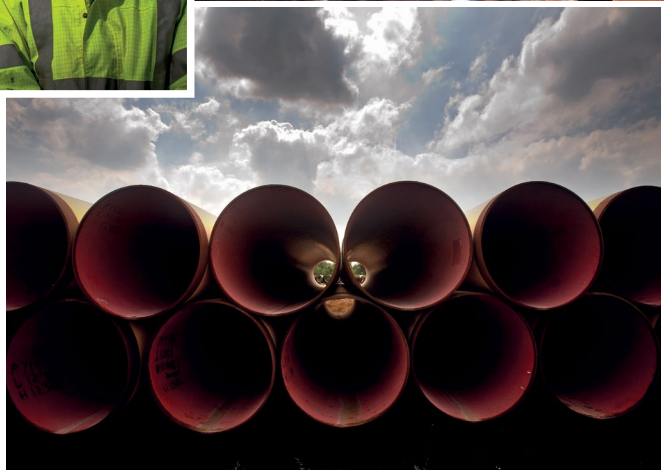
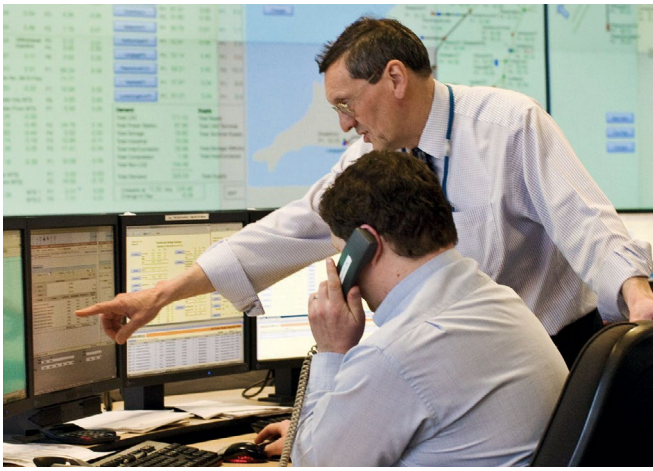
Gas Transmission

Network Innovation Allowance

Annual Summary 2016/17





Contents

Welcome to our innovation annual summary for 2016/17

Our pipeline of new projects has developed this year, with ground-breaking work in areas such as cognitive technology, digital asset data collection and robotics. We're committed to listening to our customers to find better ways of developing safer and cost-effective energy solutions for the future.

In the last 12 months we've delivered against our 16/17 ambition; putting the positive outcomes from our innovation projects into action and making them business as usual.

By engaging our colleagues throughout National Grid Gas Transmission (NGGT) on innovation, we're transforming the way we do business and delivering significant results across our five strategic areas for innovation; safety, sustainability, financial, customer and stakeholder, and reliability and availability.

"By engaging our colleagues throughout NGGT on innovation, we are transforming the way we do business and delivering significant impacts."

A major achievement this year was the publication of our mid-term report 'Embedding Innovation Value'. The report shows how we have delivered innovation value, highlighting outputs from our innovation portfolio that have been integrated into our business as usual activities. In fact, innovation in NGGT has so far realised £6.9m in value, generating £4 of value for every £1 invested.

For example, Building Information Modelling (BIM) is helping to deliver more efficient infrastructure projects, with savings of £4m realised to date. Meanwhile the Ramp Rate Study System is delivering studies 25% faster and £10k cheaper for each customer.

We've made good progress on Project GRAID (Gas Robotic Agile Inspection Device) building the robot launch and receive vessel and commissioning the bespoke pipe test rig, ready for the first offline trials. 17/18 will see the Project GRAID team deliver an important milestone of the project with online testing scheduled at Bacton and Cambridge.

We are also working closely with our customers to better understand their needs and our Project CLoCC (Customer Low Cost Connections) stakeholder day gave a number of them the opportunity to shape the project's direction. The coming months will see Project CLoCC enter the final phase, with the substantial time and cost savings accessible to our customers in 2018.

Over the past year we've developed strong partnerships and worked collaboratively to share learning between ourselves and other network licensees. We've taken on the role of chair of the Gas Innovation Governance Group (GIGG), and presented at industry events such as the IGEM annual conference. We also continue to work with an increasing number of small, specialist organisations, reaching out beyond our own industry sector in order to meet our business challenges and deliver benefits to our customers.

Our ambition for the fifth year of NIA is to continue to track the value we create from innovation and ensure that the things we learn from projects continue to be embedded into our business as usual activities. We will continue to grow our portfolio of innovation in order to deliver a safe, reliable and efficient energy system for the future.

Nicola Shaw
Executive Director, UK
National Grid

Safety

Sustain world-class levels of safety and seek innovative solutions to reduce the risk on our network.

Keeping people safe is our key priority. Innovation is driving greater safety across NGGT. We explore new working practices through developing new tools, techniques and processes. We are also focusing on reducing the risk of damage by third parties working on or near our pipelines. This ensures the safest network for our workforce, our customers and the public.

Title: New techniques for the measurement of pipeline depth of cover

NIA reference: NIA_NGGT0085 **Supplier:** ROSEN **PEA cost:** £196k

Practical protection for our pipelines – and the public

Protecting our buried gas pipelines against accidental damage is a safety priority. One vital project is helping us minimise this risk and keep those working near our network safer than ever.

Intensive farming across the UK has led to significant erosion of soil levels.

Through our pipeline depth of cover project, we've been working to develop more accurate measurements of how deeply our pipes are buried in the ground.

It's important we measure this, because areas without adequate soil cover are at an increased risk of damage from third parties. Reduced depth of cover is a growing problem. Since our pipes were installed, intensive farming across the UK has led to significant erosion of soil levels.

This project explores new methods for identifying these risk areas. It combines internal pipeline measurement with additional geographic data to give us a detailed picture of cover depth across an entire pipeline.

The story so far

A key part of the project has been to establish the true position of pipelines in the ground using internal inspection devices called pigs (pipeline inspection gauges). These are used more traditionally to identify corrosion in our pipes, but they also measure their x, y and z co-ordinates. It's the 'z' data that is most important to us, as this measures how deep the pipe is buried.

We worked with project partners ROSEN to optimise the pig's internal measurement device and improve the quality of 'z' data it collected. Alongside that, we developed above-ground markers to track the progress of the pig through the pipe and give us reliable depth readings.

We made our measurements more robust by gathering additional data on ground elevation from the Environment Agency, called Light and Detection Ranging (LiDAR) data.

As we implement these new methods, our readings will be much improved. This will allow us to identify problem areas and carry out necessary works more quickly. It will also minimise the risk of damage to our pipelines and ensure our people, contractors and the public are as safe as possible.

Title: Utilisation of 3D laser scanner for pipeline damage and coating assessments

NIA reference: NIA_NGGT0092 **Supplier:** Creaform **PEA cost:** £113k

Laser innovation transforms damage assessment

The HandySCAN 700 handheld laser scanner has replaced our conventional manual methods of assessing damage on our pipe network.

An investigation into how the latest 3D laser scanning technology could improve the way we assess pipeline damage delivered significant results this year.

The project saw us replace our conventional manual methods of assessing damage on our pipe network with the new HandySCAN 700 handheld laser scanner and accompanying Pipecheck software. The contrast between the old and new method has been striking.

Set-up times have been radically improved, with engineers simply placing targets on the damaged area before scanning starts. The scan itself takes five minutes or less, compared to several hours with previous techniques. Reliable results are on the engineer's computer screen in seconds, rather than hours.

Lightweight, accurate and safe

Technicians also spend less time on excavations which keeps them safer. Lightweight design also makes it easier for our engineers to transport and use the scanners, with highly accurate and repeatable results regardless of the conditions under which the equipment is used.

With this improved data, we'll be able to make better decisions on where we need to invest in our network, helping us to provide the best value to customers.

Find out more at **Connecting**.

Alan Kirkham, Inspection Manager.

Title: Ultrasonic testing of thin wall pipeline girth welds using high frequency probes

NIA reference: NIA_NGGT0093 **Supplier:** GB Inspection Systems **PEA cost:** £10k

Safer solution for detecting defects

Refining ultrasonic inspections has helped us improve safety and led to significant cost savings. Alan Kirkham, Inspection Manager, explains more.

What's the background to the project?

We carry out inspections on all our gas welds across the system. For many years we used radiography – much like a doctor does on a broken bone – to look for cracks or defects. However, we've been moving towards ultrasonics as a safer alternative. While this successfully measures defects in pipes over 8mm thick, it doesn't perform as well on smaller thicknesses. We wanted to find a better solution and reduce the need for radiography on these thinner pipes.

Talk us through the work you've done?

The main issue was that conventional probes – the part that generates the ultrasonic energy that allows us to detect defects – were too large to get close enough to the welds on thinner pipes. So we procured and tested smaller, higher frequency probes and found they were able to detect all the defects they're required to under the business' strict welding standards.

What are the benefits for gas consumers?

By reducing the use of radiography on the network, it enables us to operate in a safer, more effective way. The new process also brings significant cost savings, with ultrasonic tests estimated to cost 80% less than current radiography tests. As we do a few hundred inspections a year, both the cost savings and safety benefits will be significant.

What are the next steps?

Based on our work, we've now updated the company's rules on inspecting welds to allow for the use of ultrasonics down to a wall thickness of 4.8mm. Our engineers have already begun to apply the technology out in the field.

Sustainability
Embed sustainability into our network to reduce our environmental impact and make the most of the resources we use.

Innovation has played a major role in our commitment to reducing our emissions. We're developing new technologies to reduce our emissions both from vented gas and from our compressor fleet. Ultimately, this will reduce the impact our operations have on the environment in which we operate.

Title: Selective Catalytic Reduction (SCR) Pre-FEED Environmental and Technical Study
NIA reference: NIA_NGGT0087 **Supplier:** Costain and AAF **PEA cost:** £647.5k

Meeting stringent standards with SCR

A study to investigate whether installing Selective Catalytic Reduction (SCR) systems on our compressors could bring them in line with new emission standards has also made significant savings possible. Neil Billingham, Senior Environmental Engineer, tells us more.

Collaboration helped us discover that, with the right design, we can virtually future-proof our SCR system.

What's the background to this project?
The arrival of more stringent environmental legislation means our existing fleet of standard Rolls-Royce RB211 and Rolls-Royce Avon gas turbine-driven compressors falls short of the required standards. Our business has two options; either to replace the older equipment with newer, lower emission gas turbines or to retrofit emission reduction systems or emissions abatement technology to cut emissions to appropriate levels. This project investigates whether a selective catalytic reduction (SCR) system could help us meet our emissions obligations in the best way.

What exactly is SCR and how does it work?
It's an emissions abatement system that's fitted to the exhaust of a machine. Injected ammonia (in the form of aqueous ammonia or urea) reacts with NO and NO_2 in the exhaust causing a chemical reaction that separates the nitrogen and oxygen. The reaction is assisted with the use of a catalyst and the process allows for the release of nitrogen and water into the atmosphere, instead of nitrogen oxide (NOx).

What work has been completed?
We completed an outline conceptual design for an SCR scheme that would work on our fleet. We then screened all the Avon and RB211 turbines across our fleet to see which units were best suited to having the system installed and three were identified. For each of them, we carried out a best-available technique (BAT) study to assess the cost and environmental benefits of installing SCR.

Through collaboration with a transmission operator using SCR in Holland and Germany, we also discovered that with the right design we can virtually future-proof our SCR system.

What did you learn?
Our results showed that SCR could be a viable solution for all unit types. The work to date indicates that it meets emission standards and brings significant cost savings compared to installing new turbines.

Fast forward – what are the next steps?

The next stage is to undertake a more detailed engineering design study and then we'll identify potential providers of the system. Assuming everything is taken forward, our aim is to have the first unit operational towards the end of 2019.

Title: Next generation predictive emission monitoring validation (PEMS)

NIA reference: NIA_NGGT0074 **Supplier:** Siemens Industrial Turbomachinery **PEA cost:** £151k

At the forefront of predictive emissions research

A new generation of predictive emissions monitoring technology promises more accurate results – and significant cost savings – compared to systems that measure emissions continuously. We've been testing its credentials on one of our turbines.

Measuring nitrogen oxide (NOx) and carbon (C) emissions from our compressor stations – and proving we're meeting our emissions responsibilities – is an important consideration for our business.

It can be a complex and expensive process. So it's important we explore new technologies to see how they can deliver the accurate readings we need in the most cost-effective way.

Through this project, we're putting ourselves at the forefront of research into the latest generation of predictive emissions monitoring systems (PEMS). They provide an opportunity to meet the latest Industrial Emissions Directive (IED) standards at a significant cost saving compared to systems that constantly monitor emissions (CEMS).

Understanding the project
The project involves us running a prototype of the latest PEMS technology in parallel with a continuously monitoring CEMS system. We wanted to assess its ability to provide emissions measurements that meet the requirements of the IED.

The system we're testing has been developed by project partners Siemens. It's able to integrate more fully with a turbine's control system, which improves its ability to accurately predict emissions.

The story so far
Since August 2016, we've been running the PEMS alongside a CEMS on a SGT-400 turbine. Testing will run for 12 months so we can build a detailed picture of how it performs across a range of operating conditions and seasons. This is important, as weather conditions are known to affect the ability of PEMS to predict emissions. Predicted values will be compared to actual measured values throughout the process, and this will tell us whether the system does, in fact, meet our needs.

Early indications are good
Indications from an interim report are that the prototype will meet the performance criteria of the IED. This requires an accuracy of +/-5ppm (parts per million) relative to measured values for NOx and CO. With further tuning of the model, which we'll do in collaboration with Siemens, we're confident we can improve the performance of the prototype even further.

What are the benefits?
Should the PEMS prove as accurate as we expect, we'll look to implement it across our full fleet of SGT-400 turbines. Based on a price comparison with equivalent CEMS, we estimate a cost saving in the region of £490k.

What's more, we expect the PEMS to require less maintenance and testing than existing models. This will bring both additional cost savings and reduced environmental impact as we won't need to run our turbines specifically for testing.

The project offers further potential for the system to be developed for use on our ex-Rolls-Royce fleet. If this materialises, some 75% of gas turbines (51 units) currently on the National Transmission System (NTS) would be covered by the new Siemens PEMS.

Innovation in numbers

£910k
Cost of rolling out CEMS across the fleet

£420k
Cost of rolling out PEMS

£490k
Estimated cost saving across the full fleet of SGT-400 turbines

"The prototype is able to integrate more fully with a turbine's control system, which may improve its ability to accurately predict emissions compared to previous PEMS."
Matt Williams, Project Lead

£

Strategic

Deliver value for our stakeholders and seek opportunities to deliver a safe and efficient service across our operations now and into the future.

Cutting-edge technologies are unlocking the potential for smarter investment decisions on our network. We are exploring these innovative techniques to deliver significant efficiencies in our operations and exploit untapped sources of data.

Title: Artificial Intelligence (AI) for Pipe Coating Inspection

NIA reference: NIA_NGGT0103 **Supplier:** Tractable **PEA cost:** £142k

Enhancing visual inspections with artificial intelligence

We're applying the latest ideas in artificial intelligence (AI), to improve how we conduct inspections on our above-ground assets. This intriguing new technology will make categorisation of corrosion more consistent – and help us make smarter investment decisions.

Pipe coating systems help protect our pipelines from corrosion at around 450 above-ground installations on our network. To support the safe and efficient operation of these pipelines, it's important we carry out a high volume of inspections to regularly assess their condition. These are carried out by our team of trained technicians.

Human nature, however, can lead to some inconsistencies. When multiplied over a large number of inspections, these can have an impact on how we view the overall health of our assets and affect the decisions we make on where best to invest.

Through this project, we've been exploring whether AI can standardise our inspection process and make our results more consistent. By making the process more efficient, we can also free up our technicians to carry out higher value tasks in the business.

What's involved?
Using the latest machine learning technology, we're training an algorithm – a set of mathematical instructions that allow a machine to learn for itself – to recognise the different equipment types and categories of corrosion found on our network. This is done using a library of tens of thousands of photographs along with knowledge gathered from technicians and engineers.

Work completed so far
The first phase of development is complete, with the AI system successfully achieving more than 85% accuracy in identifying the seven types of asset inspected by our technicians. We're now training the algorithm in corrosion classification.

Following that, we'll transfer the algorithm from development into reality in the form of a computer-based app. This will provide an easy-to-use interface for our technicians to take and organise photos, quickly conduct assessments and develop a report.

What are the benefits?
Using AI in this way will improve our data collection and standardise how corrosion condition is categorised. With this enhanced pool of information, we'll be able to better focus our maintenance strategies and investment decisions. Ultimately, it will help us build a safer, more reliable network for the consumer.

What's next?
We've identified several other processes across the NGGT business where we believe the technology could benefit operations. Once the technology is proven – and in our technicians' hands – we'll ensure we share everything we've learned so that this innovation brings benefits to the wider business and beyond.

To support the safe and efficient operation of our pipelines, our team of trained technicians carry out a high volume of inspections.

Innovation in numbers

450

The number of above-ground installations where the new technology could be applied

"One advantage of artificial intelligence is the continued learning of the algorithm. So even after the project finishes, the system will go on improving its level of accuracy."
Richard Waine, Specifications and Standards Manager

Title: Cognitive Technology for Technical Standards

NIA reference: NIA_NGGT0104 **Supplier:** IBM **PEA cost:** £460k

Retaining knowledge through cognitive systems

Innovation in numbers

Up to £4m and 10,000 hrs

Estimated annual cost of work and time spent by technical specialists dealing with technical standards issues

We're improving the way we capture knowledge across the business – and how we share and use it – through the application of cognitive technology. Richard Waine, Project Lead, tells us more.

What's the background to this project?
In NGGT, we face three important challenges when it comes to capturing the knowledge that exists within our business. Firstly, our engineering knowledge is dispersed across more than 600 technical standards, numerous associated reports and supporting data. Secondly, the business has an older workforce and we risk losing knowledge if we don't capture it quickly. Finally, both the regulator and our customers expect us to make decisions and respond to enquiries more efficiently than ever. We need to find a way to adapt rapidly to these changes.

So what is this project all about?
Cognitive technologies can observe, interpret and evaluate unstructured materials such as documents and reports. They provide great opportunities to improve how we capture knowledge, expertise and experience in our business. They also have the powerful capability to make recommendations based on that knowledge to support the decisions of subject matter experts in our business. In this project, we wanted to assess and show how the technology could be applied in an asset management environment.

What did you learn?
We're using a system called IBM Watson to create two tools that aim to show that cognitive systems have practical potential for us. The first is an **engineering standards cognitive adviser**. It will capture knowledge from 630 technical standards documents and then use cognitive techniques to provide intelligent, reasoned responses to queries from engineers in the field. The second is a **third-party cognitive adviser**, which streamlines the enquiry process for third parties working near our assets. So where, traditionally, technical experts would be called upon to cross-reference information and respond to these queries, customers will interact with the cognitive adviser using natural language instead, obtaining information quickly and reliably.

What are the key benefits of this?
The part of the project covering technical standards will improve how we retain and develop knowledge in the business. It will make the process of accessing technical standards quicker and easier, bringing significant cost and time savings. In terms of the third-party cognitive adviser, it has demonstrated the potential to reduce lead times for customers in finding the information they need. This will not only improve the customers' experience, but also enable NGGT and the wider gas industry to reduce the time and risk associated with third parties operating near our pipeline assets.

What are the next steps?
Both concepts have been successfully proved and we're now putting together proposals for where we take the technology. In the longer term, this project will inform the strategy for the application of cognitive systems in the gas transmission business, so we can deliver quicker, more informed decisions.

IBM Watson will capture knowledge and then use cognitive techniques to provide intelligent, reasoned responses to queries from engineers in the field.

Customer and Commercial

Deliver value for our stakeholders and seek opportunities to deliver a safe and efficient service across our operations, both now and into the future.

We aim to satisfy the needs of our customers while preparing our network for the future demands from new sources of gas, and the impact it could have on the NTS. This requires us to challenge existing practices, and develop new methodologies and efficiencies in areas such as network constraint modelling.

Innovation in numbers

£350m

The estimated annual processing costs for gas entering the UK network. Widening the current gas-quality specification could remove some, or all, of this additional requirement for gas processing, with reduced costs passed on to gas consumers

Title: Gas Quality 2020

NIA reference: NIA_NGGT0094 **Supplier:** DNV GL **PEA cost:** £296k

Understanding the impact of gas harmonisation

A future shift in the available sources of gas is expected to result in a widening of the UK's gas-quality specifications. To ensure our network is fully prepared, we've been investigating the potential impact on our assets and operations – and how to address them.

By the end of the 2020s, gas supplies available to the UK market will have largely switched from UK continental shelf (UKCS) production to other sources, such as liquefied natural gas (LNG), shale and bio-gas. It's predicted that historic gas-quality specifications will widen in order to reduce the cost of processing this gas and strengthen security of supply.

Through this project, we identified which of our assets, operations and processes could be affected by these anticipated gas-quality changes. Next, we pulled together the most robust research from leading European gas experts to calculate a range of likely new gas compositions. This information will form the basis of our recommendations on a number of key areas:

Impact on compressor sites – installing additional software, hardware and gas-conditioning equipment, to ensure units continue to operate at their optimum level, so we can mitigate potential starting problems and stalling issues that a change in gas quality could bring.

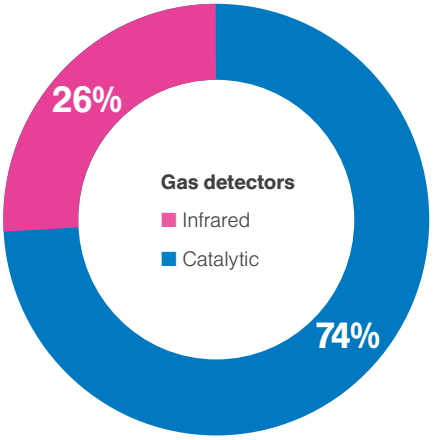
Impact on pipeline fractures – where pipelines are identified as more vulnerable to long-running cracks due to changing gas quality, retrofitting crack arrestors.

Impact on gas detectors – ensuring gas detectors are able to accommodate changes in gas composition and continue to operate effectively.

Impact on NGGT and IGEM safety specifications – understanding the requirements to update and modify NGGT and IGEM (Institute of Gas Engineers and Managers) specifications to accommodate different gas compositions.

Impact on emissions – installing additional emissions control technology to accommodate changes in emissions resulting from burning gas of different compositions.

Next on the project, we'll be sharing and embedding our findings across the business, so we're ready to deliver properly informed programmes of work should these changes come into force. We're also identifying relevant industry forums to share what we've learned across the UK gas chain.



Percentage split of the two types of detectors used on NGGT sites.

"This project provides a valuable insight to all parties connected to the network – and those responsible for onward transportation of gas in high-pressure networks."

John Harris, Engineering Manager

Title: National Transmission System (NTS) Constraint Modelling

NIA reference: NIA_NGGT0022 **Supplier:** The University of Warwick **PEA cost:** £330k

Improving risk assessment with advanced data mining

Rhys Ashman, Operational Capability Development Manager.

We've been refining the way we identify future supply and demand scenarios that pose potential risks to the gas network. Rhys Ashman, Operational Capability Development Manager, explains more.

Describe the background to the project – and what you aim to achieve.
Through a process called constraint modelling, we estimate the likelihood of constraints on the network based on all the future supply-and-demand patterns that we might realistically see. It's important we do this because we're here to meet the needs of our customers and would receive significant commercial penalties if we didn't.

Traditional modelling is carried out by checking a database of 350,000 possible supply-and-demand patterns against network capability. Where we find potential breaches of capability, an expert analyst assesses the pattern to check for risks that we judge to be legitimate. Current tools and techniques enable us to evaluate six network configurations per minute, so 350,000 patterns would take three and a half years.

We've been working with experts from the University of Warwick to investigate the latest data-mining tools and assess whether they could be of use to us. These tools allow us to reveal similarities in large data sets and ultimately improve capacity management on the NTS.

What work has been carried out?
We worked with the Statistics Department at the university to consider several new methods for analysis of the data sets we use in risk assessment. An approach called cluster analysis was identified as one of the suitable tools. This is a mathematical technique that allows for automatic classification of supply and demand patterns that could lead to similar risks within the network. Instead of analysing every pattern, we can identify representative clusters. This allows for better focus of effort from our analysts. The project also developed a mathematical model for calculating NTS Linepack (the quantity of gas stored in NGGT's pipes) in zones across the network. This gives us another useful tool for understanding constraint risks.

What are the benefits?
Broadening our analysis in this way means we can build a better understanding of where the constraints are on our network. This will help us to improve safety, risk management and investment planning – and reduce the probability of network constraints. This should impact positively on all our key stakeholders and customers.

How do you plan to implement what you've learned?
The project is complete and trials have proven the modelling to be successful. The next step is to implement what we've learned into our regular business processes. We've already recruited new members of the team who have similar skill sets and knowledge to the researchers at Warwick. We'll be working with them to take this learning on board, and provide improved and quicker analysis both from new data sets and historical observations.

Cluster analysis allows for automatic classification of supply and demand patterns that could lead to similar risks within the network.

Reliability and operability

Drive improvements in asset health across our network to ensure it can operate reliably and flexibly to deliver the best possible services.

Innovation is playing a vital role in identifying new opportunities to intelligently manage our network. A major focus has been on inspection of our pipelines using more accurate and efficient methods. Techniques to optimise repairs and provide the best method of component recognition are helping to build a more reliable network for the future.

"It's exciting to be involved in a project that solves a long-standing problem in a practical and achievable way. This innovation project has been a fantastic opportunity to engage my passion – and not just my intellect."
Derek Comerford, Technical Engineer

Title: Combined CP and P remote monitoring

NIA reference: NIA_NGGT0108 **Supplier:** Des19ncor **PEA cost:** £369.4k

Merged monitoring simplifies asset management

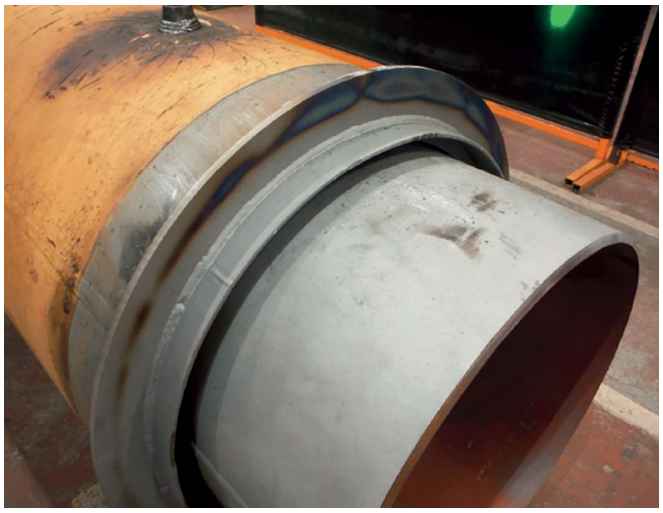
Monitoring the effectiveness of nitrogen sleeves – which provide added protection for our pipelines – is being made simpler, safer and more affordable than ever. Derek Comerford, Technical Engineer, shares how.

What's the story behind this project?
There are more than 1,200 nitrogen sleeves on the NTS, which we use to provide additional protection to key short sections of pipework, such as road crossings. A nitrogen sleeve comprises a sealed steel shell that's pressurised with nitrogen to protect it against corrosion on the inside of the shell. Cathodic protection (CP) is also applied to protect the outside from corrosion. We need to monitor both the pressure of nitrogen and the voltage of the CP to ensure the system is working effectively, and the shell and pipe are properly protected. Currently, these measurements are captured through two separate processes, both of which require site visits. The results are held in different systems, but must be cross-checked with each other. The aim of this project is to develop a single electronic device that can measure both voltages and pressure in a single unit – and report the results remotely to a database.

What progress have you made to date?
The project began in January 2017 with an analysis of the sensor market. Since then, we've worked with our chosen developers to confirm exactly what we need the device to measure and report. This has been developed into product requirements documentation, which covers hardware, software and the device's mechanical elements.

What are the next steps?
We'll build the hardware – the alpha version – for laboratory testing. Through this, we'll show that the design and software meet all the requirements of the project. Once testing is complete, we'll sign off on a beta product and put 18 monitors to the test on our pipelines. By March 2018, we hope to have the unit fully developed, proven and ready to roll out across the network.

How will the business and its customers benefit?
Site visits will be greatly reduced. Rather than visiting each site to test for compliance, technicians will only be called upon should an alarm on the system signal a problem. This will bring significant time and cost savings. By reducing the need to work at roadside access points, the project will also have a positive impact on safety. CO_2 emissions will fall too, as a result of fewer journeys. Finally, by having the data reported through a single, simple interface, data quality will be enhanced and it will become simpler and more affordable to demonstrate compliance to the regulator.



A nitrogen sleeve comprises a sealed steel shell that's pressurised with nitrogen to protect it against corrosion on the inside of the shell.

Title: Asset Information Modelling (AIM)

NIA reference: NIA_NGGT0089 **Supplier:** Premtech **PEA cost:** £662k

New approach to asset information modelling

Innovation in numbers

£8m

Estimated savings across our portfolio of major projects when component recognition is applied

50,000

Number of components we've designed to form an easy-to-use library of components for designers to simply drop in

"By developing a library of components that are ready to drop in, the process becomes more like assembling Lego than traditional design work."
Paul Lee, Investment Scheme Manager

We're helping designers across our supply chain to reduce the time it takes to scan and build 3D models of our assets by developing a drag-and-drop library of 50,000 gas components.

Our design processes have taken huge strides forward in recent years. Intelligent 3D models, built off the back of laser-scanning innovations, are replacing traditional two-dimensional technical drawings in the project life cycle.

These 3D models, embedded with data, can be shared across design and construction teams, leading to significant reductions in time and final design costs.

Through Project AIM (asset information modelling), we're taking the work we've done with Building Information Modelling (BIM), even further with the addition of sophisticated component recognition software. The software can quickly identify assets picked up in scans and convert them into detailed 3D models, automating part of the process and simplifying the job for the designer.

Achievements from the past 12 months have included:

- Working with project partners Premtech, we developed a library of 50,000 complex gas components that the software can now recognise. The software will be issued for free to all designers in our supply chain, allowing them to reduce CAD time by an estimated 20% as they drag and drop components at the touch of a button
- We developed a new laser-scanning standard, which outlines the optimum equipment that we expect suppliers to use, taking into account the installation size and complexity
- Major project design still begins with 2D models before progressing to 3D at detailed design stage, there's considerable value in creating 3D models from the start. For projects above the value of £1.5m – such as replacing new compressors or significant site work – the efficiencies we make by using 3D models soon outweighs the cost of doing it at the front end. This could bring even greater savings in the future
- We fed all the lessons learned on the project through to our contract documents as things progressed. This means suppliers will be able to hit the ground running as soon as the project is complete
- The Health and Safety Executive (HSE) has reinforced the safety credentials of our work with the development of a new BIM for Health and Safety Standard 1192-6, using a number of our case studies. This backs up our conclusion that by making projects more efficient through BIM and AIM, while reducing the time required on site, we also reduce the likelihood of accidents – which makes our construction projects safer than ever.

The current innovation project has been successfully delivered. We'll now look to share the component library and the things we've learnt across the supply chain to ensure our work on AIM results in cheaper, quicker and safer projects for the future.

Intelligent 3D models, built off the back of laser-scanning innovations, are replacing traditional two-dimensional technical drawings in the project life cycle.

Reliability and operability

Title: Acoustic Resonance Technology (ART)

NIA reference: NIA_NGGT0102 **Supplier:** Halfwave and Pipeline Integrity Engineers (PIE) **PEA cost:** £350k

ART inspections minimise network disruption

A fresh technique for carrying out inline inspections – acoustic resonance technology (ART) – promises to tell the inside story of the condition of our pipelines.

In-pipe inspections play an important role in the ongoing maintenance of our network of gas transmission pipelines. We've been exploring whether ART could offer a step change in how we assess and maintain our assets.

Conventional techniques are based on magnetic flux leakage (MFL) technology. While the technique is highly developed and understood, it doesn't directly measure how thick the walls are, which is a key reading for assessing the magnitude of defects.

The percentage of wall thickness loss is estimated by using magnetic saturation to work out the size and shape of the pipeline and then comparing it against the thickness the wall is expected to be. The error range of readings could cause the estimation of remaining pipeline life to be out by up to 20 years in extreme cases.

ART has the potential to deliver a number of benefits, including:

- Accuracy of pipe wall measurement is +/-0.2mm
- ART can cope with higher range of gas flows, meaning there's less need to control flows during testing – reducing disruption for our customers
- Sensors on the ART device don't touch the pipe wall, so it can be easily adapted to a range of pipe sizes by changing its control cups
- Any areas of disbonded pipeline coating can be identified, which provides a clear case for the onset of corrosion. This can't currently be picked up by MFL
- It is possible to identify natural laminations, which would previously have been reported as a defect by MFL
- We're able to load the device in standby mode and trigger it later. This brings potential savings as we can time the loading process to fit in with other maintenance work.

Pursuit of precision

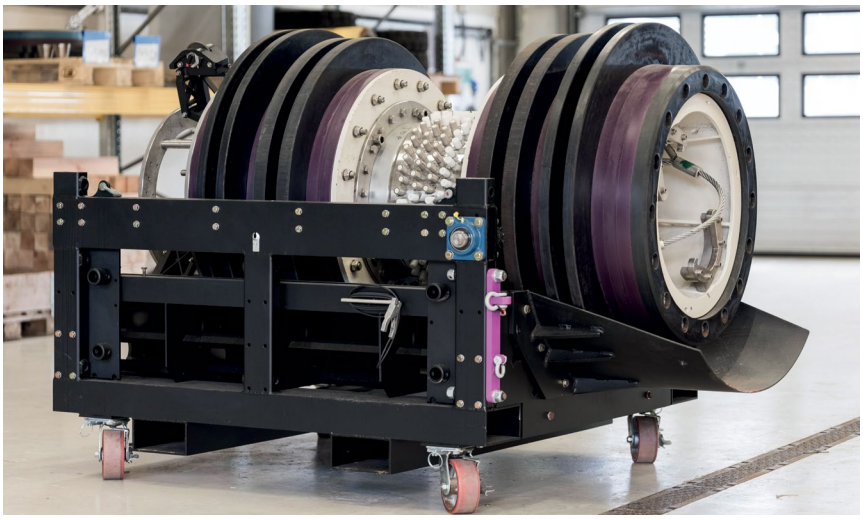
ART uses ultrasonic techniques to accurately locate and measure any defects it identifies on a pipe. This potentially provides much more precise information, allowing us to make more efficient decisions on repairs and replacement.

We've been trialling ART on our Feeder 10 pipeline in Scotland where the device was successfully deployed along a 45km section of pipeline. While we still need to validate the data we collected, we've already identified a number of advantages.

Next steps for the project will include robust data analysis to ensure the ART readings match the true condition of the pipeline. If successful, NGGT will look to use the technology to support the work currently carried out by MFL.

Kirsty McDermott, Project Engineer, said: "In the past three years, we've detected 400 defects using in-pipe inspection that required action, such as excavation. However, 25% of those proved unnecessary. By increasing the accuracy of our results, we can make more realistic corrosion assessment and avoid needless disruption and costs for consumers."

The ART device uses ultrasonic techniques to accurately locate and measure any defects it identifies on a pipe.



Innovation in numbers

25% The number of excavations based on existing techniques that turn out to be unnecessary

£70k Cost for pipeline excavation

Title: Valve Sealant Line Grouted Tee

NIA reference: NIA_NGGT0084 **Supplier:** DNV GL **PEA cost:** £147k

Radical repair solution boosts system reliability

Innovation in numbers

£5m per year

Estimated cost savings by using grouted tees to repair defective sealant lines

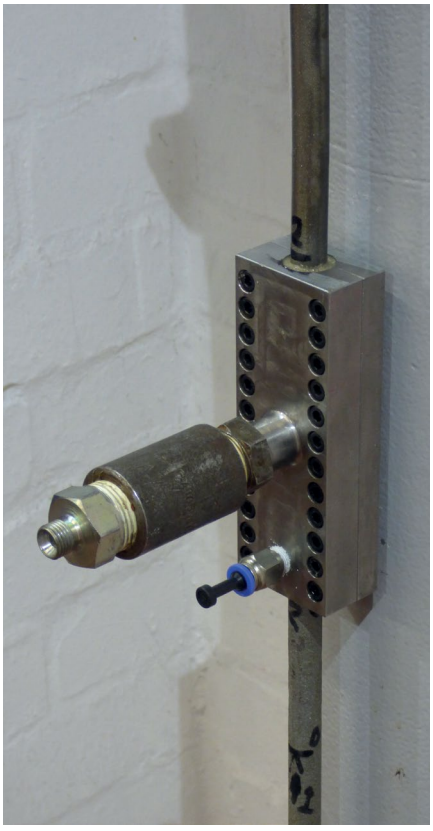
An innovative new way of making under-pressure repairs to sealant lines is set to bring significant cost and reliability benefits. James Beardsley, Project Engineer, tells us more about mini grouted tees.

What prompted this project?
A lot of buried valves on the NTS have sealant lines connected to them, which come up out of the ground for maintenance purposes. Over years of exposure to the weather, these can become corroded. Up to now, there's been no safe and effective method for making repairs while the lines are live. The only option was to squeeze the line with a crimping tool and then request an outage. Once gas was taken out of the pipeline, we could carry out the necessary repairs. Recompressing a section of pipework following repairs cost the business up to £200k. So we looked for a solution that would allow us to work while the lines were still live.

What's your solution?
We've accepted an existing pipeline connection – called the grouted tee – for use on sealant lines for the very first time. The tee we've developed comprises two half shells that fit around a section of pipe below the crimped section. Via the tee, we can drill the pipe and seal it off with a flow-stopping element that has been specially adapted. With the line sealed, we can safely modify or replace the remaining pipework, getting the valve back into use quickly and safely. A second phase of the project has also seen us develop a compression-fitting epoxy encapsulation sleeve. This allows us to strengthen any sections we feel are susceptible to leaks by encasing them with a grouted tee, then flooding them with an epoxy grout.

What are the benefits to NGGT and end consumers?
At the moment, many sealant lines that have been crimped off are awaiting funding so that gas can be taken out of the pipeline, repairs carried out and valves put back into service. By introducing our new tee innovations, we'll significantly reduce repair costs and bring efficiencies in terms of the time it will take to carry out repairs and in the amount of equipment we need to take on site. We'll also see environmental benefits through a reduced need for recompression, which typically sees a volume of gas vented out into the atmosphere.

What's next?
With the project now almost complete, we're gearing up to put the tees into immediate use at our Kings Lynn compressor station. There are several valves where the sealant line has been condemned. This has prevented the station from being able to compress gas out to certain parts of the network. Using mini grouted tees will allow us to bring the station back to full capability more quickly and at lower cost, reinforcing the reliability of the transmission system.

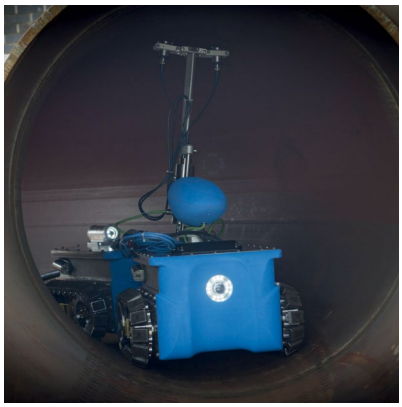


Using mini grouted tees will allow us to bring the station back to full capability more quickly and at lower cost.

Title: Gas Robotic Agile Inspection Device (GRAID) **NIC Reference:** NGGTGN02

Partners: Synthotech, Premtech, Pipeline Integrity Engineers (PIE)

Next-generation robot set to transform asset management



The Twin Chassis Design.

"To finally see our robot moving around pipework and sending images back to the control centre in offline testing is hugely exciting. It really brings home how close we now are to making this a reality for our business."
David Hardman, Project Lead

Visit our brand new **Project GRAID website** to find out more about the rise of our GRAID robot.

A radical redesign of our robotic platform and the start of offline testing were among the highlights of Project GRAID this year, as we took significant steps towards making this important innovation a reality on our network.

Through Project GRAID – a key part of our innovation portfolio – we're developing a new type of robot capable of inspecting the condition of buried pipework at high-pressure gas installations (AGIs) from the inside. The quality of data it will provide, once complete, will allow us to manage, maintain and replace these assets more efficiently.

Let's explore some of the highlights from a productive year...

Robot design and build
After testing, our partners Synthotech took another look at the design of our robot. What was previously a single unit has now been split into two modules, giving the robot improved steering and agility as well as a robust mounting point for the non-destructive testing (NDT) arm which has specially developed Electromagnetic Acoustic Transducer (EMAT) sensors. This is the part of the robot that will rotate 360 degrees, collecting wall-thickness data and detecting defects.

The improved design also features four driving tracks, loaded with magnets, in place of the previous two. This gives the robot more magnetic contact with the wall and, much like a 4x4 car, better grip and traction.

We also successfully developed an Umbilical Management System (UMS), a sophisticated trolley and cable that acts as our connection to the robot. This is essential to the robot's operation, sending drive commands in one direction and feeding data back to us in the other. Alongside this, we completed the robot's control system. This features a series of monitors displaying video feeds and the control mechanism which allows operators to drive the robot.

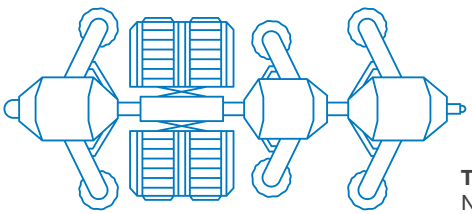
Testing rig
Alongside partners DNV GL, we completed the development and construction of a testing rig, for use in offline trials, at RAF Spadeadam in Cumbria. The facility recreates the conditions of an AGI site, with 90-degree bends, 45-degree climbs, fully vertical sections and the ability to be pressurised to the same level as a live installation, including fans to generate a flow rate of 5m/s for the robot to operate against.

Our launch and retrieve vessel, which does the crucial job of getting the robot safely in and out of the pipe, was also completed with the support of partners Premtech.

Offline trials
Our offline trials began on 10 April, which was an exciting highlight for everyone on the project. Early tests were carried out at normal atmospheric pressure to see if the robot moved and operated as expected. We then moved on to fully pressurised testing. Results so far have been very promising and we'll conduct a minimum of ten trials before progressing to the next stage of testing at our live installations in Bacton and Cambridge.

Keeping stakeholders in the loop
We've been busy sharing what we're learning at a series of industry events. We sparked lots of interest and discussion at the Pipeline Pigging and Integrity Management (PPIM) conference in Houston, USA and the Low Carbon Networks and Innovation (LCNI) conference here in the UK. Our goal from collaborating in this way is to inspire stakeholders and stimulate further innovation.

The evolution of GRAID



The 'Crawler' Concept
November 2014 – May 2015

Title: Gas Robotic Agile Inspection Device (GRAID) **NIC Reference:** NGGTGN02

Partners: Synthotech, Premtech, Pipeline Integrity Engineers (PIE)

Innovation in numbers

£60m
Predicted savings of circa £60m over a 20-year period

2,000T
2,000 tonnes of carbon will be saved annually

5m/min
Speed of robot – a steady five metres a minute

100 BarG
Maximum operating pressure

7
Camera feeds from the robot

500+
Components in the total assembly of the robot

1200mm
Approx in length

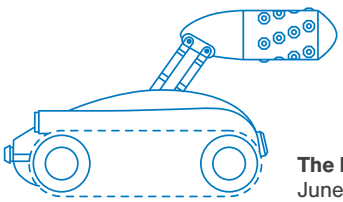
240kg
Weight

Future focus – what's next on GRAID?

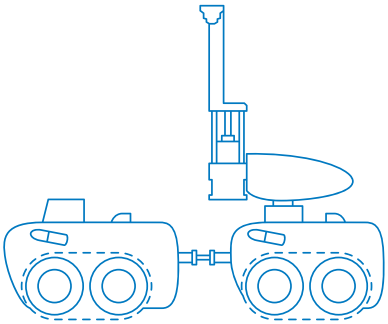
Online testing: Online testing at Bacton and Cambridge is scheduled for the end of the year. We're currently constructing a permanent connection point for the launch vessel at Bacton. While in Cambridge, we're cutting costs by planning trials alongside unrelated maintenance work. This will leave us with a temporary opening in the pipework to send in our robot and record the data we need without additional investment.

Data: Once we start to collect data from our installations, we'll begin to build a more reliable data model, which will be used to inform and improve our asset management decisions in the future.

Training: Colleagues from our Pipeline Maintenance Centre (PMC) will be responsible for operating the robots day-to-day once the project is complete. Partners Synthotech will carry out training in how to operate the control station, robot and Umbilical Management System (UMS) – so PMC technicians can get the best from our robots long into the future.



The Dolphin Design
June 2015 – May 2016



The Twin Chassis Design
June 2016 (current)

Title: Customer Low Cost Connections (CLoCC) **NIC Reference:** NGGTGN03

Partners: Premtech, Aqua Consultants, PROTECH

Flexible connections for the emerging gas market

Innovation in numbers

50%

Reduction in cost of connection versus historical approach

£100m

Savings for our customers, assuming 100 connections are made over the next 20 years

Visit our **Project CLoCC website** for more information on how we are enabling flexible future connections for our customers.

Through project CLoCC, we're simplifying the process of connecting to the National Transmission System (NTS) for a new generation of gas customers. A productive 12 months on the project has seen the development of a suite of innovative new connection designs and to help customers choose the connection option that's best for them.

Collaborating with our customers has been at the heart of driving Project CLoCC's progress this year, as we work towards reducing the time and cost of connecting to the NTS.

The project aims to open up the high-pressure gas network to new types of customers – from creating new entry connections for unconventional gas producers, such as biomethane, to greatly simplified exit connections for applications such as natural gas fuel stations.

By creating new opportunities to connect these emerging markets to the NTS we can help maximise the potential for newer forms of indigenous gas, improving the nation's energy security and reducing our carbon footprint in the process.

Let's explore the key achievements of the past 12 months, which saw the project successfully complete stage 2 and move into its final phase.

Online customer connections portal

One of the main objectives of the project was to create an online customer connections portal – and this year saw the successful completion of its prototype version.

One important feature is a facility whereby customers can easily compare and assess their best option for an NTS connection. In less than 60 seconds, after entering basic details about their project such as location and predicted gas flow, the portal will provide:

- A high-level indication of how much a connection will cost
- An indication of the capacity available
- Advice on the right connection design and size.

What's more, the portal provides information about the entire customer journey, from application to first gas. So once registered, customers can return to the site and easily follow the progress of a connection application.

We listened to our customers and included information about the capacity application process. Applying for a connection and applying for capacity are separate processes, but customers told us they were keen to bring them more in line with each other. We've included information and useful links about the capacity process on the site, so both processes can be explored from a single location.

The prototype portal has been thoroughly tested, with stakeholders describing the user experience as either 'good' or 'excellent' at this stage. Further feedback from the testing phase will be used to shape the final version.

Physical connection

We developed conceptual designs for a comprehensive suite of CLoCC connections, with options covering connection pipework sizes of 80mm, 200mm and 300mm. The suite of designs can therefore accommodate a broad range of customers with a wide range of gas flows.

We've also been looking at the possible removal of remotely operable valves (ROV), which could bring clear benefits to customers. Up to now, it is specified that these valves – which allow us to remotely shut off a connection at any time – were included on any new connection to the NTS. Subject to appropriate risk assessments it is possible to remove this valve in certain circumstances. In turn, this has the benefit of reducing the hardware a customer requires onsite and therefore their costs.

Communications

Project CLoCC is one of the main customer-facing innovations in our business and we've been meeting and listening to customers to ensure our work supports their needs.

The culmination of this was our annual stakeholder conference, held at the National Motorcycle Museum in February. The event was focused on giving stakeholders the opportunity to influence the project's future direction.

Title: Customer Low Cost Connections (CLoCC) **NIC Reference:** NGGTGN03

Partners: Premtech, Aqua Consultants, PROTECH

Project CLoCC launched in February 2016 and entered the final stage 3 in May 2017. The project is due to be completed in October 2018.

Attendees came from a variety of industries including biomethane, shale and compressed natural gas (CNG), along with industry bodies such as UKOOG, IGEM and Ofgem. Attracting such a diverse group of industry professionals allowed us to gain a broad cross-section of insights.

A recurring theme across all sectors was the importance of flexibility and choice so that a variety of different types of customer could be appropriately supported.

Next steps
As we move into the final phase of our project, we'll deliver detailed designs of each connection solution, and build and test them. Alongside this, we'll complete work on the online portal and ensure all commercial arrangements are in place so the wide-reaching benefits of the project will be accessible to a new generation of customers as soon as the project closes in October 2018.

We held our annual stakeholder conference at the National Motorcycle Museum in February.

"By making connections quicker and cheaper, we're laying the groundwork for further strategies to be developed that can help us meet the challenges of tomorrow."
Anne-Marie Liszczyk, Project Manager

Why collaboration is at the heart of innovation

We're constantly looking for new partners, and building on our relationships with existing partners to create new opportunities and share best practice. Alongside our partners, we're nurturing innovation across the gas industry, building a safe, reliable and efficient gas network for the future.

We've continued to share learning and work collaboratively across the networks.

Working together across the Industry

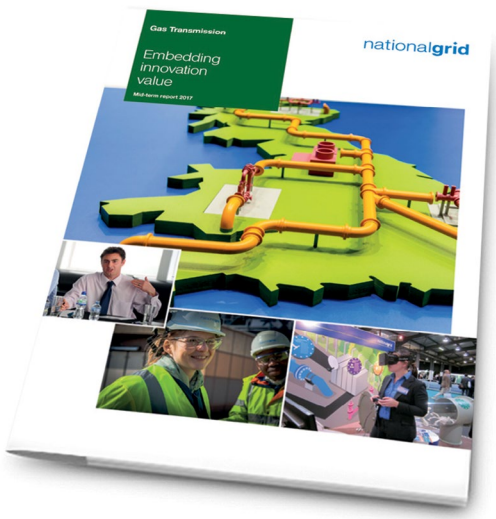
Gas Innovation Governance Group
The Gas Innovation Governance Group (GIGG) is an important forum for NGGT to collaborate with the gas distribution networks. Having taken the role as chair for 2017, we've continued to share learning and work collaboratively across the networks. The group has successfully published the first set of joint problem statements, which identify key areas of focus for future innovation. In addition, GIGG has pushed for increased engagement across the industry. The Group has led a joint session at the 2016 LCNI Conference on the 'Evolution of an Innovation Project', introduced a quarterly newsletter and headed up events such as IGEM's Affiliates event.

Memberships
We've continued our involvement in three industry groups throughout the year. The PIPESAFE Group provides research into the management of safety risks on pipelines and above-ground installations, as a result of potential major hazards, including the damage by interference. The European Pipeline Research Group (EPRG) and Pipeline Research Council International (PRCI) are made up of a number of member organisations from across the globe. They provide a forum for sharing knowledge, and allow us to encourage funding contributions from all member organisations so they can access a wide range of research and development programmes. All three of these memberships are relevant to the needs of NGGT, but are also of significant interest to the wider gas industry.

Innovation Roundtable
The Innovation Roundtable remained at the centre of our innovation engagement, giving us the chance to share insights, knowledge and experience with innovation professionals from large, multinational businesses across the globe. Themes for this year have focused on the innovation pipeline and how to create sustainable innovation, cultural transformation and building a collaborative innovation culture.

LCNI Conference

We showcased a selection of NIA and NIC projects at the Low Carbon Networks and Innovation (LCNI) Conference held in Manchester in October 2016, designing our exhibits to be engaging and interactive. Visitors could operate a model of our CLoCC project, see the latest design for our GRAID robot, hand-held laser scanning and see how our composite transition pieces actually work. As well as the exhibits, breakout sessions were a great opportunity to learn, with sessions covering the latest developments on Project GRAID and Project CLoCC, along with a session looking at the role of innovation in meeting the UK's climate change targets.



Innovation Value Report

In the past 12 months, we've been focusing on showing the value that our innovation projects have delivered to our customers. As part of this work, we carried out an innovation stakeholder survey, asking over 100 of our internal project leads and external project partners for their views on our innovation performance. The result has been our recent publication of the first mid-term Innovation Value Report, which outlines the benefits our innovation portfolio is bringing, with a focus on ten key case studies. The benefits we've seen so far from our portfolio are £6.9m which brings a positive benefit ratio of roughly 4:1 against costs already incurred. You can read much more about these case studies and our stakeholder survey by downloading the full report.

Innovation Drop-In Sessions

We held an internal Innovation Drop-In day in March 2017 for the NGGT teams, to promote our innovation pipeline and provide an opportunity to share ideas, knowledge and best practice, which have potential for our business. The event was a great success, with guests able to get hands-on with some of the latest technology on the market, speak to the innovation team and discover how innovation is delivering value to the business. Event feedback was extremely positive and as a direct result of the showcase, we gained business support for a new innovation project due to be registered in the 2017/18 reporting period.

List of projects: NGGT Lead

We had a portfolio of 44 innovation projects in 2016/17. To learn more about the projects, click the title to be taken to the ENA smarter networks portal.

Project Reference	Registered Title
NIA_NGGT0009	Removable Composite Transition Pieces (CTP)
NIA_NGGT0022	National Transmission System (NTS) Constraint Modelling
NIA_NGGT0023	Development of "AGI safe"
NIA_NGGT0035	Investigation of Flow Physics in Gas Pipe Network
NIA_NGGT0049	Investigation into the use of Constrained-layer Damping
NIA_NGGT0051	Wireless Gas Detection Assessment
NIA_NGGT0060	Gas Generator Preservation Assessment
NIA_NGGT0063	Investigation into Novel Robotics Locomotion Techniques
NIA_NGGT0066	Meter Validation Assessment Tool (MVAT)
NIA_NGGT0067	Sensitivity and Specificity of Stress Concentration Tomography – I CASE award
NIA_NGGT0071	Spatial District Heating Analysis and Impact on Gas and Power Demand
NIA_NGGT0073	Investigation into LPRC pipeline material
NIA_NGGT0074	Next Generation Predictive Emission Monitoring Validation (PEMS)
NIA_NGGT0075	Enhanced Operational Forecasting
NIA_NGGT0079	Remaining Useful Life (RUL) Determination for Compressors
NIA_NGGT0083	Geospatial Information System (GIS) Pipeline Costing Tool
NIA_NGGT0084	Valve Sealant Line Grouted Tee
NIA_NGGT0085	New Techniques for the Measurement of Pipeline Depth of Cover
NIA_NGGT0087	Selective Catalytic Reduction (SCR) Pre-FEED Environmental and Technical Study
NIA_NGGT0088	Nitrogen Sleeve Epoxy End-Seal Repair Solution
NIA_NGGT0089	Asset Information Models (AIM) for Component/Pattern Recognition
NIA_NGGT0090	Infra-red Photography for Maintenance
NIA_NGGT0091	Installation Risk and Technology Assessment Model
NIA_NGGT0092	Utilisation of 3D Laser Scanners for Pipeline Damage and Coating Assessments
NIA_NGGT0093	Ultrasonic Testing of Thin Wall Pipeline Girth Welds Using High Frequency Probes
NIA_NGGT0094	Gas Quality 2020
NIA_NGGT0095	Technical Standards Strategy
NIA_NGGT0096	Seam Weld Identification
NIA_NGGT0097	Permanent PE Slab Protection
NIA_NGGT0098	Composite Pipe Supports Phase 2
NIA_NGGT0099	Gas Transmission Network Output Methodology Analytics
NIA_NGGT0100	PRCI – Pipeline Research Council International – 2016
NIA_NGGT0102	Acoustic Resonance Technology (ART)
NIA_NGGT0103	Artificial Intelligence for Pipe Coating Inspection
NIA_NGGT0104	Cognitive Technology for Technical Standards
NIA_NGGT0105	Risk Assessment Methodologies 2016/17
NIA_NGGT0106	EPRG 2016
NIA_NGGT0107	Project EVA – Extreme Value Analysis
NIA_NGGT0108	Combined CP and P Remote Monitor

List of projects: NGGT Participation

Project Reference	Registered Title
NIA_NGET0135	Enhanced Sensor Development (ICASE Award)
NIA_NGET0144	Integrated Electricity and Gas Transmission Network Operating Model (ICASE Award)
NIA_NGGD0094	Composite Repairs to Complex Shapes
NIA_SGN0092	Pit Protect
NIA_SGN0094	Energy Map and Plan

How you can help drive NGGT Innovation

Projects funded under NIA and NIC should be at least one of the following:

- Unproven in Great Britain
- Novel arrangement or application
- Novel operational practice
- Novel commercial arrangement

There are two funding mechanisms available to facilitate innovation across the gas industry as part of the RIIO-T1 price control. The Network Innovation Allowance (NIA) provides an annual allowance to fund smaller scale projects, while the Network Innovation Competition (NIC) is an annual competition to secure funding for large-scale demonstration projects that seek to build a lower carbon future for the UK.

Network Innovation Allowance (NIA)

NIA provides NGGT with an annual allowance to fund innovation projects that deliver value to our customers. **Key drivers for the NIA:**

- **Research and Development** – Encouraging operational and technological innovation
- **Collaboration and Dissemination** – Working with external partners to solve problems and sharing new learning
- **Customers and Strategy** – Focusing on new solutions to old problems that deliver financial value to our customers.

The NIA allowance is accessible throughout the year with projects required to satisfy the following criteria:

- Demonstrate customer value
- Directly impact the gas network
- Share learning and intellectual property
- Avoid duplication.

Network Innovation Competition (NIC)

NIC is an annual competition to fund flagship innovative projects that can deliver financial and environmental benefits for gas customers. There is a fund of £18m available each year to Gas Transmission and Distribution networks with collaboration at the heart of the NIC.

To secure funding, projects should:

- Accelerate the development of a low-carbon energy sector and/or deliver environmental benefits
- Deliver value for money for gas customers
- Create knowledge that can be shared across energy networks in Great Britain (GB) or create opportunities for roll-out across a significant proportion of GB networks
- Be innovative (i.e. not business as usual) and have an unproven business case where the risk surrounding the innovation warrants a project to demonstrate its effectiveness.

Estimated timeline for NIC 2018 Bids:

Meet the Team and get in touch
We are the Gas Transmission Innovation Team – here to help facilitate innovation across NGGT. Please get in touch with us if you would like to be added to our mailing list, have a question or an idea you'd like to discuss!

To get in touch, please email:
box.GT.innovation@nationalgrid.com

Or find us on social media:
LinkedIn, Twitter and Facebook

To find out more about innovation, visit:
www.nationalgrid.com/innovation

Image: Left to right: Tom Neal, Feona Weekes-James, Peter Amos, Tamsin Kashap, Matt Nevin, Alison Dineley, Quentin Mabbutt.

nationalgrid

National Grid Gas Transmission
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA
www.nationalgrid.com/innovation