



## Gas to the West

### Innovation and Technology Transfer

**Submitted to:** The Northern Ireland Authority for Utility Regulation under Gas Network Extensions in Northern Ireland, Gas to the West licence submission.

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# 1 Introduction

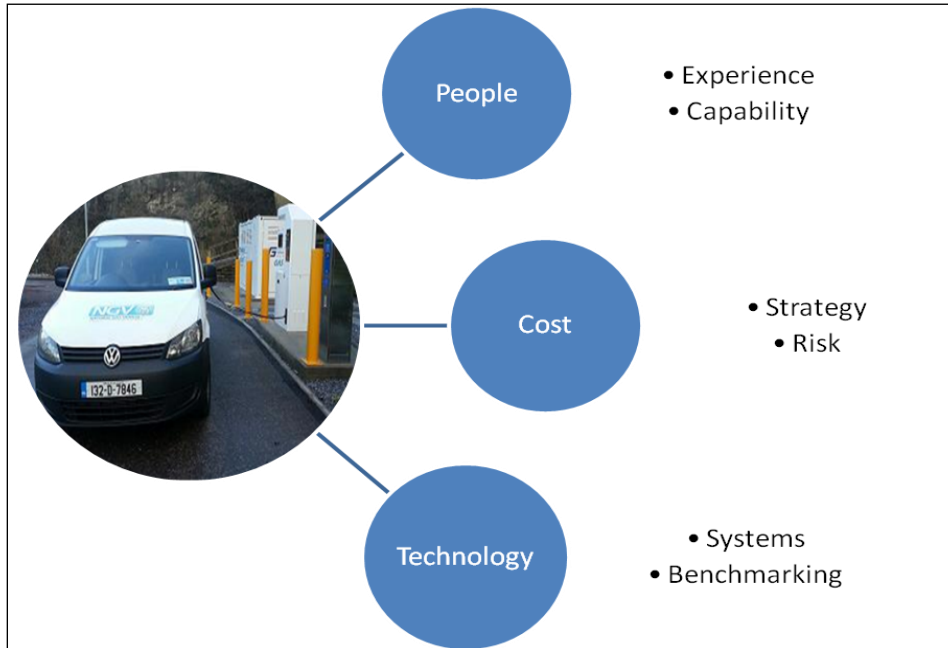
There is a history of innovation within BGE and BGE (UK) which has allowed the efficient development of a modern and safe gas network in multiple jurisdictions. We have over 13,500 km of transmission and distribution gas networks with two sub-sea interconnector pipelines.

We continue to build and operate one of the most modern and safe gas networks in the world and are committed to growth, innovation and sustainability to achieve efficiencies and cost savings.

BGE (UK) and BGE are committed to designing, constructing and operating the natural gas network as efficiently as possible. In order to drive efficiency and create value for the gas industry we will transfer our knowledge and technology in to the Gas to the West project for the benefit of the Northern Ireland Consumer.

The following are key success factors, Figure 1, to delivering efficiencies and cost savings in a modern gas network;

**Figure 1 Key Success Factors**



We continually seek to improve to drive performance, efficiencies and cost effectiveness. This is achieved through continuous review, application of ideal behaviours based on correct principles and encompassing the activities shown in Figure 2, in order to deliver operational excellence at the core of the business which lead to overall efficiencies and cost savings throughout the business.

**Figure 2 Operational Excellence**



## 2 People

Innovation is driven by our people and our ability to overcome challenges by continuously seeking to improve, through new technology or solving engineering problems to provide cost effective solutions.

A key factor in delivering this is our Competency Framework which allows us to identify the training needs at both role and individual levels to ensure no competency gaps occur, so that our people are highly trained and have the skill set to deliver the optimum solutions to overcome challenges.

### 2.1 Network Transformation Programme (NTP)

2010 marked a transformational year for BGE with the successful transition to the new business systems, processes and organisational structure developed under the Networks Transformation Programme (NTP). The NTP was a strategic programme of work to enhance optimisation of the business processes and information technology systems into the future to become an Asset Centric Organisation, focusing on the assets of the natural gas network. As part of this transformation, the Work, Asset Management and Field Force systems were developed and implemented.

Figure 3 shows a schematic of the process and the interaction between software and field mobility device.

Figure 3 Asset Management Interaction with field mobility devices



This has delivered efficiencies and savings through;

- Recording of information, moving from paper based job cards to handheld devices, reducing administration labour and increasing efficiencies on availability of information.
- Real time data update regarding customer information (domestic or industrial commercial) leading to efficiencies on planned or unplanned maintenance activities.
- Optimising investment decisions on refurbishment or replacement activities, through availability of appropriate information regarding the asset class (age of equipment and history).

## **2.2 Competency**

BGE recognises that a structured and controlled approach to learning and development is critical to our continued success. The Learning & Development Policy sets out the policy of BGE to have a systematic approach to the planning, coordination, implementation, recording, and evaluation of learning and development activities.

The Learning & Development Procedure sets out the steps entailed in organising all types of learning and development activities. This includes the Gas Technical Competency Framework which sets out the gas technical competencies required for roles in Asset Operations, Asset Management, Health, Safety, Quality and Environmental aligned with Technical Competency Development.

The BGE Technical Training Centre in Dublin is part of Technical Competency Development department and aims to ensure that all personnel have the necessary gas technical skills, knowledge and abilities to undertake their activities in the field safely and efficiently.

Our Training and Development Strategy document sets out the strategy for further developing technical training and assessment programmes to meet the need of the Gas Technical Competency Framework.

We are currently planning to build a Transmission Competency training and assessment centre at our offices in Finglas, Dublin.

This will be utilised to develop and enhance the skills for operational personnel on the Gas to the West pipeline.

## **2.3 Performance Management**

BGE believes that people are its most important asset and this is evident in the culture of the organisation. We continually meet new challenges through the application of technology, industry best practice and positioning ourselves as a market leader in the gas industry.

We are committed to, and assist, our employees to up skill through our Employee Development Programme which provides training and development programmes to meet their individual needs. We also believe in bringing out potential in order to facilitate professional development within our organisation.

We have a performance management culture embedded within the organisation where our strategy is to develop our employees, through clear objectives and behavioural competencies so they can achieve career aspirations while meeting the needs and challenges of the organisation, through systematic career development and planning.

Our focus is to continually ensure that our employees develop their experience and to assist them, we have a job rotational policy in place within the business.

This will benefit the Gas to the West project by ensuring the range of skills required to deliver innovation are always available.

## **3 Cost Efficiencies**

### **3.1 Engineering Innovation**

BGE (UK) continually seeks to adopt and create new innovation engineering solutions, to reduce capital and maintenance activity costs. We have a well established material and design review forum in place where we continually seek improvement and challenge existing practices to ensure the best and most cost effective engineering solutions are always applied.

Below are examples of the efficiencies delivered through the materials review and design forums;

#### **3.1.1 Temporary Filtration for Pipeline Pigging**

During the course of the pipeline pigging process a pipeline inspection gauge is placed into the pipeline and using differential pressure is passed through the network until it reaches a point where it can be extracted. Part of the physical extraction requires that natural gas at the point where the pig is extracted is filtered in advance of re-injecting it into the pipeline. This traditionally has been conducted by specialist contractors and managed by the pigging service provider. BGE (UK) decided that, in order to reduce costs on this element of the work, we would develop a solution in house and implement it. This was done and resulted in improved programme efficiency and delivered cost savings of circa €1.5m over a five year period.

#### **3.1.2 Pre-insulated Transmission Pipe**

BGE (UK) design are constantly evaluating opportunities for innovation and seeking ways to optimise designs and materials. Previously standard practise was to lay steel pipe and then apply insulation in what was a two stage site process. A number of years ago the design team began evaluating a single stage pre-insulated pipe system where the pipe is insulated by the manufacturer and arrives to site ready to be laid. This innovation was trialled and following successful pilot trials was implemented as a standard design. This has saved time and operational savings regarding repairs to pipeline coating and has reduced the frequency of inspections thereby delivering a higher quality product.

#### **3.1.3 400mm Polyethylene Pipe Allowing for Further Network Expansion**

In order to continually expand the gas distribution network, BGE following a series of pilot projects, research and working with pipe manufactures, introduced 400 mm PE100 pipe to its 4 bar gas networks. This delivered significant benefits as it facilitated connection of new towns to the natural gas network which previously needed a transmission connection. The 400 mm PE increased the quantity of gas that could be transported and increased the distance over which the gas could be delivered while maintaining an acceptable pressure in the pipeline to meet customer requirements.



This innovation is leading to the connection of County Wexford in the Republic of Ireland which is approximately 40 km from the nearest point on the existing gas network. This innovation has resulted in higher quantities of gas being transported through the network leading to reduced tariffs for customers.

### 3.2 Contracting Strategy

Delivering the optimum contracting strategy can deliver increased value while reducing risk. The following schematic represents how we achieve efficiency in our business through a well defined contract strategy processes.

This will be applied to the Gas to the West project. We also have a number of contract strategies under implementation, Figure 4, which will achieve further efficiencies and cost savings.

**Figure 4 Contract Strategy Inputs**



### **3.2.1 Contract Strategies under Implementation**

We have a number of contracting initiatives underway which will deliver further cost savings and efficiencies within the business. This will be achieved by amalgamating a number of regional contracts into a single contract, through economies of scale achieving approximate savings of 5 – 10% on operational costs. The following sets out a number of contracts under implementation. These savings, when delivered, can be applied to the ongoing activities on the Gas to the West pipeline.

#### **National Inspection Services Contract.**

This contract will provide a range of pipeline inspection activities such as pipeline location and identification where third parties may encroach on existing pipelines and;

- Combines several current inspection contracts to drive efficiencies.
- Attracts potentially larger service providers.
- Moves to activity based costs from rates per hour/mile etc.
- Removes a number of personnel through optimised work bundles.

#### **National Aerial Surveillance Contract.**

This contract will provide aerial patrols and;

- Combines two current inspection contracts to drive efficiencies.
- Consolidates different levels of current performance.

#### **National Surveying Contract.**

This contract will provide surveying activities such as topographic surveys, as-built records, and geophysical surveys and;

- Combines current Transmission contract with distribution surveying activities.

#### **Transmission Linepipe Framework.**

This contract will provide efficiencies through reduced procurement timelines for capital and emergency works and;

- Maintains two suppliers on a longer term framework.
- Generates competition as spend in intermittent markets is volatile.

### Transmission Pressure Reduction Skids Framework.

This contract will provide efficiencies through reduced procurement timelines for capital and emergency works and;

- Maintains two suppliers on a longer term framework.
- Generates competition as delivery times and quality have been issues in the past.

### Transmission Boiler House Framework.

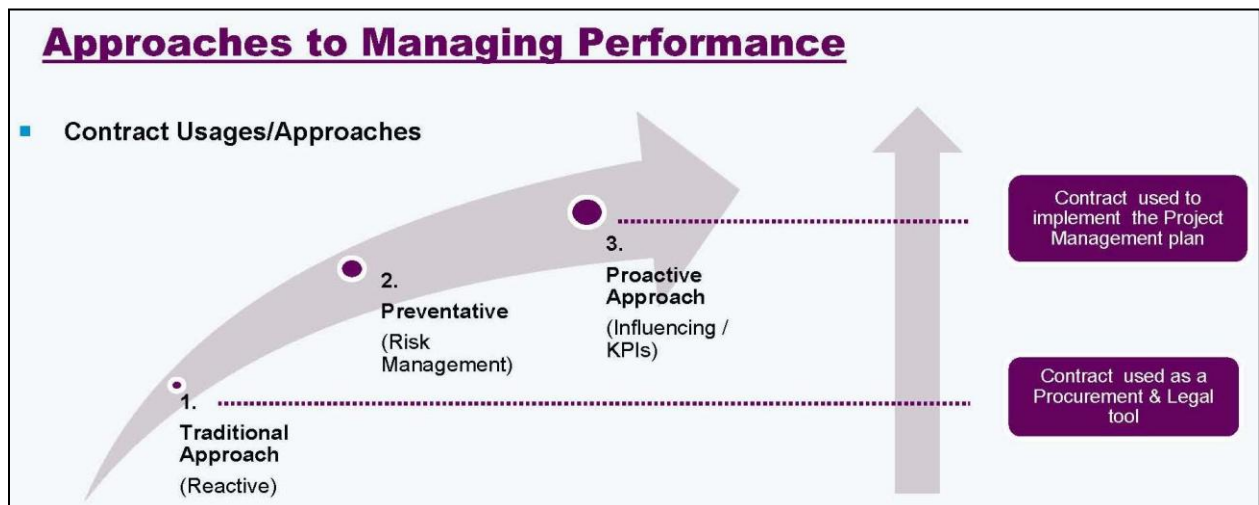
This contract will provide efficiencies and savings through reduced procurement timelines for capital and operational works such as new projects and refurbishment works and;

- Only one realistic supplier in market.
- Standardise designs on longer term framework to drive cost savings.

### 3.2.2 Contract Performance

We adopt the following approach to managing contracts, Figure 5, pending the type of contract required. This can deliver savings through pain gain mechanism, fixed price type contract, or re-measurable bill of quantities. We seek to set out key performance indicators (KPIs) to ensure cost efficiencies and minimise overspend on all contracts.

Figure 5 Approach to Managing Performance



The following are the key elements to ensuring contract performance management;

- Contracts will have a dedicated Contract Management Plan;
- A single 'Contract Manager' within the business;
- A projected budget for the lifetime of the contract;
- A dedicated risk register;
- Regular performance meetings with the Contractor and Service Provider will be held;
- Monthly or quarterly KPIs will be tracked; and
- These contracts will be reported to senior management.

Critical Success Factors for Contract Strategy;

- A coherent inclusive strategy with a minimum two year horizon;
- Deep integration with all internal and external interfaces;
- A comprehensive integrated Contract Management System with simple effective reporting;
- Engaged, energetic and skilled personnel; and
- A clear and simple plan, communicated effectively.

### **3.2.3 Risk versus Value**

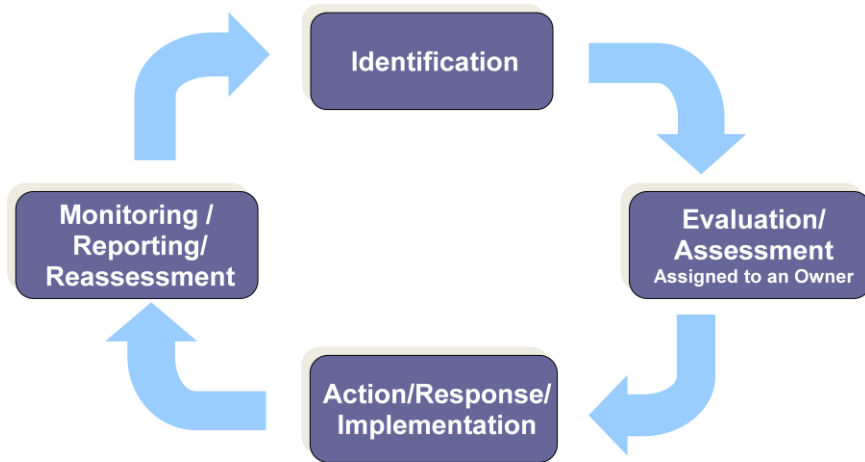
The Contract Strategy mission is to contract for services, goods and works to support the achievement of BGE (UK) through its strategic objectives, at least risk and maximum value. The following are key outcomes for successful contacts;

- Strategic Delivery;
- Financial Controls;
- Operational Delivery;
- Compliance (including Legal and Regulatory);
- Maintaining and improving reputation; and
- Technology and Information Technology (continuous improvement).

Proactive Risk Management is key to the successful outcome. The Risk Cycle Process includes;

- Ongoing individual risk management;
- High priority risks discussed at weekly team meeting; and
- Highest priority risks (if necessary) and issues escalated.

**Figure 6 Risk Cycle Process**



### **3.3 Business Efficiency Programme**

#### **3.3.1 Overview**

BGE has introduced a Business Efficiency Programme which is aimed at driving efficiency across all aspects of the organisation. This is a company strategy which is focused on incremental reductions in budget spend.

The scope of the programme is to impact direct Operational and Capital expenditure through:

- Innovation;
- Spend Efficiency (Category Management);
- Contract and Procurement Efficiency;
- Process Efficiency;
- Waste Reductions; and
- Spend Reductions.

This programme is focused on minimising the recurring cost base of the business, minimising waste and maximising value for the customer. The operating expenditure is targeted to reduce by agreed targets over a five year horizon.

This is to be achieved through increased productivity and reduced waste.

The programme will consist of discrete initiatives, all of which will be concerned with the reduction of Operational Expenditure, efficiency of Capital Expenditure and the creation of value such as;

- Bundling of maintenance contracts;
- Extended maintenance frequencies on pressure reduction installations;
- Risk Assessment of activities; and
- Material Innovation.

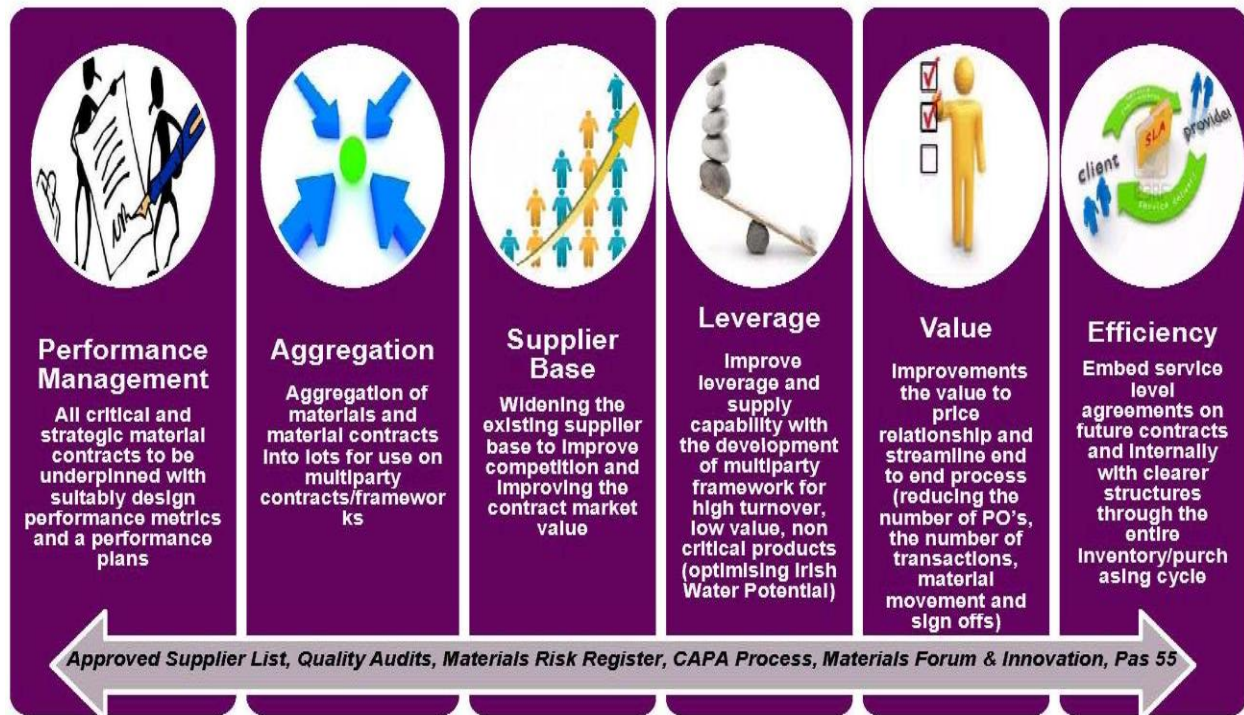
All savings that are applicable to the Gas to West project will be applied.

### **3.4 Procurement Solutions**

BGE (UK) recognise that materials are a key component to ensure the successful delivery of key infrastructure projects; therefore it is important to have contracts in place which mitigate delays in delivery of materials, or availability of materials, which could impact on project programmes. At the same time these contracts need to ensure quality, provide choice, cost savings and innovation to the internal business that utilise these contracts. In this regard, our Contract Strategy Division has developed a material strategy which meets this requirement to deliver our business objectives.

Figure 7 shows the key pillars of our material strategy;

**Figure 7 Key Pillars of Material Strategy**



The materials strategy ensures diversity of suppliers, cost efficiency and manages supplier risk where multiple sources of materials are required. Our material strategy enables our designers to work with suppliers on innovative design solutions which add value to our design process.

All of the processes throughout this section of innovation and technology have regard to business efficiency, material strategy and contract performance. BGE (UK) propose to utilise the processes outlined if successful in securing the Transmission licence for the Gas to the West project and already utilise the measures outlined regarding our existing business in Northern Ireland.

### 3.5 New Projects

#### 3.5.1 Efficiency in the Use of Gas

We seek to optimise the use of gas, either through technology in our pressure reducing installations in terms of fuel gas for heating, maximising the use of materials and design or mitigating pressure losses through optimally designed equipment.

Some recent examples are;

- Boiler Replacement Programme: this project is currently ongoing with the replacement of modulating boilers with modulating condensing boilers. This replaces the oldest and most inefficient boilers with modern condensing boilers that are approximately 90% efficient. This is resulting in significant fuel and CO<sub>2</sub> savings. With new control systems the new boilers are capable of modulating their output to more carefully match the required thermal input at each installation.
- Combined Heat and Power Units (CHP): as part of the boiler and waterbath replacement project, BGE are engaged in a pilot project to upgrade some boiler units with small CHP boilers. These units would replace a single boiler in the boiler houses, and operate as a base load boiler, while simultaneously producing electricity for the AGI. This has the potential to significantly reduce the electrical demand at the larger installations. Should this initiative be successful it will be rolled out to other installations.

BGE (UK) are currently developing the refuelling infrastructure required to support the commercial transport market, Figure 8.

The European Parliament has outlined its strategy to reduce our dependence on imported oil. Part of the solution is natural gas and biogas in transport. It is a cleaner, cheaper and proven fuel. Over the next ten years BGE expect to provide natural gas as a fuel to 5% of the commercial fleet market, we would seek to implement this in other jurisdictions where demand exists.



**Figure 8 CNG Vehicle**



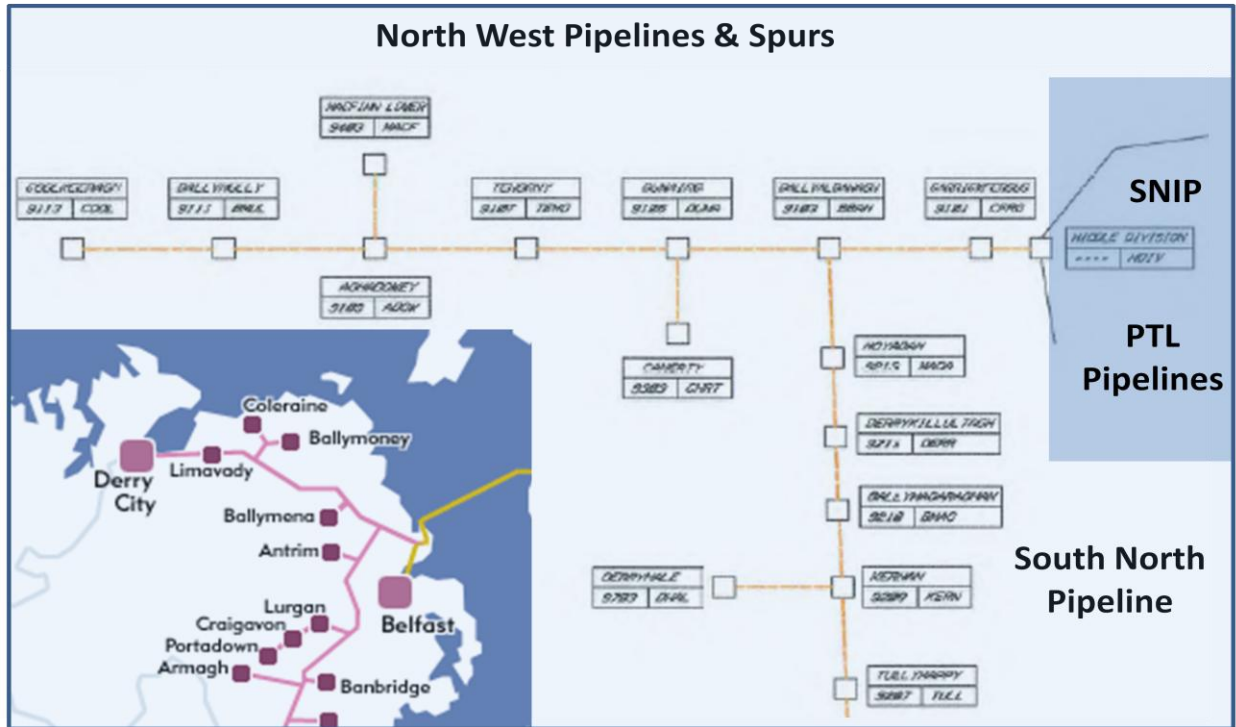
### **3.5.2 Biogas**

BGE (UK) are also actively engaged in reviewing options for renewable gas and are currently working with regulatory authorities on connection procedures for renewable gas injection facilities to the natural gas network. As this technology and connection procedure is developed they could be transferred to Northern Ireland.

### 3.6 Development of the Gas Network

The following (Figure 9) is a schematic of the existing gas networks in Northern Ireland;

**Figure 9 Northwest, South North pipeline and spur pipelines**



The network has been developed over time in conjunction with the Utility Regulator in Northern Ireland, with pipelines constructed as follows;

- North West Pipeline in 2004;
- South North pipeline 2006; and
- Kernan to Derryhale pipeline 2010.

BGE (UK) has worked successfully to rollout infrastructure with the Utility Regulator and will continue to meet the needs of growth to extend the gas network to the benefit of the Northern Ireland consumer.

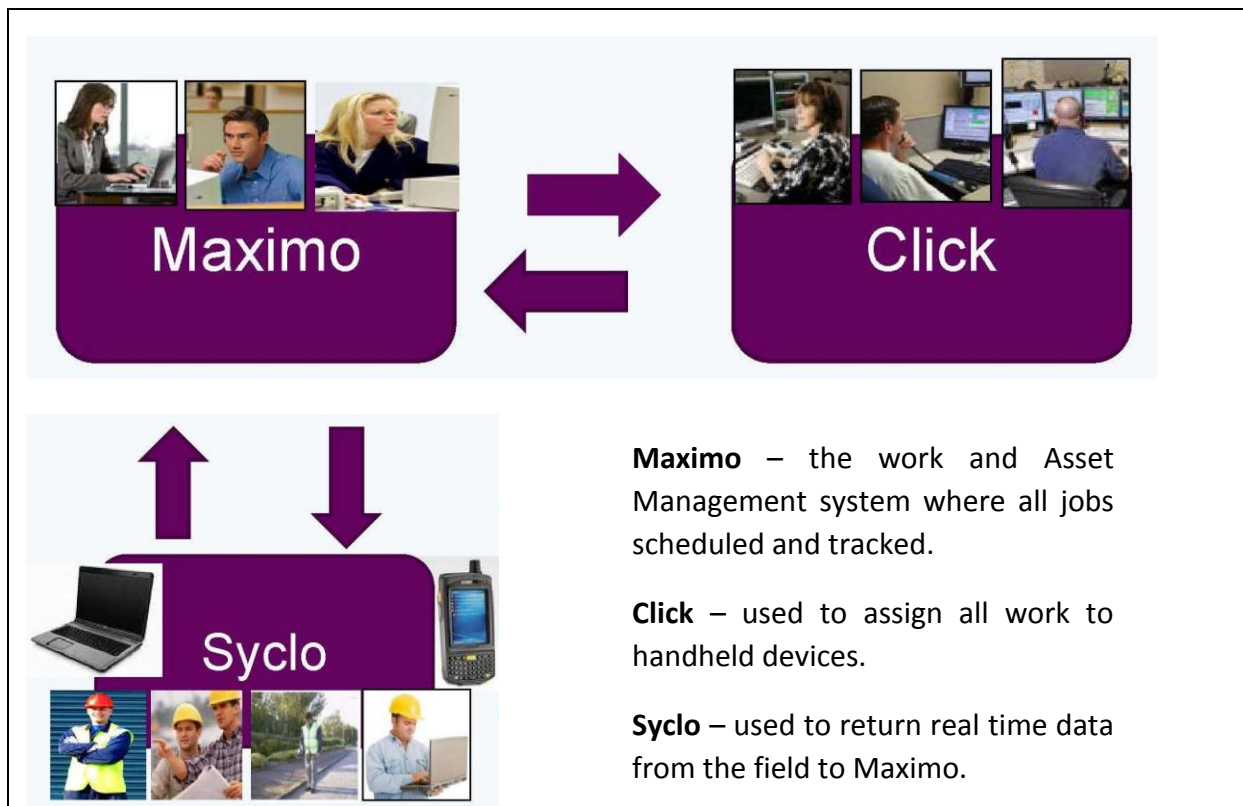
## 4 Technology

### 4.1 Maximo, Click and Syclo

BGE (UK) is an asset centric organisation and the IBM Maximo Asset Management system is the key Enterprise Asset Management system used by both Asset Operations and Asset Management. Assets are managed in Maximo through their full lifecycle from commissioning through to disposal. The version of Maximo in use is Maximo for Utilities as this gives BGE (UK) functionality specific to Gas Transmission & Distribution organisations.

Integrated into Maximo is SAP Syclo Work Management which provides mobile work management capabilities used by field workers and additionally Click Schedule is also integrated to provide job scheduling, optimisation and dispatch functions. Operational and Management reporting is provided both by BIRT reporting in Maximo as well as through SAP Business Objects which reports against an Enterprise Data Warehouse. The following (Figure 10) represents the interaction between various asset management software.

Figure 10 Asset Management Software



Maximo is an enterprise work and asset management application platform designed to support the transmission and distribution of gas utilities. It is currently used to support functions such as asset management, project management, work management, resource management, preventive maintenance, leak management, purchasing, and inventory and call centre support.

ClickSchedule is specifically designed for the field service industry and enables service organisations to define the balance between the conflicting needs of service operations efficiencies, customer satisfaction, field resource satisfaction and revenue considerations. ClickSchedule continually adjusts the schedule throughout the day to ensure that all jobs and resources are optimally matched and provides an automatic scheduling service that creates an optimised schedule, while providing the dispatcher with the necessary tools to support unexpected events that are typical for any service organization.

Syclo's SMART Mobile Suite for Maximo is built on Syclo's Agency Mobile Platform and is a set of pre-built, pre-integrated mobile applications that extend IBM's Maximo asset management and work management application to a variety of mobile devices. Syclo's SMART Mobile Suite for Maximo allows field workers to download, review and complete complex work orders on their mobile devices. It also enables field workers to conduct asset audits and enter measurement data from the field and also supports asset calibrations. SMART also facilitates the use of mobile devices in storerooms and warehouses by supporting material tracking, stock counts, material issues and transfers and other inventory operations.

All these systems and technology are being used on BGE (UK)'s current assets and would be expanded to the management of the Gas to the West pipeline to deliver innovation and cost efficiency.

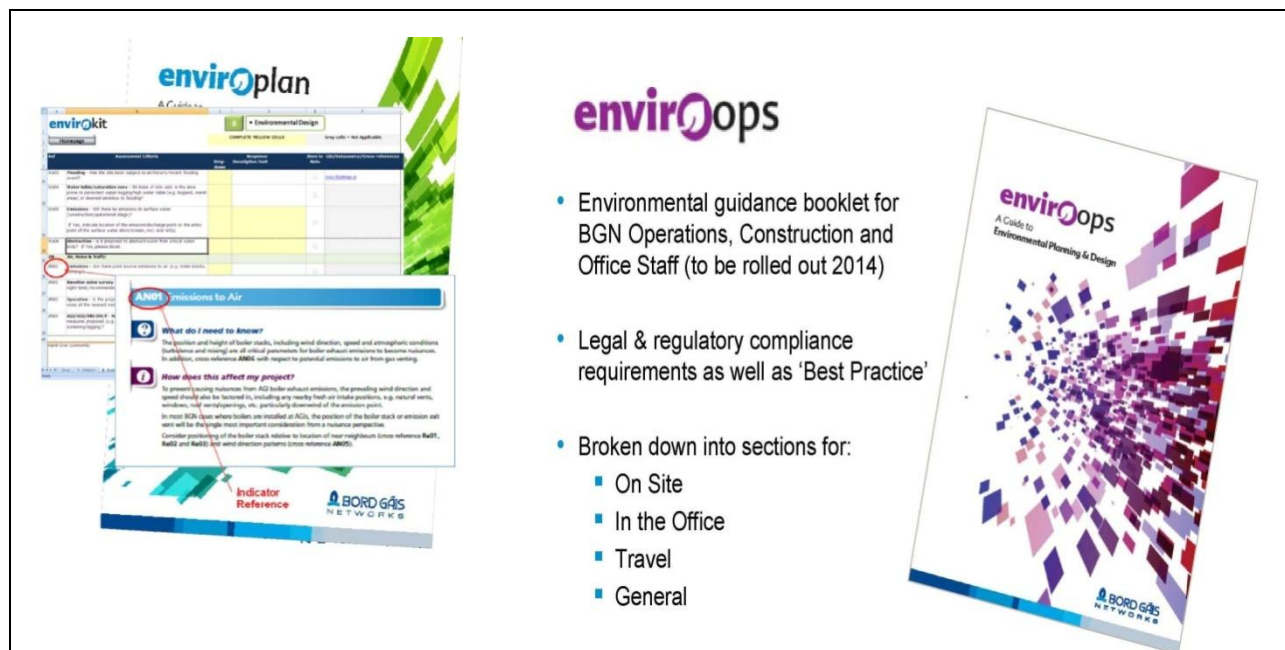
## 5 Environmental

### 5.1 Environmental Tools

Environmental sustainability is one of the BGE corporate values. We have developed an environmental policy and also achieved National Standard Authority of Ireland (NSAI) accreditation of Environmental Management System to I.S. EN ISO 14001:2004.

In practice we have developed techniques (Figure 11) to ensure we adhere to policy such as the Envirokit, Enviroplan and are currently developing Enviroops, all applicable to construction and operational personnel, inclusive of contractors on behalf of BGE (UK). This innovative approach to environmental sustainability will be applied to Gas to the West project.

Figure 11 Enviroplan and Enviroops



These documents provide guidance to planning and assessment, operations, construction and office staff. They are easy to navigate, providing concise information and answers, with next step advice. They are developed in hardcopy and eBook version. They provide a system for a robust handover of information to the construction team.

## **5.2 Business Working Responsible Mark**

BGE was awarded the Business Working Responsibly Mark certification for responsible and sustainable business practices in 2013 and is one of 11 companies to hold the Mark in Ireland. The Mark, developed by Business in the Community Ireland and audited by the NSAI is based on the ISO 26000 guidance standard for social responsibility. The Mark process evaluates policy, practice and procedures on responsibility and sustainability within 5 key business areas including environment, workplace, marketplace, community and corporate responsibility management and communications. Environmental assessment for the mark focussed on compliance and standards, best practice and company process in voluntarily exercising responsibility in the following areas; environmental management and staff awareness, climate change and greenhouse gas emissions, water, energy, pollution control, waste management and biodiversity. All these principles would be applied to work carried out by BGE (UK) on the Gas to the West project.