

Gas Network Innovation Problem Statements

March 2017 Edition

nationalgrid


**Northern
Gas Networks**


SGN
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Introduction

This document has been jointly compiled by the members of the Energy Network Association's (ENA) Gas Innovation Governance Group (GIGG), which consists of:

- National Grid Gas Transmission
- National Grid Gas Distribution Limited
- SGN
- Northern Gas Networks
- Wales & West Utilities

The purpose of this document is to outline a number of current problem statements applicable across the gas transmission and distribution networks in the UK. These problems align to the key themes identified below:

- Safety and Emergency
- The Future of Gas
- Reliability and Maintenance (corrosion management, pressure management, preheating, compressor maintenance, electrical & instrumentation)
- Repair
- Distribution Mains Replacement
- Security
- Environment and Low Carbon

The ENA's Smarter Networks Portal includes a complete list of all current and previous innovation projects that have been funded under the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) mechanisms and can be found at: <http://www.smarternetworks.org>

Getting in touch

If you have any questions or would like discuss the problem statements in more detail then please get in touch at:

gas@energynetworks.org

and use : 'Gas Network Innovation Problem Statements' in the subject field

Safety and Emergency

BACKGROUND – Gas transmission and distribution networks are continually looking to improve safety performance; topics of particular interest include solutions to prevent damage to underground assets and tracing, identifying and mapping of any underground plant or apparatus.

- **PROBLEM** – Solutions to identify exposed underground plant to avoid accidental damage once the utility has been identified and located.
- **PROBLEM** – Techniques to improve utility collaboration to identify underground plant in order to avoid accidental damage.
- **PROBLEM** – Solutions to reduce the risk of damage due to third party interference as a result of digging or working too close to pipelines.

The Future of Gas

BACKGROUND - Natural gas is the primary fuel for domestic and industrial heat and in order to ensure the UK's legally binding carbon targets are met, decarbonisation of heat is essential. Renewable and sustainable sources of gases have the potential to provide heat without requiring fundamental changes to the networks, consumer appliances or significant investment in electrical infrastructure. Networks want to facilitate and encourage new sources of low carbon gas; in particular the use of hydrogen as a new source of gas or a blend. New models and systems for changing supply and demand patterns is a key area of focus.

- **PROBLEM** – The impact of operating a more distributed gas system.
- **PROBLEM** – New methods and processes to facilitate the connection of unconventional and low carbon sources to the distribution and transmission networks. In particular, low cost, simple to operate gas quality monitoring and analysis equipment.
- **PROBLEM** - New methods and new technologies to remove barriers, simplifying processes, improving access to gas grid for bio methane connections.
- **PROBLEM** – Further work to understand new markets that will help UK achieve its carbon economy e.g. private bio-gas networks anaerobic digestion, co- digestion, shale gas etc.
- **PROBLEM** – Understand the impact and emerging barriers to using hydrogen and other low carbon gases blended together within the network.
- **PROBLEM** – Alternatives energy solutions for rural off grid areas.
- **PROBLEM** – There is a requirement to develop demand models that better predict the peak /off-peak demand on the system for short and long term planning.
- **PROBLEM** – Identify options for telecommunication systems or devices to monitor and/or control gas usage during peak load usage and to assist in load management.

- **PROBLEM** – Investigate alternative options to the incumbent Flow Weighted Average Calorific Value (FWACV) method attributing energy to a consumer’s bill into a new method which reduces the need for processing of unconventional or low carbon gases.

Reliability and Maintenance (corrosion management, pressure management, preheating, compressor maintenance, electrical & instrumentation)

BACKGROUND – *Managing aging networks requires new approaches and new techniques. Asset records are a key area of focus across the gas networks, in particular the quality and accuracy of as-laid gas network drawings. Methods to improve data completeness and accuracy are required to provide simple and effective solutions to improve the asset data held. Corrosion is another area of particular focus as is intelligent maintenance and management of the national transmission system compressor fleet; maximising use of existing data and instrumentation.*

- **PROBLEM** – Improve methods for accurately capturing and transferring previously laid and new pipe locations directly into asset management systems.
- **PROBLEM** – Understanding of the potential use of Unmanned Aerial Vehicles (UAVs) for overhead mapping/imaging techniques such as infrared or radar to aid routine overhead inspection.
- **PROBLEM** – There is a need to explore alternative mapping solutions to record the location and condition of assets.
- **PROBLEM** – Develop robust method to survey and monitor remote sites and buried assets.
- **PROBLEM** – Methods to accurately quantify asset corrosion levels from above ground and/or internally from remote locations.
- **PROBLEM** – New coatings or compounds to protect assets not currently protected e.g. intermediate pressure steel pipes where corrosion could be internal or external.
- **PROBLEM** – There is a need for a system to protect overhead crossings i.e. Canals, Rivers and Bridges from internal or external corrosion or interference without the need to excavate.
- **PROBLEM** – Techniques to help identify and manage corrosion.
- **PROBLEM** – New methods of pipeline fracture detection and alerting are required to provide more accurate results.
- **PROBLEM** – An early warning system is needed to warn of riverbank erosion ground movement and coastal erosion that can affect assets.
- **PROBLEM** – There is a need to develop more compact and efficient pressure reduction systems that operate at high capacity and operate with the minimum level of intervention.
- **PROBLEM** – Cost effective and reliable solutions for the remote operation of mechanical valves and plant are required.

- **PROBLEM** – Awareness of new materials to repair and remediate assets providing both medium and long term solutions for extending asset life.
- **PROBLEM** - Flexible and mobile compressor station solutions.
- **PROBLEM** – Sourcing of equipment and assets with a correct provenance and identification of non-compliant components and their vendors.
- **PROBLEM** – A solution is required to reduce the time taken to capture / modify asset records with minimum amount of effort but to high levels of required accuracy.
- **PROBLEM** - Smarter methods and data for optimising asset management.
- **PROBLEM** – Develop alternative means to pre heat gas as part of the pressure reduction process.

Repair

BACKGROUND – *Repair techniques that require minimal excavation are the key to driving down cost and disruption to customers. Keyhole techniques are of particular interest as are solutions to remove blockages caused by water entering the low pressure mains.*

- **PROBLEM** – Keyhole techniques have been demonstrated to be successful and now there is a need to understand the potential of keyhole techniques beyond the current application to deliver further cost and time-savings on current operational activities.
- **PROBLEM** – There is a need for a solution that can accurately locate water entry points and prevent entry of water to the system.
- **PROBLEM** – A key requirement is to identify water ingress into pipes, detecting where water or other foreign bodies have caused blockages.
- **PROBLEM** – An efficient method to remove water that has entered gas pipes is required to restore gas supplies as quickly as possible.
- **PROBLEM** – New permanent PE repair techniques for both low pressure (LP) and medium pressure (MP).

Distribution Mains Replacement

BACKGROUND – *We are looking for methods and techniques to improve the mains replacement and remediation process. Typically, the duration of a planned supply interruption can lead to a customer being off the gas grid between six to eight hours, which for vulnerable customers this can be very difficult. We are also interested in technical and process improvements allow for a quicker and less disruptive replacement and remediation process.*

- **PROBLEM** - Alternatives to PE pipe need to be investigated in order to find a solution that could remove the need to hold a large stock of PE pipe.

- **PROBLEM**- Inspection, assessment and remediation systems are required for larger pipes (>8”) along with processes and systems to support any decision to remediate for life extension.
- **PROBLEM** – There is a need to identify new materials that can be connected using alternative methods to fusion and we are looking for opportunities to achieve faster rates of production in gas mains connections.
- **PROBLEM** – Methods that minimise the time customers are off gas is a key priority, whether it is speeding up the work or providing alternative heating or cooking facilities during these periods.
- **PROBLEM** – Need to identify and test no dig techniques and systems to replace existing steel, metallic, asbestos, and cast iron gas mains and services for both above and below ground pipelines, across all pressure ranges.
- **PROBLEM** – There is a need for a system to replace gas service and supplies to high-rise building and other multi occupancy units, without the need to remove the existing system.
- **PROBLEM** – Cured in place linings are required as an alternative to PE for mains and riser replacement, and asset life extension.

Security

BACKGROUND – *We are looking for new methods to improve site security, including security incidents associated with the operation of emergency exit gates, options for sites with no E&I infrastructure, and systems to improve resilience against cyber-attack.*

- **PROBLEM** – A solution is required to detect intruders to sites, which should be simplistic to support sites with restricted E&I capability, demonstrate a low false alarm rate and be compatible with a gas environment.
- **PROBLEM** – There is a need for a unified incident management tool, demonstrating an end-to-end approach for all security incidents.
- **PROBLEM** – Simple and effective methods to authenticate site access are required for those who have a manual key and which means that if the key is used by an unauthorised person, the alarms will still be deactivated.
- **PROBLEM** – Alternative methods to protecting copper pipe entering domestic, industrial and commercial properties are required to prevent theft (which can create a potential fire or explosion hazard)
- **PROBLEM** – Either identify alternatives to copper pipe, or methods to safeguard copper pipes used in the construction and operation of un-manned governor kiosks and other gas sites to deter theft.
- **PROBLEM** – Identify systems and devices that can improve the resilience of the networks to cyber or acts of terrorism and enable swift access to authorised personnel during an emergency.

- **PROBLEM** – There is a challenge to significantly reduce or remove emissions from our assets through new techniques and technology to prevent loss of gas into the atmosphere.

Environment and Low Carbon

BACKGROUND – Methane (CH₄) is the prime constitute of natural gas and is a much more potent Greenhouse Gas than carbon dioxide (CO₂). Leakage from the natural gas grid is approximately 0.06% of transported gas but can have a disproportionate impact on the environment. Location of very small leakages, economic cessation of these leaks and removing the need to expose buried pipework is a challenge to the gas sector to reduce its carbon footprint

- **PROBLEM** – Opportunities to reduce gas at high volumes must be identified.
- **PROBLEM** – Methods are required for a safe, efficient, and cost effective system to decommission old gas storage sites, gas manufacturing and coke works sites and the removal of contaminated land.
- **PROBLEM** – New techniques to facilitate efficient and cost effective environmental de-contamination processes are required for the old equipment, pipelines, Gas Holders, Buildings and land.
- **PROBLEM** – Solutions are needed to prevent the contamination of watercourses during decommissioning of sites and pipeline and buried gas plant.
- **PROBLEM** – There is a need for methods to filter or dispose of contaminated water in the most environmentally effective way.
- **PROBLEM** – There is a need to reduce or remove the need to vent gas used for control purposes.
- **PROBLEM** – Identify opportunities to operate on a sustainable basis in terms of onsite generation of power.
- **PROBLEM** – Develop a means to reduce waste from excavations and understand the possibilities of reusing excavated materials.