

Annual Innovation Summary **2021/22**



We bring gas to 11 million homes and businesses

throughout the North West, West Midlands, East Midlands, East of England and North London.

We are the UK’s largest gas distribution network (GDN) with a 200-year legacy. We are in a unique position to build on strong foundations whilst encouraging the curiosity to think differently and the courage to embrace change. Day to day, we operate, maintain and innovate our network, transporting gas safely and protecting people in an emergency.

Our skilled engineers and specialists are committed to the communities we serve, working day and night to ensure gas reaches 11 million homes and businesses from Cumbria to North London and the Welsh Borders to East Anglia, to keep the energy flowing. We also manage the National Gas Emergency Service free phone line on behalf of the gas industry - **0800 111 999***.

We look after over 131,000km of pipeline and almost 50% of Great Britain’s gas customers. We deliver our services through our four networks, each with their own geographical and social requirements. Collaborating with our customers, stakeholders and the other Gas Distribution Networks we are working hard to decarbonise heat, power and transport so we can deliver a net zero future. We are owned by a consortium of global investors.





We know that thinking ahead means a brighter future for customers and for our planet.


*All calls are recorded and may be monitored.


Navigating this report

To help you understand the relevance of each case study in this report, we’ve categorised them as below. Keep an eye out for our quick reference icons throughout the document.

- 

Project update
The latest news on an existing project.
- 

Network initiative
A project with the aim of creating a more efficient gas network.
- 

Collaborative project
A project involving partners from other gas distribution networks within the UK.
- 

Greener future
Projects supporting the UK’s energy transition to cleaner energy.

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Welcome from David Goldsmith

Head of Process & Innovation

Setting the Standard

We are proud to share our Innovation Annual Summary 2021/22, which details the conclusion of our RIIO-1 outputs and describes our exciting new innovations for the first year of our RIIO-1 journey. We also share how we are working collaboratively with our industry partners to deliver innovation in a safe and reliable way.

We work hard to deploy innovations across our footprint; firstly, ensuring we support the UK's energy transition, secondly, supporting our customers in vulnerable situations and thirdly, our localised operating model continues to enable innovations into our networks to further improve our operational efficiency.

Supporting the UK's Energy Transition

Despite the restrictions COVID-19 presented during 2020-2021, we have continued to influence policy decisions on the future role of gas and the development of hydrogen as a future energy to support decarbonisation and to meet net zero targets. We are leading the way with the development of a broad range of evidence-based programmes that are supporting the case for hydrogen as a technology for use in industry, transport and for heating. In addition to these programmes, Summer 2022 also sees the completion of the Optinet project which supports the Gas Goes Green initiative.



Supporting Customers in Vulnerable Situations

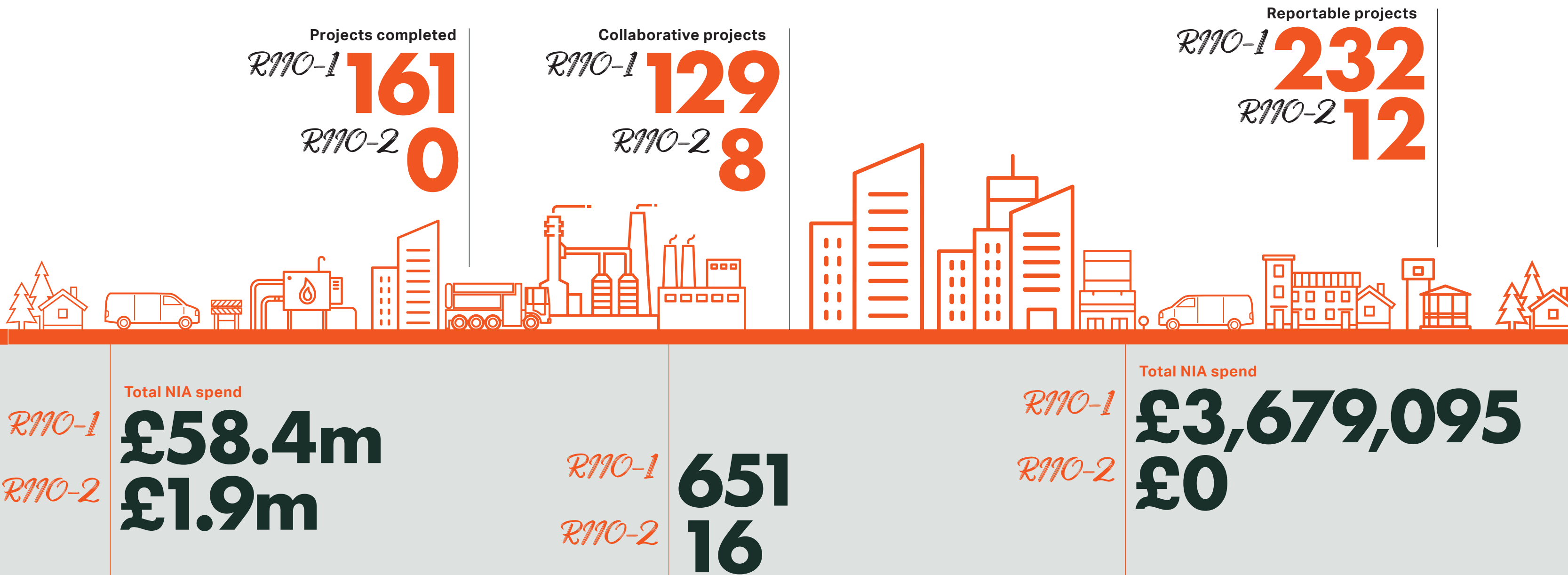
We continually strive to deliver a quality experience to all our customers. Their expectations change along with societal progression; and need to innovate at pace, particularly for customers in vulnerable situations. We recognise that individual needs and levels of vulnerability are ever changing. Our EasyAssist ECV (Emergency Control Valve) project has harnessed technology for those customers with limited mobility and enables a better solution for isolating their gas supply in the event of a gas emergency. We continue to work with internal and external partners and stakeholders to proactively adapt our strategy to reflect progressive thinking.

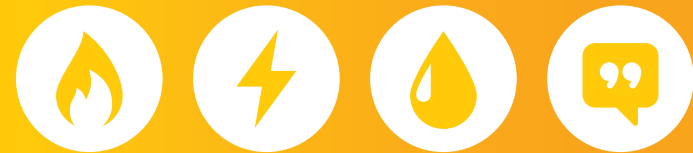
Always Improving Operational Efficiency

Our localised teams proactively work to meet the objectives of improving efficiency within their respective networks. Good examples of this can be seen in the delivery of our Duraseal project, which sees the operational improvement of our repair techniques, leading to reduced costs and improved network resilience. We also saw the introduction of Valve Track in our North West network - a low powered tracking device that is activated through a secure mobile application. This allows our field force operatives to expediently locate underground assets whilst acquiring asset records specifically for the asset in question. In our North London network, we have successfully trialled Pipeline Spacers, which will soon be introduced as business as usual and will further support the safety of our field force. Energy Centres is another North London development, which sees the feasibility study of an energy exchange for multi-occupancy buildings (MOBs). We then move to the West Midlands for a customer service improvement initiative which sees the introduction of video surveying in the form of Vyn - connecting with customers.

R110-1/2 in numbers

Our vision is to set standards that all of our customers love and others aspire to.





Future of Gas

Keeping the Energy Flowing for *Future Generations*



HyDeploy

HyDeploy is pioneering the safe use of blended hydrogen in gas networks to reduce carbon emissions. Delivering low carbon heat through blended hydrogen would make the most of the existing gas grid network, and as meters and appliances are able to safely receive up to 20% hydrogen gas mix, this means that customers do not require disruptive and expensive changes in their homes.

HyDeploy is providing evidence to the Health and Safety Executive (HSE) and Government that a blend of hydrogen is as safe as fossil gas alone. HyDeploy has delivered two separate live blending trials over the past three years, safely delivering to a total of more than 700 homes and businesses at Keele University and in the village of Winlaton, near Gateshead.

Find out more at hydeploy.co.uk



Evidence to Support Heat Policy Decision

During 2021/22, we kick-started several collaborative projects into the required research and development to support policy decisions on the use of hydrogen for heat. This involves gathering critical safety evidence such as component assessment under hydrogen, services, and the wider impacts of the transition to hydrogen. These outputs will be used to support the HSE and Government's decisions on the safe use of hydrogen and the potential for blending as a low carbon heat solution, ahead of the anticipated heat policy decision in 2026.



Hydrogen Village

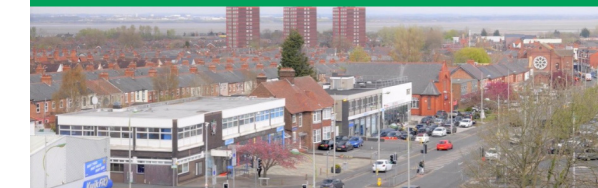
Our proposal for the development of a Hydrogen village located in Whitby, Ellesmere Port located in the North West was successfully selected to progress to the next stage. In Spring 2022, Cadent and British Gas wrote to every address in Whitby to confirm which properties are located within the proposed 'Village' boundary. We are engaging with residents from around 2,000 homes in the Whitby area and they will receive a free in-home hydrogen assessment. Ofgem will confirm the location of the village in 2023 and properties in the confirmed 'HYDROGEN VILLAGE' will be provided with a free 'hydrogen-ready' gas boiler upgrade. Hydrogen gas will then be supplied from 2025 for the duration of the programme – currently expected to last around two years.

Find out more at hydrogenvillage.com



Introducing the Hydrogen Village

Whitby, Ellesmere Port





Capital Hydrogen

This feasibility study is being undertaken in conjunction with SGN and National Grid for London's future hydrogen network. The Capital Hydrogen project will create a vision for hydrogen in London and will assess demand, capacity and costs to convert London's gas networks to hydrogen.



Hy4Transport

The future use of hydrogen in our gas grids provides an excellent opportunity for the development of forecourts for hydrogen fuel cell refuelling from the gas grid. Hy4Transport consortia partners include Arup & Partners Limited, Kiwa Limited, DNV, NPL Management Limited, Gemserv, and independent experts from Imperial College London through Imperial Consultants.

Our Green Gas Transport Pathway study forecasts hydrogen demand of up to 100TWh for the UK's transport industry by 2050. The Hy4Transport project will be developing innovation opportunities to address how to purify the gas from the network so it can be used in a fuel cell. This will unlock significant potential for hydrogen to decarbonise the transport sector.



HyNet North West Pipeline

We are currently developing a brand new hydrogen pipeline to serve the HyNet North West cluster. This will be the UK's first 100% hydrogen pipeline at scale. The project is part of the HyNet low carbon cluster that will deliver hydrogen to multiple industrial users and power generators in the region. You can read more about this exciting project at

www.hynethydrogenpipeline.co.uk



East Coast Hydrogen

In 2021, we launched East Coast Hydrogen and delivered a feasibility study to kick start a 15–20 year programme to convert the East Midlands and North East regional gas networks to hydrogen. This project is being delivered in partnership with National Grid and Northern Gas Networks. A high-level vision has been created and has established the cost of new and re-purposed infrastructure as well as stakeholder engagement and support. This project is laying the foundations for the development of a hydrogen economy for the East Coast of England.



HyNet North West

We are also a key partner in HyNet North West. HyNet is the UK's leading industrial decarbonisation cluster and is an infrastructure project. It will unlock a low carbon economy for North West England and North Wales, putting the region at the forefront of the UK's hydrogen and Carbon Capture and Storage (CCS) economy as we lead the journey to net zero. HyNet North West will create new roles, secure existing jobs and bring investment to the UK. Beginning the decarbonisation process from the mid-2020s, HyNet will bring economic and environmental benefits to the North West and across the UK.

Find out more at www.hynet.co.uk



Optinet

Optinet is seeking to unlock the gas networks' ability to receive more green gas, typically biomethane in areas with limited capacity at times of low demand. The project is aligned with the Energy Networks Association's (ENA's) Gas Goes Green programme which has highlighted significant opportunity to increase biomethane injection from existing anaerobic digestion (AD) plants across Great Britain. Project partner's Wales & West Utilities (WWU) have been exploring smarter pressure control and we have been developing a within-grid compression solution.

This year, good progress has been made in developing the compression facility whereby the design has been completed, the compressor has been built to the point of Factory Acceptance Testing (FAT) and the site has been constructed in anticipation of the compressor delivery. The project has been set back by significant external challenges, such as the COVID-19 pandemic and Brexit, which impacted compressor procurement and created delays throughout the build of the compressor. This was further exacerbated by further outbreaks of COVID-19 at factories which resulted in labour shortages. This has impacted the schedule of the project, with the project now set to complete in the Summer of 2022.



Dr Angela Needle, Director of Strategy



"We firmly believe innovations in the development of home-grown low carbon hydrogen will be central to decarbonising our entire energy system, especially as this also allows us to ensure energy security for future generations.

"Ground-breaking projects like our Hydrogen Village will pave the way for customers to live and experience hydrogen in their homes. HyDeploy has already shown that use of blended hydrogen means customers do not require disruptive and expensive changes to their properties.

"We also know the transport industry needs rapid decarbonisation and low carbon hydrogen usage can make that a reality through projects like Hy4Transport. Our gas networks could be repurposed to supply fuel cell grade hydrogen to large vehicles like HGVs, buses, trains and passenger vehicles.

"Our future low carbon energy system will need more than one technology and plenty of innovation, including electrification and renewable sources. However, it is an inescapable fact that two-thirds of energy used in the UK is currently met by using fossil gas.

"Here in the UK, we have lots of industrial, large gas users who have heat intensive processes like glass or steel manufacturing and will absolutely need low carbon hydrogen to decarbonise production. We also must consider high demand for heat and energy for buildings in the winter peaks, these needs may not be entirely met by electricity alone.

"We must innovate to find ways to deliver low carbon energy and to do this; the future needs gas, and that gas is hydrogen."

Supporting Customers in Vulnerable Situations

Being in a vulnerable situation can occur in anyone's life and can be short, medium or long term. We want to ensure that everyone has access to our services and that customers continue to feel safe and warm in their homes.

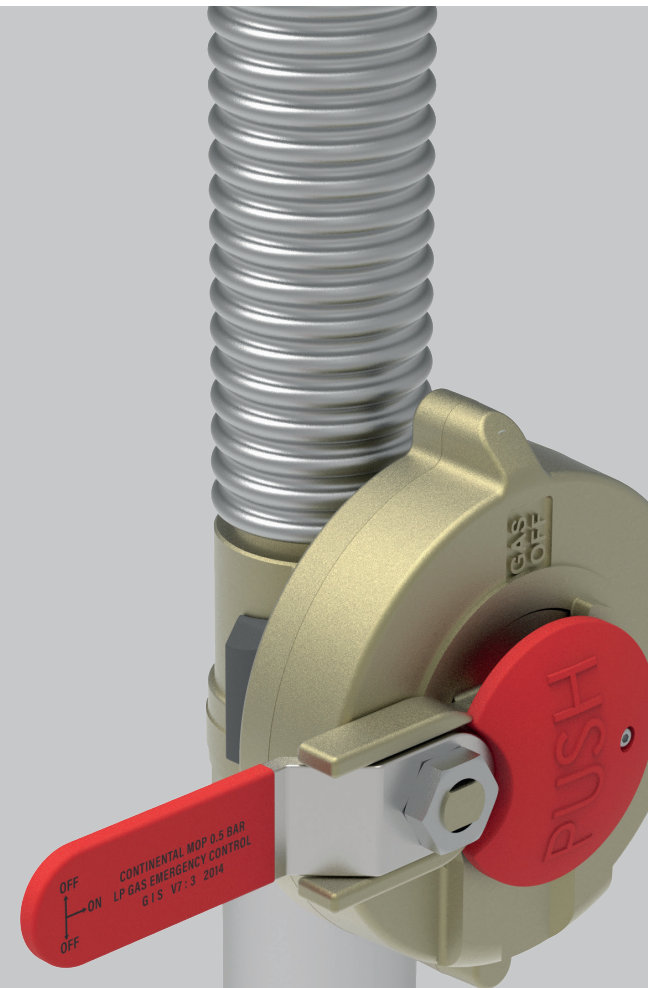


EasyAssist ECV (Emergency Control Valve)

This project places customers with mobility challenges at the forefront of our thinking and we have been working with Continental & Oxford Product Designs to create a device which would allow such customers to easily turn off their gas supply. The mechanical device can be retrofitted over the existing ECV with a single push button. This provides the customer with a solution to isolate their gas supply whilst also making the property a safer environment for our field force colleagues. Alongside these benefits, the initiative will also reduce the understandable stress and confusion that a gas emergency can create.

"EasyAssist gave us an opportunity to make customers lives easier in the event of an emergency. I knew we needed to solve this for them. Working closely with Operations and the Safeguarding Team we were able to find a solution."

Becky Payne , East Midlands Innovation Specialist



"When deliberating over the Priority Services Register (PSR) Needs Codes, it was clear that there was an opportunity to do something better to support accessibility for those customers who might have restricted hand movement (and other relevant needs). Some customers may struggle to follow the simple gas emergency guidance of turning their ECV off, in the case of them smelling gas or their carbon monoxide alarm sounding. Thinking of our customers but also our colleagues who attend these uncontrolled calls, we knew that we needed to do something to safeguard all."

Jo Giles, Senior Manager Customer Safeguarding



StreetScore Phase 2

This is a cross network collaboration project, working alongside our Gas Distribution and Electricity Networks partners, to take learnings from the phase 1 StreetScore project and accelerate them forward.

At the end of the Phase 1 Research Project, it was clear that individuals' carers and advocates are unhappy with the current way street works are designed and there is a wish for more accessible works.

This project will look to further understand the challenges when travelling through Street Works for customers, to ensure they are not put into vulnerable situations and have a range of designed and tested products and systems to enable minimal disruption to customers in vulnerable situations as well as the wider public.

Operational *Efficiency*



Duraseal Repair Method

Where existing methods approved for the repair of leaking mains and services on the Low and Medium Pressure Gas Distribution Network are applied, there are several instances where the initial repair technique is unsuccessful. Duraseal is a recognised interim repair solution for a range of pipe diameters and joint types on metallic mains operating at low and medium pressure. It has the potential to reduce the costs associated with current working practices, offering an alternative repair method that will improve network resilience. Duraseal uses Self Sealing Amalgamating Tape (SSAT) to compress a non-curing silicone putty into the leak path, creating a long-lasting seal protected and enhanced by encasement in a robust composite. This is a collaborative project with WWU and facilitated by the EIC (Energy Innovation Centre).

Testing with Rosen has completed and passed to the required standards. The field trials commenced in May 2021, and we completed 21 trials across Cadent and WWU. The solution was trialled on Low Pressure (LP) and Medium Pressure (MP), from 4" to 14" and on Lead Yarn and Mechanical joints. All trial sites tested were completed with no issues, the G23 documentation has been completed and is awaiting sign off. We will continue to work on commercialisation and implementation.



Valve Track

Replace the whole of the valve track section with: Valve Track is a low powered tracking device that is activated through a secure mobile application allowing field based operatives to quickly locate underground assets while acquiring asset records specifically for the asset in question.

Throughout the Valve Track trial, a range of installations have been successfully carried out on both high-rise buildings, complex distribution systems and M1 valves. Early installations were performed by the manufacturer, acting as Cadent operatives to allow them to complete future installations. This approach successfully mobilised end users with the ability to successfully install, commission and test the system, concluding these trials with validation that the correct data was appropriately aligned in the Valve Track system.

In relation to customer focus, several benefits could be experienced by them. In addition to improved operational efficiencies, the introduction of Valve Track will also deliver indirect benefits to our customers. More accurately measured excavations will mean minimal disruption for our customers and the public. In addition, and in reference to post completion of onsite activities, the provision of accurate data from such technology could support with the provision of engagement opportunities under our Vulnerability and Carbon Monoxide Allowance (VCMA) programme.

We're also proud to announce that Valve Track won the Pipeline Industries Guild Award 2022 for the best land based/onshore pipeline



technology of the year.



Pipeline Spacers

We have been working with leading pipe supplier FT Pipeline to improve the efficiency and safety of work for our field force colleagues. Working inside buried gas pipes could result in ground failure and flooding from adjacent water mains. The result of the partnership being Pipeline Spacers, which eliminates the need for entry in to a cast iron pipe.

The Spacer is an encirclement band with wheeled ramps, for installation onto PE pipe in order for it to be inserted into a cast iron host pipe without the need to remove Weko seals from socket and spigot joints, with the spacers rolling over the seals and brackets holding them in place.

During the first year of RIIO-2, we have successfully delivered two trials of the Pipeline Spacers in our North London network. The trials took place in Central London; the first using 99 spacers, the second using 33 spacers in Belgravia. The results of both trials delivered the desired output, and we are now in a position to deploy the spacers across the business. We will then continue to explore



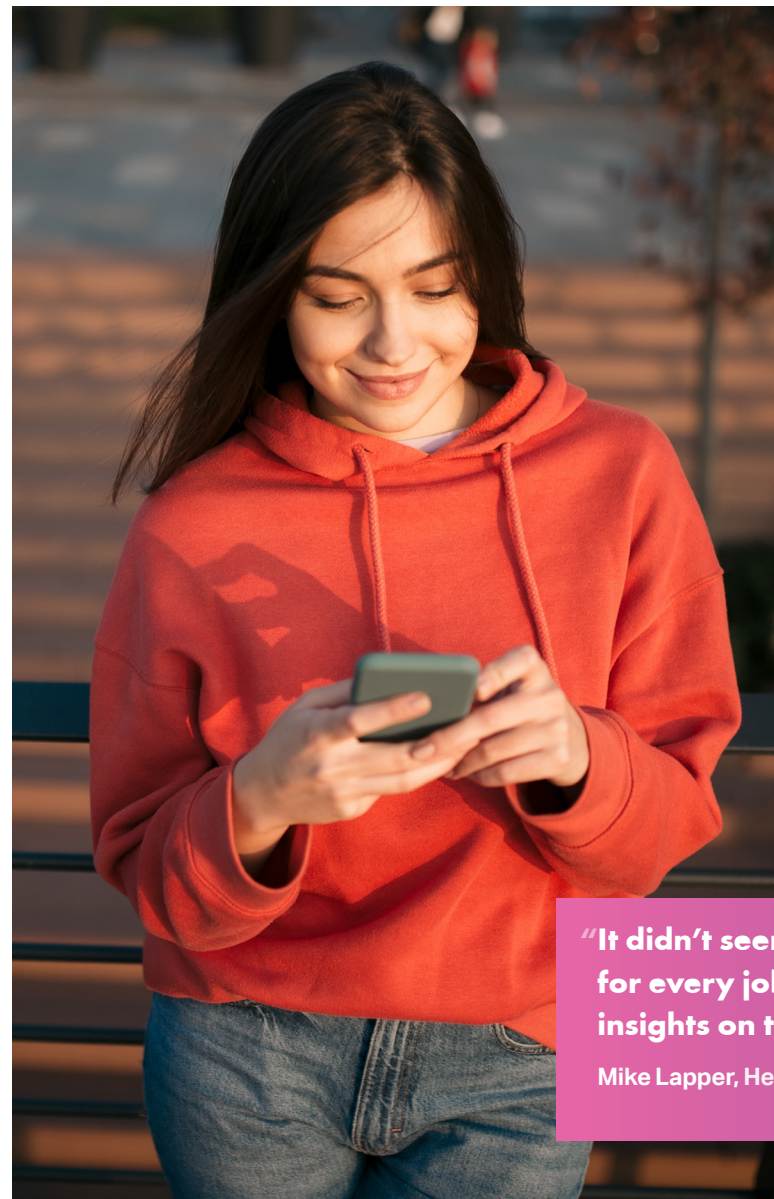
options for spacers for different sized polyethylene pipes.



Energy Centres

An Energy Centre is a process where heat is generated to supply a community heating system. For us, this particular innovation has looked to draw gas from our network and convert it to electricity at a multi-occupancy building (MOB) location. We have worked to understand the building requirements for the Energy Centre where customers remain on gas which is then converted to electricity. The project objectives were to review long term sustainable alternatives to gas risers in MOB's, improve energy efficiency and have the potential to impact customers energy bills through improved efficiency. The project has allowed us to understand the requirements for Energy Centres and their viability for use within our networks. Over the course of the last year; Aqua Consultants, Hackney Council, and ourselves have worked closely to deliver a detailed feasibility report.

For the initiative to move forwards, it has been decided that that the solution be taken forward for further investigation with the connection to an existing Hackney Council owned Shoreditch heat network. This involved a technical assessment of the existing plant and equipment through dialogue with Hackney Council. For us, the project has now been brought to a close – and the learning has been shared across our business and other Gas Distribution Networks.



Connecting with Customers - Vyn

If a customer wants a new connection or alteration, or wishes to report an issue with work undertaken, Vyn helps them record a pre-installation video using their smartphone. This saves the surveyor having to make an in-person visit.

In the case of issues reported on the quality of work, previously, when receiving a complaint, a supervisor would drive to site to review the issue. This may not happen until the next day, which can frustrate customers. Now, customers can record a short, guided video of the issue, enabling us to resolve it faster.

The platform uses artificial intelligence and machine learning technology to label, tag, and categorise the video content, making it searchable and actionable, enabling faster triage and response.

By reducing the need for physical visits, Vyn helps save time, cuts costs and improves overall productivity. Replanning and waste are significantly down, creating a "first time right" culture. In the West Midlands trial, customer complaint 2-day response rate improved by 100% and there were zero aborted jobs.

With this technology, surveyors can also share insight, best practice and collaborate across teams, breaking down silos.

"It didn't seem like the right approach to have to send out a surveyor for every job. We were searching for something better – to get visual insights on the job, captured and sent by the customer themselves."

Mike Lapper, Head of Customer Experience, West Midlands.



"Vyn is not just a customer tool - there's absolutely benefit for us in terms of delivery and productivity for surveyors. The surveyor can now desktop survey double-figure jobs in a day without leaving the office."

Innovation Measurement Framework (IMF)

The new reporting framework has been introduced in to our RIIO-2 governance arrangements and continuing to improve the quality and relevance of the data is an ongoing commitment for us.

Innovation Strategy

We work hard to deploy innovations across our footprint; firstly, ensuring we support the UK's energy transition, secondly supporting our customers in vulnerable situations and thirdly, our localised operating model continues to enable innovations into our networks to further improve our operational efficiency.

PROJECTS WHICH ALIGN WITH OUR STRATEGY

For the first year of RIIO2, we have 4 exciting projects which help and support our energy transition



55K

HyNet Homes Understanding Phase

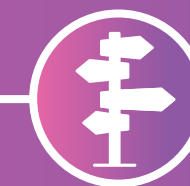
START TRL* 2



6K

Hydrogen Village Consumer Research

START TRL* 2



10K

Common Future End States & Transition Pathways

START TRL* 5



20K

HyNet – Management of Additional Sources of Hydrogen Supply

START TRL* 4



16 IDEAS

**have been generated
25% taken forward to delivery stage**

Collaboration

Other gas distribution networks

- Wales and West Utilities
- Northern Gas Networks
- SGN
- National Grid

External Suppliers

- WSP UK Limited
- KIWA
- Element Energy
- DNV
- Savanta
- Britain Thinks
- Element Energy
- Progressive Energy Limited

A Bright Future

– Looking Ahead

As our innovation ethos continues to grow and we constantly promote opportunities for innovation throughout the business, progressing ideas that will better serve our customers and support the energy transition is at the forefront of our thinking. Throughout RIIO-2, we will achieve great things and continue to be part of industry leading innovation.

Current Projects

We are working with Haydale Ltd and the Energy Innovation Centre (EIC) to deliver a Low Power Hot Water solution, to be deployed in the event of a gas supply incident. The initiative looks to deliver an alternative method to the current heating appliances provided by us. Low Power Hot Water would support customers in a vulnerable situation where there is a requirement for hot water due to a health reason.

GDNs have for many years had licence conditions (and GSOP requirements) to provide fan heaters & hot plates to PSR customers & those in vulnerable situations during a gas outage to help them stay warm. RIIO-2 has seen the addition in the case of an incident of in excess of 250 households to also provide both hot water & hot food. For this requirement there are some market ready options available such as larger kettles and portable showers with a bucket however, many customers will physically struggle and potentially be at risk if trying to transfer hot water to a bowl or sink to be able to wash or clean with. With our Customer Value Proposition (CVP) we have committed to go further than our GSOP requirements and provide alternatives to reduce risk and improve the situation for those customers with additional needs and hot water provision is a clear priority for certain health conditions and



other vulnerable situations. Not only is hot water a priority to help keep our customers safe, warm and independent in their homes but current options are expensive to use in the home as they rely upon high wattage electricity and too many large kettles (or other electrical items) also puts the electricity network at risk when numbers increase. They are also generally intrusive, heavy and not easy to use.

Haydale's graphene ink-based heaters offer a potential low power usage solution to heat water in domestic premises when the gas supply is interrupted and can be easily adapted into different designs to deliver bespoke solutions for a wide range of customer requirements, so is of interest and in our challenge of providing hot water to customers in vulnerable situations in a non-intrusive, easy and cost-effective way when their gas supply is interrupted.

Future projects

There's a bright future ahead of us. We're currently looking to deliver a further step forward with EasyAssist – Remote Actuation. This will provide a complementary device specifically and uniquely designed to be installed with the EasyAssist™, to provide our customers on the PSR with mobility & movement limitations, the ability to isolate the supply in the case of an emergency gas situation. This would also benefit customers where their Emergency Control Valve is in an inaccessible location.

We're also reviewing the feasibility of a research project for Digital Exclusion – A project which will look at how Gas Networks can ensure that customers who do not have access to digital communications, are not excluded from important correspondence that may impact them.

Summary

We can already see the impacts of climate change, and these will become more severe and widespread as global temperatures rise. How great the impacts will become depends upon our success in reducing greenhouse gas emissions. As the UK's largest gas distributor, we are acutely aware of the scale of change needed and are focused on playing our part.

The overarching principle of our customer vulnerability strategy is to provide services for all, recognising the requirements of each customer individually and tailoring services to meet their needs.

We will continue to work collaboratively with stakeholders to ensure customers benefit from the sharing of effective new ways of working and future technology. Our innovation specialists will continue to harness new initiatives within their respective areas.

Funding mechanisms within innovation, namely NIA (Network Innovation Allowance) and the newly formed SIF (Strategic Innovation Fund) give us the opportunity to set the tone for a second to none innovation culture.

Keeping the conversation *flowing*

If you would like to talk to us about any of our existing projects or a new idea, contact: innovation@cadentgas.com

Cadent
Your Gas Network