

# Cadent

Your Gas Network

# A culture of innovation

Driven by curiosity



Innovation Annual Summary

2019/20

# Beneath your feet runs 200 years of gas innovation

It's our invisible commitment to meet the needs of our customers, today and tomorrow.

We play a crucial role in maintaining, repairing and replacing gas pipes across four of the eight gas distribution networks (GDNs) in the UK. Our aim is to set a new standard on what it means to take care of an essential and vital public service.

We're responsible for ensuring the safe and reliable flow of energy, now and long into the future. We're proud to work closely with our communities to keep them safe, warm and connected, providing extra care for those who might need it in a gas emergency.

We recognise that we have a significant part to play in providing a cleaner, greener and sustainable future, and we are working closely with other gas networks and energy companies to pursue innovation in all aspects of our business.

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

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## Navigating this report

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



### New project

Refers to a project launched in 2019/20.



### Project update

The latest news on an existing project.



### Market ready

Innovations which have progressed to business as usual implementation.



### Sharing best practice

Industry-leading innovations which we are sharing the benefits of with our partners.



### Embedded innovation

Employee-led innovation projects, independent of NIA or NIC funding.



**Kate Grant**

Director of Operational Performance

## Welcome to the Innovation Annual Summary 2019/20

We're committed to providing a service that delights our customers. We believe that by working collaboratively, we can respond in an agile way to the changing needs of the communities we serve.

I am delighted to welcome you to our seventh and penultimate Innovation Annual Summary under RIIO-1. In this report, we share our progress on key Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) projects, and how we are working with our industry partners to drive lasting change.

### Setting standards our customers love and others aspire to

We started on a journey 18 months ago to get closer to our communities, giving accountability to our local management teams. By structuring our networks into 28 local customer areas, we've been able to get much closer to the needs of our customers, and we are using this to inform and enhance our innovation strategy.

### Acting for our communities

As society's and customers' expectations evolve, our innovation outcomes must reach beyond pipes and fittings. I'm particularly proud of our new portfolio of projects to help customers in vulnerable situations remain safe, warm and independent in their home. We've reached out to our industry and beyond with our 'Dementia – Call 4 Action' event (see p.6), run in partnership with the Energy Innovation Centre (EIC), putting us at the forefront of shaping more accessible utilities services for those living with Dementia(s).

### Tackling climate change

The gas networks are key to achieving net zero. We are leading research into repurposing the networks to deliver hydrogen that can power heavy industry and transport, and heat our homes.

HyDeploy (p.9) has continued to gain real momentum this year, and we have presented our vision for a more sustainable transport future with the publication of our HyMotion report (p.10).

### A safe and resilient network

We continue to transform our day-to-day operations in line with customers' expectations, keeping disruption to a minimum. We've introduced novel technologies like Composite Repairs and Top Tee Siphon Adaptor (p.14-15), and successfully deployed several of our gas mains replacement innovations, including Bonded Saddle and ServiFlex (p.17-18) on our networks.

### Driving real change in the industry

The NIA has been instrumental in driving collaboration across our industry throughout RIIO-1. As part of our preparations for RIIO-2, we contributed to a joint Gas Network Innovation Strategy (p.20), working with the other GDNs and the Energy Networks Association (ENA).

We also recognise that it is important to have a robust and consistent framework to measure the impact of our innovation. That's why we supported the development of the Innovation Measurement Framework (IMF, p.20), which we are implementing now in readiness for RIIO-2.

I am proud of our continued efforts to develop and promote a culture of innovation, and this year we've included examples of 'embedded innovation' across our networks, where creative thinkers in the organisation have developed their own initiatives and secured funding from the business outside of the NIA or NIC.

We are challenging ourselves to create an industry-leading innovation capability for RIIO-2. We will continue to cultivate an ethos of learning and accountability, enabling us to respond dynamically to the changing needs of our customers, and make a positive contribution to our environment.

## RIIO-1 in numbers

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



Projects completed

**123**

Reportable projects

**193**

Total NIA spend

**£46m**

Collaborative projects

**113**

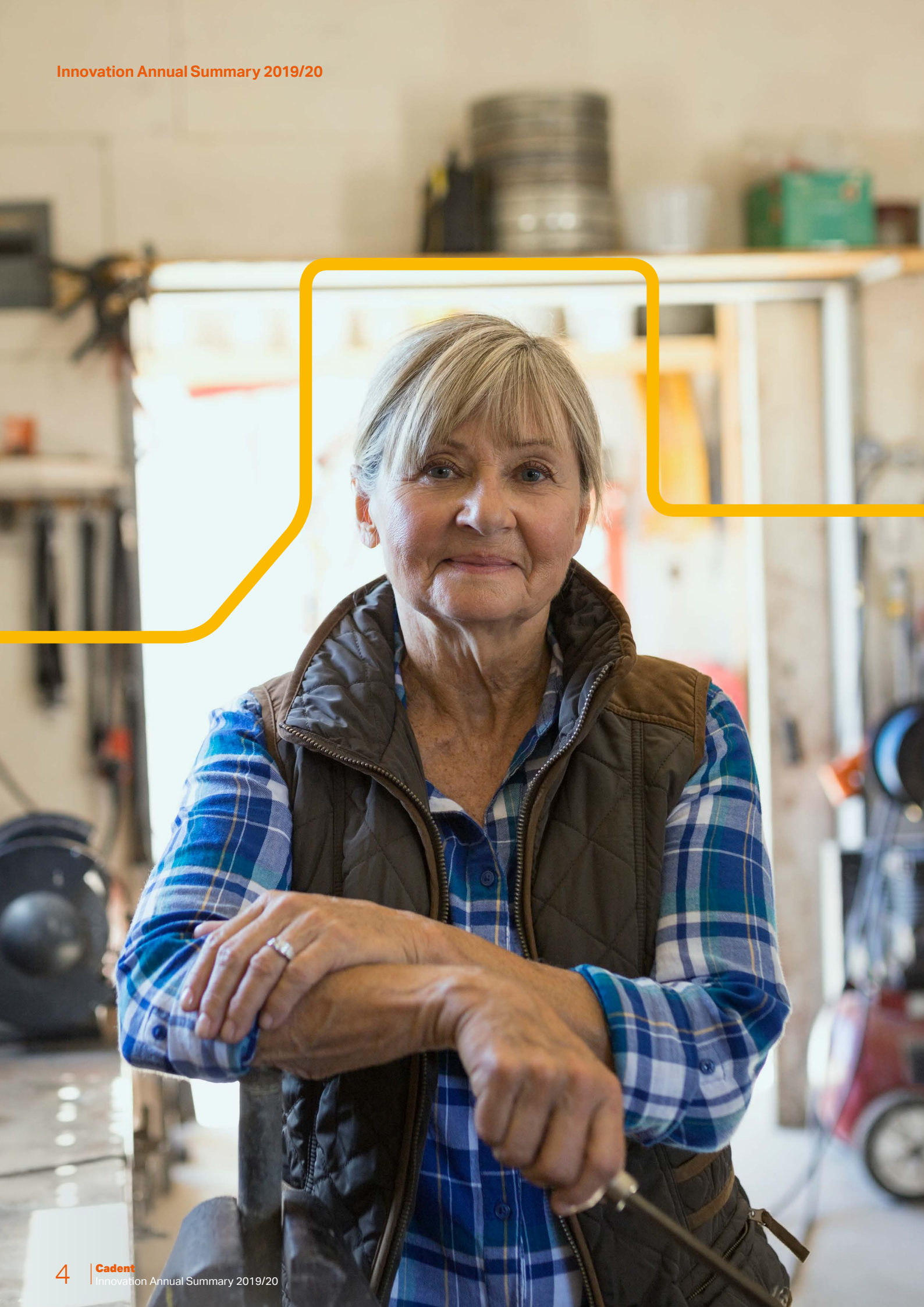
Ideas

**630**

Total NIC spend

**£14.1m**





# Keeping people safe, warm and independent in their home



Anyone can be vulnerable if their circumstances change. Rather than using labels, we prefer to focus on individual needs and what we can do to ensure customers stay safe, warm, connected and independent in their home.

This year, we have used our customer vulnerability strategy and commitment to inclusive services to expand the way we think about innovation, leading the way on a series of collaborative initiatives to transform experiences for customers across gas, electricity, water and communications.



## Accessibility when our customers need it most: Easy Assist Emergency Control Valve (ECV)

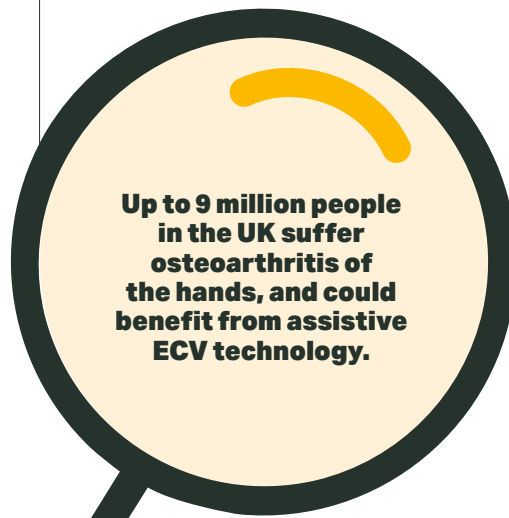
Our Easy Assist ECV project is putting customers with mobility challenges at the forefront of our thinking, with a simple, accessible technology solution.

We have identified a large population of our customers on the Priority Services Register (PSR), who would find it difficult to turn off their gas supply in the event of an emergency. This is due to limited mobility or hand movement.

Our proposed solution is a mechanical device that can be retrofitted over the existing emergency control valve (ECV), with a single push button which could be extended from the device. The device would then turn the ECV to the 'off' position.

We carried out initial scoping of requirements with support from emergency engineers and call handlers in our Customer Centre. Working with the Energy Innovation Centre (EIC) and Oxford Product Design, we have developed concept designs and created initial models, which we are thoroughly testing for user acceptance with engineers and customers. Once we have identified the necessary changes, we will work at pace to manufacture the product and bring it to market.

This technology has the potential to transform the way our customers access their gas supply in the event of an emergency, reducing the understandable stress and confusion that gas emergencies can create.



**Up to 9 million people in the UK suffer osteoarthritis of the hands, and could benefit from assistive ECV technology.**



# Keeping people safe, warm and independent in their home

## Advancing the role of Dementia Friendly Utilities

We lead and chair the National Mental Capacity Forum (NMCF) Utilities Working Group, and this year we have used this platform to spearhead a series of cross-industry safeguarding initiatives.



At the UK Energy Innovation Awards 2019, we launched a new cross-industry project to develop a pipeline of dementia-friendly utilities innovations. To start generating ideas, we fully funded and delivered a 'Dementia – Call 4 Action' workshop in collaboration with EIC and Alzheimer's Society, with support from the Royal National Institute for the Blind (RNIB) and Carers Trust.

All attendees, including innovators, networks and charities, received Dementia Friends awareness training to improve their understanding of the challenges associated with Dementia(s).

The creative impetus generated by this event, and further communications about it, have resulted in a steady stream of innovation proposals by suppliers, suggesting ways to improve customer experiences across electricity, gas, water and communications.

Working with the NMCF, we are reviewing these proposals on an ongoing basis to understand their suitability and feasibility, with a view to progressing the most appropriate ideas into production.



## Going further to secure consistent, reliable amenities: No Power Hot Water

Through effective research and testing, we have explored alternative ways to supply hot water to customers during gas outages.

We make every effort to support customers when their gas is off, providing alternative cooking and heating provisions such as electric fan heaters. However, experience has shown us that during gas network incidents, the additional electricity demand generated by these devices can place additional strain on the electricity network, leaving customers at risk of being without gas or electricity.

Our PSR data indicates that some of our customers would struggle to access hot water in the absence of alternative heating provisions, posing a safety risk if they were to use an alternative such as a boiling kettle and attempt to move around the house with it.

There is currently no alternative on the market to heat water safely in the absence of an electric or gas supply.

Working with the National Physics Laboratory, we have explored a range of safe, easy-to-move solutions including chemical heating, phase change materials – which release or absorb energy as they transition from one state to another, e.g. from solid to liquid – and battery heating. Having completed initial testing, we are now preparing for a second phase of research in 2020/21 to refine and progress solutions.



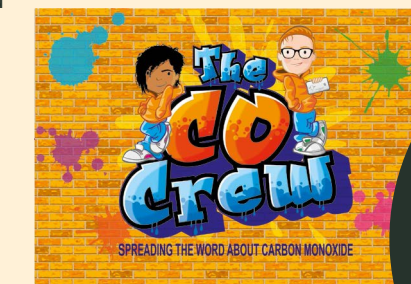
## Teaching children about gas safety to save lives: The launch of the CO Crew

We're ramping up our efforts to teach young children about carbon monoxide (CO), as we know they amplify gas safety messaging with their parents, grandparents and siblings.

Following the success of our Safety Seymour initiative to educate primary school children about carbon monoxide, schools and local councils told us they wanted to educate older children about CO and find a solution where schools were not reliant on third parties delivering the training.

Our Customer Safeguarding Team used this insight to create another CO education programme, targeting children in their last two years of primary school through videos and interactive learning modules. This new approach is teacher-led so we can roll it out across all primary schools, enabling us to expand our reach to many more children, making more homes safer.

The CO Crew further consolidates children's awareness of CO and following a successful pilot earlier this year, will launch fully across our footprint in 2020/21.



**17,000 children trained on CO safety via our Safety Seymour programme.**





# Tackling climate change – a cleaner, greener future



The target for a net zero UK by 2050 is now well established, and we continue to build towards it using a range of fuel sources including network-delivered hydrogen. Both renewable electricity and green gas have key roles to play in meeting the needs of domestic and industrial customers in a net zero carbon future.

We have focused our attention on decarbonising domestic heat, which accounts for around a third of the UK's CO<sub>2</sub> emissions. At the same time, we have pioneered research into the use of hydrogen for industry and as a fuel for heavy transport such as heavy goods vehicles (HGVs), trains and ferries. We have seen significant progress in our hydrogen projects, and we are confident that we can capitalise on this in the coming year, to secure the role of networked hydrogen in the Government's future energy policies.



## HyDeploy

### Hydrogen in our homes: HyDeploy

We are in the third year of our pioneering project to demonstrate that a hydrogen fuel network can work in a domestic setting.

We have tested a blend of up to 20% hydrogen with natural gas in 100 houses and 30 faculty buildings at Keele University, in the UK's first ever live demonstration of hydrogen. With our partners in the HyDeploy Consortium, we have successfully gathered the technical evidence to show that this blending is safe and effective.

Our Social Science colleagues at Keele are undertaking research into customers' perceptions before, during and after the demonstration. So far, the evidence suggests that customers not only support but advocate this greener alternative to heating their homes.

Blending hydrogen with natural gas means that customers do not need to change their appliances, keeping disruption to a minimum.

The second phase of our programme – HyDeploy North East – is due to start in Winlaton by September 2020. This demonstration will be on a public network and on a larger scale, with around 750 Northern Gas Networks customers receiving the blend. The third phase – HyDeploy North West – will commence in September 2021.





# Tackling climate change – a cleaner, greener future

## Shaping the future of transport: HyMotion and HG2V

We have picked up pace on our work to explore how networked hydrogen from HyNet could facilitate zero carbon fuels for freight transport.



Our HyMotion report inspired a workshop with our fellow members of the North West Hydrogen Alliance (NWHHA) to explore the next steps to making hydrogen transport a reality. The ideas discussed in this workshop were published in March 2020, in a report containing four key findings:

- Both electricity and hydrogen have a key role to play in decarbonising transport. Hydrogen is particularly suited to larger vehicles such as HGVs, buses and ferries.
- Hydrogen offers significantly longer running distances and faster refuelling times than electric batteries, and is therefore ideal for long-haul transportation.

- Successful implementation depends on the Government taking a series of actions to enable widespread deployment of hydrogen vehicles.
- The Renewable Transport Fuel Obligation should be amended to include green hydrogen as a vehicle fuel, reassuring investors and encouraging manufacturers and fleet operators to pursue hydrogen fuel cell vehicles.

We are also advancing our Hydrogen Grid to Vehicle (HG2V) project, to progress hydrogen fuel cell transport. Working with the National Physics Laboratory, we are exploring what kind of contaminants are present in network-supplied or blended hydrogen, what kind of technologies could restore sufficient purity levels to the hydrogen, and the costs involved. The first findings of HG2V are due by the end of July 2020, with a view to undertaking further research and identifying next steps.

**Hydrogen is a zero emissions option for transport fuel.**



## Vision for North West hydrogen economy gains momentum: HyNet

This year, we have secured funding for several key elements of HyNet which allow us to start making our vision a reality.

We launched our HyNet concept in May 2018 with Progressive Energy Ltd. The concept consists of large-scale hydrogen production to power local industry and heat up to 2 million homes, supported by carbon capture and storage.

We are supporting the UK's first low-carbon hydrogen plant at Essar Oil UK's Stanlow refinery in Ellesmere Port. The £7.5 million project will produce 3TWh of low-carbon and low-cost hydrogen, and capture over 95% of the carbon used in the process.

HyNet has also received £5.2 million to fund live trials of hydrogen fuelling at Unilever's Port Sunlight manufacturing site, and at Pilkington's Greengate Works glass-making plant in St Helens, which will be a world first. The projects will demonstrate that hydrogen can be used as a substitute fuel for natural gas in manufacturing, helping UK industry lead the way to a low-carbon future.

The implementation of HyNet will help to safeguard and grow jobs in the manufacturing sector, making the North West a trailblazer for the transition to a low-carbon economy. Our next step is to upscale these operations and, in time, to maximise the environmental benefits across the UK by distributing hydrogen via a new national pipeline network.



## Powering our operations with renewable energy: Brisley solar array

We have shared our strategy to tackle climate change across our business, empowering colleagues to innovate. As a result, one of our engineers identified an opportunity to minimise the environmental impact of one of our core operational sites.

The above ground installation (AGI), in Norfolk, would typically be powered via the electricity grid. Our engineer proposed an alternative approach, using a solar panel array to make the site self-sufficient.

We engaged with local landowners and authorities to gather support, and arranged plans to ensure timely delivery. Our safety team assisted the project's development, helping to secure the funding required to make it a reality. After liaising with UK Power Networks, it became clear that whole system value could be added by the project, supplying excess electricity back to the grid.

The site is now fully powered by solar panels, with excess electricity being fed into the local distribution network to provide a clean and renewable energy source for local homes, schools, businesses and community facilities.







# Transforming our customer operations



One of our key priorities is to provide a quality experience to all customers, and we have pushed ahead with several of our industry-leading projects to minimise disruption.

We've seen several of our projects shortlisted for the Network Awards 2020, demonstrating the value these techniques bring to the industry and our commitment to sharing best practice. Our focus now and for the foreseeable future is to keep innovating at pace, bringing effective tools, techniques and processes to market to keep the energy flowing safely, reliably and with minimal disruption.



## Smart solutions for cost-effective repairs: Polyethylene (PE) Repairs

We're setting the standards for how plastic pipes are repaired across the UK.

As we reported last year, with our PE Repairs project we set out to define industry standards for lower cost solutions to repairing plastic pipes, while maintaining the flow of gas to customers.

After completing this project, we went above and beyond by developing a new formal specification that sets out precisely the acceptable standard for any PE repair technique carried out in our sector. These developments will help us reduce disruption to customers, road users and the general public across the UK.



## A smarter way to manage resources: Our process innovations

To minimise customers' time off gas, we have carried out several successful trials to adapt our ways of working.

After trialling 'staggered' shift patterns in the East of England, we changed engineers' working hours, so they can now work evenings when customers are more likely to be at home. To maximise the efficiency of our repair works, we instigated a new two-van process, equipping teams with a spare van containing signage, lighting and guarding and thus preventing the need for extra support teams.

We also trialled a new cross-skilling approach for our engineers, empowering them to assess problems and diagnose solutions without additional support. For instance, we trained repair engineers to work with internal pipes, meters and appliances, and trained our first call operatives (FCOs) to assist during repair works in the street.



These simple yet effective process innovations are allowing us to consistently meet customers' needs and expectations.



# Transforming our day-to-day operations



## Faster repairs on complex pipe features: Composite Repairs

We have led our industry partners on a journey to rethink how we repair complex pipe shapes.

As we reported last year, the current Composite Repairs project follows on from our initial research into using composite repairs on simpler pipe shapes, an approach which has been successfully adopted into day-to-day operations.

This proactive approach to managing gas transmission and distribution assets means we can repair gas pipes in the most efficient and cost-effective manner possible, securing their integrity for the long term.



Working closely with the experts at TEAM and DNV GL and our gas network partners, we have taken the lead in advancing composite repairs to complex pipe shapes. We have not only achieved a valuable solution to our own operational challenges, but developed the knowledge of our industry, dispelling myths about what is and isn't possible in repair technology.



## Duraseal

With Duraseal, we are exploring the use of self-amalgamating tape to minimise disruption during the repair of low and medium pressure metallic gas mains.

This technology can be applied with just three core components, allowing engineers to make essential repairs with minimal disruption to customers' gas supplies and road users.

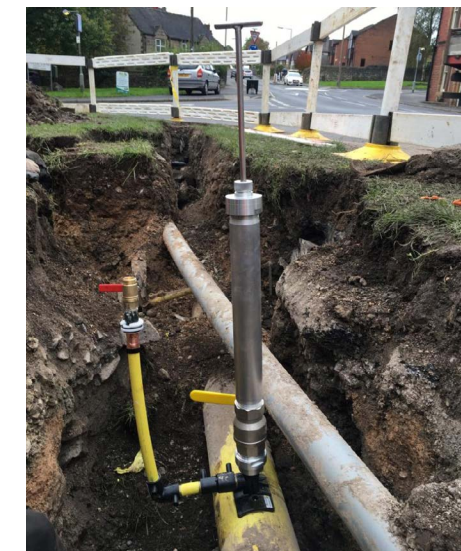
We have completed Phase 1 of the project with our partners Rosen, testing each component to ensure it is fit for purpose. This has allowed us to define our testing plans for Phase 2. If proven as a safe and reliable repair technique, Duraseal will transform the way we carry out repairs on a wide range of metallic mains.



## A better way to remove water from pipes: Top Tee Siphon Adaptor

We initiated our Top Tee Siphon Adaptor project to tackle the issue of water entering gas pipes and disrupting customers' gas supplies.

When water enters gas pipes, it can leave customers without gas for several days. Common industry solutions are often time-consuming, and keep customers off gas until the water is removed. The Top Tee Siphon Adaptor (TTSA) was adapted from a concept imagined by one of our own engineers, supported by the technical expertise of Gas Leakage Solutions. The result is an easy-to-use, flexible technology that is the first of its kind to be used on a UK gas network.



Since last year, the TTSA has proven its worth on a live, large-scale gas incident in Wirksworth, Derbyshire, demonstrating its ability to benefit gas customers across the UK. We are now distributing the equipment to teams across our networks, with formal training in place to ensure we can deploy it at pace.







# Finding faster, better ways to upgrade our network



It is essential that we maintain a safe and reliable network for our customers, and our mains replacement programme is allowing us to upgrade the gas pipes in the communities we serve, keeping gas flowing safely and reliably to homes and businesses.

This year we have successfully deployed a variety of our innovations on our networks, ready to make a big impact to customers across the UK.



## A quick, smart solution: Bonded Saddle

The Bonded Saddle is a technology solution which gives quick and easy access to large diameter pipes, reducing time and disruption on-site when carrying out essential upgrades to our network.

This project builds on the existing 'bond and bolt' technique developed by SGN and ALH Systems, allowing us to drill into gas pipes by exposing just the top, rather than the whole of the pipe.

Since last year's report, we have successfully used numerous Bonded Saddles across our networks for business as usual activity.

We have delivered formal training to our operational teams in how to safely and efficiently install the technology, along with several of our service partners.

We're actively sharing the learnings from our project across the UK gas industry, and we've seen interest from other utility businesses in the UK and internationally.





# Finding faster, better ways to upgrade our network



## Pressure testing at your fingertips: MP SMARTester

We have made great strides on implementing the MP SMARTester, allowing us to quickly and reliably test gas pressures as part of our mains replacement work.

Our SMARTester project took valuable learnings from the low pressure (LP) SMARTester project led by Wales & West Utilities and Steve Vick International. We worked closely with the experts at Steve Vick to redevelop the tester into the medium pressure (MP) SMARTester, greatly expanding the capability of this Bluetooth technology.

As we continue to share the benefits of this technology, gas networks will be able to minimise time spent working in open excavations, and get customers back on gas far quicker when replacing large lengths of gas main.



Having completed development of the MP SMARTester in June 2019, we are now planning its implementation across all our networks, while investigating the possibility of further development for use with LP pressure tests.



## Keeping North London on gas: Microstop and 40mm ServiFlex

With Microstop and ServiFlex, we are embracing new technology to minimise our impact on customers' gas supply pipes – and we have seen great results in our North London network.

Microstop – which we first encountered when learning from our partners at SGN – works by creating a bypass on a section of the 'riser' pipe supplying multi occupancy buildings, so that we can complete our essential works without interrupting gas supplies. Since last year, we have formally trained our teams in the use of Microstop, and successfully deployed it on multiple trial sites – including both planned and reactive jobs with differing pipe diameters and locations.

The 40mm ServiFlex helps us work on large diameter service pipes in the street, while minimising the amount of digging involved. ServiFlex is adaptable and easy to install, reducing the requirement to excavate or move/resupply customers' meters or pipework. Since last year, we have finalised our formal training package for this technique, and are deploying ServiFlex across our North London network.



## Transforming our mains replacement process: Remote live mains insertion

As part of our plans to upgrade the gas network, we identified the need for a safe, efficient and practical method for replacing short lengths of metallic gas mains in challenging locations.

Remote live mains insertion builds on several robust, approved techniques already on the market. Once proven, it will allow us to access areas of pipework where additional planning would otherwise have been required (for instance, underneath busy junctions), while

significantly reducing disruption to road users and customers and ensuring safe working conditions for our engineers and the public.

We are now preparing for 12 extensive field trials, after which we intend to deploy remote live mains insertion across our networks.



## Harnessing Big Data: Advanced asset profiling

Over the last 12 months, we have transformed the way we update and analyse data about our gas network assets.

We harnessed the power of Big Data analytics to collate information from a range of sources, including records on postcodes, pipes, meters and network pressures. By gathering these sources into one central location, we were able to intelligently map trends and identify asset management opportunities.

This has allowed us to build a sophisticated prioritisation tool which proactively determines our approach to maintaining assets, to ensure a safe and reliable network for our customers. Enhanced data analytics capabilities mean our operational teams are equipped with the information they need, when they need it.



**Our ongoing data transformation journey is allowing us to make the informed strategic decisions required to keep gas flowing safely and reliably to our customers.**



# Looking ahead



## Setting ourselves up for success: Our RIIO-2 plans

**Throughout RIIO-1 we have brought effective tools, techniques and processes to market that add real value to customers and communities, while working with our partners to learn from and share best practice.**

We have worked hard to instil a culture of innovation and continuous improvement, with customers at the heart of everything we do.

We recognise we need to build on our progress to date, and have identified the following key learnings:

**We need to improve the speed at which we deploy new ideas**

To enable this, we have built enhanced innovation capability within our regional networks, engaging our customer operations teams to identify challenges and pursue solutions. This is allowing us to respond to local customer needs at pace.

**We must develop a more robust measure of the benefits of innovations**

We collaborated with our gas industry partners to develop a new Innovation Measurement Framework, which we will use as the basis for tracking the impact of innovation within our organisation.

**We have seen the importance of partnerships and collaboration**

We continue to learn from our peers and share best practice. As we prepare for RIIO-2, we're identifying the partnerships that deliver the greatest value, and we will move beyond traditional technology innovation to embrace cultural, behavioural and commercial innovation. Our aspiration is to become known as a partner of choice for innovators, and we are working closely with EIC to reach out to an ever-expanding network of providers.

**We must consider innovation in all its forms and avoid focusing purely on technological solutions**

Through our customer and stakeholder engagement, we identified key priorities that can be supported by innovation, and used these to develop five core innovation themes (see opposite). We're setting ourselves up for success by putting customers at the heart of our thinking, and working with industry to deliver lasting change.

**The Gas Network Innovation Strategy (GNIS)**

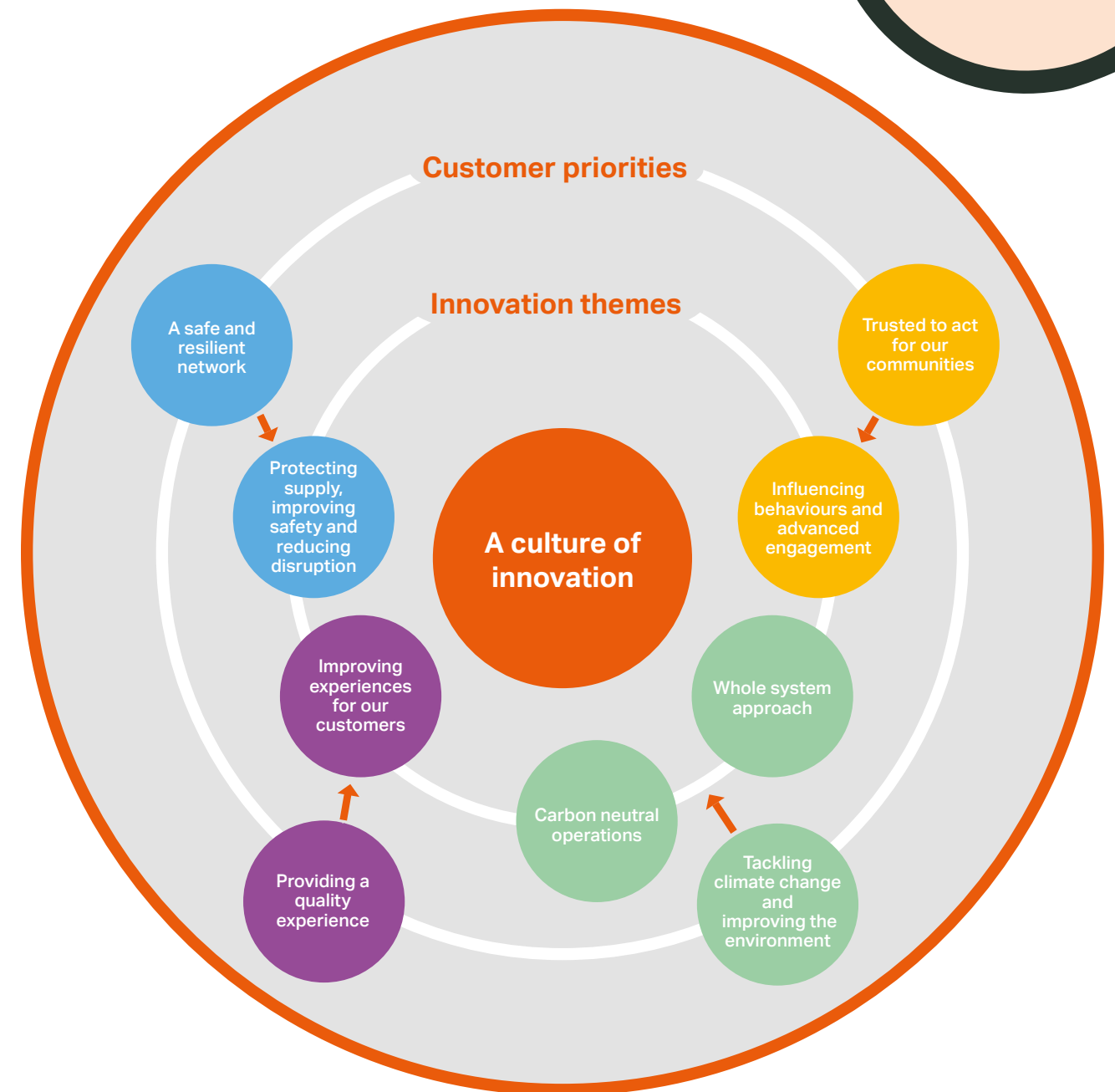
We collaborated with the Energy Networks Association (ENA), our gas network partners, and a range of associated stakeholders to prepare the latest collaborative Gas Network Innovation Strategy, which was published this year.

The revised strategy has shared principles and themes with the Electricity Network Innovation Strategy, and we are moving towards producing one shared strategy in the future, ensuring sustainable whole system approaches to innovation.

These changes will allow us to operate at pace and bring effective solutions to market much faster, applying existing tools to achieve new outcomes in line with customer needs and expectations.

We are working to develop industry-leading innovation capabilities for RIIO-2, and we are excited about the journey to get there.

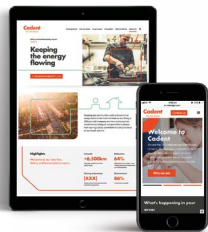
## Summary of our innovation strategy





# Cadent

Your Gas Network



## Keeping the conversation flowing

If you would like to talk to us about any of our existing projects or a new idea contact:

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