

# Biomethane News

News from **cng services ltd** - Autumn 2010

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## Breakthrough at last!

**CNG** Services' biomethane journey started in 2006 when we carried out a feasibility study in relation to making compressed biomethane (CBM) for vehicles from local authority organic waste. We were able to show that it was possible for refuse collection vehicles to run on CBM, however at the time it was not a practical proposition. Too much biomethane was made and there was no economic outlet for the excess, in particular at weekends when no refuse trucks operated. Injection into the gas grid was possible but with no renewable premium it was not economic. Generating electricity even without a use for waste heat was still the best financial outcome. This sparked our lobbying for a change in legislation to have a premium for biomethane injected into the gas grid.

In 2007 we developed a biomethane project at Davyhulme for United Utilities which was designed to prove the feasibility of the technologies used to make biomethane and inject it into the gas grid. During 2007 we worked with the Renewable Energy Association to promote biomethane and finally, in November 2008 legislation was passed to create the Renewable Heat Incentive (RHI) as the reward mechanism for biomethane injection.

In April 2009 we made a proposal to Scotia Gas Networks to carry out a feasibility study in relation to the development of a biomethane to grid project for Thames Water at their Didcot site. Less than 18 months later we have biomethane flowing into the grid, delivering significant environmental benefits. The Didcot project is now a beacon for a new renewable energy market in the UK, showcasing technologies previously only available in countries such as Sweden and Germany.

With the RHI coming into force on 1st April 2011 there are now real prospects for the creation of a biomethane industry in the UK, for both grid injection and as a vehicle fuel.

For details please contact  
[john.baldwin@cngservices.co.uk](mailto:john.baldwin@cngservices.co.uk)



## Didcot - UK's first BtG Project

The first biomethane to grid project completed in the UK was created by CNG Services. At the Thames Water Didcot sewage works site, anaerobic digesters are used as part of the sewage treatment process. Most of the biogas produced through this process was flared as it had previously been uneconomic to use this resource due to the high cost of connection to the electricity grid.

The Didcot project, sponsored by SGN, established that BtG is possible and identified opportunities to reduce the capital and operating costs of the plant to make it easier for future biomethane injection projects to go ahead. SGN provided 'Innovation Funds', designed to facilitate research and development in the UK gas industry which enabled the project to go ahead without the RHI premium.

Biogas produced at the site undergoes a clean-up and upgrading process using a water wash technology provided by Chesterfield Biogas. This removes moisture, CO<sub>2</sub> and H<sub>2</sub>S to produce a clean, dry gas composed of around 97% biomethane. Before the biomethane can be injected into the grid, propane must be added so the calorific value of the biomethane matches that of the gas in the local SGN grid.

The official launch event on October 5th marked the successful completion of the project and showcased the first biomethane injected into the grid in the UK, with the gas purchased by British Gas.

"The Didcot project represents an important milestone for the UK and the start of a new energy market. SGN, Thames Water and Centrica deserve congratulations for the project and CNG Services looks forward to many similar projects in the years to come."

John Baldwin, MD of CNG Services

For technical details on the Didcot project please contact the project manager:  
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Before - Gas being flared



During construction



Complete - Gas being put to good use

## Where is the gas grid?

As part of our support to potential biomethane projects we have now obtained access to all gas Grid Network Maps owned by National Grid, Wales & West Utilities, Northern Gas Networks and Scotia Gas Networks (including Southern Gas Networks).

With access to these maps we are now offering a service to determine if there are any gas pipelines in the areas for potential AD sites to enable gas injection into the grid. We will provide Satellite view maps, supported with the same image on a Gas

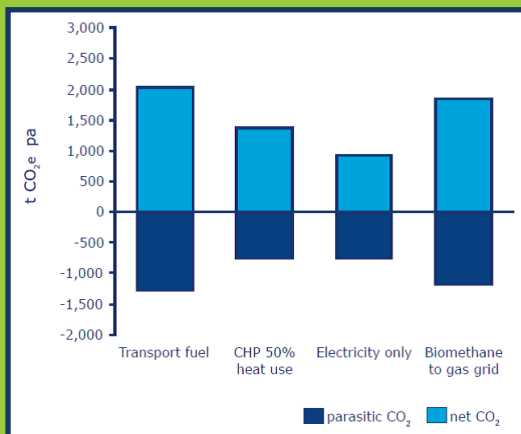
Grid Map, showing the closest connections and type of pressure Gas Mains in the area of interest.

Once connection points have been identified, we can progress the query directly with the Grid owners for confirmation of pipeline capacity to ensure your project has the opportunity to go down the biomethane route.

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## The Carbon Trust

A project commissioned by The Carbon Trust and aided by CNG Services compared the different uses of biogas from AD in terms of carbon savings and economics. It established that by 2020 the highest carbon saving would result from biomethane as a transport fuel, closely followed by a biomethane to grid (BtG) scenario. The generation of electricity or CHP was found to result in much lower carbon savings. For biomethane to be used as a transport fuel or injected into the gas grid it is important for the gas to be cleaned and upgraded. This involves removing moisture and impurities such as H<sub>2</sub>S and NO<sub>x</sub> from



the biogas to produce clean, dry biomethane. CNG Services completed a technology and cost review for The Carbon Trust in relation to biogas cleanup and upgrading

## Technology Visits

In the last 18 months CNG Services staff have completed technology reviews for a number of clients including visits to operational biogas clean-up and upgrading plants across the EU, as follows:

- Sweden - Water Wash, Chemical wash, PSA
- Austria - Membrane
- Switzerland - PSA
- Germany - Chemical Wash, Water Wash, PSA
- France - Water Wash
- Netherlands - Chemical Wash, Cryogenic



## Adnams Brewery

One of the projects in which CNG Services has provided design and other consultancy relates to the injection of gas into the service grid at the Adnams brewery, Southwold. Adnams Bio Energy, owned by Bio Group, alongside British Gas and National Grid have delivered the UK's first biomethane produced from brewery and food waste, to the gas grid.

The project will generate up to 4.8 million kWh pa which would heat up to 235 homes for a year or power a family sized car for 4 million miles. In the future it is hoped that enough gas will be produced to power both the Adnams brewery and its fleet of lorries as well as injecting the remaining 60% into the grid. The project uses an innovative cryogenic CO<sub>2</sub> removal plant with the CO<sub>2</sub> being used to grow algae to make more biogas.

In addition to reducing waste from the brewery itself, Adnams also provides an outlet for local food waste from both Waitrose and John Lewis, significantly reducing waste sent to landfill. On top of this, other sources of renewable energy such as photovoltaic cells and solar thermal panels have been incorporated into the site to further increase sustainability. Bio Group are now developing other similar projects across the UK.

For details please contact:  
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In each case we also visited the AD plants, including one in Germany which was harvesting 'whole crop' silage (left) in July, ready to plant another crop the day after.

If you are interested in the technical reports from these visits and our cost data base (which has capex and opex for different sized plants using the main clean up and upgrading technologies) then please contact:  
[jen.clayton@cngservices.co.uk](mailto:jen.clayton@cngservices.co.uk)

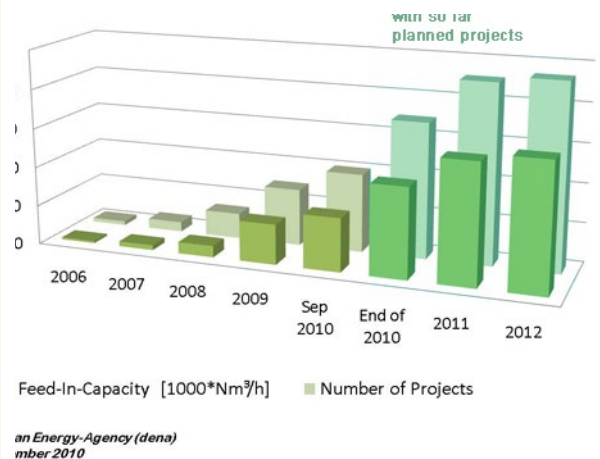
## Regulatory Round Up

Managing Director of CNG Services, John Baldwin is Chairman of the Renewable Energy Association's Biogas Group. The following sets out key developments in the last few months:

- JB attended a Ministerial Round table meeting in July hosted by Ministers Greg Barker (DECC) and Lord Henley (DEFRA). It was agreed to develop an AD Action Plan which would remove the remaining barriers to the development of a thriving anaerobic digester market in the UK. Update on progress to be presented at the Renewable Energy Association (REA) Biogas Group meeting on 21 October 2010.
- As part of the Government Comprehensive Spending Review, it is expected that DECC will set out an update in relation to the Renewable Heat Incentive on 20th October 2010. The REA has argued that the proposed tariff of 4p/kwh is insufficient to match the returns from generation of electricity.
- On behalf of the REA, JB has attended a number of meetings of the Uniform Network Code Review Group 251 to discuss the issues associated with enrichment of biomethane. There is consensus amongst this group (which includes all main gas transporters and gas suppliers) that it is appropriate to add propane, the costs associated with this should be taken into account by DECC when the level of RHI is set.
- Following on from the success of the Didcot and Adnams projects, a 'Green Gas Certificate' scheme has been introduced which will allow the biomethane energy that enters the grid to be tracked and allocated properly to any consumers. This will allow, for example, supermarkets to have their food waste made into biomethane and injected into the grid with an equivalent amount of natural gas taken out of the gas grid at a distribution depot and used to deliver food to stores by fuelling dual fuel CNG/Diesel trucks.
- The REA Biogas Group has a Compressed Biomethane (CBM) sub-group and this has made a number of proposals to DfT (Department for Transport) in order to promote CBM as a vehicle fuel. Proposals include making CBM duty free, offering 2 Renewable Transport Fuel Certificates and allow a higher GVW for 3.5te vans that have CBM storage tanks to prevent loss of payload (as is approved in the French market) without affecting their vehicle categorisation.

## biogaspartner

CNG Services is the only UK member in the German Energy Agency (DENA) "Biogaspartnership" project. The project aims to form a leading platform for the injection of biogas into the gas grid. Although Dena's role is of a neutral facilitator for the acquisition and preparation of information and its distribution, Germany sets a prime example of the potential of BtG, as shown by the growth of the country's biomethane market (see graph).



## Reaseheath

Farm slurry is a significant contributor to UK methane emissions. As such, having AD plants on farms is seen as a highly attractive option to prevent methane emissions and also create renewable energy. However, small individual farm AD plants are often not economic.

CNG Services have completed a Feasibility Study for Reaseheath College as part of a Defra funded project that analyses the potential of joining farms together into a biogas system, with a larger plant allowing BtG.

The model presented is based on the formation of 'clusters' of farms across the Cheshire area. The farms in each cluster would first transport slurry to a central AD plant to produce biogas; this would then be piped to a single clean-up and upgrading facility at a grid injection point. Not only would harnessing the biogas produce a clean, renewable source of energy but putting the digestate by-product back onto the farmland would reduce the need for expensive and environmentally damaging mineral fertilisers.

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## Biomethane for Transport

In the search for alternatives to petrol and diesel for fuelling vehicles, biomethane is making a strong challenge with an ever increasing range of vans and trucks. The first natural gas vehicles developed in the UK in the 1990s were petrol vehicles converted to run on natural gas. However, as the gas was 'wet'; this led to problems both with the vehicles and filling stations. Additionally in the past the CNG storage cylinders meant that storage space was reduced.

In 2010, following from the example set by mainland Europe, the UK is restarting the CNG industry. Natural gas has claims to be a safer fuel than diesel or petrol as it is non-toxic and lighter than air so will rise and disperse if a leak occurs. A gas-fuelled vehicle can reduce carbon monoxide (CO) emissions by 97%, hydrocarbons by 81%, nitrous oxides (NO<sub>x</sub>) by 86% and particulate matter by 94%. By designing the vehicles from first principles to run CNG, the storage cylinders are hidden under the floor, with no loss of luggage space.

The UK produces the largest volume of renewable methane (biomethane) in Europe due to the high level of waste sent to landfill sites. The other major source of biogas production is at sewage works, such as the Yorkshire Water site in Sheffield.

Sheffield City Council and the council's main recycling and waste management contractor, Veolia Environ-



mental Services, have launched the country's largest fleet of gas powered vehicles. This follows the council's successful six month trial of biomethane fuelled caddy vans, part of a new initiative to promote 'green' fuels. The fleet, purchased by Veolia, consists of 10 Mercedes-Benz Eonic lorries which will be used for refuse collection across the city. The Eonic runs on compressed natural gas (CNG) which will produce less CO<sub>2</sub> than a vehicle that uses fossil based fuels on a 'well to wheel' basis as well as very low emissions of NO<sub>x</sub> and particulates.

CNG Services supported Sheffield City Council in its successful application to have a grant for a new CNG filling station which is expected to be in operation by Summer 2011.

### MB Sprinter CNG

The Mercedes Benz Sprinter van runs on CNG but also has a back-up petrol capacity giving a total range of 1100km. It has a 1.8 litre turbocharged engine and fuel consumption of 13km per kg of fuel.



### VW Caddy Ecofuel

This car runs primarily on CNG but has a back-up petrol capability similar to the Sprinter. It has a 2.0 litre engine and a range of 550km. CO<sub>2</sub> emissions per km are around 20% less for the Ecofuel Caddy than for the gasoline Caddy. Fuel consumption is around 18km per kg of fuel.

## Passat Ecofuel

During September 2010, Volkswagen's Passat Ecofuel made its debut in the UK to showcase the drive for biogas as a renewable vehicle fuel. The car proved popular at the recent Low Carbon Vehicle event at Millbrook Proving Ground and made its first TV appearance on BBC Look North and ITV Yorkshire at the launch of the biogas to Compressed Biomethane (CBM) plant in Sheffield. Such approval, however, comes as no surprise given the car's credentials. It is exceptionally environmentally friendly and produces very little waste.



20g of CO<sub>2</sub> emissions per km on a Well to Wheel basis. Cars powered by biomethane are indistinguishable in their performance from fossil fuel powered cars.

After 5 years of development (2004 – 2009), the CBM-fuelled Passat is now one of Sweden's top selling low carbon vehicles. With a 1.4 litre engine, twin-supercharger and turbocharger the Passat offers high performance of 0 - 60 mph in 9.5 seconds and a range of 400 km on CBM and a further 400 km on petrol, so easily matches its diesel competitors.

On fossil Compressed Natural Gas (CNG), the vehicle emits 119 g CO<sub>2</sub> per km, around 20% less than the equivalent performance diesel. On CBM, it produces just

## Kazakhstan

A joint venture by KazTransGas and BG Kazakhstan has resulted in Kazakhstan's first CNG filling station. The station in Almaty City has a capacity of 2000m<sup>3</sup> which will fuel 240 buses, 200 of which have already been purchased by Akimat of Almaty. This marks the beginning of KazTransGas' "Concept on Expansion of CNG as a motor fuel for 2010-2015" with investment funds totalling KZT 600 million.

The concept aims to convert around 50,000 vehicles in Kazakhstan to run on CNG fuelled by a network of over 100 filling stations, at a cost of around KZT 20 billion. It is hoped that by promoting CNG as a vehicle fuel it will push Kazakhstan towards a cleaner, more sustainable future.

CNG Services provided design and project management support to BG on this project. For details please contact: [nick.harbord@cngservices.co.uk](mailto:nick.harbord@cngservices.co.uk)



## Bio-SNG

Biomethane can be produced during the conversion of a thermally-derived synthetic gas into methane. This is known as Bio-SNG (synthetic natural gas). The Regional Bio-SNG Project funded by Nepic, National Grid and Centrica aims to provide an evaluation of the viability of Bio-SNG as a technology option in the UK. A feasibility study was carried out by CNG Services and Progressive Energy which provided proposals for a lead project in the North East.

Two feedstock types are being trialled; the first is 'indigenous waste' and the second is woody biomass. The former targets a moderate scale capacity potentially supplying 15,000 homes, whilst the latter targets a larger scale that could supply up to 100,000 homes.

The long term vision is to use the existing gas grid to transport Bio-SNG to customers.

For details of the Bio-SNG project please contact: [john.baldwin@cngservices.co.uk](mailto:john.baldwin@cngservices.co.uk)

## CNG Economics

With the availability of new CNG vehicles made by the likes of Mercedes Benz, CNG Services is working on a number of CNG filling station feasibility studies. Whilst the 20% CO<sub>2</sub> saving of diesel-CNG dual fuel is important, the economics of CNG are the key. The price of CNG is made up of various elements as follows :

- 1) The price of gas from the grid which is currently around 50 p/therm if bought on a 'flat profile' (i.e. same amount all year, no seasonality). 1 therm is 2 kg, so assume 25 p/kg for gas.
- 2) The fuel duty on CNG which is 25.05 p/kg
- 3) Compression charges, fixed maintenance and capacity related gas transportation and electricity supply tariffs which can be calculated in p/kg - can be anything from 20 p/kg to 40 p/kg depending on the size, throughput and also required reliability (i.e. if the vehicle only runs on CNG like an Econic Refuse truck you need more filling station assets than if it was dual fuel diesel-CNG tractor or a bi-fuel Sprinter). Assume around 30 p/kg

- 4) Variable costs such as variable maintenance (running hours related) and variable gas transportation and electricity supply costs. Assume around 10 p/kg

So total would be around 90 p/kg for CNG of which 30 p/kg is fixed and 60 p/kg is variable.

This means that once a customer has covered the fixed cost in any year then any additional CNG reduces in cost to 60 p/kg. The best way to see what it costs on CNG is to take a km/kg figure. So, a Sprinter NGT will do around 12 km per kg. At 90 p/kg that means it costs around 8.5 p/km. If you are above the minimum in a year (i.e. fixed costs covered) it falls to 60 p/kg so that is 5 p/km. This is simplest way to work out the economics. Its all about throughput. It also makes it easy to compare with diesel.

For information on our CNG Feasibility Study please contact: [jen.clayton@cngservices.co.uk](mailto:jen.clayton@cngservices.co.uk)

## Natural Gas News

### Rydale Gas Project

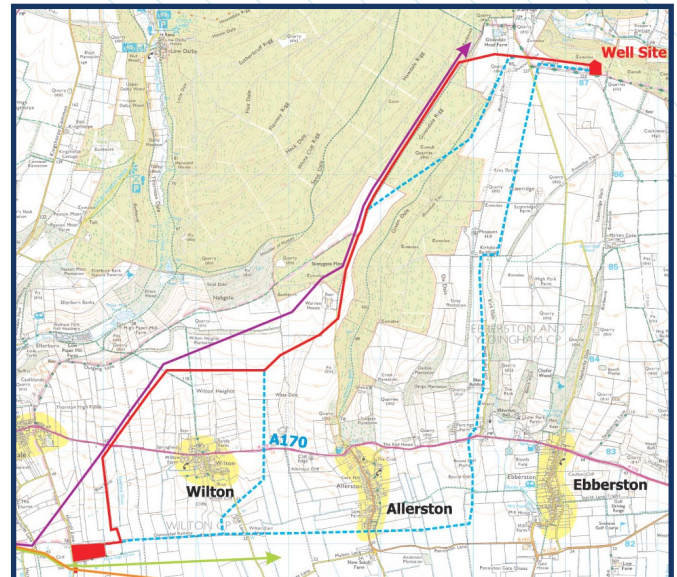
Successful exploratory drilling from a well site at Eberston, North Yorkshire, in March 2009 revealed that the field contains sufficient gas reserves to allow further development. The Rydale Gas Project covers the development needed to extract, process and supply that gas into the grid.

CNG Services Ltd (CSL) produced Basis of Design documentation for the treatment of gas for export into the LTS or NTS network. The principles of this were accepted by MEL who then commissioned CSL to ascertain the capacity of the LTS and NTS networks and produce the FEED and associated tender documentation to be issued to selected process contracting groups. CSL fronted discussions with the National Grid for the connection of the MEL gas supply into the NTS. These discussions have been successfully completed to the next stage (Design and Build). The FEED tender documentation was issued and the tender returns evaluated by CSL and MEL with an overall recommendation to use ProTech Land and Marine as the FEED consultant.

CSL were then commissioned to provide technical and project engineering support during the FEED and planning development stages. This included a review of the proposed technical design and detailed routing of the pipelines for the planning documentation. On submission of the planning application, CSL have continued to provide support during the planning deliberation phase which has included support during the public exhibitions carried out in the local communities

For details please contact:

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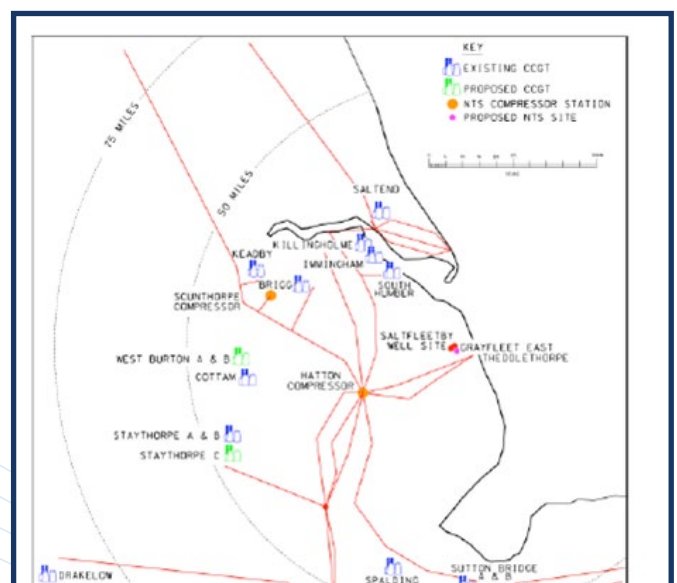


### Saltfleetby

Wingas Storage UK Ltd (WSUK) has recently won planning consent to develop its depleted gas field at Saltfleetby, Lincolnshire into an underground storage facility for natural gas. The storage site has a capacity of 755 million cubic metres of gas. The stored gas will be released in the winter period over 100 days then refilled during the summer months.

John Baldwin, MD of CNG Services, compiled the need case for the Saltfleetby project. In his evidence, JB explained that by 2020 there would be a lot of electricity generated by offshore wind. Because this is intermittent, it will require flexible generation from gas combined cycle power stations, which in turn will need flexible local gas supplies like that at Saltfleetby.

The map on the right shows that the Saltfleetby storage facility is located within 60 miles of the majority of the UK's gas fired electricity generation fleet and so is ideal to provide the flexibility required.



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[john.baldwin@cngservices.co.uk](mailto:john.baldwin@cngservices.co.uk)

## Biogas to Biomethane Plant

Throughout Autumn 2010 CNG Services has been trialling a portable gas clean up and upgrading plant at various sites throughout the UK. The unit takes Biogas produced from a waste source e.g. Sewage Works or Food waste treatment plants, cleans it, ( $H_2S$  and Siloxane removal), upgrades it ( $CO_2$  removal) and then compresses it to 250bar. The resulting compressed biomethane can then be used as fuel for vehicles. The trial successfully took place in three locations:

### Biogen Greenfinch, Bedford

The plant was installed at a food waste processing plant with the gas being used to fuel Mercedes Benz Sprinters provided by Bedfordshire County Council.

### Kelda Water Services, Sheffield

In partnership with Yorkshire Water and Sheffield City Council the plant was installed at the Woodhouse Mill Sewage Treatment works. The gas was used to fuel Sheffield City Council Caddy vans and the Passat Ecofuel.

### Scottish Water Horizons, Cumbernauld

Scottish Water Horizons have just opened a new Biogas production plant at the Deerdykes Food Waste Treatment Facility. As part of the opening event attended by Scottish Environment Secretary, Richard Lochhead, Scottish Water Horizons started their trial of the portable clean up plant in order to review the use of the CBM as a vehicle fuel for their fleet.

The plant has successfully demonstrated that Biomethane is a sustainable alternative vehicle fuel that can be used in cases where there is surplus biogas or biogas is used to generate electricity.



Biogen Greenfinch, Bedford



Woodhouse Mill, Sheffield



Deerdykes Cumbernauld

## Design, Consultancy, Project Management

CNG Services Ltd is the UK's leading independent Biomethane Consultancy that provides support from initial feasibility, design, costing, procurement, project management and gas contracts through to commissioning. We are independent of equipment suppliers.

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## New Recruits

CNG Services is expanding as the biomethane market develops. We are pleased to welcome Greg Lee and Jen Clayton to our team.



Jen has recently graduated from The University of Manchester after having studied Environmental and Resource Geology. She joins the team as Process Analyst and Support Officer.



Greg has 10 years experience in the Gas and Oil Industry specialising in plant design and joins us a Mechanical Designer.

CNG Services Ltd is a member of a number of trade associations that are supporting the development of Biomethane in the UK:

