cadent to carry out the pipeline construction and connection
- Indication of costs for Cadent to procure and install the injection facility
- Plant and equipment required to be provided by the customer
- Details of proposed site and pipeline route

Once you have reviewed the study we can discuss next steps or you can proceed to connection agreement when you are ready.

**TIMESCALE: 30 Working days to issue study following receipt of payment
30 day payment terms for invoice**

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,

<http://cadentgas.com/Business-with-us/Biomethane/Biomethane-get-connected/Biomethane-application-to-connect>

Please submit your application form to Box.nonstandardconnections@cadentgas.com

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

TIMESCALE: 2 Working days

STEP

4

CONTRACTUAL AGREEMENTS

Connection offer

We will aim to provide a connection offer within 3 weeks of receiving your application.

For the Maximum connection model and in more complex scenarios we may need to do additional work before issuing a connection offer.

For all entry connections we will issue a connection offer that sets out both parties obligations for the onsite works associated with the installation of the injection facility and the physical entry connection onto our gas network. The costs outlined are an estimate and will be reconciled both during the project and following commissioning.

Connection offer for the design and construction of pipelines to the LTS network (above 7barg)

If you are connecting to our LTS pipeline our connection offer will cover the activities associated with installation of the injection facility, gas quality and hazardous operations etc. Once you have accepted the connection offer we will issue a connection offer to your contractor for the construction and connection of the LTS pipeline.

Easements

You will be responsible for obtaining all easements associated with the entry connection onto the pipeline grid network.

Network Entry Agreement

You will be issued a draft network entry agreement following acceptance and prior to commissioning.

TIMESCALE: 15 Working days for connection offer
Validity period 45 calendar days
30 calendar days invoice payment terms

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



STEP

5

TECHNICAL ASSESSMENT AND DESIGN

Following receipt of your signed connection agreement and payment,

We will contact you to arrange an initial meeting for relevant parties where roles and responsibilities can be laid out

Our technical team will support a joint meeting to discuss

- technical project risk assessment of gas quality,
- hazardous on site operations.

We facilitate your design requirements dependent upon your preferred connection model to facilitate your gas to grid date.

A brief timeline of deliverables is given below, these can change depending on the specifics of your connection. The timeline is dated with respect to your Gas to Grid (G2G) date, the date when you first flow biomethane into our network.

Document Deliverable Timeline

- Prior to construction all G17/GL5 documents to be submitted to us for review and user acceptance.
- No later than 6 weeks prior to G2G – I/O schedules to be submitted to us
- No later than 2 weeks prior to G2G – ME2, 10723, SAT test reports approved by us
- 1 week prior to G2G -End to End testing undertaken

STEP

6

BUILD AND INSTALLATION

In the case of a Minimum connection model where you are carrying out full installation of the injection facility and pipeline you will need to submit the appropriate assurance documents to demonstrate that the equipment that we will adopt has been built to our specifications and is fit for purpose.

We will review these documents and approve as necessary.

Commence civil works on site installation of the injection facility.

TIMESCALE: Steps 5-7 are dependent upon the complexity of the project but typically 6-9 months following acceptance and payment of connection offer

STEP

7

TESTING AND COMMISSION

As part of the assurance process you will provide us the results of onsite testing of the injection facility and associated equipment to demonstrate that it has been installed correctly and it is fit for purpose.

We will approve the onsite test results and once completed undertake joint testing to check that the signals from site to our control centre (DNCC) are fully operational.

You will need to carry out gas sampling on your raw biogas and biomethane in line with the sampling protocol from the gas quality meeting. The results of these will be approved by ***** and will demonstrate that your gas meets the quality specified in GS(M)R 1996.

We will issue a final network entry agreement as early as possible before commissioning that we will both need to sign before the gas to grid date. This sets out the technical and operational conditions for the plant on an enduring basis. This is required by the uniform Network Code and will cover responsibilities for the maintenance and operation of the connection and injection facility.

The injection facility will be ready to inject gas onto our network once we have
Final sign off for the pipeline and connection
Approval from all ***** departments that testing and assurance activities have been completed
and equipment
A dual signed Network Entry Agreement in place.

STEP

8

PROJECT CLOSE OUT AND BUSINESS AS USUAL

We will carry out project financial reconciliation and provide feedback to you.

We will need you (or your contractor) to provide any appropriate project document records.

We will hold a project close out meeting.

We welcome your feedback and will carry out a review of the project with you to capture successes and areas for improvement.

As part of your enduring obligations under the Network Entry Agreement, amongst other things, you will need to provide

- daily calibration files
- your planned maintenance schedule
- gas sampling test results to the timescales outlined in your sampling protocol
- test results associated with the measurement equipment, which should be carried out to the timescales outlined in the Network Entry Agreement
- details of any unplanned outages
- responses to any Ofgem inspections associated with the injection facility

It is also very important to keep both in hours and out of hours contact details up to date in case we need to contact the site.

TIMESCALE: We aim to carry out project closure within 6-8 weeks of commissioning

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.





CASE HISTORY
SEVERN TRENT WATER,
MINWORTH

The Minworth project was the first grid-connected AD plant in the Cadent network to run on sewerage waste, producing enough gas to heat on average 900 homes in the local community, who will benefit from using sustainable energy. It was also the first grid-connected AD plant in the West Midlands Distribution Network.

To achieve this we've worked closely with Severn Trent Water on a step by step basis to collaborate and innovate to make this connection a reality. Our innovative approach means we are now able to offer our customers and stakeholders a range of options to install a connection of this kind. By working in this way we can help facilitate the connection of alternatives to traditional energy sources which will make a significant contribution to future secure, affordable and sustainable energy delivery to consumers.

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.

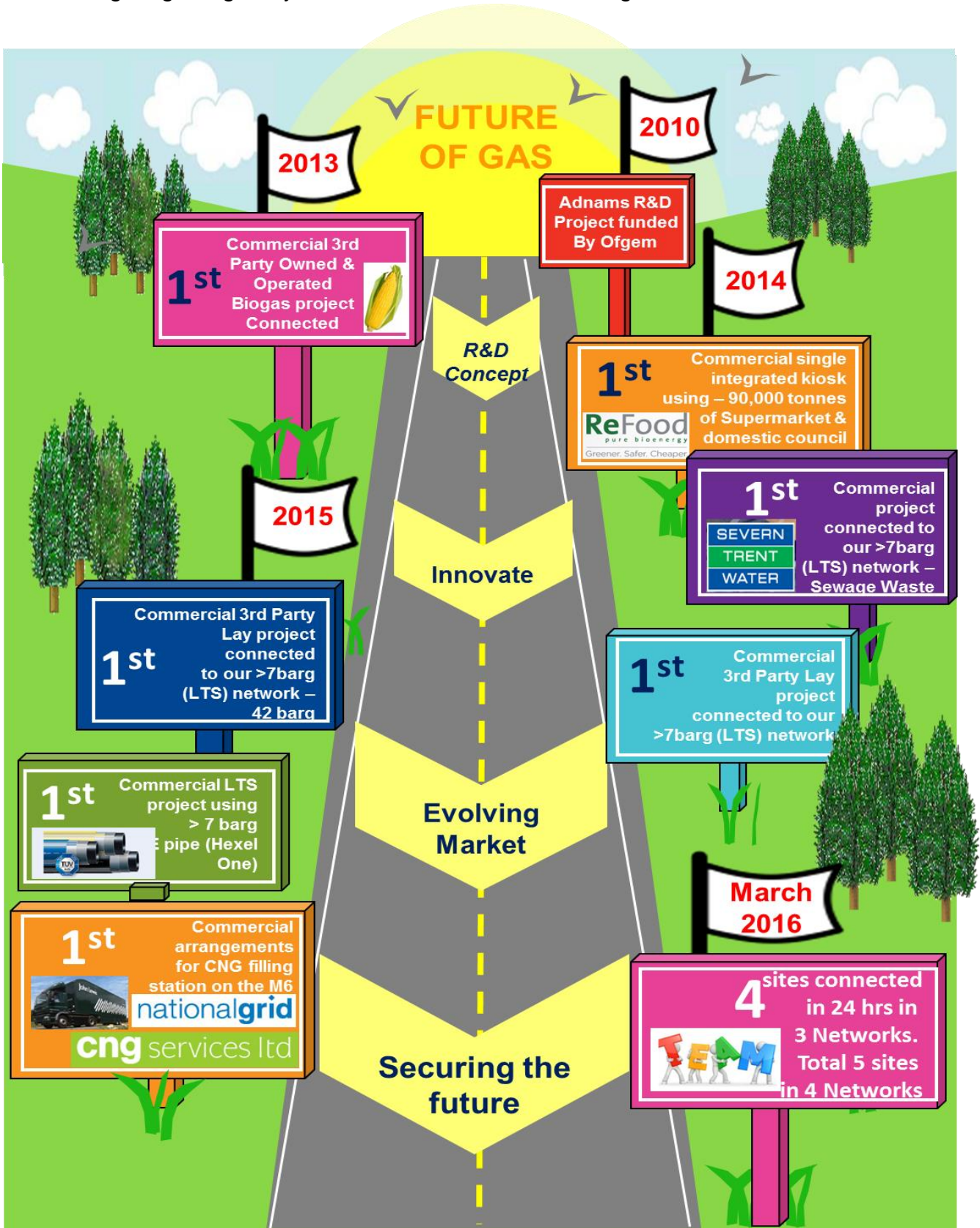




OUR SUCCESSES

The biomethane landscape has been constantly changing over the last few years. At Cadent we pride ourselves on listening to our customers and adapting our processes and procedures where possible to meet their changing requirements.

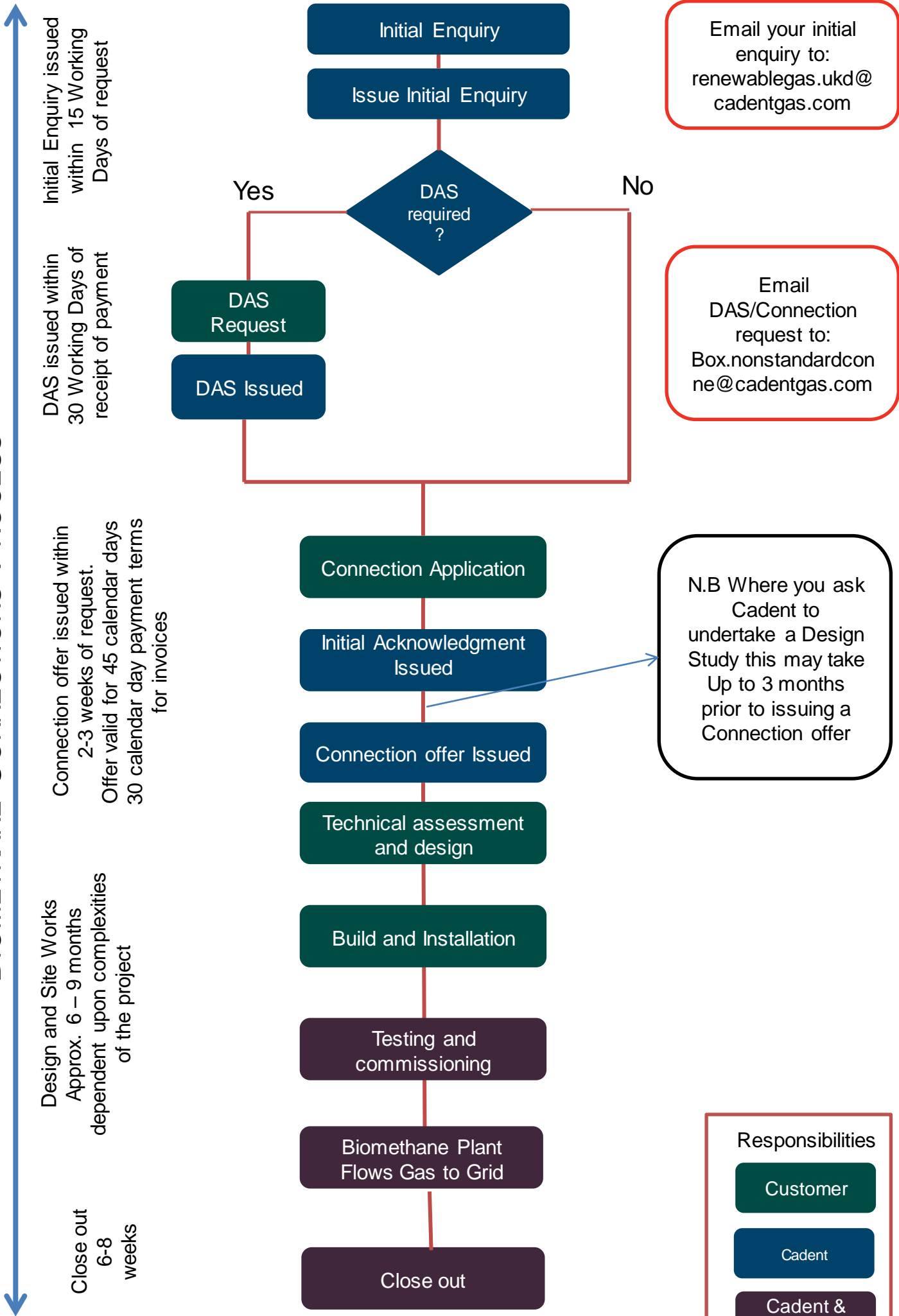
The following diagram gives you an idea how much has changed and how far we have come.







BIOMETHANE CONNECTIONS PROCESS



Useful references



Gas to Grid entry connection Initial enquiries renewables
renewablegas.ukd@cadentgas.com

Detailed Analysis Surveys and Connection Offer Applications/Non Standard Connections
Box.NonStandardConne@cadentgas.com

Government Bodies

Department for Business, Energy & Industrial Strategy (BEIS)
gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy

Ofgem
ofgem.gov.uk

Health and Safety Executive
hse.gov.uk

Department for environment, Food and Rural Affairs
defra.gov.uk

Ofgem Factsheet
ofgem.gov.uk/ofgem-publications/64019/biomethanearenewablegassourcefs-pdf

Gas Law Legislation
legislation.gov.uk/ukpga

Lloyds Register Gas Industry Registration Scheme
lr.org/en/energy/utilities-and-building-assurance-schemes/gas-industry-registration-scheme

Other

AD portal (NNFCC)
biogas-info.co.uk

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

Commercial/contractual customer care queries and support
Lisa Burgoyne, Commercial Services Support Assistant T: 07816 145573

Technical customer care queries and support
Tina McKie, Design Manager, Entry Connections T: 07825 676694

Find out more at our website
cadentgas.com/greengas

