Welcome

This is the second Innovation Annual Summary for National Grid Gas Distribution under the Network Innovation Allowance (NIA). Our second year under RIIO and the NIA framework has seen a growth in innovation activity, with our portfolio increasing from 40 to 61 projects, with an annual expenditure of £7.64m. The focus for this year has been driving projects forwards from concept through to implementation.

We have concentrated on ensuring a balanced range of projects in our Innovation Portfolio, contributing towards the continual delivery of our stakeholder commitments: to keep people safe, be reliable, safeguard future generations, provide value for money and deliver quality service for all.

This year we have focused on projects that reduce disruption to our customers. Technologies to minimise installation times and excavations in our iron mains replacement work are key, and as such we have developed our PRISM (Pipe Replacement In Situ Manufacturing) and TORS (Tier One Replacement System) robot. Leakage reduction has also been an important drive leading to significant research in MEG (Monoethylene Glycol) Fogging.

We have continued our focus on collaboration, expanding our breadth of innovation through new partnerships, through our self-funded Technology Search and through support from forums such as the Energy Innovation Centre and Energy Networks Association.

Alongside the growth of our NIA portfolio, 2014/15 saw the launch of our first NIC (National Innovation Competition) project, a BioSNG Demonstration plant. The aim is to design and construct a pilot conversion and clean up plant that will upgrade waste-derived syngas to a pipeline quality gas, enabling the decarbonisation of our gas supply through future injection of syngas into our networks.

Looking forward to 2015/16, there will be a continued strategic focus on our six Strategic Value areas with a drive towards implementing project outputs into the business and delivering long-term value for our customers.

David Parkin
Director of Network Strategy
Gas Distribution
Our innovation strategy

Our strategy focuses on six Value Areas, which reflect the RIIO Outputs and our Gas Distribution Ambition. These areas have been split into two categories: For Today and For Tomorrow.

For Today

**Customer Experience**
Reduce the size and duration of our replacement and remediation activities. Continually improve our safety standards for our customers and employees. Improve our customer and stakeholder experience through proactive communication.

**Cost Efficiency**
Continually reduce the cost of running our network by optimising the way we work, improving the efficiency of assets and the cost effectiveness of investment decisions.

**Life Extension**
Extend the life of our assets through increased monitoring and new remediation techniques. Increase our network reliability, thereby reducing disruption of service.

**Environment**
Reduce our impact on the environment through energy demand and waste reduction and wherever possible have a positive impact on the environment in which we work.

For Tomorrow

**Unconventional Supplies**
Open up the use of our network to alternative energy sources. Increase diversity and security of supply through the identification of renewable gas sources.

**Future Network**
Facilitate the integration of our network into the wider energy chain to ensure least-cost energy provision for our customers. Understand the future energy needs of our customers.
Over the past year, the Innovation Delivery Team has expanded to 15 people, all working in line with our Strategic Value Areas, to help deliver our ambitions under each section. To implement the innovation strategy, we have formed the Monthly Innovation Performance Group, with key representation from the core functions of the business.

New partnerships
We are now working with more suppliers across the energy industry too. Through our collaboration with the Energy Innovation Centre and the Energy Networks Association, we have forged new partnerships with several Small and Medium Enterprises.

In addition, our self-funded Technology Search at the start of 2015 has identified a number of potential innovation partners. We have already used the output of this exercise to develop the SENSET Project, with sanctioning and registration scheduled for the 2015/16 financial year.

Driving value
Our portfolio has been expanded throughout the year, to ensure a spread across our six strategic value areas. As a result, we had a diversified set of projects throughout 2014/15 that were driving value for our customers.

As shown in the bar chart on the right, our focus was on projects that will deliver benefits within the GD1 timeframe (For Today). These projects look at improving our customers’ experience and driving efficiency in our replacement works through more cost-effective tools and techniques and decreasing our environmental impact.

We acknowledge the importance of looking ahead to GD2 and beyond and have therefore invested in research to support the development of our future gas network (For Tomorrow).

Our NIA spend in 2014/15

Looking forward to 2015/16
We are in a strong position, with our key priorities established and our six Strategic Value Areas clearly defined. We have the relevant governance and resources in place to support the delivery of our strategy.

The innovation investment strategy will be to focus 80% of the available Network Innovation Allowance budget on the For Today value areas with the expectation that these will begin to optimise Totex and Repex performance and deliver value for customers in the near-term.

The remaining 20% of the NIA budget will be invested in projects to help us to understand the future energy needs of our customers and identify opportunities for decarbonisation of the network.

We will also seek to fund For Tomorrow projects through submissions to the Network Innovation Competition.
This is the second year of the Network Innovation Allowance (NIA). The past 12 months has seen us build a portfolio of 61 projects spread across our six value areas:

<table>
<thead>
<tr>
<th>Projects per Value Area</th>
<th>11</th>
<th>17</th>
<th>15</th>
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<td>Future Network</td>
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<td>Total Projects</td>
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**Fact and figures**

£7.64m was spent on NIA projects during 2014/15 financial year.

33 projects were carried out collaboratively with gas distribution network operators.

27 projects were completed by the end of the 2014/15 financial year.
The Customer Experience Strategic Area has seen a continued drive towards improving our customer and stakeholder experience. We hope to do this through the reduction of the size and duration of our replacement and remediation activities, and the improvement of our safety standards for customers and employees.

We have placed a significant emphasis on ‘no dig’ projects, using technologies to reduce our excavations and to work remotely.

Some examples include the PRISM (Pipe Replacement in Situ Manufacturing) project, where we are spray-lining an existing cast iron pipe with a polymer to create a fully structured liner. We can do this without the need to excavate to remove the existing cast iron pipe.

This can significantly reduce the number of excavations and the time taken for work to be completed. It could reduce a standard mains replacement job from a few days to a single day or less.

A simpler solution TORS (Tier One Replacement System) is a remotely controlled robot that can be inserted into a pipeline to perform work inside the pipe that would otherwise require excavation.

Again, this reduces the impact on the customer and environment by removing the need for multiple excavations.

Meanwhile, the Acoustek Project helps to accurately detect underground assets using sound waves, leading to more focused excavations.

Safety in the home
We have engaged in the Intelligent Carbon Monoxide Project, a collaborative project with Northern Gas Networks, Wales and West Utilities and the Energy Innovation Centre. This trials Intelligent CO Monitors in student housing.

The monitor is battery powered, with GPRS communications and advanced self-monitoring capabilities. The benefit of this is that the monitor can raise and automatically communicate faults to the property owner and therefore reduce the risks of CO to tenants. In addition, the health of the monitor can be monitored via an online portal.

50 years
The lifespan of new pipes created through the PRISM technique

This remotely-controlled TORS robot enables remote service to mains connections

Watch the videos
PRISM
TORS
Intelligent CO

Intelligent CO detectors are helping make customers safer

Continues on the next page
The focus of projects in this area has been on monitoring and remediation techniques that can contribute towards the life extension of our assets. This is key to reducing service disruption and increasing our network reliability.

We have been validating the suitability of Orbis Oxifree Corrosion Coating for use on GB gas networks. This has involved using the coating at a number of sites both above and below ground. The aim is to determine the suitability of the product in different environmental conditions.

In addition, our project on polyethylene (PE) repair systems will help us to identify improved methods for maintaining our PE assets. The project is looking at potential repair techniques for PE pipe systems that could provide an alternative to replacement.

Our Cast Iron Fit for Purpose (CIFFP) project is looking at developing a methodology that satisfies obligations under the Pipeline Safety Regulations and enables Tier 2 and 3 pipes to be either safely remediated for continued use, or prioritised for replacement and decommissioning.
Our MEG Fogger project is developing a new fogging unit which will improve the mono-ethylene glycol saturation in lead yarn joints in cast iron pipes. This could lead to a significant reduction in gas leakage.

The development of a Packaged Solution for Bio Methane Injection project looks at how Biomethane producers can connect to the <7 bar network – with the potential to apply to the >7 bar network. This will be a big step towards reducing the use of fossil fuels by making the National Grid network accessible to suppliers of renewable gases.

Our Pressure to Gas project assessed the feasibility of replacing existing pressure reduction equipment with an integrated energy recovery and hydrogen electrolysis equipment package.

By focusing on continually reducing our waste and energy demand, we can contribute to meeting our 2050 environmental commitments.

Our MEG Fogger project aims to increase MEG saturation and reduce gas leaks in our network.
**Significant new learning**

Throughout 2014/15, our portfolio of projects has demonstrated a number of lessons that are invaluable in informing current and future projects. A key lesson that has been at the forefront throughout the year is this: a strong strategy, understood both internally and externally, will support the right idea generation and maintain a clear focus on delivering value for customers.

A well-balanced portfolio is key to success

It is important to have a balanced portfolio in terms of scale and project duration. However, what is more important is the breadth of innovation activity across the key areas and their alignment with our business drivers. Maintaining this balance along with a clear strategic view has allowed the effective management of our innovation portfolio, giving us the ability to react to changes in project direction. Our Value Areas are aligned to Gas Distribution Ambition Statements and are supported across our core functions, ensuring we are focusing innovation on areas with the greatest potential to deliver value to our customers.

**PROJECTS THAT TAUGHT US THIS**

The balance of portfolio is demonstrated by projects such as PRISM and CIPP, which are long-term, higher investment projects seeking to revolutionise how we carry out our mains replacement work. By contrast our Fence Feet and QR Code projects are short-term, low investment projects with transferable solutions that have been trialled and tested and are now under consideration for implementation into our business. Additionally, the development of inter-linked project schemes such as the HTC Serline and Nu Flow technology trials, alongside the development of a riser lining specification, allow for a structured approach to developing the most suitable methods for lining our riser assets in Multi-Occupancy Buildings (MOBs).
Decommissioned assets can play a key role in innovation

Innovation, by its nature, can be unknown, with ideas and concepts needing to be trialled and tested. Technology allows for real-life conditions to be simulated, such as the ageing of assets. However, the most effective testing method is to use decommissioned assets, which were once part of the gas network and show genuine signs of ageing. Greater coordination across our operations departments will help to build a ‘store’ of these obsolete, yet valuable assets, which could be vital to informing the proof of concept field trials.

We use decommissioned assets to carry out trials for our projects

Stakeholder interaction is essential for successful project delivery

We are always reviewing how our stakeholder interactions, both internally and externally, can be enhanced in order to deliver what our stakeholders need at the best possible time. Working with the relevant local organisations and customers has helped us to inform and engage external stakeholders and improve our awareness of their requirements. From an internal perspective, this has been achieved by working closely with our core functions to understand their needs and to facilitate the most effective development of our innovation portfolio.

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The projects in our portfolio have been sourced in many different ways. These include working closely with our suppliers to develop tailored technical solutions, through to issuing challenge statements via collaborative forums, such as EIC and ENA. This has developed a great breadth of innovation projects with a number of different suppliers.

Throughout the year, we have sought to widen our reach, in particular with our self-funded Technology Search carried out in January 2015 as well as actively seeking ideas from potential partners of all sizes. This, along with our work with our Gas Distribution Strategic Partners, has given us the greatest possible reach to find new partners.

Our SENSIT project has improved our ability to locate underground pipe work

PROJECTS THAT TAUGHT US THIS

The SENSIT Acoustic Pipe Locator project is the first project that we have initiated as a result of the Innovation Technology Search, completed in early 2015.

This project is targeted at improving our ability to locate underground pipe work, which will reduce the size of excavations and improve safety around damage to our assets. This project has led to extensive learning and shared knowledge in the Repair space between the National Grid stakeholders and the supplier of this product.

It has especially helped us to understand how this technology, and others, is trialled, assessed and deployed in America and what else is available worldwide to meet the requirement of identifying underground assets.

The Optomole project is targeted at identifying gas in ducts via optical sensing equipment.

This project was presented to the GDNs via the Energy Innovation Centre, which aims to present SME business innovations to the GDNs for NIA/NIC funding.

The EIC agreed a series of innovation ‘challenge statements’ targeted at supporting outperformance of the RIIO targets. This project has been inflight for approximately 12 months with National Grid, Northern Gas Network and SGN. It is now moving to the next phase of field trials throughout the UK gas network.

The Futurewave project was initiated via the EIC as a collaborative project, sponsored at Director level among all of the Gas Distribution Networks. The project targets the creation of a digital platform (IGNITE) to allow UK energy customers and stakeholders to identify and engage new customer-centric energy solutions.

We have successfully trialled a Fence Feet product that has been designed to minimise trip hazards for members of the public and our staff.

The product has a smaller footprint (150mm smaller than existing products) and is highly visible. In addition it is lighter than existing products and is made from recycled PVC. Following positive feedback from our field operatives and successful wind tunnel testing of the product, we are now looking at mechanisms for rolling this product out into our business.

For more about Fence Feet and to hear from its designer, see page 15 of this document.

FENCE FEET: MAKING THE PUBLIC SAFER

BEFORE

AFTER

Continues on the next page
Up-front engagement is the key to successful collaboration

Collaboration with partner suppliers as well as, in some cases, other gas distribution networks, has ensured that we have been able to leverage the best knowledge and skills across the industry.

Collaboration will help ensure we deliver the greatest value to our customers across all gas distribution networks. However, contractual and in-house process requirements can cause delays in project start-up and throughout the life of the project when working with multiple partners.

Careful coordination, early planning and up-front engagement is key to ensuring all partners are aware of process and contractual constraints so that these can be factored into project planning to prevent any unnecessary blockers to innovation.

PROJECTS THAT TAUGHT US THIS
PRISM demonstrated how this approach can be critical, with National Grid and four other partners completing contractual and project sanctioning processes within a constrained timeline and difficult conditions. The Irons Main Condition Assessment project and CIPP have demonstrated a similar approach; the collaborative team has brought together a wider range of skills and knowledge via a joint GDN team, allowing for the leverage of greater skills and knowledge.

(Above): Our PRISM (Pipe Replacement In Situ Manufacturing) project aimed to minimise installation times and excavations in our iron mains replacement work
Collaborative innovation

Partnerships have been crucial to National Grid’s innovation strategy over the last 12 months. Working with specialist organisations across a range of disciplines, the Gas Distribution team is helping change the industry for the better.

LCNI: An innovation showcase
NEXT EVENT: LCNI 2015 is being held at the ACC Liverpool on 24-26 November

National Grid showcased many of its innovation projects at an event in Aberdeen, Scotland: the Low Carbon Networks and Innovation (LCNI) Conference. The 2014 LCNI Conference was the most highly attended to date, welcoming over 750 delegates and over 70 exhibitors from across the world.

Now in its fifth year, this unique event is the only conference dedicated to showcasing the breadth of innovative engineering work taking place across the networks to deliver the UK’s energy future. The event was an excellent opportunity to talk about the great work being done with our partner companies who undertake the essential research and development for our innovation projects.

Some of the revolutionary innovation projects on display included PRISM and TORS. It was the first time that PRISM, a collaboration with our partners at Balfour Beatty, was displayed in a public forum.

Also on display was a fourth generation Core and Vac truck, used for keyhole technology and supporting our objectives to enhance customer experience and reduce customer interruption.

BRINGING THE INDUSTRY TOGETHER

National Grid has partnered with the Energy Innovation Centre, a not-for-profit organisation which acts as a gateway between small and medium enterprises and network operators.

At the same time the Smarter Networks web portal, developed by another partner, the Energy Networks Association, has provided a focused channel of communication for the industry.

For a full list of all the innovation projects currently on the Smarter Networks portal, click here.
In the early part of 2014/15 we launched our QR Code Trial, helping customers by providing more accessible, real-time information about the work being carried out in their neighbourhoods.

The project came about as a result of our drive to improve communication with our customers. The revamped roadworks.org website had already been developed by utility companies to display roadworks planned as a result of essential repairs and maintenance.

QR Code boards were placed on planned work sites across London during the trial period. Members of the public were able to scan the code and they were then taken directly to the job details on the roadworks.org website. Here customers could find more information about how long the disruption was likely to last, videos explaining why the work was happening and contact information for enquiries.

Hits to the roadworks.org website doubled during the trial. Following on from the success of the trial, we are now in the process of rolling out the QR Code technology across all four of our networks.

Following on from the success of the trial we have shared our learning with Wales & West Utilities, who have used these outputs to trial the inclusion of QR codes on their information boards on site. The next steps are to understand the rollout opportunities across our four networks to deliver the greatest value to our customers.

**QR CODES: Keeping customers updated**

(Above) The London public were better informed about maintenance work during the QR code trial and (left) a similar project in Bristol by Wales & West Utilities

**Award-winning innovation**

Several partners have received industry honours this year for National Grid-related projects.

**TORS (SYNTHOTECH)**
- Winner of the Utility Pipeline Technology Award at the 2015 Pipeline Industry Guild Awards
- Winner of the 2015 WRC ‘Best of the Best’ Innovation Award

**INTELLIGENT CO MONITORING (SMART COMPLIANCE)**
- Winner of the Best Safety Innovation Award at the 2015 Energy Innovation Centre awards

**ACOUSTEK (PARTNER SGN)**
- Winner of the Best University Technology Award at the 2015 Energy Innovation Centre awards

Continues on the next page
"A BioSNG plant using all the waste from Coventry could make enough green gas to heat a quarter of the homes there"

Household waste could be a viable option for generating renewable gas

**BIO SNG: Turning household waste into fuel**

**PARTNERS:** Advanced Plasma Power, Progressive Energy and Carbotech

In a highly populated country like the UK, rubbish is the biggest potential source of low carbon fuel. Mixed waste could produce enough renewable gas to meet up to 40% of the gas we use in our homes. This year, National Grid has begun to look at the potential of ‘gasification’.

This means heating up organic matter, such as the stuff you throw away, and breaking it down to create a useable fuel from the gas produced. For example, a BioSNG plant using all the waste from the city of Coventry could make enough green gas to heat a quarter the homes there.

Once the pilot plant in Swindon is fully commissioned by our specialist partners, Advanced Power Plasma, Progressive Energy and Carbotech, later in 2015, we can start testing and optimising the process. We expect to be producing BioSNG by early 2016, when the facility will be used as a showcase to demonstrate the technology to energy suppliers and the Government.

**Innovation doesn’t mean added complication**

The Fence Feet product is one that arose from humble origins with inventor Richard Layne having set up the business from his shed. National Grid, Balfour Beatty and tRILIO are now trialling the new design for these simple but essential fence feet that provide stability for the high two-metre fences that are used on site to build compounds around our works.

“I have been working on these new innovative designs for four years and I am really pleased that National Grid has put their faith, funding and expertise into my business and also to Balfour Beatty for guiding me in the right direction,” said Richard.

“The cost and safety speak for themselves, but we shouldn’t forget that they are made from 100% recyclable material making them environmentally sound as well. I am really looking forward to hearing what the people who work with them every day think of the designs.”

**Read more**

Click here to find out more about BioSNG by reading a detailed article on National Grid’s Connecting website.
## Our innovation portfolio

The next two pages contain the full list of projects that were registered within 2014/15. For further information on these projects, and to read the project progress reports, please either click the link next to the specific project, or visit the Energy Networks Association Smarter Networks Portal at www.smarternetworks.org

### National Grid Gas Distribution Projects

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**If you have any more queries, please contact:** National Grid Gas Distribution, Hinckley Operational Centre, Brick Kiln Street, Hinckley, Leicestershire, LE10 0NA  
www.nationalgrid.com/innovation  
box.gd.innovation@nationalgrid.com

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