

Gas to the West

Innovation and
Technology Transfer

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Table of Contents

INNOVATION AND TECHNOLOGY TRANSFER	2
11.1 ENVIRONMENTAL SUSTAINABILITY	2
11.2 EFFICIENCY IN THE USE OF GAS AND THE USE OF NEW SOURCES OF GAS	7
11.3 COST EFFICIENCY	11
11.4 DEVELOPMENT OF A GAS NETWORK UNDER THE LICENCE TO MORE REMOTE GEOGRAPHICAL AREAS	14
11.5 HISTORY OF INNOVATION	15
11.6 ABILITY TO SECURE FUNDING FROM OTHER GOVERNMENTAL OR REGULATORY AUTHORITIES.....	20
11.7 PROPOSALS TO TRANSFER ANY INNOVATION INTO NORTHERN IRELAND	22
11.8 EXISTING SKILLS AND EXPERIENCE	22

Innovation and Technology Transfer

- Proven track record of bringing innovation and technology transfer to natural gas network development in Northern Ireland e.g. Craigavon Bridge and No Dig Technologies;
- Estimated £10m savings can be made by taking an innovative approach to the Utility Regulator's proposed Fingleton-McAdams network design;
- firmus energy in developing the GTTW network will continue to play a full role in tackling both fuel poverty and climate change whilst maintain security of supply and providing value for money to customers;
- firmus energy is committed to ensuring that any learning gained from its innovation is openly disseminated to other utility providers to ensure further benefits to Northern Ireland.

At firmus energy we have embedded a culture of innovation, and aim to continuously improve our business, through both technical and commercial innovation. This will help us to develop our knowledge in order to provide a safe, efficient and reliable network, which will deliver value to our customers and safeguard our environment.

11.1 Environmental sustainability

Natural gas, the cleanest fossil fuel (30% less CO₂ than heating oil, and 45% CO₂ less than coal) is a highly efficient form of energy. Natural gas' advantages over other fuels include the following: it has fewer impurities; it is less chemically complex and its combustion results in less pollution.

Using natural gas produces less of the following substances than oil or coal:

- Carbon Dioxide (CO₂), which is the primary greenhouse gas;
- Sulphur Dioxide, which is the primary precursor of acid rain;
- Nitrogen Oxides, which is the primary precursor of smog; and
- Particulate matter, which can affect health and visibility.

In addition, the inherent cleanliness of gas means that environmental controls on gas equipment, if required, tend to be less expensive than those for other fuels.

Figure: 11.1a Comparison of Air Emissions from Fossil Fuels (Pounds of air emissions produced per billion Btu of energy)

Emission	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000

Since 2005, firmus energy's existing operations have removed c.450,000 tonnes of CO₂. We estimate over the 40 year life of GTTW, conversion to natural gas from existing fuels would lead to c.2.8 million less tonnes of CO₂ entering the environment. In developing its Business Plan for GTTW, firmus energy has examined:

- The role it can play in delivering a low carbon economy to Northern Ireland;
- How as a business we can reduce the overall carbon footprint of our gas distribution businesses;
- How we can enable alternative and/or renewable sources of gas to connect to the GTTW network; and
- How to ensure our network build is future proofed to ensure it can cope with the impact of climate change.

To ensure environmental sustainability within our plan we are planning to bring the following innovative solutions forward within our GTTW development.

A. No Dig Technology Innovation

A.1 Trenchless Gas Mainlaying

Trenchless gas mainlaying is the preferred construction method for firmus energy when installing new gas pipes. The use of such techniques:

- Offer a price advantage over traditional open-cut options of underground installations and offers higher productivity;
- Are environmentally friendly with low disruption and minimum excavation;
- Environmental rehabilitation time for affected areas can be much shorter than open-cut operations;
- The possibilities of trenchless operations to be installed beneath existing services such as roadways, established natural environment etc.
- Local business, roads and paths can remain open as disturbance is minimised by trenchless operations; and
- Access to equipment is reduced, hereby minimising disturbance to the natural and social environment.

Trenchless technologies, which minimise surface excavation, significantly reduce the environmental impact of underground utility service installation. It minimises surface disruption, traffic congestion and reduces air and noise pollution as well as minimising the amount of waste caused by earth and pavement excavation. This technique can also overcome obstacle crossings where the regular open-cut main laying methods are not suitable. Trenchless technology is widely used for installing long services and mains, especially beneath rivers, canals, railways and busy roads.

The environmental and social benefits of trenchless technologies are as follows:

- **Reduced Travel delays:** Utility construction work can cause significant traffic delay due to lane closures or complete road closures. Trenchless gas mainlaying therefore has a lower local economic impact as there are reduced delays and a lower environmental impact as stop-and-go traffic leads to greater fuel consumption, For example 1,000 speed changes from 50mph to 15mph and back to 50 mph cause an additional fuel consumption of 12.2 gallons for light duty vehicles (Budhu and Isely, 1994);
- **Improved road surface value:** Open excavations can result in pavement deformations and asphalt cracking at the edges of the trench, which leads to an accelerated degradation of the pavement. Reduction in useful pavement/road life due an open-cut excavation is estimated to be as high as 30% (Tithe, et al, 2002);
- **Loss of Trade:** Open excavations can result in reduced accessibility to local businesses due to congested traffic conditions, blocked parking spaces and barriers from the construction site itself. In addition local businesses experience a loss of customers, who prefer to go to more convenient places, while on the other hand businesses depending on deliveries may have problems with their supplies;
- **Cost of dust control:** Open excavations result in a significant amount of dust. Cleaning needs, and thus costs, increase. Also the quality of life for people living near the construction zone decreases; and
- **Worker safety:** Open trenches pose a higher risk to workers and pedestrians than trenchless technologies. Accidents related to trenching are approximately 112% higher than the average value for construction work in general (Jung and Sinha, 2004).

All trenchless techniques used on the firmus energy gas distribution network are carried out with consideration to IGEM/SR/28 Edition 2 Trenchless Techniques. Two types of trenchless technologies are by employed firmus energy. We would propose that these would also be used in GTTW:

- Impact Moling; and
- Horizontal Directional Drilling (HDD).

Depending on ground type there is approximately a 20% cost saving per meter using Trenchless Techniques compared to normal trench laying.

A.1.1 Impact Moling

Impact moling is a technique in which a pneumatic soil displacement hammer (SDH) is used to create a bore hole. This technique has been developed to minimise disruption and reinstatement. The decision to conduct impact moling is based on a sound understanding of the site conditions including soil stability. This is standard practice for firmus energy. Prior to commencing moling operations, significant preparatory work is needed. firmus energy undertakes site surveys and trial holes are excavated to determine the exact location and depth of all plant and utilities. Underground apparatus is 'marked up' on the ground. The route of the proposed bore path is then determined.

The mole is launched with the use of a launch cradle. Any deviation from this technique is subject to risk assessment. Any launch activity is carried out in a controlled manner, ensuring sufficient clearance from existing

utilities and plant. Techniques for launching must follow best practice guidelines. The basic equipment requirements for impact moling include a:

- soil displacement hammer
- starting platform (for larger diameters)
- telescopic aiming frame for alignment of the displacement hammer
- air hose
- compressor
- 2 metre surveyor's staff

A.1.2 Horizontal Directional Drilling (HDD)

firmus energy uses HDD machines to install gas pipe by pilot boring underground, using a removable drilling head. The drilling head is selected by the Period Contractor depending on the ground conditions and this is rotated and pushed through the ground using a series of drill stems. Once the pilot has bored from the launch pit to the receiving pit a reamer is attached to the pilot head. Once the drill is pulled back the reamer enlarges the bore, so that the pipe can easily be pulled back through the ground.

firmus energy will ensure that all utility apparatus records and mark-ups are used to avoid damaging existing utilities. A site survey will be conducted and trial holes excavated to determine the exact location and depth of all plant and utilities along the proposed route of any proposed gas main. Where any drilling route will cross existing utilities a trial hole will be dug to confirm the depth and location of the existing services. Trial holes will remain open during drilling operations to ensure 300mm clearance from any other utility.

All HDD operations will be conducted under a 'permit to drill' arrangement. This is accompanied by a site specific risk assessment and suitable method statement. Permission will not be granted to conduct HDD in the vicinity of high voltage electricity cables. All machinery and tools required to operate the HDD rig in a safe and controlled manner will be serviced or calibrated to the required standard. It will be the responsibility of the Period Contractor to ensure that all operatives engaged in HDD operations are fully competent.

In the course of HDD operations an exclusion zone will be established using a suitable system of barriers and fencing complying with Safety at Street Works and Road Works Code of Practice. This must be sufficient to prevent access from members of the public.

HDD machines using metal drill stems will have an approved alarm box type cable strike detector, complete with earthing spike and metal grid mat. The Period Contractor will wear appropriate Personal Protective Equipment (PPE) (boots, gloves, helmets goggles etc.). The alarm system will be checked before the machine is used. All site operatives will be briefed and fully trained in the emergency procedures appropriate to the HDD operation.

Using the appropriate location equipment it will be possible to identify the location and depth of the pilot head whilst drilling. This location equipment will be calibrated and must be fit for purpose for use by the competent person(s). It will be the responsibility of the construction team leader to ensure that this is carried out at sufficient points along the route (maximum of 3 metre intervals) to allow an accurate record to be produced. The team leader in conjunction with the Records Officer must produce accurate schematic records with the works package and may be asked to confirm the accuracy of his work by firmus energy by means of trial holes at locations selected by firmus energy.

Although it is not possible to place marker tape above the drilled gas main, it is a requirement that any opening on the main will be marked appropriately. Due to the inability to place marker tape over the main, it will be essential that the records produced are accurate and that there is sufficient depth of cover on the gas main. The cover on the main should be a minimum of 1,000mm and this should not rise above 1,200mm without the approval of the firmus energy engineer.

A.1.3 Tensile Loading

During pipe installation using Horizontal Directional Drilling, tensile forces are applied to the pipe and in some cases these can be considerable. It is important that these tensile forces do not exceed the pipe manufacturer's recommendations. As a rule of thumb they will be calculated by using a maximum of half the minimum yield strength of the pipe material. By limiting these tensile forces, the pipe will not be subjected to significant elongation (stretching) under load, and equally will not be taken to a point where plastic damage (yielding) of the pipe will occur. Suitable equipment shall be selected and used at the worksite to limit the loads applied to the pipe.

A.1.4 Cable Avoidance Tools (C.A.T4™ and Genny4™ range)

firmus energy will use the latest evolution of the highly popular Cable Avoidance Tools. The new C.A.T4 digital platform will deliver highly refined locate capabilities. It incorporates an Avoidance Mode which will allow the operator to check an intended excavation area for Power, Radio and Genny signals, and pinpoint located utilities in a single scan.

Figure 11.1b: C.A.T 4 in use



Due to the long term stability of the product accuracy, there is no requirement for annual calibration with the C.A.T4 which ultimately results in cost savings and downtime. The system also includes Bluetooth connectivity to enable accurate communication with firmus energy's existing GPS data logging, mapping and surveying systems. firmus energy's Period Contractor has used the existing CAT4 for several years in the Ten Towns Network.

B. Customer Technology Innovation

B.1 Climote

As part of firmus energy's commitment to keeping pace with new technologies in energy management, we have undertaken our trial of the Climote system within our Ten Towns and the Belfast Licence area. Climote is a smart energy controller which allows domestic customers to control their heating from any computer or enabled smart device. This additional control helps users spend less money and save on energy usage as the system provides a facility to reset, boost or turn off heating and hot water controls remotely.

Figure 11.1c: Climote Hub



The Climote system replaces the boiler's time clock with an interactive HUB, which allows the householder to communicate to the boiler via the internet from home or abroad or by sending text commands. Homes using Climote have found that they were using their heating up to 20% less, which provides savings on an average natural gas bill of around £140 per annum. We hope to roll out this technology to suitable GTTW households.

B.2 Natural Gas Vehicles fuelled by Compressed Natural Gas (CNG)

firmus energy will look to build upon our existing parent company's experience of supporting a CNG infrastructure for vehicles. Bord Gais Networks have installed Ireland's first fast fill re-fuelling station in Cork, with a further two stations will planned for Dublin this year.

Natural-gas Vehicles (NGVs) use the same principles as petrol-powered vehicles, but provide cost savings between 30-50% and CO₂ savings between 10-25% per vehicle. In addition, CNG is a very clean fuel and does not generate the particulate matter into the environment, with the subsequent respiratory problems, that diesel fuel causes. CNG can be used as a fuel for vans, trucks and cars.

We will consider providing a site within the GTTW area for a CNG station to initially fuel both our own vehicles and those of our customers. In addition, many of the large I&C customers within GTTW operate large fleets of Heavy Goods Vehicles that return to depot each day. Going forward these vehicles could be powered by CNG.

Figure 11.1d: Bord Gais Networks' Natural Gas Fleet Vehicle



B.3 Natural Gas Domestic Appliances

As we develop GTTW we will work with all natural gas suppliers to support the uptake of natural gas domestic appliances:

- Gas Cooker - On average, gas ovens cost around £9 a year to run, whereas electric ovens cost around £44 a year. Installing a gas oven provides an annual saving of £35 (Source: EST);
- Gas Tumble Dryer - can be up to 70% faster than an electric dryer and up to 60% cheaper to run than an electric dryer (Source: EST). In customer testing, *Which?* calculated the annual energy costs for around 101 tumble dryers and found that they vary between £29, for gas dryers, and £139 per year for the least efficient electric models; and
- We will continue to promote natural gas appliances in GTTW, should our organisation prove successful.

C. Sustainability of firmus energy's operations in GTTW

In developing and operating our business for GTTW, firmus energy will ensure its operations are undertaken in the most sustainable manner. firmus energy has already attained the CORE corporate responsibility standard from Business in the Community Northern Ireland. CORE is based on Business in the Community's Corporate Responsibility (CR) Model. This model details the main corporate responsibility issues under the People, Planet and Place themes alongside the three essential requirements that businesses must consider:

- Marketplace responsibility;
- Stakeholder engagement; and
- Responsible leadership.

Each theme is assessed against a key focusing on the operational requirements for CR in an organisation, specifically:

- Strategic planning and objectives;
- Policy and processes;
- Activities and engagement;
- Targets; and
- Measuring and reporting.

It is through this standard that we will manage our GTTW operations, should our application prove successful. We understand that as a business we need to minimise our impact on the environment – balancing the need to save money with the global imperative to be more sustainable.

Figure 11.1e: firmus energy fleet vehicle



We work closely with our Period Contractor, McNicholas Construction Services to ensure that as an overall business we manage our environmental responsibilities through the adoption of relevant policies and commit to the principles of sustainable development, including pollution prevention and will focus on continually improving in this area. We have set McNicholas Construction a large number of KPI's to ensure they minimise environmental impact through waste management, pipe re-cycling and achieving standards such as ISO 14001 (Environmental Management) ISO 14064 (Greenhouse Gases) and ISO 9001 (Quality Management Systems). Overall activity is measured throughout the year and measured against the company scorecard.

In GTTW, we will further develop our operations by undertaking the following:

- Formalise our Sustainable Travel Policy, providing employees with advice and guidance on the most sustainable ways of travelling, including staff route planning – to minimise travel and environmental impact;
- Encourage the purchase of low emission company cars and fleet vehicles. With a target to reduce emissions from our Company Car fleet to <math><120\text{g CO}_2/\text{km}</math>;
- Examine the use of Natural Gas Vehicles powered by CNG, which can provide cost savings between 30-50% and CO₂ savings between 10-25% per vehicle;
- Greater use of on-site mobile technologies to support engineering and sales staff. Integration of mobile devices with our systems will enable firmus energy to improve asset management. Furthermore, it will further improve workforce productivity and overall sustainability by ensuring on-site staff will need to spend less time updating records in the office. A 2013 PWC Study showed that utilities who have successfully deployed mobility solutions achieve productivity improvements of 20% - 30%;
- Carbon Trust audits of our own operations (Head Office, satellite yards etc.) to further improve our sustainability and reduce our energy usage;
- Examine opportunities to work with other utilities (NIE, NI Water etc.) to realise environmental and cost savings through dual trenching and reinstatement activities;
- Ensure zero recyclable waste to landfill;
- Continue to provide health information to our employees; including mandatory health surveillance for all 'safety critical' employees and raising awareness of health issues pertinent to our workforce;
- Allowing employees to engage in volunteering activities – recently received CORE Accreditation from BITCNI; and
- Using programmes such as 'Bridge to Employment' and 'Energy Utility Skills' to provide employment to suitable unemployed persons.

11.2 Efficiency in the use of gas and the use of new sources of gas

Efficiency in the use of gas

Customer Innovation

1. Decentralised Heating

There are a number of hospitals within the GTTW network area which we have identified as having heating supplied from central boiler plants. Heat is distributed from the boiler plants via underground heating pipes throughout the premises. These underground pipes are poorly insulated and therefore lose extensive amounts of heat.

Therefore, when gas is made available there will be an opportunity for these sites to decentralise their heating with the use of independent premise boilers and thereby increasing overall heating efficiency of these site, whilst further reducing CO₂ emissions (on top of the initial environmental savings from converting to natural gas)

and ultimately saving on the overall cost of energy. firmus energy has already undertaken similar projects to this in 7 Hospital sites across the Ten Towns network area, and we have determined that there are 3 such opportunities for de-centralisation in the GTTW towns. Decentralising heating provides cost savings of around 50% of a customer's energy bill, and overall CO₂ savings of between 50-60%.

2. Combined Heat & Power (CHP)

firmus energy has facilitated the installation of CHP plants in several locations. These include Altnagelvin Hospital & 6 units in various Tesco stores. The CHP plant cut CO₂ emissions by up to 70% whilst supplying excess clean electricity to the local power grid. firmus energy has identified 10 loads in GTTW which are potentially suitable for medium/large scale CHP installations which will undoubtedly improve energy efficiency and reduce carbon emissions in GTTW. CHP also has the direct benefit of providing electricity into the local network which helps to reduce existing stress on the electricity network.

3. Direct Fired Water Heating

Large industrial sites mainly in the Agri-Food sector require extensive amounts of hot water for sterilisation purposes. Historically steam has been raised using inefficient heavy fuel oil fired steam boilers; the steam is then cooled to produce hot water to the desired temperature. firmus energy actively promotes the use of Direct Fired Water Heaters are 99% energy efficient and can provide up to 40% energy savings to the customer. Within the Ten Towns network area customers like Foyle Meats have installed such a system. We will replicate the promotion of such technologies in our development of GTTW.

4. Direct Fired Heating

As in direct fired water heating many industrial premises heat water which is transmitted through pipes into heaters. Natural gas allows many direct heat processes that remove this inefficient method. This technology can achieve 40% to 70% energy savings to a customer. Within the Ten Towns we have assisted customers such as Huhtamaki install this technology. We will replicate the promotion of such technologies in our development of GTTW.

Distribution Network Innovation

1. Remote Pressure Regulation

In GTTW every I&C Meter will be equipped with telemetry equipment which will provide hourly consumption data to the Sensorlog platform which firmus energy can then access via a secure internet log-in. This information can, in turn, be shared with the customer via a web platform where the customer can view their own consumption data. Diaphragm meters (16 SCMH – 40 SCMH capacities) can be fitted with a plug in data logger, this has an integrated Machine to Machine (M2M) SIM card which delivers data to a central server, this data can be uploaded to the Sensorlog platform on a daily basis (6am every morning). The data can be shared with the customer by way of a secure log in (via firmus energy's website). The installation of this type of meter for GTTW commercial customers will offer a range of cost benefits for the Network Operator, energy suppliers and the customer.

Figure 11.2a: Meter with Sensorlog platform attached



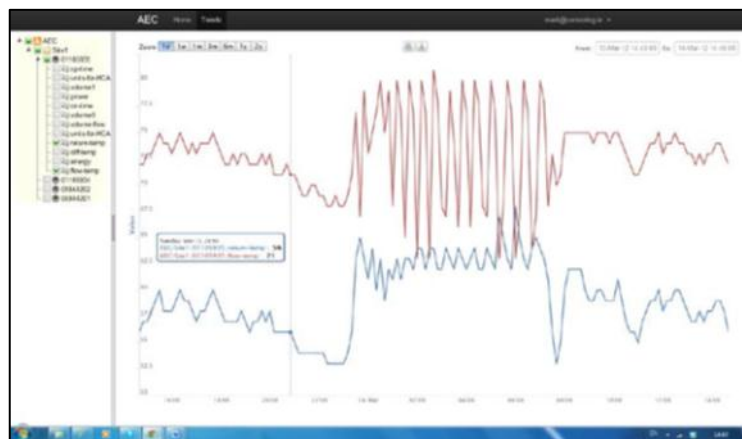
2. Meters requiring a flow corrector & flow data via telemetry

In GTTW, firmus energy will also use Emerson/Francal rigs retro-fitted with a Maxi Elcor flow corrector which features an integrated M2M SIM card. This data will be uploaded to the Sensorlog platform with firmus energy's users and customers having similar access as described above. This corrector & logger will have the added advantage of also collecting pressure data which can be used by engineering to monitor general network operating parameters to ensure correct system operation and to highlight pressure issues immediately.

Figure 11.2b: Meter Rig attached with a flow corrector and flow data



Figure 11.2c: Screenshot of Telemetry Data provided from the Sensorlog Platform



3. Active Energy Control Rigs

In addition, firmuse energy will also use Active Energy Control Rigs within GTTW. These rigs come with factory fitted integrated flow corrector & M2M SIM, as well as monitoring flow & pressure data. They also monitor filter differential pressure and slam shut status. A pulse signal is provided locally which the customer can utilise to connect to their own energy management system. In addition these units will also be linked to firmus energy's proposed Sensorlog platform. Water, steam, heat and electricity usage data can also be logged onto the customer energy management system to give the customer full view and better control of total energy demand.

Such innovative technology will help improve customers energy efficiency and control production costs, whilst also contributing to a reduction in CO₂ emissions. In GTTW, firmus energy will actively promote the benefits of this system and work closely with the supplier to provided tailored solutions for every interested customer.

Figure 11.2d: Active Energy Control Rig

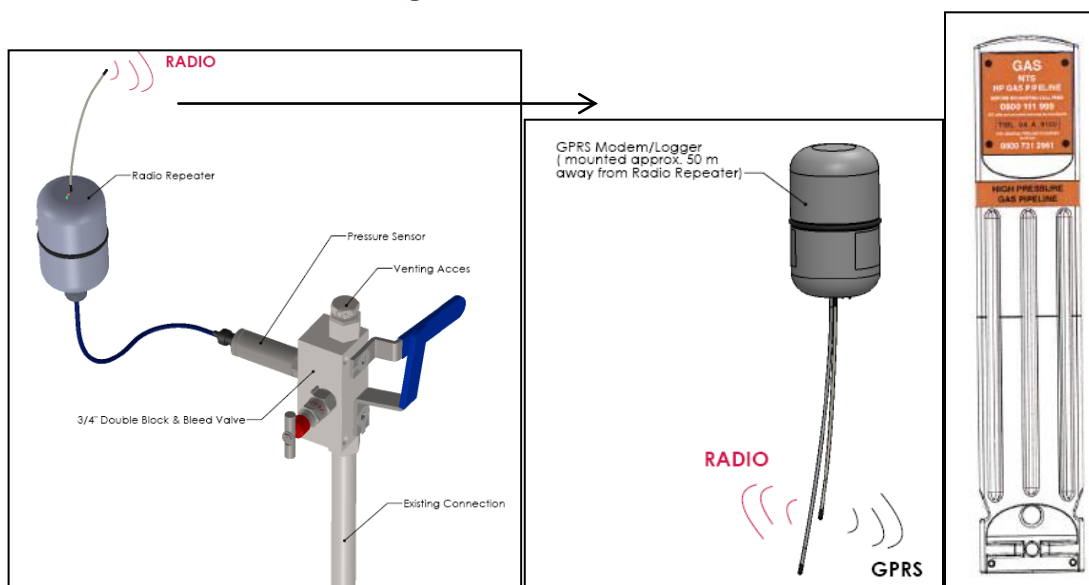


4. District Pressure Monitoring

In developing the GTTW, firmus energy plans to install a series network pressure sensors. These sensors are located within a standard below ground chamber, this will relay information over a distance of up to 50 metres to a logger sited within an above ground marker post which will, in turn, communicate with the Sensorlog platform providing visible data to firmus energy.

In addition, the Sensorlog software can be set up to raise a mobile alarm to firmus energy staff once pre-determined thresholds have been passed i.e. Low Pressure/High Pressure e.g. below 3.5 Bar for MP system monitoring & below 60 mbar for LP system monitoring. A further input will be gathered from a District Pressure Reduction Module to raise an alarm should the slam-shut device activate within the module.

Figure 11.2e: District Pressure Monitoring



These alarms are notified to firmus energy by way of an e-mail which will be sent to firmus energy’s Operations & Maintenance Department. Outside normal office hours, this will be sent to firmus energy’s monitoring service who will, in turn, contact the appropriate standby manager. The standby manager will have internet access to Sensorlog and will be able to access this facility via any internet enabled device, ascertain the nature of the problem and arrange the appropriate Response Engineer to attend. The hardware and installation costs for a site which will monitor pressure on the Medium Pressure and Low pressure networks at key points is £2,300.

firmus energy are confident that such technology will lead to network gas and maintenance efficiencies which are overcoming the challenges of the dispersed rural nature of the GTTW network.

11.3 Cost efficiency

A. Stakeholder Engagement ensuring cost effective network build

Strong stakeholder engagement is a central feature to firmus energy's GTTW bid. Throughout our operation of the GTTW licence, firmus energy will undertake its own customer engagement (in partnership with our stakeholders such as CCNI) to justify the services and outputs we will deliver to customers during the various price control periods.

firmus energy commit to proactively engage with stakeholders and consumers on an on-going basis in order to justify that our business plan is aligned with the needs of existing and future consumers. The key stakeholders we have identified in this customer engagement process are:

- Domestic consumers and their representatives;
- Industrial and business consumers and their representatives;
- Environmental groups;
- Regional and Local Government;
- Local Politicians (MPs, MEPs, MLAs, Councillors etc.);
- Other regulators (HSENI etc.);
- Investors;
- Gas Suppliers; and
- Transmission Network Operators.

Such an initiative will ensure that firmus energy's operation of the GTTW accurately and cost effectively reflects the needs of customers in the GTTW area.

B. Innovative Fuel Poverty Initiatives

Natural Gas is a recognised means of reducing fuel poverty. A recent CCNI Report¹ showed that households in Northern Ireland that use natural gas spend on average over £1,000 less on heating per year than those households using home heating oil.

Building on this significant intrinsic benefit, firmus energy has engaged in several partnerships with Bryson Energy and including a "Winter Warmth Scheme" which helps most vulnerable customers improve energy efficiency in their homes. This has a knock-on effect of lowering natural gas bills. This free service was designed for customers living in our network area who were more than 60 years old and living alone or with a minor, having a disability or being chronically ill. The scheme offered a home visit from a professionally trained Bryson Energy representative who reviewed the customers energy bills, ensured they were fully aware of how to get the best use from their natural gas heating system and referred those eligible to suitable energy efficiency schemes. In fact 34% of all scheme participants passed a benefits entitlement check with a £47 per week average increase for successful applicants. This partnership approach to fuel poverty would be replicated for GTTW.

firmus energy advisors also actively source referrals and promote the Warm Homes Scheme introduced by the DSD to tackle fuel poverty. The scheme provides a package of free energy efficiency and heating measures to residential home-owners and those who rent from private landlords on a qualifying benefit. In addition to providing a natural gas connection, Warm Homes offers:

- Cavity wall insulation;
- Loft insulation;
- Hot water tank jacket;
- Benefit entitlement check;
- Energy advice;
- Warm Homes Plus offers; and
- Insulation measures.

firmus energy's sales team currently promotes this scheme in their day to day contact with residential customers, and this approach would be replicated for the GTTW towns.

¹ "Customers Experience of Natural Gas in Northern Ireland", Consumer Council for Northern Ireland, June 2012

In addition, firmus energy is actively engaged with stakeholders in Northern Ireland that represent fuel poor customers such as NEANI, EST, Bryson Energy, Age Sector Platform, the Fuel Poverty Coalition, CCNI and Professor Christine Liddell at University of Ulster (who is the leading fuel poverty academic in Northern Ireland). Through this active engagement we participate both at a policy level (firmus energy is Chair of the DSD thematic group on Fuel Poverty Prevention and member of the Northern Ireland Fuel Poverty Coalition) and in several funding schemes such as Northern Ireland Sustainable Energy Project (NISEP), Warm Homes, Cosy Homes and the DSD Boiler Replacement Scheme. Therefore we will work to ensure fuel poor customers in GTTW can convert and receive the benefits of natural gas in the most cost effective manner.

Within the Ten Towns licence area we offer a wide range of innovative measures that assist vulnerable groups, and we will extend these benefits to customers within the GTTW area. These include:

i. Prepayment meters:

- Prepayment meters help fuel poor households to manage their gas consumption on a 'pay as they go' basis;
- Oil companies do not provide prepayment facilities and charge around 2 times the standard pence per litre rate for a 20 litre 'emergency' oil drum on garage forecourts; and
- Prepayment meters continue to be used as an effective budgeting tool in many households across the 10 towns.

ii. Prepayment tariffs:

- firmus energy does not charge any premium for using prepayment meters – this is contrary to GB where a premium is often charged.

iii. Efficient heating systems:

- Natural gas is a highly efficient fuel, so consumers get an excellent return on every unit of energy spent². Modern condensing boilers, which use hot flue gases that are wasted in a standard boiler, have very high efficiency and converting from a 10 year old 'G' rated oil boiler to a new 'A' rated natural gas boiler can lead to an improvement of 32% boiler efficiency and a saving of around 44% per annum for domestic customers.
- firmus energy works closely with Gas Safe and our provincial installer network to promote the installation of high efficiency Sedbuk 'A' rated boilers plus full system controls (time clocks, room thermostats and Thermostatic Radiator Valves) which ensures reduced energy costs and carbon emissions for customers.

iv. firmus care scheme:

firmus energy operate a care scheme for its vulnerable natural gas customers, which provides:

- A free annual boiler service to firmus care customers;
- A pre-arranged password scheme with older or vulnerable customers to give added peace of mind;
- Special controls and adaptors for customers who have difficulty turning appliances on or off, free of charge;
- Energy efficiency advice;
- The ability to send bills to a relative, friend or neighbour; and
- A service to reposition a gas meter if it is difficult to access free of charge - subject to technical survey.

C. Engineering Innovation

1. AGI positioning

firmus energy has carried out a detailed load survey of the towns and following any award of licence it would be our intention to carry out a comprehensive detailed review of all routes and pipe sizes to ensure design optimisation and all associated cost efficiencies are realised.

firmus energy has innovatively investigated the possibility of substituting transmission pipelines for distribution mains. The cost of transmission mains exceed the cost of lower pressure distribution mains and it would be the intention to substitute transmission pipelines for distribution main wherever possible to reduce costs and to make gas available to more households as individual connections cannot be taken off transmission pipelines. This would reduce construction time on the transmission pipeline and hence will get customers connected to the distribution system in a shorter timeframe and the reduction in transmission build will minimise disruption to farmers and landowners.

firmus energy would propose that the extension of the transmission pipeline from Derry/Londonderry to Strabane is substituted for a distribution main. We have carried out a load survey of the town and are confident

² <http://www.which.co.uk/energy/creating-an-energy-saving-home/guides/home-heating-systems/gas-central-heating/>

that the town can be adequately supplied gas using a 4 bar distribution main connected to the firmus energy network in Derry/Londonderry at Maydown roundabout. We would estimate that installing distribution main from Derry/Londonderry to Strabane **could save up to £8.6m in construction costs** relating to the transmission network, inclusive of proposed AGI costs and hot tap connection costs to the northwest pipeline.

In addition, firmus energy would propose that the AGI in Cookstown is relocated to save on cost. We have carried out a detailed load survey of Cookstown, Moneymore, Magherafelt, and Toome and are confident that the AGI could be located closer to Dungannon and the transmission pipeline substituted for distribution mains to **save in the region of £1.5m.**

2. Distribution Network Design

Whilst firmus energy has submitted its Business Plan on the basis of the Fingleton McAdam survey, we have undertaken our own survey of each of the GTTW towns. firmus energy are confident that significant costs savings can be made and we would wish to discuss these further with the Utility Regulator as the bid process progresses.

3. Offsite engineering

In order to minimise cost and on-site disruption, firmus energy will undertake its engineering operations in a manner that, as much as possible, is constructed 'offsite'. This policy/process also has significant site safety benefits and impact on the local/natural environment.

4. Small diameter pupped valves and PE valves

firmus energy has innovatively used pre-manufactured pupped valves and PE valves. This saves on assembly time and costs as the units are preassembled. In addition, because the units are constructed in a sterile factory environment, rather than on-site, they are of a higher overall construction standard and therefore a safer and more robust unit further reduces the potential for human error and resultant gas escapes.

5. Handheld Computer Tablet solution – Engineering and Sales

firmus energy is currently undergoing a trial of hand held devices for data capture and recording of assets in line with the new period contract within the Ten Towns. Handheld devices (PDAs/tablets) will allow for direct data capture by the Period Contractor on site. The devices allow asset information to be recorded in real time and have a direct link to a diary management system which can be accessed by firmus energy staff to monitor construction activity, job progress, completeness of records and asset maintenance. Furthermore, as previously discussed it will further improve workforce productivity and overall sustainability by ensuring on-site staff will need to spend less time updating records in the office - a 2013 PWC Study showed that utilities that have successfully deployed mobility solutions achieve productivity improvements of 20% to 30%.

6. Pay As You Go & Smart metering

Within the Ten Towns, 80% of domestic customers have requested prepayment meters from firmus energy. Prepayment meters help customers to better manage their usage but we are experiencing high emergency call out numbers as customers cannot reset their meter once they have run out of gas, which incurs a cost, as our engineers have to call out and reset the meter. Therefore, in the greenfield GTTW we are proposing to implement an evolution of this meter, to that it can be reset remotely from firmus energy's offices. We have calculated that over 10 years of GTTW savings of c.£400,000 could be achieved by fitting this meter.

In developing GTTW, firmus energy will also examine the opportunities to install smart meters throughout the GTTW network. In doing so we will learn from the experience in Great Britain and the Republic of Ireland to ensure we fully take on board the learning from their deployment. Smart meters will enable customers to have greater control over their energy usage and help with cost budgeting.

As smart meters take automatic, accurate readings of energy usage and remove the need for estimated readings, energy suppliers and firmus energy's Transportation Services Team could access the meter reading remotely, which will help to save further costs with a completely accurate allocation and nomination procedure.

In Great Britain, it is estimated that Smart Meters will save energy suppliers more than £300m a year, by removing the need to take meter readings or deal with bill disputes, therefore their implementation will help in reducing all utility companies Bad Debt positions and their related costs.

Figure 11.3: Smart Gas Meter



7. Vehicle Tracker System

firmus energy will install GPS Vehicle Tracking into all operatives' vehicles. The live GPS tracking system will enable better fleet and personnel management, as it will show up to the minute real time tracking information of vehicles and vehicle activity. Detailed information including speed, mileage, route data and fuel level can clearly be monitored, which ensures proficient running of the vehicle. The system will also ensure excessive driving time will decrease as the most efficient route possible will be presented to the driver via a Sat Nav. In addition, it will be possible to calculate mileage prior to journey commencement giving a more accurate arrival time to customers, which will further increase our overall level of service. Vehicle tracking is already installed in McNicholas vehicles in Ten Towns Period Contract.

8. Dual Trenching

In developing GTTW, firmus energy will look to other utility network providers (NI Water and NIE) to see if overall cost savings can be made by using dual trenching (i.e. using the same trench for all utilities). firmus energy already has had initial positive discussions with NIE and we have requested a meeting with NI Water in this regard. It is believed that significant reinstatement savings could especially be made if the Traffic Management Act was enacted in Northern Ireland.

11.4 Development of a gas network under the licence to more remote geographical areas

firmus energy has unique practical experience of successfully developing a natural gas network in a remote geographical area within Northern Ireland. firmus energy's original business plan and licence application for the development of the provincial network from Derry/Londonderry via Antrim to Newry, which came to be known as the Ten Towns set out that firmus energy would connect natural gas to 60,000 homes and business over a 30 year licence period.

firmus energy connected its first customer, Michelin, to our network in November 2005, and its first domestic customers in Stathfoyle, Londonderry in April 2006. In the 9 years since our licence was awarded (24th March 2005), we have connected around 22,000 homes and business. Our strong performance in developing the geographically remote Ten Towns was reflected in our robust regulatory performance in our last price control (PCR02), where we:

- Were 8% underspent on operating expenditure; and
- Achieved 49% more connections to our distribution network than our regulatory target.

On the back of this success, our aim in 2014, 2015 and 2016, is to double the connection assumption within our original 2005 business plan and connect 4,000 customers. This has all been achieved whilst also laying more than 870 km of gas pipelines since 2005.

In addition, we have requested and gained network extension approvals to bring natural gas to eight areas (Portstewart, Ballyclare, Bessbrook, Warrenpoint, Craigadoo, Coleraine Quarries, Bushmills and Glenavy) over and above the original Ten Towns. Currently, we are preparing a licence extension application to bring natural gas to Mackles Foods in Moy. Therefore, in developing the remote geographical gas network for GTTW we will not be resting on our laurels and we will continue to actively look for economically viable network extension over and above the 8 GTTW towns.

In developing our Ten Towns network we have made the key strategic decision to underwrite all our activities on the basis of our 4 key values:

- Clarity;
- Empathy;
- Integrity; and
- Teamwork.

This innovative common sense approach to gas development and stakeholder relationships has enabled firmus energy to become a trusted (97% Satisfaction – 2013 Milward Brown Customer Survey) brand in the Ten Towns which has helped to enable natural gas to become the heating fuel of choice within our network area.

firmus energy's success has been built on developing excellent local stakeholder relationships with local politicians, community groups, heating installers, businesses and by sponsoring locally focused events such as:

- firmus energy Mid Ulster Youth Football League;
- firmus energy Super 5 – local youth athletics – covers from Derry/Londonderry-Antrim, Newry and Mid Ulster;
- firmus energy "Person to be Proud of" award – in support of exceptional people in communities across Northern Ireland;
- firmus energy Derry City Triathlon;
- firmus energy sponsored the Torch Run for the World Police and Fire Games (in support of the Special Olympics); and
- Local Business Awards.

Figure 11.4: Innovative Local Community Initiatives



We will replicate this innovative targeted community approach in developing GTTW to ensure the local success of the development of natural gas in the towns of Strabane, Omagh, Magherafelt, Cookstown, Coalisland, Dungannon, Enniskillen, and Derrylin.

11.5 History of innovation

firmus energy has developed a reputation for bringing innovation and technology transfer to natural gas network development in Northern Ireland.

firmus energy use fora such as Institute of Gas Engineers and Managers (IGEM), Pipeline Industries Guild and NI Natural Gas Association (NINGA) to disseminate these innovations. Indeed, firmus energy won the 2014 IGEM Irish Section Young Persons Paper Final, for our Project Engineer's (Oonagh Malone) paper on 'Asset Protection - All Wrapped Up' which focuses on the inspection and maintenance programme undertaken on a steel gas pipeline operating at 4bar on the Craigavon Bridge in Derry/Londonderry. Indeed, firmus energy also won the 2013 IGEM Irish Section Young Persons Paper Final, for Conan Hodgkinson's (Project Engineer) paper³ on how firmus energy overcame certain engineering difficulties in expanding the gas distribution network to Ballyclare.

In addition, throughout our operations we have made the issue of addressing fuel poverty a key aim. Our innovative work in this regard has been recognised with DSD asking firmus energy to chair its thematic sub group on fuel poverty prevention. We have worked closely with other stakeholders to activity reduce fuel poverty in our Network Area, through promotion of conversion grants and partnerships with the likes of Bryson Energy

³ <http://www.mcnicholas.co.uk/Expanding%20the%20natural%20gas%20network.pdf>

and Heatsmart to provide vulnerable customers with energy efficiency advice/audits as well as benefits entitlement checks. firmus energy who supported NEANI was asked to speak at an event at the House of Lords to highlight the fuel poverty problem in Northern Ireland to key political and policy decision makers.

Examples of innovation undertaken are:

1. Craigavon Bridge – Inspection and Maintenance Programme

Since 2005 firmus energy has crossed four bridges with exposed steel pipework, an asset which requires continuous assessment and protection until replacement or removal. These crossings are of critical importance to the continuity of supply for firmus energy. The most critical crossing is over the Foyle Estuary, Derry/Londonderry, which is an area of special scientific interest. In 2007, a steel gas pipe was attached to Craigavon Bridge as part of the planned development of gas in Derry/Londonderry. Future plans included a second river crossing to provide supply security to the City Side of Derry/Londonderry. The City Side has approximately 103km of network pipeline and c. 5,000 customers fed from the single crossing on the Craigavon Bridge. The Craigavon Bridge is a 270m multiple span double decked steel bridge, the steel pipeline is 6.4mm thick, 273mm steel pipe operating at 4Bar, coated with liquid protection in the exact colour of the bridge (RAL 5003) which provided a life expectancy of approximately 3-5 years.

During an annual inspection it was noted that the steel pipeline was showing evidence of degradation, the pipework was subject to corrosion under the rusted paint work.

Figure 11.5a: Craigavon Bridge pipeline with evidence of corrosion



The speed and level of degradation was attributed to the River Foyle being tidal, therefore the salt water, high tides, driving winds and the exposed pipeline accelerate corrosion. Also the top deck of the bridge has water runoff positioned directly above the steel pipeline, while this was not directly attributable; the bad weather in the winters of 2009/10 increased the amount of rock-salt being spread on the top deck running surface and subsequently onto the pipeline.

In 2012, an appraisal of the level of new protection required for the Craigavon Bridge, was undertaken. As part of this appraisal it was necessary to consider the alternatives available for the second river crossing. The following options were assessed for feasibility: Foyle Bridge, Peace Bridge, and Horizontal Directional Drill (HDD) under the River Foyle. Of these options the drilling of the River Foyle is the only feasible option to reinforce the network due to the structures of the two bridges. However, this substantial specialist project would require high level consultation with long lead times. With this in mind the existing river crossing degradation needed to be halted to ensure no maintenance requiring isolation was required until the second crossing was in position. A full survey of the Craigavon Bridge crossing was commissioned to ascertain the level and extent of the corrosion.

Experts GL Noble Denton were employed to carry out an investigation of the pipeline, this included a visual inspection, wall thickness measurements and corrosion survey. The following was noted:

- Pipeline wall thickness measured using ultrasonic digital thickness meter at several locations showed a nominal thickness of 6.4mm.
- Corrosion pits were found to be a depth of between 0.5mm – 0.6mm
- Wall thickness was corroded at parts between 7.8% - 9.3%

From this inspection GL Noble Denton recommended two options:

- Corrosion > 10% wall thickness – refurbish external coating
- Corrosion < 10% wall thickness – recoat surface of pipe with appropriate coating and perform repairs where required.

The corrosion found on the pipeline fell under the 10% corrosion recommendations. Therefore, a recoating of the liquid protection would be sufficient to protect the bridge crossing for approximately 7 years. Taking in to consideration the costs, quality and life expectancy of applying liquid protection and the methods required to carry it out, it was decided that more detailed investigation into other methods was required to ensure a value for money method was applied with a practical and satisfactory quality and life expectancy. As 65% of the cost for applying the liquid protection was made up of scaffolding and safety requirements, only 35% of the total cost of the scheme was dedicated to the system chosen, including labour. Of the 35% of the cost almost 10% was additional labour costs for the high level of surface preparation required for the liquid protection. If a system could be found to meet our criteria, but with an improved quality and life expectancy, then better value for money could be achieved. Any protection method considered had to meet the following criteria:

- Suitable surface preparation for a live 4Bar gas main located on the side of a live carriageway suspended over a fast flowing river;
- Suitable for the harsh environment it would be located in; and
- Colour match to RAL 5003

Research was carried out to find another protection method meeting the criteria listed above with an equal or improved quality and life expectancy. If a method could be found then even with a higher material cost the reduction in labour and time scales would show an overall reduction in cost and thus value for money. After some research into the various existing recoating methods available i.e. epoxy paint, acrylic paint, zinc tape, it was deemed that none of these were suitable to meet our criteria.

As no tried and tested method was suitable a number of companies were approached to find more innovative methods. After assessing and ruling out a number of methods for unsuitability an innovative system never used in Ireland before was presented to us by Denso. Denso's proposed system was the Denso Steelcoat 100/400 combination system, they demonstrated examples of its application in other parts of the world with customer recommendations on its quality and effectiveness. The Denso Steelcoat 100/400 combination system comprised of the Steelcoat 400 system, used on structural steel pipework and Steelcoat 100 system specified for above ground fittings of irregular shape. This system was ideal for the steel pipeline due to the clamped supports at 6 metre intervals and bellow units.

The Steelcoat combination system incorporated:

- Denso Hi-Tack Primer – a high melting point petrolatum liquid used for its adhesive properties to aid adhesion of petrolatum tapes. It will penetrate existing rust and displace moisture.
- Denso Profiling Mastic – a petrolatum compound containing beads of cellular polymers, used to build up and smooth contours of irregular shaped fittings.
- Denso Hi-Tack Tape – a non-woven synthetic fabric coated with an adhesive compound based on petrolatum, polymers and inert siliceous fillers. It has an excellent resistance to acids, alkalis and salts.
- Denso Ultraseal Tape – an acrylic coated non-woven synthetic fibre fabric coated on one side with a polymer bitumen adhesive compound.
- Denso Acrylic Topcoat – a water based synthetic coating which produces a tough weather and U.V. resistant coating. It is resistant to mineral acids, alkalis and salts.

Each of these components is an integral part of the coating system, in which its application is vital to its successful life expectancy. These include specific locations where each method should start and stop and the correct amount of overlap required for each component. The surface preparation is also of significant importance and was chosen specifically due to its location and proximity to vehicles. The chosen preparation included a fresh water wash down, heavy chipping hammers and thorough hand wire brushing.

The prescribed preparation used with the Denso system gave an expected surface life of 30 years, with a maintenance coat expected after 10 years. Comparing this system to the liquid protection the quality and life expectancy are both significantly improved. It achieves all the specified criteria with a vastly reduced level of surface preparation required. While the material costs for the Denso system is more expensive the time scales are reduced and therefore overall a more cost effective system will be applied with a better quality and longer

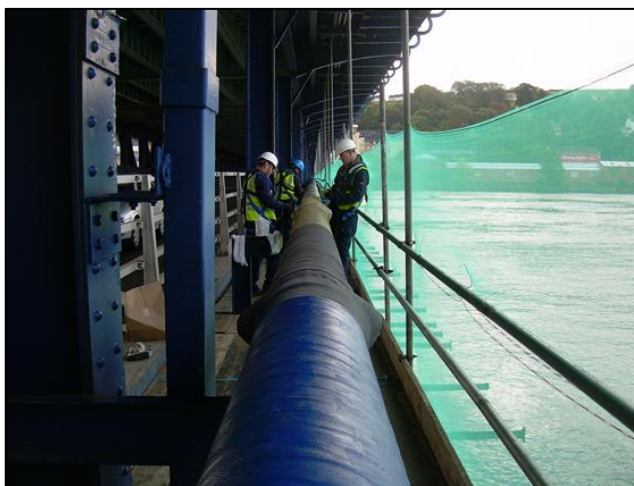
life expectancy of the final product. With this improved method and following trial of the system it was agreed to proceed with its application

Once a refurbishment system was agreed, planning and programming was undertaken with key stakeholders including DRD Roads Service, DRD Structures Section and Londonderry Harbour Authority.

Risk assessments highlighted the need for all operatives working on the bridge to wear life jackets at all times, be secured to the bridge through the use of lanyards and for the requirement of a manned life boat at all times during operation to be located on the water. firmus energy's period contractor McNicholas Construction employed EB Gas to carry out surface preparation and the application of the Denso Steelcoat 100/400 combination system. The operatives were first inducted and briefed on specific risk assessments and method statements. Denso spent two days with the operatives training them on the correct preparation and application of the combination system.

Additional cost savings were achieved with an innovative method of erecting the scaffolding. With close coordination with DRD Roads Service, DRD Structures and the specialist scaffolding company a bespoke scaffolding system was designed to ensure no road closures or disruption to pedestrians or traffic was required. With this new scaffolding design no night work or weekend work was required which in turn provided a financial saving and reduction in time scales with no lost time due to down time. This new scaffolding design still met all safety requirements as per the specific risk assessments. Once the scaffolding was installed, a final inspection was carried out by GL Noble Denton to fully ascertain the level of corrosion, validating their earlier inspection. EB Gas operatives commenced work on 8th October 2013 with an estimated duration of 15 days.

Figure 11.5b: Operatives applying the various Steelcoat layers



A final inspection was carried out on 7th November 2014 by firmus energy and McNicholas construction prior to removal of scaffolding. After months of planning and executing the works the final scaffold was removed on 22nd November 2013 leaving a completely refurbished steel pipeline, with an extended maintenance free period of 10 years.

Figure 11.5c: Completed works on the Craigavon Bridge



Since this successful refurbishment, the Denso Steelcoat system has been praised by DRD Structures, with a number of stakeholders and other distribution companies making contact with firmus energy to enquire about the system following its successful implementation for the first time in Ireland and this has sent a new benchmark for bridge crossings. If the environment dictates, this new system will be used for all steel pipeline crossings going forward in the firmus energy distribution network and will be part of our GTTW network development.

2. Excess flow valves / flow limiters

Previously, I&C gas services would have an isolation valve fitted on the service pipe to shut off the flow of gas in an emergency, such as a fire at the premises. This was dependant on the gas company being informed of the emergency and an emergency response operative being on site quickly to operate the valve. This highlighted an added risk to response personnel attending fires where the premises had a supply of natural gas or contractors carrying out works in the vicinity of gas services where the escape of gas is not contained until the valve is operated.

firmus energy investigated the possibility of developing technology previously used on domestic gas services and examined whether it could be employed in a similar arrangement for industrial and commercial applications. The excess flow valve or flow limiter works in a similar way as electrical circuit breakers that trip when electrical current exceeds design limits. It provides an automatic cut off of the flow of gas should the service pipe be severed as in the instance of interference damage by a mechanical excavator or in the case of a fire, where the meter enclosure is damaged by fire and gas escapes at the meter. firmus energy have been successful in developing this innovative solution for excess flow valves for industrial and commercial applications, and all 32mm and 63mm, 4bar services have been fitted with excess flow valves in the firmus energy network since 2009. This continued innovation demonstrates firmus energy's on-going commitment to safety and provides a safer environment for all emergency personnel and contractors.

3. Offsite Construction

As already discussed, in order to minimise cost and on-site disruption, firmus energy will undertake its engineering operations in a manner that as much as possible is constructed "offsite". This policy/process also has significant site safety benefits and impact on the local/natural environment. firmus energy within its Ten Towns development has innovatively used pre-manufactured pupped valves and PE valves. This saves on assembly time and costs as the units are preassembled. In addition, because the units are constructed in a sterile factory environment, rather than on-site, they are of a higher overall construction standard and therefore a safer and more robust unit further reduces the potential human error and the resulting gas escapes.

4. Combined Heat and Power Units - Daisy Hill Hospital

firmus energy was successful in securing NISEP funding for the installation of a new CHP unit at Daisy Hill Hospital in Newry. We have learnt from the experience and understanding of the 50% energy/CO₂ savings of this project. Similar projects have been undertaken with Gallahers, Altnagelvin Hospital and a number of Tesco stores and we are now currently involved in a similar CHP project at Craigavon Hospital. In addition, we are in discussion with several of our large Ten Towns customers e.g. Michelin, Fane Valley, Huhtamaki, as to whether similar plant will be of cost and environmental benefit to their operations. A number of opportunities exist in

GTTW for the installation of medium and large scale CHP units. Should our application be successful firmus energy will also actively work with the consumers to deliver these projects, and where possible firmus energy will try to identify grant funding for these projects.

In addition to our innovative CHP work, we have worked with St. Luke's Hospital, Gransha, Causeway & Lurgan Hospitals to develop de-centralisation projects where steam boiler systems are replaced with localised boiler installations annual energy usage is typically reduced by 50%. We have also worked on similar projects with our large I&C customers in the Ten Towns, for example Foyle Meats had a need for large volumes of hot water. Historically steam this was generated and then cooled to provide the hot water requirement, which proved very inefficient and costly. Working with the customer the steam boiler has recently been replaced with a dedicated hot water boiler with the result being that the annual gas consumption and CO₂ output being reduced by 70%. We will replicate this approach with customers in GTTW to ensure they achieve the highest cost savings and sustainability impact.

5. Northern Ireland Inventory Product

firmus energy approached the UR in 2006 with plans to run a Northern Ireland Inventory Product. Initially the NI Inventory Product was to be a trial with firmus energy. The aim of the Inventory Product service was to buy gas when gas prices were lower and to store this gas in the pipeline for use at peak times when gas prices were likely to be higher. The value of the Inventory Product clearly relied on market price signals/differentials. Business rules were agreed and the trial was operationally successful. Following consultation in early 2007 the trial was approved by what is now the Utility Regulator's office. The aim of the trial was to identify volume opportunities for storage within the North-West and South-North pipelines. It aimed to identify and resolve any operational and code issues associated with storage and it also aimed to quantify potential savings that such a service could offer Northern Ireland gas consumers. It was proposed that the trial would continue to operate under the following principles:

- All suppliers would be kept whole – operationally and commercially;
- The product would continue to operate on an interruptible basis and all nominations would be on an interruptible basis;
- It was proposed that volume be increased to 732,668 kWh (25,000 therms). This level was the equivalent of a “minimum trade” in the UK NBP gas trading context and firmus energy was confident that its processes were sufficiently robust to facilitate this quantity; and
- As agreed, any savings incurred as part of the trial were split 50:50 between the supplier and the transporter. The costs of trial were borne by firmus energy.

Market stability prevented the inventory product trial from continuing but the basis of the trial (to prove that natural gas could be stored within Northern Ireland's gas transmission pipeline) was met and this will remain a viable future option.

6. LPG Supply Company Relationships

firmus energy has long standing relationships with the LPG supply companies (Calor Gas and Flogas) in Northern Ireland in which they temporarily supply LPG to large industrial users/new build schemes in advance of the arrival of natural gas. In our surveys of the GTTW network area we have already had discussions with customers about two new factory sites which can undertake this process as they will be operational before GTTW goes live. Therefore, we have already consulted with Calor Gas to arrange installation of LPG fired systems in advance of gas becoming available. This will enable a simple conversion process upon the arrival of natural gas in the area.

11.6 Ability to secure funding from other governmental or regulatory authorities

firmus energy has a dedicated Energy Advisor who specialises in managing government or regulatory authority funding. We have secured funding from the following sources:

1. Northern Ireland Sustainable Energy Programme (NISEP)

firmus energy is the only Gas Distribution Network operator to avail of NISEP. We have been successful in two strands of funding:

a. Toasty Homes Scheme

firmus energy “Toasty Homes” initiative, part-funded through NISEP. It offers grants to qualifying households to switch their existing heating system to natural gas. Through this scheme, householders can take advantage of up to £1,500 towards the installation costs of conversion.

Those successfully securing a grant can also benefit from up to £800 towards insulation costs, as well as free energy-saving light bulbs and an energy monitor. Customers who meet the criteria and secure a grant receive financial support to install a high efficiency natural gas boiler to help reduce household fuel bills and CO₂ emissions by c.30%.

firmus energy has just secured £1.2million of funding for 2014/5 after similar funding in 2013/14 delivered grants to over 600 households. With the demographics (see Section 7 of firmus energy's GTTW Operational Business Plan) of the GTTW a similar grant scheme would be important in supporting the target number of residential connections.

b. Combined Heat and Power

firmus energy worked with EST to gain a NISEP grant of £60,000 toward the costs of installing a gas-fired combined heat and power unit to supply electricity and hot water to the main Daisy Hill Hospital Building in Newry.

c. Cosy Homes

The Cosy Homes Heating Replacement Scheme provides financial support, advice and encourages registered Housing Associations to remove Economy 7 (off peak) electric heating and solid fuel heating and replace them with energy efficient gas/oil heating systems. Housing Associations are encouraged to take the whole house approach, ensuring that heating systems are installed in insulated, energy efficient homes. The scheme also provides support for insulation measures, low energy lighting and home energy advice to tenants. The scheme helps improve the energy efficiency of homes normally occupied by the vulnerable sector of the community, it helps reduce fuel poverty and it will also aid in the reduction of carbon emissions. The Cosy Homes scheme is managed by Bryson Energy on behalf of Power NI.

2. Department of Social Development's Funding Schemes

a. Boiler Replacement Allowance

The Boiler Replacement Allowance is funded by the NI Executive and administered by the Housing Executive. It is aimed at owner occupiers with a total gross income of less than £40,000.

firmus energy launched the new Boiler Replacement scheme during May 2013 which provides qualifying owner occupiers with up to £1,300 to convert to a new, efficient natural gas heating system.

The grant scheme, funded by the Northern Ireland Executive, DSD and firmus energy, is designed to help tackle fuel poverty and allow more people across the province to benefit from a cheap and more efficient fuel to heat their homes.

Under the scheme, firmus energy, pledged to provide an additional £300 grant to all households wishing to convert to natural gas within their network and the NI Executive will then contribute up to an additional £1,000, dependent on income, to owner occupiers with an oil or LPG boiler that is at least 15 years old. We are the only network operator to currently offer the additional funding.

b. Warm Homes

The Warm Homes Scheme is funded by DSD and is for persons who receive certain benefits and own their own home or rent it from a private landlord. There are two levels of help available:

- Warm Homes – offers a range of insulation measures of householders on a qualifying benefit; and
- Warm Homes Plus – Offers insulation and heating measures to householders in receipt of a qualifying benefit and who are identified through the assessment process to have Economy 7, Solid Fuel, bottled gas/LPG heating system or no system at all.

firmus energy's dedicated Energy Advisor will work with the scheme operators (H&A Mechanical and Bryson Energy) to develop connection opportunities working with householders, vulnerable groups and seeking out referrals through established contacts.

3. Utility Regulator Network Extensions

firmus energy has gained 8 Utility Regulator network extension approvals to bring natural gas to eight areas (Portstewart, Ballyclare, Bessbrook, Warrenpoint, Craigadoo, Coleraine Quarries, Bushmills and Glenavy) over and above the original Ten Towns. Currently, we are preparing a licence extension application to bring natural gas to Mackles Foods in Moy.

4. Energy & Utility Skills

firmus energy has successfully applied and received £20,000 funding from Energy & Utility Skills for energy efficiency and skills development training.

Energy & Utility Skills is the UK authority on professional development and employment in the energy and utilities industries, it helps members such as firmus energy embrace new talent and technology to meet the challenges of a competitive global market. Market intelligence is central to our approach. From projecting skills gaps to benchmarking standards, they help us provide the most accurate, up-to-date information on skills and employment in the energy and utilities sector.

11.7 Proposals to transfer any innovation into Northern Ireland

As an indigenous Northern Ireland company, with a locally based workforce, firmus energy is committed to develop and/or bring new innovative best practice into its operations.

firmus energy is a member of various industry fora (IGEM, Energy Institute, NI Pipeline Industries Guild, NINGA and the Energy Network's Association), from this association and other forum, firmus energy is actively looking for opportunities to bring further innovation to our gas Distribution Network operations in Northern Ireland.

We are excited that our new owners, iCON Infrastructure Partners II. L.P have significant experience owning and managing core infrastructure businesses, including regulated utilities in the United Kingdom and overseas. iCON Infrastructure's current portfolio includes Mountaineer Gas Company, the largest gas distribution network and supply company in West Virginia, USA, and Porterbrook, one of the three major railway rolling stock leasing companies in the UK. iCON Infrastructure funds have also previously owned Sutton & East Surrey Water, a regulated water utility in the South of England.

firmus energy are already in initial discussions with the Mountaineer Gas Company⁴ to understand their operations and whether we can replicate or transfer any gas distribution network innovation into our current operations and within GTTW.

11.8 Existing skills and experience

The existing skills and experience of firmus energy's staff are contained within Section 2.3.2 of our GTTW Operational Business Plan. We have developed a competency framework to manage personal development, progression, skills gaps and succession planning within the organisation. The framework includes:

- Annual Training Matrix to monitor and measure the success of our learning and development activities;
- Generic and role specific training and development plans for all staff aligned to their specific role and career aspirations; and
- Provision and support for Further Education as required.

firmus energy undertakes regular training/competency gap analysis in order to plan the training for safety critical staff, including the engineering function. The structure of the initial assessment is through interview and further analysis is based upon the Institute of Gas Engineers & Managers (IGEM) – TD102 Competency Framework. The framework allows levels of competency to be determined for all positions within the engineering function (foundation, professionalism & mastery) and allows for the development of individuals into new and more challenging roles. firmus energy measures the requirements of each position against the criteria in the framework and identifies training and/or experiences which prove each individual's understanding of each criteria. Each engineer is selected for the most appropriate role within the business. Where a skills gap is identified or where an individual could be assisted in developing within the business, a training program is put in place for the individual.

firmus energy staff have significant connection sales and engineering skills, gained in the adjacent Ten Towns Licence area. A skills transfer programme will be put in place on award of the licence to ensure all existing skills are optimised across the new project. Experienced existing staff will be used to mentor and train recruits with 'on the job' training within the contiguous Ten Towns Network in the run up to the commencement of construction.

⁴ Mountaineer Gas Company serves over 220,000 customers and is the largest natural gas distribution company in West Virginia with around 5,600 miles of natural gas distribution pipeline.