



CNG Services

10 Years of Biomethane Innovation and Challenges for 2025

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- Innovation Highlights

CNG Services Ltd



- CNG Services Limited (CSL) provides consultancy, design and build services to the biomethane industry, all focused on reducing Greenhouse Gas (GHG) emissions
- In the past 10 years our efforts have produced a material impact with an estimated 20-year project life reduction in CO₂ emissions of 17,500,000 tonnes through:
 - Biomethane injection into the gas grid
 - Running trucks on Bio-CNG
 - Acting as developer and design and build contractor for the Highlands CNG Project
- Working on a number of Biomethane, H₂ and CCUS innovation projects including:
 - Biomethane from manure with CCS
 - Biomethane direct into the NTS
 - Green H₂ into the NTS and Hydrogen Business Model Projects
 - Reverse Compression to Create Capacity for Biomethane Injection
- CSL is an ISO 9001, 14001 and 45001 approved company and has also achieved Achilles certification. CSL is GIRS accredited for design and project management and has been certified as a competent design organisation for high pressure UK onshore natural gas works by DNVGL

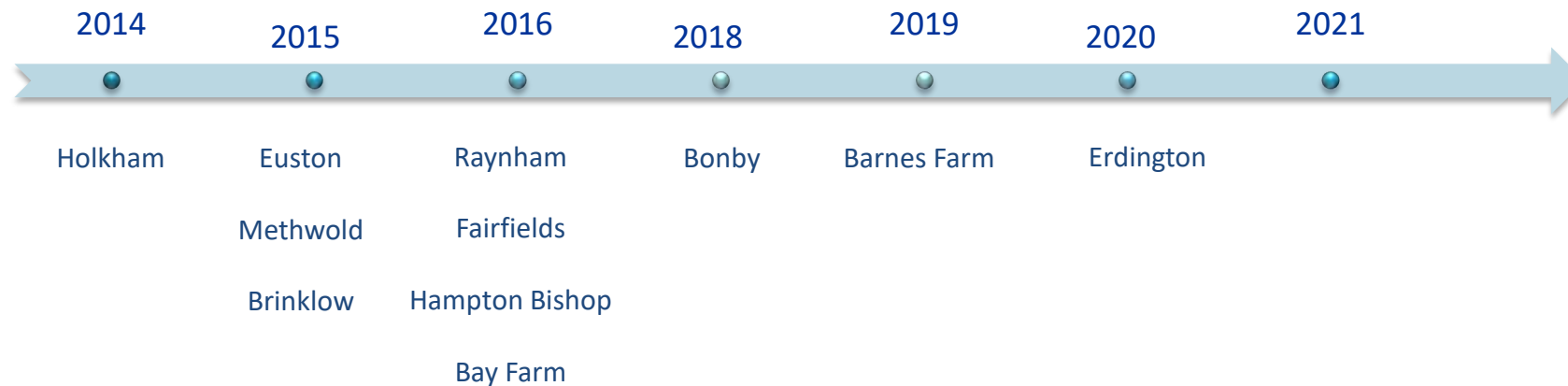


Highlights from 2014 to 2024

>7 bar LTS projects – Pipeline adopted by Cadent

1. Holkham Biomethane Project
2. Euston Biomethane Project
3. Raynham Biomethane Project
4. Methwold Biomethane Project
5. Brinklow Biomethane Project
6. Fairfields Biomethane Project
7. Hampton Bishop Biomethane Project
8. Bay Farm Biomethane Project
9. Bonby Biomethane Project
10. Barnes Farm Biomethane Project
11. Erdington Bio-CNG Station

CSL accepts LD's for failure to complete on schedule
Gives control of the pipeline project to the AD developer
We always met the schedule

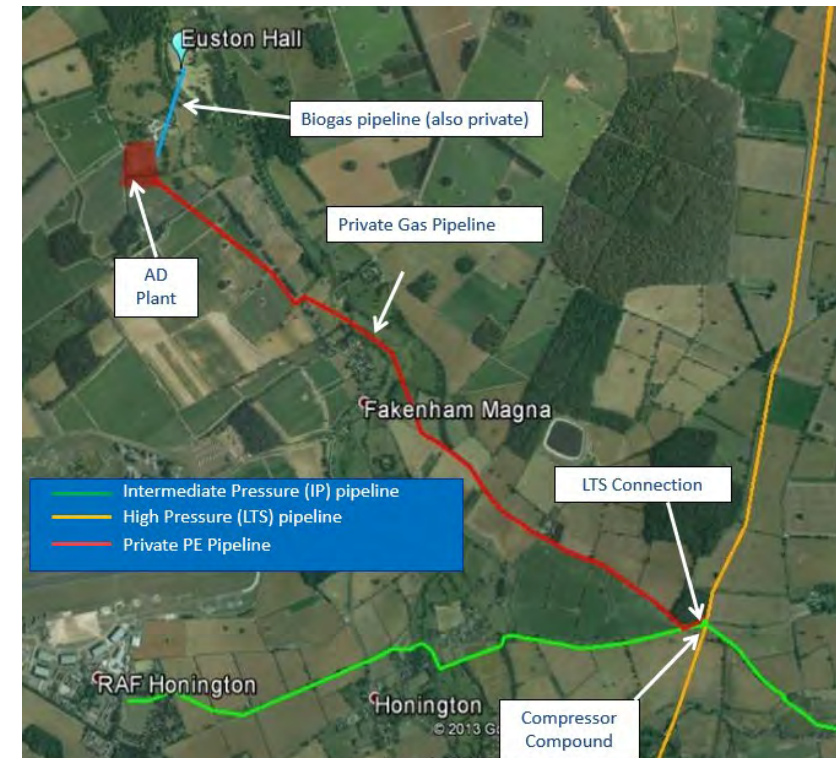


Euston Biomethane Project – 2014

Client	Euston Biogas Ltd
Gas Network Operator	Cadent Gas
Location	Euston Hall Farm Estate, Thetford, Suffolk
Type of Project	Biomethane
Local or Remote Compressor	Remote
Entry/Exit	Entry – injection into existing LTS network

Pipeline Length, Material and Diameter	Private Pipeline – 6 km 125mm PE100 IP , 15m 100/50NB Steel LTS rated
Maximum Operating Pressure (MOP)	42 barg
Maximum Flowrate/LTS Diameter	1000 scmh/100NB
Compressor Type	SAFE reciprocating compressors
Completion Date	May 2015

First project with compression remote from the AD plant
Now 4 similar projects



Leyland Bio-CNG Truck Filling Station 2015

Civils Build



Connection to LTS



Gas Meter



300barg CNG Storage



First Bio-CNG station on the LTS with 26 bar inlet pressure and low unit operating cost
Persuade HSE to change the law to allow unregulated gas meter

Waitrose CNG Trucks Filling



Emerald Biogas CBM Project - 2019

Connection at inlet to GEU



Inlet to Compressor



Dispenser



CBM Storage



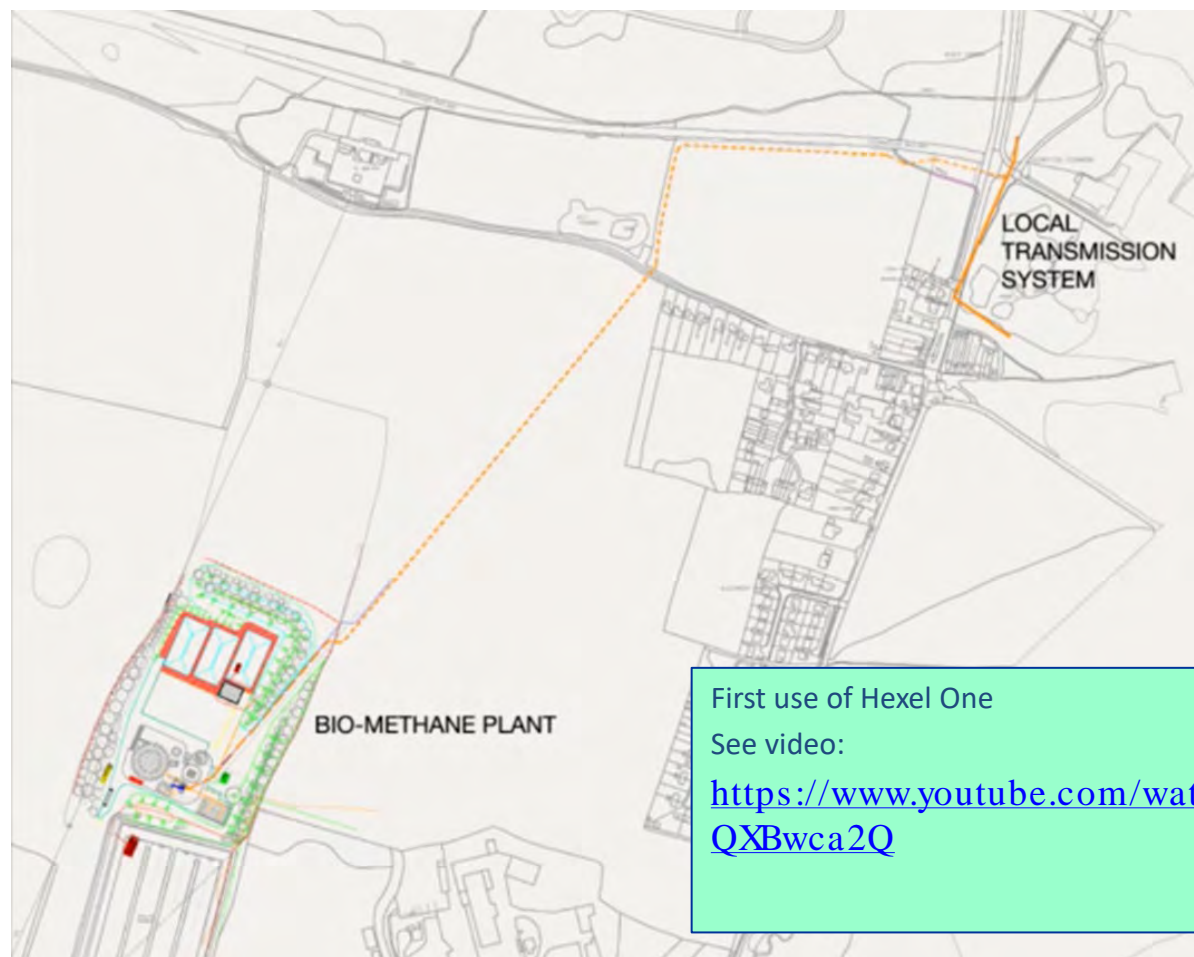
First biomethane upstream of a gas to grid Grid Entry Unit compressed to 250 bar for use by food waste delivery trucks

Completed Installation



Raynham - Hexel One Innovation

Hexel One 19 bar (Raynham 2015-16)



First use of Hexel One

See video:

<https://www.youtube.com/watch?v=qSAQXBwca2Q>



Fordoun NTS Connected Bio-CNG Mother Station and Self-lay Project - 2019

Connection at 85 Bar Block Valve



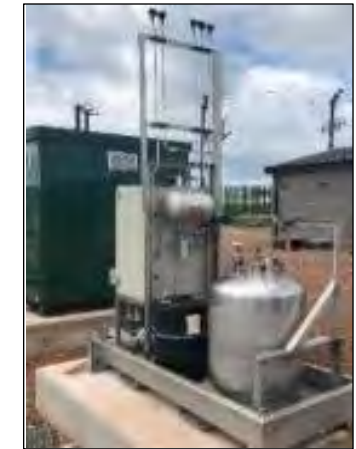
900m 85 bar pipeline



Energy Measurement



Odorant



Compressors (each 7,000 Sm³/hr max)



- NTS Self-lay pilot
- Major capex/opex savings by higher throughput per compressor, lower electricity consumption, lower unit maintenance costs and avoidance of gas distribution charges
- Site required Hazardous Substances Consent to store 40 tonnes of CNG
- No NTS ROV and no gas chromatograph

Bio-CNG trailers being Filled



Glenmorangie Bio-CNG Daughter Station Pipeline and Boiler Conversion - 2019

PRMS (250 – 2barg) and Bio-CNG Storage



Offloading Cabinet and Bio-CNG Trailer



500M Pipeline to Distillery



Final 2 bar to 200 mbar Regulator



- First daughter Bio-CNG station
- Glenmorangie annual Bio-CNG consumption around 40 million kWh
- Decanting station remote from distillery

<https://youtu.be/mcZUOvJNscw?si=RUoOng2O9Cjji hv>

Boilers converted to dual fuel gas with gas oil back up



Somerset Farm – first Biomethane into NTS Project - 2020

10-75 bar Compressors



Biomethane Energy and Gas Quality Measurement



75 bar Soluforce Pipeline



75 bar Export Pipeline



NTS Compound and Kiosk



- First biomethane into NTS
- Oil free gas compressors

Overall Plan



Theddlethorpe NTS Onshore Gas Injection Project with 70 bar Soluforce - 2021

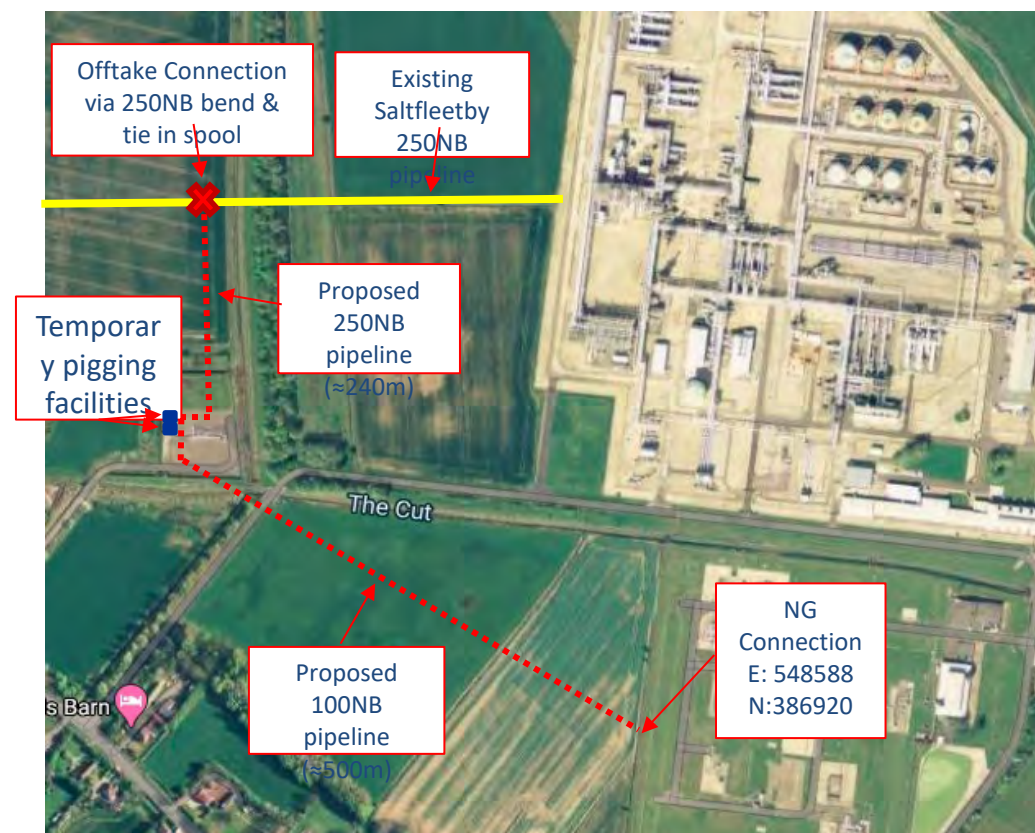
70 bar Soluforce Pipeline



HDD of Soluforce Pipeline



Overall Plan



NTS Connection Point



- First onshore gas field direct into NTS
- Use of Soluforce RTP with HDD

Moving 250 Bar Biomethane by road to decant into grid (for sites not near to a gas grid)

- Vale Green now operational and 2nd Site at Vulcan Renewables nearly completed

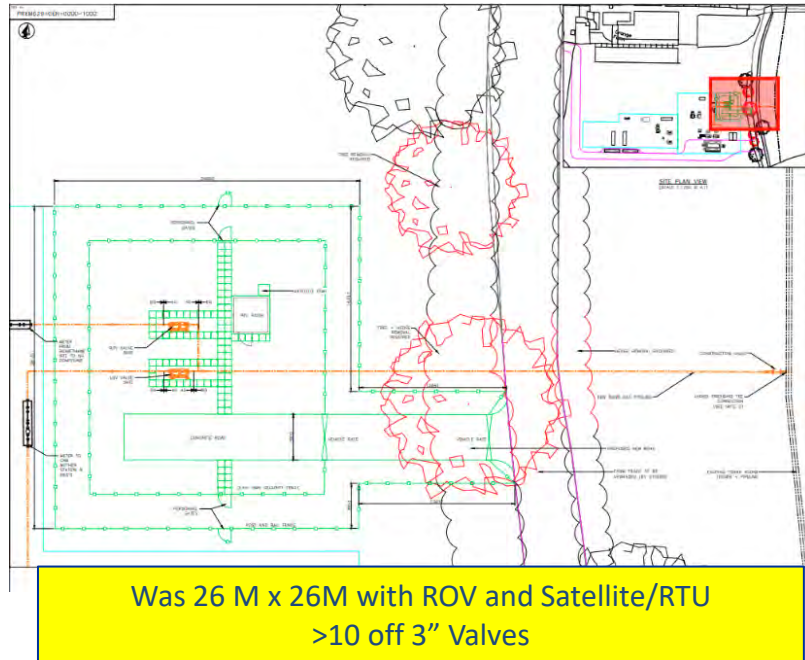


- First existing biomethane to grid plant modified to accept deliveries of stranded gas by road

NTS Connection Process

Prior to 2023

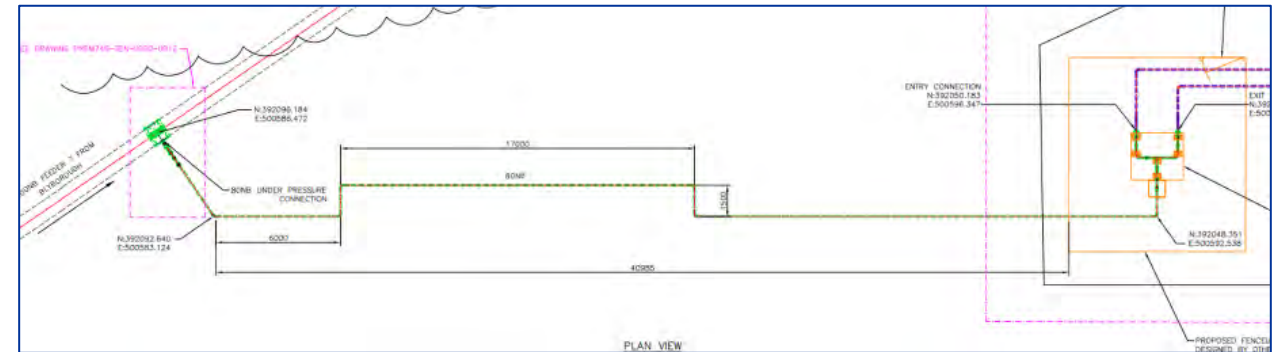
- Was c. £1.5m and 2 - 3 years
- 30M x 30 M compound for NGT with road access in compound all design & build by NGT



- NTS regime probably the best regime for biomethane for any transmission grid on earth

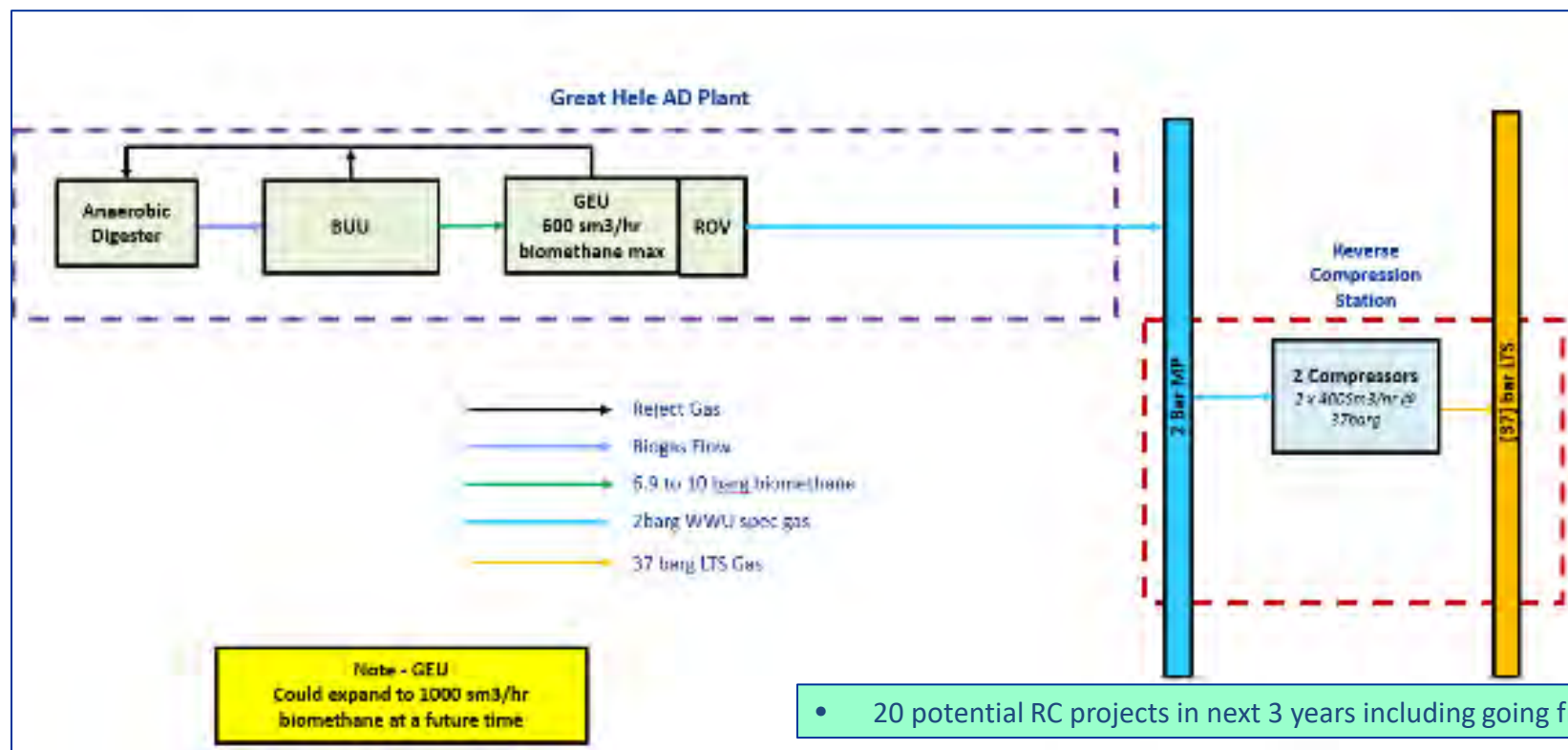
Post Biomethane Forum in 2023

- NGT standard connection to apply to all projects up to 10,000 scmh reduced offtake size to 3" rather than 8"
- Whole process and design refined – now c. £900k and 12 months
- Minimal above ground assets at the NTS to facilitate planning consent in rural areas, incl. below ground connection considered for greenfield with minimal above ground fence



No ROV, no RTU, 3 off 3" valves
Shared compound 7M x 7M

High Bickington – our first RC Project



- 20 potential RC projects in next 3 years including going from GDN to NTS

Within Grid Compression

Project: Skipton

Client: Northern Gas Networks

Concept: Install a compressor on a largely domestic 2 bar gas pipeline to demonstrate it could provide the necessary flow upstream to the 7 bar network to create capacity for biomethane injection.

Completion: 2012



Project Outcomes:

- A compressor and associated control system was designed to meet NGN's G17 criteria.
- The compression plant was installed and operated successfully. The concept is that during periods of low demand, the compressor turns on to move gas to the higher pressure network, creating capacity.
- The power demand was only 2% that of the additional injected biomethane into the grid - allowing for a net CO₂ saving.
- Within grid compression was proven capable of providing capacity to otherwise uneconomic BtG projects and to avoid flaring biogas in summer.

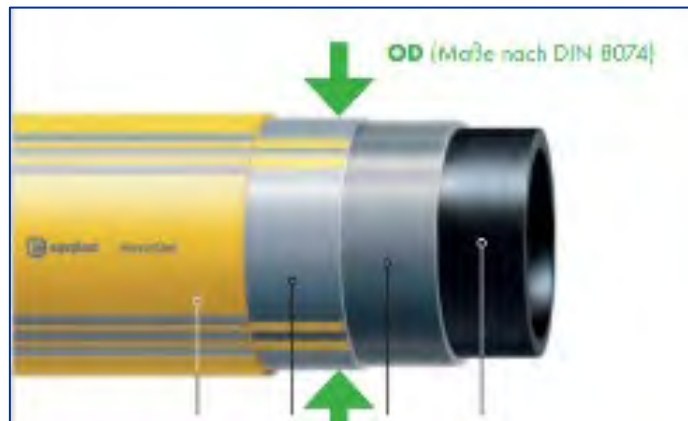
Bangley Quarry LTS – UNC 042

HexelOne pipe coils:



- SGN connection
- UNC 0842 approved
- Gas to Grid Date - October 2024

Build-up of HexelOne pipe:



Horizontal Directional Drilling of HexelOne pipe:



- CSL IGT model offers cost and time savings to developers with other upsides

CSL Innovation Challenges for 2025

CSL IGT Innovation Challenge for 2025

- For Reinforced Thermo Plastic – development of internal pigging inspection technology that will confirm that the RTP has not been damaged and remove need for hydro test after 5 years
- For pipeline commissioning, development of techniques to minimise gas vented to atmosphere (existing IGEM rules rely on large connection and high flows of gas for purging and are not fit for purpose in 2024)
- Integration of gas network pressure control with Reverse Compression (as at High Bickington)
- Low cost NTS Exit Energy Measurement system
- New Letter of Direction and simpler Grid Entry Unit for CSL IGT Projects (No heated room etc)
- For Green H2 projects – development of fit for purpose Grid Entry Unit and H2 Energy Measurement , Pressure Control and Odorant injection system
- GDN into NTS Reverse Compression
- Heat pumps to heat the digester
- Making more CH₄ with H₂