

Network Innovation

Annual Summary 2021/22

we are
the network



About Us

We are Northern Gas Networks (NGN), the gas distributor for the North of England. We keep 2.7 million homes and businesses cooking on gas, through our vast underground pipe network.

We are committed to providing a safe, reliable and great value service to our customers and stakeholders, while developing new technologies to deliver forms of low carbon energy, such as hydrogen, to support a greener future. Innovation underpins everything we do - whether we are replacing pipes, fixing leaks, developing low carbon energy solutions or supporting our most vulnerable customers.

By thinking differently, listening to our colleagues and stakeholders, working closely with our partners and considering our communities, we are pushing the boundaries of what a utility company is capable of.

About this document

NGN receives funding from our regulator, Ofgem, to develop innovative products and techniques aligned to the energy system transition and addressing challenges faced by customers in vulnerable situations.

The transition from RIIO-1 to RIIO-2 saw a change to the innovation funding mechanisms Ofgem allocated to the networks.

In RIIO-1 we led successful innovation projects across both the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC).

The RIIO-2 settlement saw a continuation of NIA with the NIC superseded by the new Strategic Innovation Fund (SIF). This report covers how we've used both our NIA and SIF funds in the 2021/22 business year to develop new products and services, invest in business-ready solutions and develop opportunities for collaborative, match-funded projects.

Get in touch: You can contact the innovation team at innovation@northerngas.co.uk

Tackling the big issues through innovation



Innovation – in the way we work, think and use technology – is helping energy networks to tackle some of the biggest challenges facing society today.

These challenges include the climate crisis and the dramatic increase in the cost of living – both of which need urgent and imaginative solutions.

The advent of a new regulatory period, RIIO-GD2, has seen new opportunities to deliver innovation across the gas distribution sector, with the continuation of the Ofgem Network Innovation Allowance funding mechanism. New to RIIO-GD2, Ofgem has now introduced the Strategic Innovation Fund. This multi-stage funding mechanism is allowing distributors to scope and evolve ambitious, complex projects which push the boundaries of what utility companies are capable of.

In 2021-2022, we used new and well-established funding streams, as well as our own commercial savvy and ingenuity, to deliver a wide range of exciting, forward-looking projects.

Our work to develop solutions that support hydrogen as a fuel for the future has continued to progress. Whether it be assessing how hydrogen behaves when flowing through our existing network, or understanding public perceptions of hydrogen, we are building a solid knowledge base that will help to inform hydrogen's future role as part of a sustainable, whole energy system.

We have continued to reinvent the way we deliver our core services, in order to keep our portion of the gas bill affordable and reduce inconvenience to our customers. From a robot that can travel through our pipes to pinpoint the source of a gas leak to pressure sensors that can be incorporated into pipe components and transmit information to the cloud, we are now working in ways that would have been inconceivable just a decade ago.

With the cost of living crisis acute, and latest research indicating more than two-thirds of children are living in poverty in the North East of England, we are continuing to do everything in our power to support our most vulnerable customers.

All our innovation projects are now assessed in their initial phase, to make sure they will deliver benefits to vulnerable households and communities. We have also continued to deliver projects specifically targeting the most vulnerable – such as training our front line engineers to spot signs of vulnerability when attending gas escapes.

As the new regulatory period continues, we will continue to use innovation to deliver our overarching objectives: provide a safe, reliable gas service; support the transition to net zero; continue to modernise our operations and provide help to our vulnerable customers.

I hope you find this year's report inspiring. Please do contact our innovation team if you'd like to find out more or if you have a suggestion for how we can work together.

Mark Horsley
Chief Executive Officer, Northern Gas Networks

Innovation in RIIO-2

The new regulatory period has seen some notable changes to the way innovation projects are funded and delivered in the energy sector. Here we take a look at the range of funding sources now available and summarise our progress, impact and learning over the past 12 months.



Our innovation strategy

Our innovation priorities in RIIO-2 build upon our achievements in RIIO-1 and reflect our wider business goals, which are to:

- **Inform policy decisions on decarbonisation of the energy sector:** through projects which demonstrate the contribution that can be made by green forms of gas, such as hydrogen, in a whole systems energy landscape.
- **Improve the customer experience:** by developing quicker, less intrusive and greener ways to deliver core services, with particular focus on the needs of customers in vulnerable situations.
- **Keep bills affordable:** by using innovative technologies and processes to reduce the costs of running our network.
- **Improve the way we manage our network:** by creating a modern, data-driven organisation that enables evidenced-based decision making that is predictive, automated and technology driven.

Sources of funding

In RIIO-2, there are two funding mechanisms available to drive forward our innovation programme. These are:

- **Ofgem Network Innovation Allowance (NIA):** This funding stream has been a mainstay of innovation in RIIO-1 and continues in the new regulatory period. The funding allowance we received from Ofgem as part of our RIIO-GD2 settlement is allocated to innovation projects assessed and approved by NGN. These projects have potential to save money, improve efficiency, support vulnerable customers and help facilitate the transition to net zero. NIA projects can vary in duration from just a few weeks or months up to two to three years.
- **Ofgem Strategic Innovation Fund (SIF):** A new funding stream for RIIO-2. It aims to find and fund ambitious projects to accelerate the transition to net zero. The fund has made around £450 million available to the UK gas and electricity networks between 2021-2026. Ofgem has described the purpose of the fund as to 'help the UK become a 'Silicon Valley' of energy. The fund has three phases – to take a project from the drawing board stage to final delivery. With each phase, the value of investment increases.

Case Study

Customer Energy Village: an innovation hub from external funding

As in RIIO-1, we will continue to leverage funders from partner organisations, to deliver successful projects.

This year, work began on the construction of a Customer Energy Village in the North East of England, after securing nearly £2 million of external funding.

The village, being constructed at our Integrated Transport, Electricity and Gas Research Laboratory (InTEGREL) facility in Gateshead, comprises nine homes from different generations. The homes will be used to research ways of decarbonising energy use across a range of housing stock and support the challenges of retrofitting older housing stock to improve comfort levels in homes.

The initial design for the project was carried out after securing £100,000 from the North East Local Enterprise Partnership (NELEP), which was subsequently matched by other funding partners.

With the design complete, we were then able to successfully bid for a further £1.86 million from the UK Government's 'Getting Building' fund, again supported by the North East LEP team.

Once construction is complete in late 2022, we will be able to carry out a broad spectrum of energy transition trials and research projects across the range of different buildings.

To that end, we are undertaking our first NIA funded project at the site to deliver an energy efficiency research project in collaboration with National Energy Action and Newcastle University.

We are also working alongside partners at Northumbrian Water, Newcastle University, National Energy Action and Procter & Gamble on a £3.8 million Ofwat funded research project, looking at ways to enable customers to reduce water, energy use and carbon emissions.

The Customer Energy Village will continue to act as a collaboration hub for research and innovation for public and private sector organisations, and bring together all utilities to drive innovation. The development will also allow us to leverage our innovation funding allowance to maximise value from every pound spent.



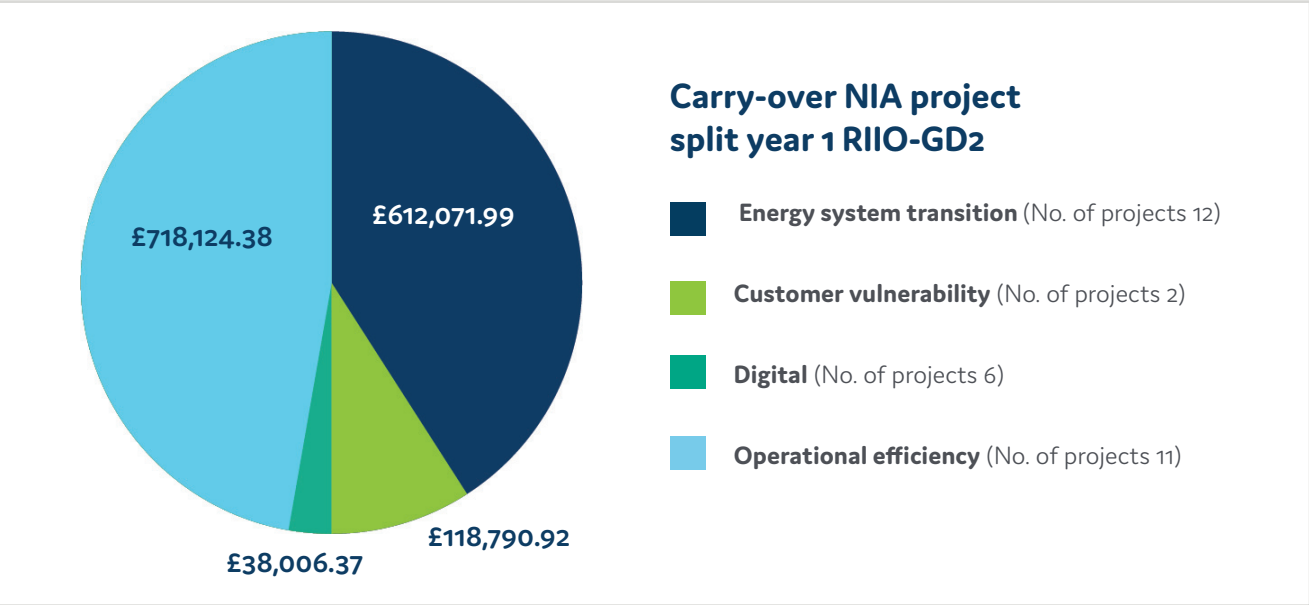
Performance summary 2021-2022

Carry-over NIA projects

This year has seen us transition between RIIO-1 and RIIO-2. As such, 31 Network Innovation Allowance (NIA) projects that began in RIIO-1 concluded in the first year of our new price control period. For some projects this was always part of the project timeline. However, the impact of the COVID-19 pandemic played a significant role in extending the time required to complete other projects due to lockdown and supply disruptions.

Of the 31 projects which ran into the current RIIO-GD2 period, two were halted having been judged they were no longer able to deliver the required outputs due to cost, timescales or technical and resource issues.

The chart below shows the number of projects and overall value across the key themes of the Energy System Transition, Customer Vulnerability, Digital and Operational Efficiency.



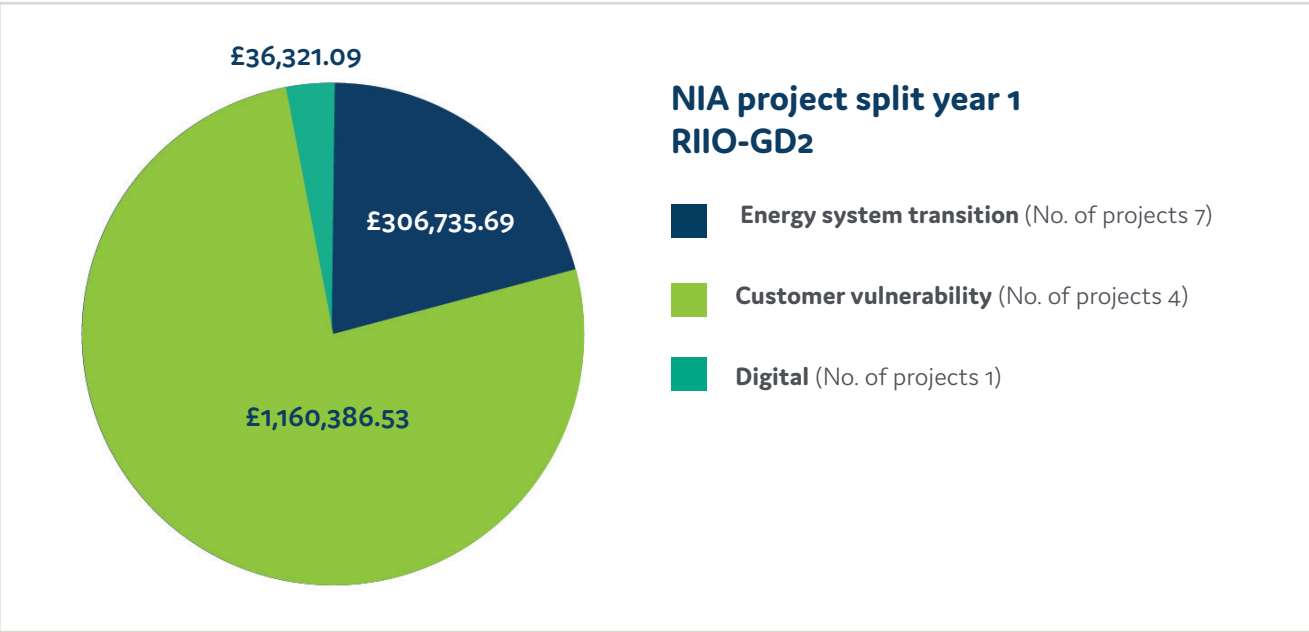
In parallel to the projects outlined above some exciting new NIA projects and Strategic Innovation Fund (SIF) projects also got out of the starting blocks this year.

RIIO-2 NIA projects

Our RIIO-2 innovation programme is guided by the big themes of energy systems transition and support for vulnerable customers, as set out in our RIIO-2 business plan. In addition to this, we continue to deliver operational efficiency as part of our business as usual innovation projects, as well as digital projects which are aligned with our digitisation strategy.

	Innovation theme	Funding request
Customer vulnerability	Creating solutions to reduce impact of our day-to-day activities on vulnerable customers	£2,000,000
	Developing enduring solutions for customers with vulnerability beyond day-to-day activities	£1,250,000
	Using whole systems and smart grids to reduce fuel poverty	£360,000
Energy systems transition	Creating evidence-based solutions to support the transition towards a hydrogen future	£1,140,000
	Creating data-driven networks to manage risk, enable transition and modernise delivery	£1,250,000
	Enabling decarbonisation through whole energy solutions	£5,500,000
		£11,500,00

With this in mind, we have progressed 12 new NIA projects in addition to the carry over projects mentioned previously. These are split across the innovation themes of the energy systems transition, customer vulnerability and digitalisation as shown in the following chart, showing the number of projects per theme and the allocated spend for each.



Of the 11 projects within this first year of innovation, seven were collaborations across the gas and electricity sectors, with six of these focused on the energy systems transition and one on customer vulnerability.

Projects raised: 12
Value of projects raised / sanctioned this year: circa £1.5M
Projects completed: 3

Project in progress: 9
Projects stopped: 0

Developing a balanced portfolio

Over the remainder of the RIIO-GD2 period we are forecasting a broadly balanced investment across the key Innovation themes but recognise changes in technologies or new learning may change the balance over time.

RIIO_GD2 Forecast Investment by Innovation themes (£m)	2023	2024	2025	2026	GD2 Totals
Digital Programme Project investment allocation	£0.46	£0.83	£0.65	£0.37	£ 2.30
Heat Programme Project investment allocation	£0.55	£0.83	£0.39	£0.37	£2.14
Customer Programme Project investment allocation	£0.46	£0.83	£0.37	£0.37	£ 2.03
Whole Systems Programme Project investment allocation	£0.28	£0.46	£0.37	£0.37	£ 1.47
Transport Systems Programme Project investment allocation	£0.31	£0.46	£0.46	£0.18	£1.42

Working together to deliver a greener, fairer future

The big challenges that the UK faces, such as climate change, requires the energy sector to work together, sharing information and delivering complementary projects.

This year has seen the creation of even more opportunities for collaboration around innovation.

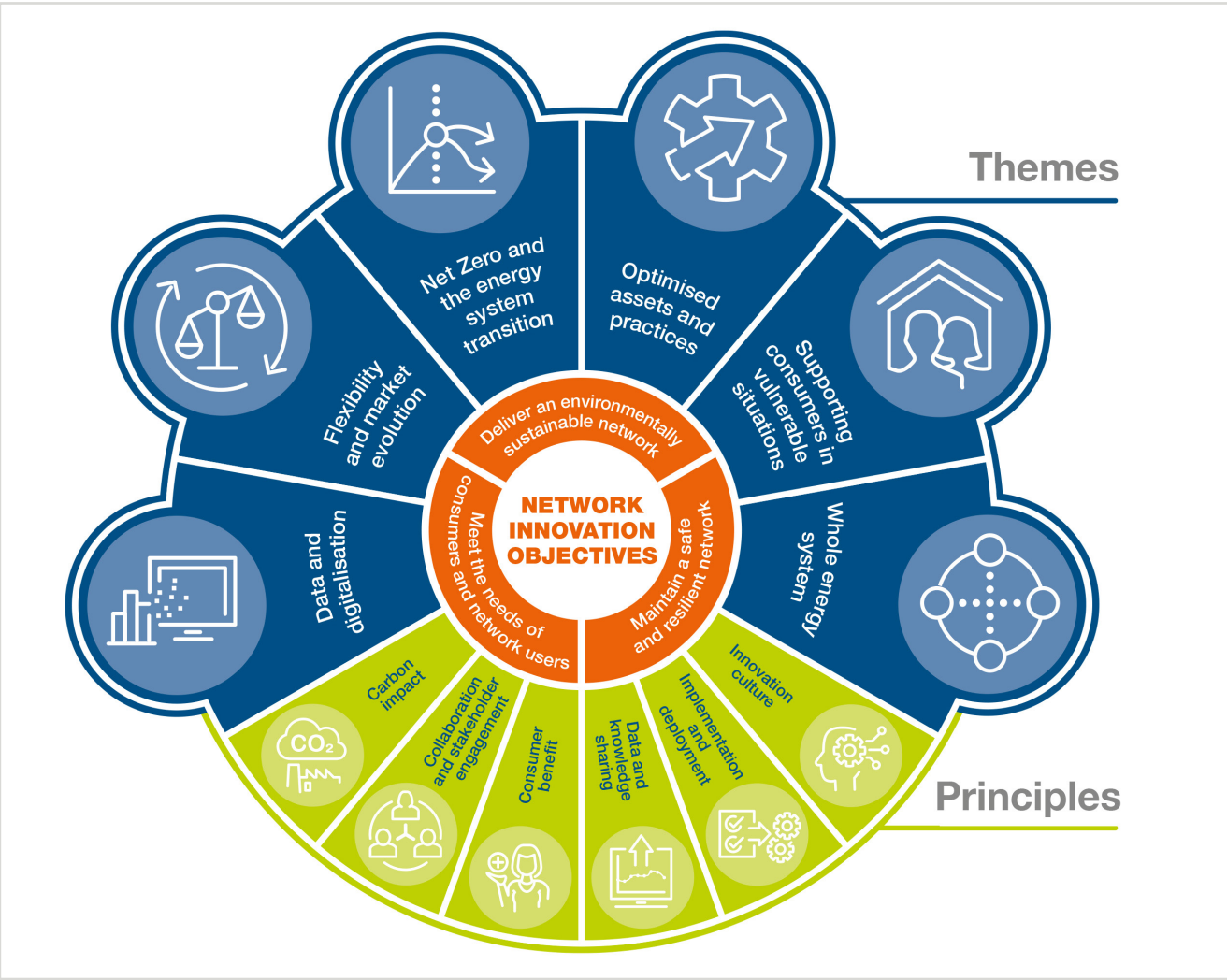
A shared strategy for whole systems innovation

This year saw the introduction of the utility sector’s first combined gas and electricity strategy for whole systems.

Whole systems thinking refers to the need to look at all forms of energy production and network activity to ensure a joined-up approach to get the UK to net zero. It is vital that utility companies don't just think within their own narrow silos.

NGN and the other UK energy networks teamed up with the Energy Networks Association (ENA) to develop a strategy with clear goals which aims to deliver a broad range of benefits to customers and support the transition to net zero.

By tackling the key issues facing our energy system, it sets out our ambitions for network innovation in a crucial period post COP26 and ensures that our innovation projects share the same strategic direction and deliver benefits to the communities we serve.



A shared strategy for assessing customer vulnerability

The move to a net zero economy and the emergence of new technology is exciting – but can present a risk of leaving vulnerable customers behind. Customers in fuel poverty or lacking internet access, for example, could end up being excluded from the benefits of new green technologies.

Against this backdrop, NGN and our fellow UK energy distributors co-developed a consumer vulnerability impact assessment tool, to make sure that NIA-funded projects take account of the needs of vulnerable customers.

The new tool is the result of engagement with more than 50 expert organisations and more than 120 individuals.

The simple desktop tool requires users to answer a series of questions when devising a new project, such as:

- Is the project expected to reduce or increase costs for households?
- Is the project expected to improve or hinder customers’ health, safety and accessibility around the home?
- Is the project expected to improve or hinder the exchange of information between networks and customers?

Projects are then given an impact score out of 10. The tool, which is now being used by NGN and the other UK gas and electricity distributors, has brought a uniform methodology to assessing the impact of new projects on vulnerable customers.

A consistent way of measuring and reporting innovation

Measuring the true impact and value of an innovation project is complex and often involves more than simply recording cost savings.

For the past three years, the energy sector has been working with the Energy Networks Association to develop a measurement framework for innovation. The framework is designed to capture the true impact of projects, and bring consistency to the way projects are evaluated and reported. The resulting Innovation Measurement Framework (IMF) is now in full use by the sector.

The outcomes from the IMF are published annually by NGN and all other energy networks- providing stakeholders with an accurate and comparable representation of the benefits of investing in network innovation.

Industry working groups

Collaboration through recognised industry groups allows us to share knowledge, work together and avoid duplication of effort. These groups include:

The Energy Networks Association (ENA): hosts a gas innovation governance group which allows us to share learnings and ideas with other gas networks.

Gas Innovation Governance Group (GIGG): a monthly gathering of UK gas networks, providing an opportunity to share knowledge and opportunities for collaboration.

Energy Innovation Centre: Over the past five years, we have developed a strong collaboration with the Energy Innovation Centre (EIC), a not-for-profit organisation which brings industry and innovators together. The organisation acts as a conduit to over 7,000 SMEs.

All-Party Parliamentary Group for Carbon Monoxide: over recent years we have built strong relationships with fellow members of the group, working with the other GDNs, industry experts from in and out of the gas sector, parliamentarians and government ministers to help shape the future of CO safety and protect everyone from the dangers of CO poisoning.

North East Task Force: we have been working closely with this group over recent years to help tackle the issues faced by ‘off grid’ communities to ensure that no customer is left behind as we move to net zero and future energy transitions. The group works with local government, energy transporters and community support organisations to create a landscape of fairness for everyone.

Cross Utility Innovation Group: a regular gathering of water, electricity and gas providers. Membership allows all members to widen their perspective beyond their own sector.

North East Energy Catalyst: a group of partner organisations in the North East of England, working together to tackle major energy challenges and drive economic growth. Members are drawn from industry, universities, the public sector and government bodies.

The Supergen Energy Networks (SEN) Hub: brings together national and international energy networks to gain a deeper understanding of the interactions and inter-dependencies of energy networks. The group shares knowledge around network infrastructure, policy, ICT, markets and regulation and equality and diversity.

IGEM: is an independent professional organisation dedicated to creating an open, collaborative, and cooperative gas industry. NGN holds the chair of the IGEM Hydrogen Standards Committee, a sub-group overseeing the development of new gas standards for hydrogen.

Developing our innovation culture

Throughout RIIO-1, we worked hard to create culture of innovation and continuous improvement, with customers at the heart of everything we do.

In RIIO-2, we are seeking to further embed this approach, by promoting opportunities for all colleagues to become actively involved in innovation projects and by working even more closely with our stakeholders.

An opportunity for everyone to get involved

All colleagues from NGN have the opportunity to take on an innovation project and manage it from start to finish.

This opportunity supports their development, encourages fresh ideas and introduces company-wide engagement in the innovation portfolio.

Our core innovation team supports colleagues across the wider business, by hosting monthly review sessions with them to monitor progress, remove roadblocks and capture lessons learned.

Each project is supported by a senior manager from within the business who can provide appropriate support.

In RIIO-1, we developed a Project Management Tool (PM Tool) to help each project manager keep tabs on all elements of a project, including finances, risks, and stakeholder engagement.

The use of the PM Tool helps ensure the likelihood that a project will succeed and has also enabled us to ‘fail fast’ where appropriate – ensuring we avoid spending unnecessary time and resource on a project that turns out not to be viable.



Our six-step innovation process

In RIIO-1, we developed a six-step innovation process, to ensure the success of projects.

This process, which spans the lifecycle of a project, continues to guide the way we develop and deliver innovation in RIIO-2.

We have recently refined the six-step process, so that there is a requirement to better understand project data and stakeholder requirements up front. We have also introduced a more robust approach to managing outcomes, so that we can be sure a project is delivering its objectives. This allows us to intervene, or even halt a project, if it becomes clear that benefits won't be realised.

Idea	Discovery	Approval	Initiation	Delivery	Implementation
Central innovation team	Business project manager	Central innovation team	Central innovation team	Business project manager	Business project manager
<div><div>-Senior sponsor appointment</div><div>-Project Manager (PM) appointment</div></div>	<div><div>-Project scoping</div><div>-Stakeholder engagement</div><div>-Statement of requirements</div><div>-Project plan</div><div>-CBA validation</div></div>	<div><div>-Project registration</div><div>Business project manager</div><div>-Think Tank approval</div><div>-Director approval</div><div>-ISG approval</div><div>-Contract approval</div><div>-PEA approval</div></div>	<div><div>-Project manager training</div><div>-Project management tool setup</div><div>Business project manager</div><div>-Project kick-off meeting</div><div>-Project communications</div><div>-G23 initiation</div><div>-Technical standards initiation</div><div>-Competency capture</div><div>-Risk assessment/ method statements</div></div>	<div><div>-PMO monthly</div><div>-Stage gate reviews</div><div>-Contact management</div><div>-CBA validation</div><div>-Project communications</div><div>-Stakeholder engagement</div><div>-Project closure report's</div><div>-Project closure meeting</div><div>-Think Tank review</div></div>	<div><div>-Implementation scope capture</div><div>-Business case</div><div>-Project plan update</div><div>-G23 approval</div><div>-Technical standards issue / approval</div><div>-Change management documentation</div><div>-Training delivered</div><div>-Training records</div><div>-Stakeholder engagement</div><div>-Project communications</div><div>-Benefit measurement</div><div>-Ongoing benefit validation</div></div>

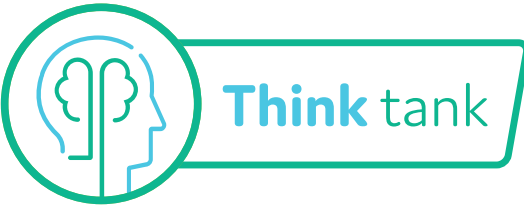
Innovation Think Tank

Our Innovation Think Tank is the monthly forum for colleagues from across the network to present potential innovation projects.

Each project is subject to rigorous, but constructive, scrutiny and debate, and then all members vote anonymously on whether the project should be formally progressed.

A refinement in RIIO-1 was the introduction of an external chair, to provide an independent voice to scrutinise potential projects and provide a consultative role to the wider innovation team.

Their involvement continues to ensure that projects are examined in a broader and more objective way and ensures that they align to our regulatory commitments and wider business strategy, and that projects drive value from every pound spent.



NIA projects update

NIA projects update

Next we take a look at our most recent Network Innovation Allowance (NIA) funded projects, many of which have recently completed or are at an advanced stage.

Case Study

Detecting hidden electricity cables

ENERGY SYSTEMS TRANSITION

It is not uncommon for electrical cables to be inserted within old disused steel gas pipes in customers' properties, when a building is being rewired.

When our gas engineers are tasked to perform a 'live/dead check' of a gas pipe, they have no way of knowing whether an electrical cable is present in the pipe and if the cable is live – presenting a significant safety risk to the engineer and customer.

We worked with Mage Control Systems, an expert in control and sensing systems, to develop a non-intrusive device that can detect both live electrical cables within a gas pipe, and also detect gas pressure in the pipe.

This all-in-one instrument stands to protect the safety of our engineers when they are carrying out their essential work.

FACT FILE

Project name: Cable and gas status analyser
Project reference: NIA_NGN_261
Project partner: Mage Control Systems Ltd
Status: Complete
Overall project value: £156,805
Innovation theme: Energy Systems Transition

Project Summary

Following successful feasibility studies, prototype devices were developed and delivered to NGN in early 2022.

The devices performed well in controlled tests, and we are now continuing to put them through their paces in our day-to-day work.

Ten devices are now in the hands of engineers in our York patch, who are using them in real world situations whenever they encounter pipes which have the potential to conceal electrical cables.

We will continue to feed back our findings to Mage Control Systems, to help them move from advanced prototype to finished product.

Benefits and new learnings

The devices are helping to keep our colleagues and customers safe, by enabling accurate detection of hidden cables. The final product stands to be an essential new tool in our kit bag.

"The live or dead check analyser gives us an opportunity to identify any electric cables which may have been installed within pipes reducing the risk to our colleagues and ensuring minimum disruption to our customers, enabling us to identify pressurised pipes. This level of innovation helps us to efficiently operate a resilient network for the future."

Andy Simcoe, Northern Gas Networks



Case Study

Printable pressure sensors: giving our pipes intelligence

DIGITALISATION

Real-world trials of a new technology which gives our standard PE gas pipes ‘intelligence’ is soon to get underway.

Working with a specialist technology partner, we have developed a printable sensor, which will allow us to monitor gas pressure remotely.

The low-cost sensor is integrated into existing pipe components –sharing data with the cloud in order to improve our responsiveness and decision making.

As well as supporting the smooth day-to-day functioning of the network, the ability to see real-time data across our low-pressure pipelines is seen as crucial in supporting the transition to a hydrogen network.

FACT FILE
Project name: Project IOT (Internet of Things) Pressure Sensor Pilot
Project reference: NIA_NGN_303
Project partner: HP1 Technologies
Status: In development
Overall project value: £779,350
Innovation theme: Digitalisation

Project Summary
A previous NIA project with NGN and HP1 Technologies saw the successful development of the prototype sensor system, designed to be incorporated into the purge tee of a standard PE pipe.

The next phase will see field trials of the sensor get underway – first at our InTEGReL (Integrated Transport Electricity and Gas Research Laboratory) test facility in Gateshead, then moving onto the wider NGN network. Results will be analysed and the sensor refined further in response.

Benefits and new learnings
With a low unit cost of approximately £100 and a long battery life, there is an opportunity for these sensors to be installed throughout the network, transforming our infrastructure into a 21st century smart gas grid.

The sensors will allow us to identify problems on the network, such as leaks, in real time, and be used to create predictive maintenance programmes. These new insights will help us to deliver a more reliable and cost-effective service.

The sensors can be adapted to measure different types of data, such as temperature and moisture levels, and provide an understanding of our low pressure network at a granular level, essential for the future roll-out of a hydrogen network.

There is also scope for the sensors to be used in other utility sectors, including the water industry.

“We can already monitor gas pressure remotely, using current generation data loggers, but this new technology gives us the opportunity to do so on a much wider scale, at a fraction of the cost.

“As the UK’s gas infrastructure becomes increasingly complex, with new forms of green gas emerging and closer integration with other energy networks, we will need large volumes of good data from our assets to make the right decisions.

“The ability to integrate the sensors into our plastic pipes, so that pipe components come off the production line with a smart element already built-in, is especially exciting.”

Keith Owen, Northern Gas Networks



Case Study

Robo-inspector helps us to pinpoint leaks

ENERGY SYSTEMS TRANSITION

A robot that can pinpoint gas leaks inside our pipes has been proving its worth beneath the streets of the North of England.

LeakVision is a small robot that can be inserted inside a gas pipe. It uses thermal imaging to highlight the location of a gas leak. Developed with our partners Synthotech, our new robotic helper has the potential to make leak detection and repair quicker, cheaper and more convenient.

FACT FILE
Project name: LeakVision
Project reference: NIA_NGN_256
Project partner: Synthotech
Status: Complete
Overall project value: £1,531,099
Innovation theme: Energy Systems Transition

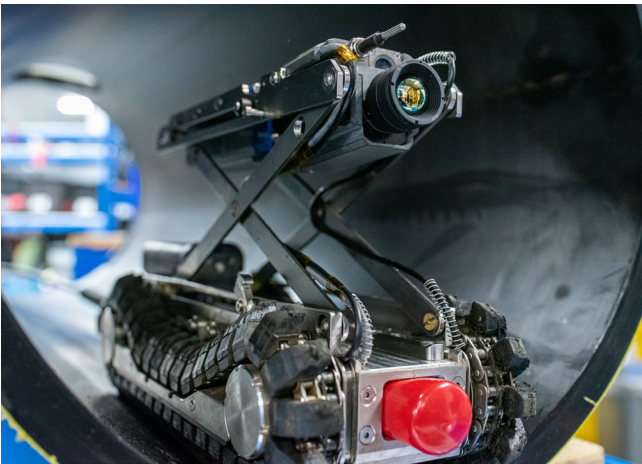
Project Summary
LeakVision is an award-winning detection system mounted to a robot base, which can travel along the length of a pipe.

The device heats up the gas inside a pipe and uses thermal imaging to highlight temperature changes – a tell-tale sign of gas escaping through a crack in the pipe.

The device is also equipped with optical cameras on the front and rear, so the operator can steer the robot.

We have successfully carried out two field trials in Halifax – one of which was on an extremely busy four-way traffic junction. Our engineers were able to insert the robot well away from the junction and steer it underground to the right location.

The robot stands to become an invaluable aid, especially when identifying leaks in heavy traffic locations.



Benefits and new learnings
The standard method to detect leaks is above ground bar holing. Holes are made within the road surface along the assumed length of the pipeline. Gas readings are taken from these locations and used to triangulate the leakage location.

This process can be time-consuming, expensive and disruptive to the public.

The LeakVision robot, by contrast, can be inserted at single point, and then travel along the length of a pipe to find the source of the leak. This reduces the number of excavations we need to make, thereby speeding up repair times, reducing traffic disruption and saving money.

We can also insert the robot well away from busy junctions, making it far more practical to detect leaks in locations that would otherwise require months of planning to investigate.

LeakVision won the innovation award category at the 2022 Gas Industry Awards.

“LeakVision performed very well in recent field trials.

“On one occasion, we used LeakVision to find the leak, and then deployed a second robot, known as STASS, to carry out the repair. The STASS robot was developed in an earlier NIA project, as is now deployed on a fairly regular basis.

“The potential of these two robots to work side-by-side – one to detect and one to repair – is an exciting proposition.”

Nick Smith, Northern Gas Networks





Case Study

Digitising our Safe Control of Operations

DIGITALISATION

Our front-line engineers need authorisation before they can carry out certain tasks – such as a deep excavation, or removal of asbestos.

Working with the tech team at QEM, we have developed a new app, which allows engineers to gain authorisation quickly from site, while also creating a digital record of the job.

This new software has replaced a 10-year-old legacy system and greatly improved compliance and efficiency.

FACT FILE
Project name: Digitisation of SCO Database
Project reference: NIA_NGN_281
Project partner: QEM solutions
Status: Complete
Overall project value: £351,206
Innovation theme: Digitalisation

Project Summary
The authorisation process for engineers to undertake high risk and complex tasks on our network used to involve paper records and making phone calls to line managers from site. Managers would often need to visit sites to authorise the work.

This project has delivered a new digital authorisation system and database which can confirm the qualifications and competence of staff for each job within minutes, monitor how jobs are going and when they will be completed.

As well as speeding up the time it takes for a job to be authorised, it has allowed for more efficient reporting and auditing.

The system has recently been rolled out across our network and will be made available to other gas distributors to improve their systems and compliance.

Benefits and new learnings
The new digital system is now being used by our front line engineers - reducing delays in work being authorised and carried out. It is also helping to reduce our carbon footprint and fuel usage by reducing the need for managers to travel to site on every occasion to authorise jobs.

"The new system is already proving much more efficient – both in authorising jobs and when it comes to record keeping."

"The ability for engineers to be able to gain authorisation out of hours, for example, over the weekend, is also extremely valuable. Previously, the engineer would have to rely on a line manager being available on the phone – but now they can go through the whole authorisation process using a phone app."

Geoffrey Harle, Northern Gas Networks

Case Study

Mapping customer vulnerability

CUSTOMER VULNERABILITY

Like all UK gas distributors, we have an obligation to support our most vulnerable customers, by working with expert partners and using our reach and investment to contribute to the social good.

To help us do this, we commissioned an interactive, visual map, which uses a variety of data sources to display hot spots of vulnerability.

The map will allow us, and our partners, to deliver investment and collaborative projects where they will have the greatest impact, by targeting areas where residents have multiple and complex needs.

FACT FILE
Project name: Vulnerability Mapping Tool
Project reference: NIA_NGN_300
Project partner: Egnida Innovation
Status: In development
Overall project value: £104,666
Innovation theme: Customer Vulnerability

Project Summary
Working with digital consultancy Egnida Innovation, this interactive mapping tool is now at an advanced stage, and is being tested by ourselves, a number of local partner organisations and electricity distributor SSEN.

GDPR-compliant data is sourced from across the business, and combined with data from open-source, paid for sector and from partner organisations. This is then displayed on the interactive map, providing a visual and highly intuitive way of understanding where vulnerability exists.

The flexible nature of the tool allows us to display criteria of specific interest, such as fuel poor households not connected to the gas grid or areas where there is poor average health and air quality.

The map is already proving a useful tool but will be subject to continual refinement in the run up to project close in October 2022, with input from NGN colleagues, third sector partners and other utilities.

The intention is to also develop a mobile app version of the tool, so it can be used by colleagues out and about in local communities.



Benefits and new learnings
The platform will ensure that the needs of vulnerable customers are taken into account when delivering a wide range of activities – from planning a mains replacement job to developing a community project.

It can also help identify clusters or gaps in our service offering, so these can be addressed.

The map is already being used by another utility (SSEN) and by some of our local partner organisations working in the third sector – and has the potential to become a widely-used, nationally available tool.

"The aspiration is for this platform to be available to all organisations who are working to support vulnerable customers – in the utilities sector and beyond. While still not the finished product, it is already working well and proving a useful tool for ourselves and our partners."

"We are excited about the potential of the platform to become a nationally-available resource, helping to tackle the complex causes of vulnerability."

Steve Dacre, Northern Gas Networks

Case Study

Making every contact count

CUSTOMER VULNERABILITY

When a customer smells gas and calls the National Gas Emergency Helpline, it can result in one of our engineers having to temporarily disconnect the gas supply, to make things safe.

But what if the customer is vulnerable? Losing gas supply, even for a few hours, could make them more vulnerable still.

NIA funding allowed us to launch a pilot project in Bradford and North Tyne, in which our emergency response engineers were trained to recognise the signs of vulnerability and offer a range of support.

Since the conclusion of the project, we have continued to roll out the training, reaching the majority of our front-line workforce.

FACT FILE
Project name: Making Every Contact Count
Project reference: NIA_NGN_163
Project partner: National Energy Action
Status: Complete
Overall project value: £113,220
Innovation theme: Customer Vulnerability

Project Summary
The NIA project saw emergency response engineers in Bradford and North Tyne undergo training to help them recognise the signs of vulnerability and offer customers relevant support. Engineers were able to signpost the customer to relevant third parties for help with a range of issues, from energy bills advice to help with debts.

The engineers also ensured that if a customer’s gas supply needs to be temporarily disconnected, they are given interim support – such as electrical heaters.

Our Customer Care team then made follow up calls to the affected customers, to close the loop.

Since the conclusion of the successful pilot project, we have continued to roll out the training across the business, which is being delivered by our own in-house vulnerability trainer. More than 1270 NGN colleagues have now received the training, plus 25 external stakeholders.

Benefits and new learnings
Training our front -line engineers ensures that customers are not left more vulnerable in the short term, if we need to temporarily disconnect their gas supply.

It also allows us to put customers in touch with a wide range of support services – given a vulnerable customer often has a variety of complex long-term needs.

“This process enables a customer to be supported, regardless of circumstance, on issues they may be experiencing. For example, debt advice, energy efficiency advice, home safety visits from fire and rescue – we can ensure they receive all of this.

“The training process is currently being rolled out across the business. We are receiving excellent feedback from front-line engineers, and as a result of the training, we are making more and more customer referrals to partner organisations.”

Stephanie Ord, Northern Gas Networks



Case Study

Progressing renewable gas

Across the UK there are many locations where materials such as sewerage, food and agricultural waste are broken down through a process called anaerobic digestion. This produces methane, often referred to as biogas or biomethane. It is used in a variety of ways from fuelling vehicles to powering electricity generation and is seen as an important element on our route to a net zero world.

FACT FILE

ENERGY SYSTEMS TRANSITION

Project name: Biomethane Study
Project reference: NIA_NGN_337
Project partner: CNG Services, EIC, WWU
Status: In development
Overall project value: £68,611
Innovation theme: Energy Systems Transition

Project Summary
The process of producing biomethane and adding it to our existing gas network can be complex, both technically and commercially. This complexity presents challenges which means producers and wider industry aren’t always able to get their product into the gas grid. Through this project, we worked with partners to investigate the technical, economic and social constraints they face and in doing so developed new learning and solutions to promote more biomethane production and unlock this great source of renewable energy. Furthermore, this research-based project identified areas for potential growth in biomethane production, by

reviewing both feedstock potential and gas grid capacity, to identify suitable clusters or key target plants than could convert from Combined Heat & Power (CHP) to biomethane injection, with minimal effort for maximum economic, environmental and social benefit.

Benefits and new learnings
The project looked at options for addressing capacity constraints on the grid, such as a central injection hub model and reverse compression, an option to help boost capacity from one pressure tier to another to reduce flaring to atmosphere and increasing the amount of gas a site can get into our network. This particular concept is now being explored further with biomethane stakeholders, GDNs and the wider industry via UNC workgroups.

The project helped us quantify the scale of the opportunity for market growth for converting existing CHP facilities to biomethane. This element of the project has been presented to BEIS and will support discussions on future support schemes for producers with tariffs that will expire within the next 5 years.

“To help us contribute to the net zero target we are keen to boost capacity availability in our networks to allow our connections to get the most out of their sites. Understanding the opportunities for future growth will help support conversations with around new support schemes for CHP producers whose tariffs will soon come to an end”

Emma Buckton, Northern Gas Networks

Case Study

Supporting our vulnerable customers

CUSTOMER VULNERABILITY

Both gas and electricity networks provide support to our support customers and communities across a wide range of needs. Making sure we do the right thing and help in the right way is important but having a complete understanding of these needs can be complex.

FACT FILE
Project name: Community Resilience
Project reference: NIA_NGN_357
Project partner: National Energy Action
Status: In development
Overall project value: £ 88,657
Innovation theme: Customer Vulnerability

Project Summary
We know that supporting the most vulnerable members of society in times of adversity is the right thing to do. The range of issues that can arise can be challenging and require significant support from many organisations.

Our continued support for net zero means new challenges will occur and we recognise the need for a so we need a more comprehensive and consistent approach to community resilience to safeguard support our most vulnerable people and the communities they live in.



Benefits and new learnings
Improving our understanding of vulnerability and how complex this can be will help gas networks improve how we help our customers. By improving our knowledge, we will be better placed to offer the right support and ensure that, no household is left behind in the drive towards net zero.

"Vulnerability is such a complex subject and so it's important we learn and adapt how we help to improve the lives and welfare of our customers where we can. This is an exciting project to help us help our customers and I'm delighted to be collaborating with National Energy Action on this important research."

Steven Dacre, Northern Gas Networks



Case Study

Moving beyond Streetscore 1

CUSTOMER VULNERABILITY

We know many customers find streetworks inconvenient, but for customers with vulnerabilities such as mobility challenges or visual impairments they can present a much bigger obstacle. To see if we could improve the layout of our streetworks, we launched Streetscore - a research project carried out with a number of specialist organisations who work with vulnerable customers.

FACT FILE
Project name: Streetscore 2
Project reference: NIA_NGN_338
Project partner: Steer Energy
Status: In development
Sanctioned project value: £ 328,119
Innovation theme: Customer Vulnerability

Project Summary
Customers in vulnerable situations and the wider public often find journeys through and around our streetworks a challenge. Our previous project, Streetscore 1, proved that vulnerable individuals, carers and advocates are unhappy with the current way streetworks are designed and want things to improve.

This project will take the ideas outlined in StreetScore 1 and test the prototype solutions live on our works. The ultimate goal is adoption of these initiatives across industry, for the benefit of our customers.

Benefits and new learnings
Streetscore 2 will continue to develop our understanding of the challenges vulnerable customers face when travelling through and around our street works. This insight will help our engineers improve how they manage their streetworks and help them better understand the challenges faced by society and particular vulnerable customers.

"We are always very aware of the impact we have when we undertake improvements to our gas system on the general public. I'm delighted we are developing Streetscore2 in collaboration with our gas and electricity partners, who all want to do the right thing and make our streetworks far simpler to move around whilst keeping our customers safe."

Steven Dacre, Northern Gas Networks

Case Study

Raising awareness of the 'silent killer'

CUSTOMER VULNERABILITY

Carbon Monoxide (CO) is a poisonous, odourless gas that continues to cause tragic deaths in the UK.

UK gas distributors all run their own education and engagement programmes to highlight the dangers of CO to their customers. However, the Health and Safety Executive (HSE) has called for even more education and awareness of CO.

In response, we recently launched a research project to gather existing data about CO from across the UK, to help gas distributors shape their future CO strategies.

FACT FILE
Project name: Improving Awareness of Carbon Monoxide
Project reference: NIA_NGN_334
Project partner: Frazer Nash, Institution of Gas Engineers and Managers (IGEM)
Status: In development
Overall project value: £130,649
Innovation theme: Customer Vulnerability

Project Summary
The project will use desktop and stakeholder research to obtain a deep understanding of the sources and risks of CO and historical campaigns that have been conducted to raise awareness.

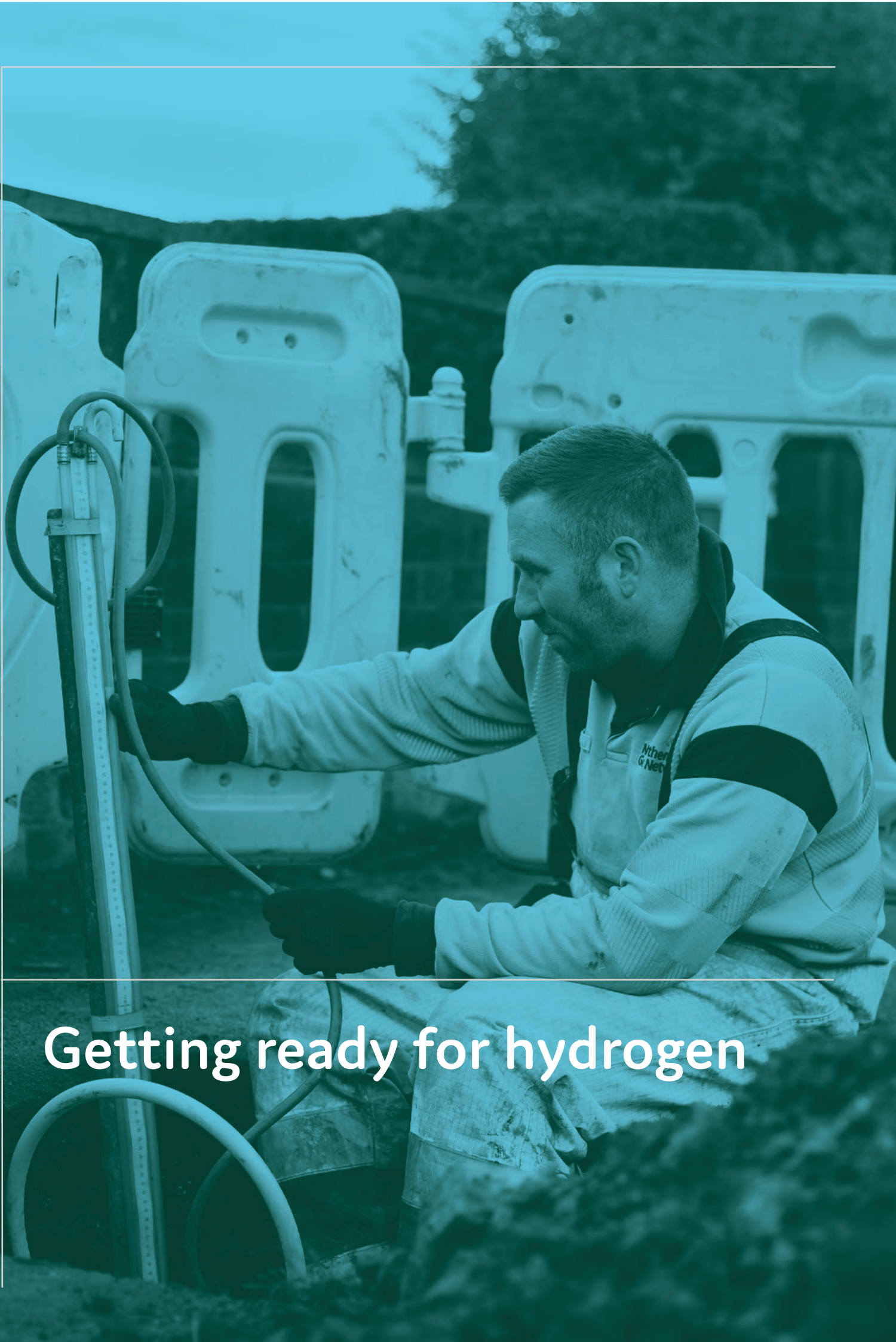
The research will be made available to all UK gas distributors in a central database, along with a roadmap for tackling CO through future activity.

Benefits and new learnings
Making the gamut of CO research available to all gas distributors will help to ensure that future customer campaigns are even better informed. The roadmap will also help to bring some uniformity to future activity – so that local campaigns are all working towards shared, national recommendations.

"For many years, UK gas distributors have been conducting research and delivering valuable activity to raise awareness of the dangers of CO."

"This project will pull together all those learnings and activities, so that they can inform future campaigns and bring a level of consistency to our work."

Steven Dacre, Northern Gas Networks



Getting ready for hydrogen

Getting ready for hydrogen

The UK is now recognised as a world-leading authority in the use of hydrogen for heating, cooking and transport.

As a clean-burning fuel, hydrogen has vast potential to help the UK, and other global economies, achieve their net zero ambitions. In the UK, research projects such as H21 and HyDeploy, have demonstrated that it is economically and technically viable to supply hydrogen to customers as a substitute for natural gas.

During RIIO-GD2, the next stage is to demonstrate the use of hydrogen on a large scale, in real-world conditions. This work will provide crucial evidence to help the UK Government make decisions on the scale and timing of the hydrogen transition.

Over the next few pages, we look at new and recently completed hydrogen innovation projects.

Case Study

Hydrogen ready components

ENERGY SYSTEMS TRANSITION

What would a 100% hydrogen network mean for the pipes, valves, filters, regulators and other devices found on our low, medium and intermediate pressure gas network?

Would these components behave in the same way as they do with methane (natural gas), or would the presence of hydrogen degrade or compromise them in some way?

To find out, we worked with Cadent and the Health and Safety Executive's Science and Research Centre on an in-depth review.

FACT FILE

Project name: H21 - Hydrogen Ready Components

Project reference: NIA_NGN_276

Project partner: QEM solutions, Cadent

Status: Complete

Overall project value: £399,488

Innovation theme: Energy Systems Transition

Project Summary

Working with Cadent, we identified all the network components that could be affected by a transition to hydrogen and shared these with the Health and Safety Executive's (HSE) Science Division. The HSE was then able to create a methodology and risk assessment for these components.

The methodology will prove vital in supporting the way we approach early trials of 100% hydrogen on our gas network.

Although this project has now concluded, we are developing a follow-up project to explore how to mitigate risk on certain network components identified by the initial study.

Benefits and new learnings

The project has given gas distribution networks a framework for assessing risk on the network when making the transition to hydrogen. As such, this project has helped to fill a significant gap.

This knowledge will help to ensure network adaptations can take place in a timely manner, to support a smooth hydrogen transition.

"The project has created a very helpful framework for assessing risk when putting 100% hydrogen through an existing gas network. As a result of the research, we now have a comprehensive database of network components and any associated risk in the presence of hydrogen."

"We are now moving rapidly towards live trials of 100% hydrogen and this methodology will help to ensure these trials are conducted in a safe and rigorous way."

Russ Oxley, Northern Gas Networks



Case Study

Checking our older pipes: what difference might hydrogen make to our network?

ENERGY SYSTEMS TRANSITION

We have been providing natural gas through our pipes and equipment since the early 1970s. The plastic pipe we use has been used in our industry since around that time to move natural gas to our customers. Does this older pipe work just as well with hydrogen? That’s what this project aims to find out.

FACT FILE

Project name: Failure modes and permeation testing of PE
Project reference: NIA_NGN_301
Project partner: Radius Systems Ltd, WWU, Cadent, SGN
Status: In development
Overall project value: £435,226
Innovation theme: Energy Systems Transition

Project Summary

We know that hydrogen behaves slightly differently to natural gas. This project will identify what this might mean for the older assets in our network, some of which are approaching 50 years old. This work complements research to analyse we need to know about converting our gas network to hydrogen.

Benefits and new learnings

We aim to address the gaps in previous research which has been referenced in recent studies focusing on older assets in our network. Most importantly, we will clearly identify our findings to support future risk assessments and the wider safety case development for hydrogen.

“Hydrogen and natural gas have different characteristics and behaviours, so understanding how hydrogen might impact our older pipes and other equipment is really important. In doing so, we ensure a future hydrogen system which will work just as well as our current natural gas network.”

*Chris Bates,
Northern Gas Networks*

Case Study

Establishing a shared, UK-wide pathway to 100% hydrogen

ENERGY SYSTEMS TRANSITION

Our existing natural gas infrastructure has evolved over decades. In doing so many regulations and safety standards have evolved to maintain high levels of design and safety for natural gas.

As we look to our net zero future and the role of hydrogen, we need to understand how these regulations and standards may need to change to ensure we can operate with the same levels of confidence and assurance we have today.

FACT FILE

Project name: H21 – Occupied Trials Phase 1 – Safety Case
Project reference: NIA_NGN_348
Project partner: Pipeline Integrity Engineers
Status: Complete
Overall project value: £45,600
Innovation theme: Energy Systems Transition

Project Summary

A team of industry experts will undertake a review of previous hydrogen research so identify where changes maybe required to the current existing Gas Safety Management Regulations and Safety Case. This analysis will inform the wider gas industry about what steps need to be taken to progress live trials of hydrogen conversion.

Benefits and new learnings

A key point from this assessment is to identify any potential gaps in in knowledge and understand that will need to be addressed in order to operate a 100% hydrogen converted natural gas network.

“Ensuring a hydrogen gas network is just as safe as today’s infrastructure is essential to any future operation – this project is helping us to understand any changes or additions that need to be made to existing standards.”

*Ryan Mallinder,
Northern Gas Networks*

Case Study

Go with the flow: what does the flow rate of hydrogen mean for our network?

ENERGY SYSTEMS TRANSITION

Natural gas (methane) has a higher energy density than hydrogen – which means we would have to flow greater volumes of hydrogen through our network to meet the needs of our customers.

This effectively means that hydrogen would need to move three times as quickly through our pipes as natural gas.

But what would these increased speeds mean for the network? For example, would it cause more noise and vibration, or pick up more dust?

To find out, we are working with three of our fellow gas distributors on a research project that will provide vital insights.

FACT FILE

Project name: Wider impacts of hydrogen
Project reference: NIA_NGN_302
Project partner: QEM Solutions, National Engineering Laboratory, WWU, Cadent, SGN
Status: In development
Overall project value: £236,234
Innovation theme: Energy Systems Transition

Project Summary

A computer modelling technique, known as computational fluid dynamic modelling, is being used to simulate the flow of hydrogen through the network.

This modelling is allowing project partners to examine how the higher velocity of hydrogen would affect dust pickup, noise, pipeline vibrations and other behaviours.

The results will highlight areas where further research and testing – potentially in real-world conditions – is necessary.

The project is now nearing completion, with the majority of phases of testing already concluded.

Benefits and new learnings

The project will help to identify any technical issues that hydrogen could pose for the existing gas network. It is one of several strands of work exploring the implications of hydrogen for the UK’s existing gas infrastructure.

“The computer modelling allows us to see if this higher velocity would affect the network. It gives us an early indication of any modifications that may be needed, and areas where we need to do more research and testing.”

Chris Bates, Northern Gas Networks

Case Study

Understanding hydrogen impacts on our equipment

ENERGY SYSTEMS TRANSITION

FACT FILE

Project reference: NIA_NGN_346
Project partner: Fingleton White
Status: Recently sanctioned - early development
Overall project value: £380,000
Innovation theme: Energy Systems Transition

Project Summary

The UK has committed to a legally binding target of Net Zero emissions by 2050. This means the UK must tackle decarbonisation at pace and change the way energy is produced, transported and consumed to meet this new target.

All gas networks have committed to working with stakeholders and the government to develop an understanding and strategy to convert the UK gas networks to hydrogen.

In order to utilise the existing transmission and distribution gas networks to convey hydrogen, we need to first understand the effects this different type of gas will have on our existing pipes and equipment. Development of this knowledge is pressing to support projects actively progressing towards live occupied trials and demonstrations of hydrogen heating and cooking.

This project will progress our knowledge related to how electrical connections can be made and how the current system of classifying hazardous areas at our various above ground facilities, might need to change to support this adoption of hydrogen as a route to net zero.

Target benefits and learning

The learning we derive from this project will inform our wider hydrogen activities and support our industry colleagues in the work they do to understand how we can convert our system to transporting hydrogen. It will also support the creation of technical guidance our industry needs to establish the evidence needed for a future hydrogen ready gas network.

Case Study

The road to a hydrogen-powered van fleet

DECARBONISATION OF TRANSPORT

The UK Government’s green agenda means that zero-emission vehicles will need to be deployed across all industry sectors by 2050.

In the gas distribution sector, we make daily use of vans of different sizes – the majority of which currently run off diesel.

When looking for net zero alternatives for our van fleet, there are lots of practical considerations, such as the typical distance our engineers need to travel, and the fact that lots of our vans need an on-board power supply so we can operate specialist equipment, such as air compressors.

Hydrogen-powered vehicles have potential to meet the practical requirements of our front-line engineers in the future, while avoiding damaging emissions.

In a joint project with Wales & West Utilities, we commissioned research specialists Cenex to look at the practical implications of running a hydrogen van fleet in the future.

FACT FILE
Project name: Hydrogen storage for zero carbon fleet transport
Project reference: NIA_NGN_263
Project partner: Cenex, WWU, EIC
Status: Complete
Overall project value: £86,867
Innovation theme: Decarbonisation of Transport

Project Summary
Cenex used specialist in-vehicle technology to track 24 work vans – 12 from NGN and 12 from Wales & West Utilities (WWU).

The data gave a comprehensive picture of vehicle journeys and on-board power usage. Cenex was also provided with existing vehicle telematics data from NGN and WWU.

All this data allowed Cenex to create a fuel demand model for the fleets and a recommended plan setting out the number and location of hydrogen refuelling stations needed to keep the fleets on the road.

Benefits and new learnings
The project has allowed NGN and WWU to understand the benefits and challenges of operating hydrogen powered vehicles across our respective networks. This will help us plan our future strategies for introducing hydrogen vehicles to our fleets.

Ultimately, a full transition to hydrogen vehicles would eliminate the carbon emissions currently derived from our diesel fleet.



Case Study

Developing a domestic hydrogen detector

DECARBONISATION OF HEAT

As hydrogen becomes an ever more viable future fuel for domestic heating and cooking, we have worked with partners to develop a domestic hydrogen detector.

We teamed up with Energy Innovation Centre (EIC) to invite suppliers to submit their ideas for the detector, leading to the development of a prototype device.

FACT FILE
Project name: H2GO - Domestic Hydrogen Detector
Project reference: NIA_NGN_292
Project partner: EIC, WWU, DefProc Engineering, HSE
Status: Early-stage development
Overall project value: £113,667
Innovation theme: Decarbonisation of Heat

Project Summary
Having a reliable hydrogen detector ready for market is one of myriad requirements for the future transition to a hydrogen network.

We worked with DefProc Engineering on the sensor design and the Health and Safety Executive’s Science Division, who tested the device at their Buxton laboratories.

Ten prototype devices were produced. They are in the style of a square, ceiling mounted smoke detector, capable of being used for an extended period of time.

The technology is now being shared with sensor designers and manufacturers, who are looking to use the results as the basis for their own sensor designs.

Benefits and new learnings
Smoke and carbon monoxide alarms are important fixtures in our homes – providing an early warning in the event of fire or the presence of CO. Introducing a hydrogen detector can increase customer confidence in a move to widespread use of hydrogen for domestic heating and cooking.

“The battery powered device is a similar size to a regular smoke alarm and can be mounted on the ceiling. By sharing the research, design documents and schematics from this project with industry, other manufacturers can develop their own designs in the future.”

David Tomkin, Northern Gas Networks

Case Study

Testing customer appetite for a hydrogen village

DECARBONISATION OF HEAT

As part of the preparatory work for hydrogen networks, the Government has identified the need for a hydrogen village – a trial of 100% hydrogen in a community setting, by 2025.

A potential location – Redcar – has already been identified, and funding bids are being prepared. However, such a project requires a lot of preparatory work – not least an understanding of customers’ appetite for taking part in the trial.

A research project has been jointly delivered by Cadent, NGN, Wales & West Utilities and SGN to better understand people’s perceptions, beliefs and likely behaviour when it comes to cooking and heating with hydrogen.

FACT FILE
Project name: Hydrogen Village
Project reference: NIA_NGN_304
Project partner: CM Monitor T/A Britain Thinks, Cadent, WWU, NGN, SGN
Status: Complete
Overall project value: £419,000
Innovation theme: Decarbonisation of Heat

Project Summary
The research into customer attitudes towards hydrogen included a desktop study of existing data; the creation of a customer panel of approximately 100 people, round table discussions with stakeholders and telephone and online surveys. The research included hard-to-reach customers – such as those who are digitally excluded, or in a vulnerable situation, such as fuel poverty. Small and medium businesses were also engaged.

Target benefits and learning
Insights from the research will help to maximise the adoption of hydrogen by residents in a hydrogen village and provide a broader understanding of consumer attitudes, behaviours and perceptions towards the use of hydrogen as a solution for heating, cooking and hot water.

“The research has now been concluded and a final report will be published soon. The project has provided lots of invaluable insights into customers’ attitudes towards climate change, hydrogen and how they would feel about taking part in the trial.”

“These insights will inform the way in which customers are communicated with, once the hydrogen village trial is ready to launch.”

Stella Matthews, Northern Gas Networks

Case Study

Establishing a shared, UK-wide pathway to 100% hydrogen

DECARBONISATION OF HEAT

A transition to hydrogen is now regarded as one of the key ways in which the UK can reach its 2050 net zero emissions target.

But there are currently different views across the country about how gas networks can make the transition and what the eventual hydrogen landscape will look like.

To bring some uniformity to the national direction of travel, we worked with our industry gas network partners on two interlinked research projects to examine current models and thinking.

By presenting the most viable options, we can assist the UK Government in making future policy decisions around hydrogen.

FACT FILE 1

Project name: Common futures end states and transition pathways
Project reference: NIA_CAD0073 | NIA_NGN_308
Project partner: Element Energy, Cadent (lead), WWU, SGN, NG
Status: Complete
Overall project value: £195,000
Innovation theme: Decarbonisation of Heat

FACT FILE 2

Project name: Assessment Methodologies
Project reference: NIA_NGGT0179 | NIA_NGN_308
Project partner: Frontier Economics, NG (lead), Cadent, WWU, SGN,
Status: Complete
Overall project value: £388,672
Innovation theme: Decarbonisation of Heat

Project Summary

The two research projects fall under a wider research programme led by BEIS, known as the System Transformation Programme.

These specific projects used desktop research to examine the technical, physical and economic viability of various options for transforming the UK’s gas networks to 100% hydrogen.

The scope of the projects covered the UK’s entire gas networks, including the high pressure national transmission system, plus the local systems operated by the distribution networks.

The research established several credible pathways to net zero and a number of potential scenarios for the energy landscape in 2050. The task is now to use this information

to add further detail to the 2050 scenarios and routes to get there. This will provide an evidence base for future policy decisions around hydrogen.

Benefits and new learnings

The project will enhance understanding of the most realistic pathways to a hydrogen gas network across the UK. It will help NGN, and our fellow gas distributors, to develop our long-term plans, as well as providing insights that can help local and regional stakeholders (e.g. local authorities) with their local area energy plans.

“This project has been pivotal in developing the sector’s understanding of the future role and impact of hydrogen, and how and where our existing network can be transformed to provide 100% hydrogen to our customers. This work form part of a wider suite of evidence which in combination inform the key decisions that will need to be taken to commence conversion of our systems and deliver net zero for heat.” .

Keith Owen, Northern Gas Networks



Case Study

Protecting our customers from the dangers of CO

CUSTOMER VULNERABILITY

FACT FILE

Project name: Helix
Project reference: NIA_NGN_359
Project partner: Affotek
Status: Recently sanctioned – early development
Overall project value: £100,100
Innovation theme: Customer Vulnerability

Project Summary

The number of deaths reported annually due to carbon monoxide (CO) poisoning is between 30-60; with 53 reported in 2019 by the Office of National Statistics. About 4,000 people attend A&E with suspected carbon monoxide (CO) poisoning and of these 200 people are admitted to hospital every year. CO related incidents constitute 10% of calls to fire services. Lower levels of less than 70 parts per million (PPM) or undiagnosed carbon monoxide poisoning can lead to lasting neurological damage, memory loss and difficulties in concentration.

The ‘first line of defence’ to reduce CO poisoning has always been the installation of a CO detectors and that gas appliances are serviced and inspected annually by a Gas Safe Registered Engineer. In addition, the gas distribution networks operate the gas emergency service (0800 111 999) to respond to CO alarms in order to make the situation safe. However, there is no self-diagnosis option for carbon

monoxide poisoning diagnosis being a combination of symptom recognition as well as measuring the amount of CO in the bloodstream.

There is no self-diagnosis option for carbon monoxide poisoning diagnosis being a combination of symptom recognition as well as measuring the amount of CO in the bloodstream.

By tapping into the latest developments in sensor technology, this project will undertake innovation to develop a wearable device capable of detecting low levels CO in the bloodstream to provide a far more responsive and advanced means to protecting life.

Target benefits and learnings

We know that lower levels of carbon monoxide can be harmful and can cause fatigue which in turn may lead to accidents and ill health. In undertaking this project, we aim to understand just how far modern day sensor technology can be adapted into wearable devices that can detect low CO levels and in doing so prevent harm. Collaborating with NHS trusts and Cadent further improves our knowledge of CO issues across the UK and how technologies such as the one might be deployed nationally both for customers and staff alike, reducing the number of incidents seen nationally each year.

NIC Projects

NIC projects

Alongside NIA funding, gas distributors were also able to bid for Network Innovation Competition (NIC) funding during RII0-1. NIC funding was designed to support larger and longer-term projects with the potential to push the industry forwards.

Although NIC funding ceased at the end of RII0-GD1, 2021/22 saw the two major NIC funded projects nearing completion – the details of which are below.



Case Study

H21: making the case for 100% hydrogen

ENERGY SYSTEMS TRANSITION

Our pioneering H21 project is delivering the critical safety evidence needed to prove that the existing gas network can safely transport 100% hydrogen in the same way it carries natural gas today.

The project is now at an exciting phase of testing hydrogen in real-world conditions, on a disused part of our gas network.

FACT FILE
Project name: H21 Phase 2
Project partner: UK GDN's, NGGT, HSE, DNVGL and Leeds Beckett University
Status: Finishes summer 2022
Overall project value: £7,600,000
Innovation theme: Energy Systems Transition

Project Summary
Following a successful first phase, in which we tested 100% hydrogen with a specially constructed pipe network at a research facility in Cumbria, we have moved onto a second phase of testing, using an existing gas network.

The network, located in the South Bank area of Middlesbrough is no longer in use, making it ideal for the trial. The disused network is located close to existing housing – allowing us to familiarise the public with the concept of hydrogen, while carrying out the technical trials.

Trails began in March 2022 and will continue until the end of summer 2022. Part of the project has seen the hydrogen odourised to smell like natural gas.

The original intention was to close the site down following the conclusion of Phase 2 this summer. However, the potential to use the location for future hands-on training means we are currently looking at options to simply mothball the site, so it can be used again.

Benefits and new learnings
The real-world trials will provide confidence that hydrogen can be safely transported through the existing gas network and help to identify any technical challenges or adaptations that may be required.

The trial will provide crucial evidence ahead of planned hydrogen trials involving local communities in the future.

"The South Bank test site is helping to further our understanding of how hydrogen behaves in an existing gas network. This is crucial evidence, not just for gas distributors such as NGN, but also for the wider supply chain."

"The site is attracting a lot of interest from political stakeholders, such as MPs, from other gas distributors and from industrial companies around the world."

Neil Travers, Northern Gas Networks



Case Study

Supplying a natural gas/hydrogen blend to customers

ENERGY SYSTEMS TRANSITION

We worked with partners on a major trial that saw customers cook and heat their homes with a blend of up to 20% hydrogen with natural gas. HyDeploy2 was undertaken on the existing gas network to demonstrate that natural gas can be distributed and utilised safely, highlighting the potential Hydrogen has to accelerate the transition to a net zero future.

The project saw the foundation work of the phase 1 trial carried out at Keele University's campus private network built upon with the second phase being sanctioned at Winlaton - a community in Gateshead, North East of England.

In both projects, the hydrogen blend was transported using the existing gas network with no need for customers to change their appliances.

FACT FILE
Project name: HyDeploy2
Project partner: Cadent Gas, Health and Safety Executive (HSE) Science Division, Progressive Energy, ITM Power, Keele University
Status: Complete
Overall project value: £14,969,000
Innovation theme: Energy Systems Transition

Project Summary
The first trial, at Keele University, began in late 2019 and saw the hydrogen blend delivered to 100 domestic properties and 30 businesses, using the university's private network.

The second trial saw 670 homes in Winlaton receive the blend, using the existing public distribution network. In both cases, customer research was carried out before, during and after the trial, to gauge perceptions.

Building upon the successful Keele University and Winlaton trials, HyDeploy is now working with additional partners to see how hydrogen performs in industrial settings.

As part of this third phase, which does not involve NGN, 20% hydrogen blend has already been used at Pilkington Glass and Unilever to produce sheets of 'float' glass and consumer products such as Persil.

Benefits and new learnings
HyDeploy2 was an opportunity to introduce the concept of hydrogen to customers, without requiring them to make any changes to their appliances, pipework or behaviour.

Research found that customers were overwhelmingly positive about taking part in the trial, with the majority of

people reporting that they did not notice any difference in the way their heating and cooking appliances behaved.

"There has been no difference to using our gas since the hydrogen was introduced. I am the sheltered scheme officer for some housing in the pilot area and everyone here is enthusiastic about doing their bit to reverse the effects for climate change and agrees that it's great that our small village in the North East was chosen for such a ground-breaking pilot."

Biba Thompson, Winlaton resident

"We've been thrilled to pass the baton from the first ever hydrogen blending trial at Keele University to Northern Gas Networks who have successfully completed blending into the gas network in the village of Winlaton. This project is the culmination of a huge amount of work putting consumers at the heart of the energy transition."

"By blending hydrogen into the gas network, the people in Winlaton could start using a greener gas without having to make any changes to their home or the way they use their heating and cooking. Forming part of the evidence we are putting to Government to enable their 2023 policy decision on blending hydrogen into the gas networks as a means to support decarbonisation targets."

Dr Angela Needle, Director of Strategy, Cadent



Strategic Innovation Fund projects

Strategic Innovation Fund projects

The Strategic Innovation Fund (SIF) is a new funding stream for RIIO-2. It aims to find and fund ambitious projects to accelerate the transition to net zero.

Ofgem has made around £450 million available to the UK gas and electricity networks between 2021-2026, which is delivered in partnership with Innovate UK, part of UK Research and Innovation (UKRI).

Ofgem has described the purpose of the fund as to 'help the UK become a "Silicon Valley" of energy.

SIF is funding in three project phases - Discovery Phase, Alpha Phase and Beta Phase – representing the life span of a project.

To take advantage of the new funding mechanism, NGN organised a series of engagement events and workshops with a wide range of stakeholders from academia, industry and local government.

This resulted in 67 project concepts which were then whittled down to 10 project proposals – 5 of which between them have received just under £500,000 SIF funding to develop initial feasibility studies and proof of concept.

All five projects have now completed this initial discovery phase.

The projects are as follows:



Using hydrogen in heavy duty transport

A project to evaluate the potential for using hydrogen in heavy transport across the North of England. It will create a joined-up regional strategy to cost-effectively kick-start the region's hydrogen economy and support the growth of zero emissions transport.

FACT FILE
Project name: Multimodal Hydrogen Transport Refuelling Network Study
Project partner: Eversholts, Durham University, Herriot Watt University and Transport for the North
Funding: £89,500
SIF round one discovery theme: Transport

This project was submitted for Alpha phase funding but was unsuccessful achieving award.

Decarbonising rail transport

This project will develop a strategy to create a net zero rail network, by advocating the most efficient and effective technological solutions. It will lead to a shared implementation plan that will enable gas and electricity networks to factor in rail decarbonisation when they are planning their own infrastructure investments.

FACT FILE
Project name: Rail Decarbonisation Planning
Project partner: Eversholts, EA Technology, Northern Powergrid and Northern Rail
Funding: £113,500
SIF round one discovery theme: Transport

This project was submitted for Alpha phase funding but was unsuccessful achieving award.

Adopting smart homes for energy efficiency

Digital technology can play an important role in the success of new energy technologies, such as smart homes. This review will examine the factors related to the uptake of digital technology to promote energy efficiency. The aim is to help reduce customer bills and ensure a fair net zero transition for all.

FACT FILE
Project name: Critical factors for the adoption of smart homes for energy efficiency and implications for consumers and providers
Project partner: National Energy Action, Newcastle University and Northern Powergrid
Funding: £55,400
SIF round One Discovery Theme: Data and Digitalisation

This project was submitted for Alpha phase funding but was unsuccessful achieving award.

A smarter pipe network

A project to develop a new assessment and forecasting tool to help us better manage our pipe network, and plan pipe replacements in a more strategic manner. The forecasting tool will be integrated with new technology out on the network, such as pressure sensors within pipes.

FACT FILE
Project name: Thermal imagery analysis – condition assessment fluid
Project partner: National Grid and Synovate limited
Funding: £78,200
SIF round one discovery theme: Data and Digitalisation

This project has now progressed through to the Alpha stage of SIF to continue the development of the technology.

Generating electricity though gas pressure

A project to explore the potential of using gas pressure in the gas system to generate electricity, using a turbine. The technology has already been proven in the offshore oil and gas sector but is new to the UK energy market.

The discovery phase of the project concluded that generating electricity in this way is not cost-effective, compared with other options currently available. As such, the project will not be progressing to the alpha stage submission.

FACT FILE
Project name: Excess gas turbine energy generation
Project partner: Revolution Turbine Technologies Ltd., Digital Catapult, Stockton & District Advice & Information Service, and Northern Powergrid
Funding: £134,200
SIF round one discovery theme: Whole Systems

Coming soon....what's next for our innovation programme?

The immense challenge of achieving net zero by 2050 requires a dramatic shift in technologies and societal behaviours throughout the UK. At NGN, we are focused on being a key enabler of breakthrough discoveries, new technologies and better ways of working. We are committed to finding answers which support a fair transition to a low carbon life for all members of society. We will continue to work collaboratively and share our discoveries, so the whole system wide benefits of any new technologies or approaches can be realised.

There is a huge amount of exciting innovation in the pipeline for the next few years, including:

Artificial Intelligence (AI)

Artificial Intelligence has immense potential to help us improve our decision making and planning. For example, we are looking at using an AI application to help us analyse and 'spring clean' the enormous amount of data we hold. This will make reporting, monitoring and planning more effective and support better decision making.

Virtual and Augmented Realities (VR / AR)

The ability to create very detailed versions of our real world will dramatically enhance our ability to communicate change and share our innovation ideas with our customers and allow us to improve training and competency and support our front line staff.

Data analytics

New number crunching techniques, know broadly as data analytics, will give new insights, and allow us to simplify complex information to support better monitoring and decision making. We can become more proactive and less reactive.

Hydrogen

Our hydrogen research programmes have delivered amazing results and we are moving ever closer to real world trials of 100% hydrogen with customers. Such projects will continue to place the UK at the forefront of the global hydrogen economy, generating jobs and economic growth, while supporting the transition to net zero.

Transport

Like many businesses, NGN is still heavily reliant on oil to get us all from A to B. While batteries are the most likely way to decarbonise cars and vans, other solutions, such as hydrogen vehicles, will also be part of the solution. NGN will continue to work with transport specialists to understand if our network will need to be the provider of hydrogen for the refuelling stations of the future, to power the rail, marine and heavy goods sectors and drive the net zero challenge.





we are
the network

Get in touch

If you're an innovator with great ideas and you want to work with NGN, we'd love to hear from you.

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