

Thanks for your time

We hope you found
this report useful.

If you'd like to know
more about us and
our love of innovation,
please get in touch.

innovation@northerngas.co.uk

northerngasnetworks.co.uk

 @NGNgas

Smell gas?

The National Gas Emergency Service
is available 24 hours a day, every day.

CALL 0800 111 999*

*All calls are recorded and may be monitored.

Smart Energy Thinking

That's Clever Stuff

OUR **2017** INNOVATION REPORT

We're Northern Gas Networks (NGN),
the gas distributor for the North
of England.

We keep 2.7 million homes and
businesses cooking on gas in the
North East, Northern Cumbria and
much of Yorkshire.

northerngasnetworks.co.uk
@NGNgas

Meet the NGN Innovation Team



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Smarter thinking, for today and the years to come

Big ideas have never been more important in the utilities sector.

As the UK moves towards a low carbon economy, we need to come up with greener ways to power and heat our homes and businesses, at an affordable price.

At Northern Gas Networks (NGN), we are working with partners in local and central Government, academia and business, to develop the energy networks of the future.

Some incredibly exciting projects are springing from this work. H21 Leeds City Gate, for example, has the ambitious goal of turning Leeds into the world's first hydrogen city.

Another project we have in the pipeline plans to examine multi-vector technology, and how we remove traditional barriers between gas, power and heat in order to create more efficient ways of generating, storing and transporting energy. Our new InTEGRel facility in Newcastle will be at the forefront of this work and we look forward to sharing early outputs next year.

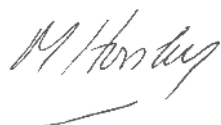
But innovation is not just about the future, it's also about the here and now.

Over the past year, we have been developing new technology and processes to minimise the disruption and cost associated with our everyday work, to enhance the value of the service we deliver to our customers.

From reducing the amount of holes we need to excavate to fix gas leaks, to using sophisticated modelling to make our network less prone to problems in the first place, we are working more smartly to provide a reliable, value for money service.

The Network Innovation Allowance (NIA) – a funding allowance provided by our regulator Ofgem – has allowed many of these great ideas to get off the ground. We're sharing our successes and learning with the wider industry, so that customers across the UK can benefit.

I hope you enjoy reading this overview of NIA funded projects from 2016/17. And if you'd like to find out more about us, and the potential to work together, please do get in touch.



Mark Horsley
Chief Executive Officer, Northern Gas Networks



From 'lightbulb' moment to roll-out: bringing ideas to life



It's one thing to have a great idea, but it's quite another to make it a reality.

At NGN, we involve colleagues from across the business, and a wide range of fantastic partners, to get ideas from the drawing board to the streets of the North of England.

Our robust project management process helps to avoid the common pitfalls that can derail a project.

Working with businesses

We have a great partnership with the Energy Innovation Centre (EIC), which acts as our dating agency with SMEs (Small to Medium Enterprises).

Through the EIC, we can ask a community of more than 2,000 businesses for solutions to common industry issues. The EIC also facilitate proposals from SMEs where innovation has been successfully implemented

from wider industry which may be relevant to gas network operations. It's a great way to source expertise and ideas, while also investing in local firms.

From our initial call to action to signing on the dotted line with an SME, the turnaround time is usually around six months. That's not bad, but we are trying to make the process even quicker.

Working with SMEs in 2016/17

34

PRESENTATIONS
MADE BY SMEs

OVER 100

EXPRESSIONS OF INTEREST
RECEIVED FROM SMEs

5.6 MONTHS

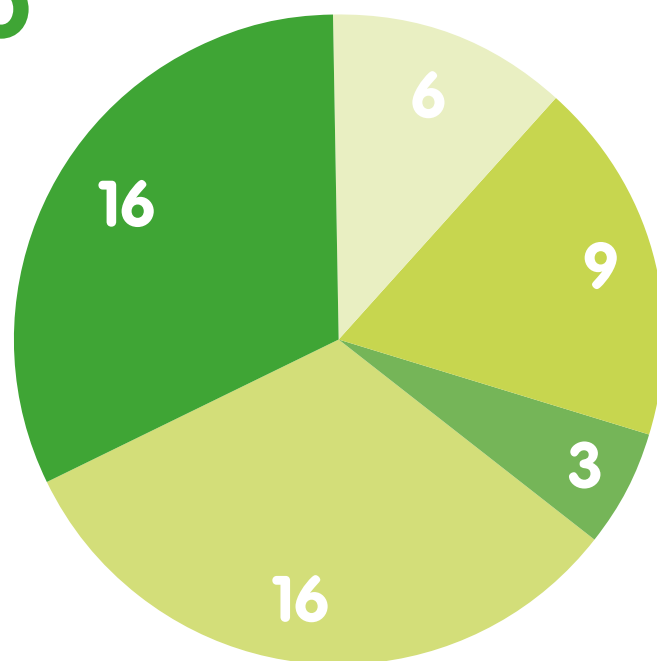
AVERAGE TIME BETWEEN INITIAL NGN BRIEF TO
A SIGNED CONTRACT WITH AN SME

£500K IN 11 NEW PRODUCTS

LAST YEAR, WE ALSO TOOK OUR PROJECTS ON TOUR VIA A SERIES OF INNOVATION DAYS, WHERE 600 OF OUR COLLEAGUES MET WITH SUPPLIERS TO BRAINSTORM IDEAS FOR PERENNIAL PROBLEMS WE FACE. AS A DIRECT RESULT, THIS STIMULATED INCREASED DRIVE FOR INNOVATION AND ACTION. WE HAVE SINCE INVESTED OVER £500K IN 11 NEW PRODUCTS TO IMPROVE EFFICIENCY, CUSTOMER SERVICE AND SAFETY.

Our portfolio

At the beginning of the year we carried out an assessment of all of our closed projects to categorise the outcome of each one. This enabled us to understand where we could better invest our customers' money.

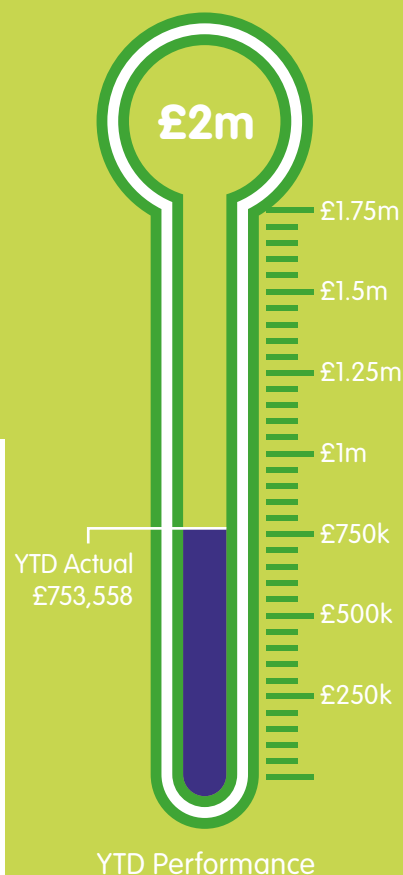


- A project that has been unable to deliver the scope as described in the project eligibility assessment, but has provided learning
- An innovation initiative that informs and influences the energy landscape
- Contributed to the development of an Network Innovation Competition bid
- Initiatives that have contributed learning, but further work is necessary before a business as usual solution is delivered
- New innovation initiative that has been rolled out into business as usual

Measuring the benefits

Here at NGN we have spent a lot of time over the last year identifying how we can capture the benefits of our implemented projects. We have developed our own cost benefit analysis system which looks at everything, from reduced man hours spent on jobs to using less fuel through more efficient operations. Our methods have been shared with other networks to pass on any learning they could benefit from.

In 2017 we set ourselves the '**£2million challenge**', to capture the return on investment for our customers. As you can see from the graphic to the right we are doing pretty well!



NIA funding: why it matters so much

Funding from the Network Innovation Allowance (NIA) allows us to develop great ideas that might otherwise remain on the back of an envelope.

60

THE NUMBER OF INNOVATION PROJECTS COMPLETED SINCE NIA FUNDING WAS FIRST INTRODUCED IN 2013/14

£2.7 MILLION

WAS INVESTED BY NGN IN 2016/17 – OUR HIGHEST ANNUAL SPEND SINCE THE ALLOWANCE FUND WAS INTRODUCED IN 2013/14

Sharing the knowledge

SHARING KNOWLEDGE FROM SUCCESSFUL (AND NOT SO SUCCESSFUL) TRIALS ALLOWS THE WHOLE INDUSTRY TO MOVE FORWARD.

At NGN, we do everything possible to share what we have learned, and have also benefitted when our fellow utility companies make a breakthrough.

For example, our colleagues at Wales & West Utilities (WWU) recently developed a new piece of equipment to cut through tough ductile iron gas pipes. It was based on a glass-cutting tool, and worked perfectly for the purpose. Following the completion of this NIA project led by WWU, we've been able to adopt the tool and roll it out among our workforce, and expect to halve the time we spend on these notoriously tricky pipe jobs.

Meanwhile the combined CCTV camera and pump conceived by our very own Rob Arthur has been shared with other networks and recently adopted by Cadent, (the new name for National Grid Gas Distribution), with other companies also showing strong interest. Most noticeably in Netherlands where our project partner Synthotech are supporting IPCO pipeline equipment to implement this solution into Europe.



Richard Hynes-Cooper, NGN's Head of Innovation said:

"UK energy networks have developed an extremely open culture and regularly share knowledge through a variety of industry forums. This allows good ideas to be adopted nationally, delivering savings to our customers and providing opportunities for suppliers."

The road to success

We have an established roadmap to guide projects from that initial lightbulb moment through to final implementation.

At each stage, the project manager is required to step back and consider every detail.

In 2016/17, we placed even more focus on the commercial viability of projects, before applying for NIA funding. That way, we could be confident that projects receiving the green light would deliver great value for our customers, further down the line.



Business case

An initial examination of the benefits and costs.

A problem shared

UTILITY COMPANIES OFTEN FACE THE SAME CHALLENGES AND GOALS, SO WE SHARE KNOWLEDGE THROUGH A VARIETY OF INDUSTRY FORUMS, INCLUDING:

Gas Innovation Governance Group

A monthly gathering of UK gas distributors. Great for sharing case studies about what has worked, and what hasn't, in the world of innovation.

Cross Utility Innovation Group

A regular get-together of water, power and gas providers. Over the past year, partners have been working on a joint project to measure the social impact of network innovation activities.

Letting our colleagues shine

INNOVATION PROJECTS CAN BE A GREAT OPPORTUNITY TO DEVELOP THE SKILLS AND EXPERIENCE OF COLLEAGUES, AS WELL AS IMPROVING SERVICES FOR OUR CUSTOMERS.

In 2016/17, we launched a new step-by-step guide for colleagues, to help them deliver innovation projects from start to finish. We also provide a range of training and mentoring support.

NGN colleague Kingsley Wetherald, pictured right, got the opportunity to work on a project to see if sniffer dogs' uncannily accurate sense of smell could be used to detect gas leaks. He said:

"Trialling the project out on the network gave me valuable first-hand experience of seeing the benefits innovation can deliver to the business.

"The opportunity to be part of day-to-day NGN operations, and meeting new people through that, was a nice change from being office-based.

"Seeing the project through to completion was really satisfying. It's something I'd definitely like to do again."



Research

A desktop project to see if the project stands up to greater scrutiny.



Development

Time to hit the lab.



Demonstration

Testing the concept out in the network.



Implementation

Final roll-out. Success!

Energy Innovation Centre Gas Distribution Network Forum

The EIC GDN forum meets quarterly for problem solving workshops to generate potential projects and a review of work in progress and any opportunities for SMEs to present to a Dragons Den style forum. This is attended by NGN, WWU, Cadent and the EIC.

Low Carbon Network Innovation Conference

An annual collaborative conference where network licensees and industry companies showcase green, affordable energy solutions.



RESEARCH

H21: building a hydrogen future

PROJECT NAME:

H21 LEEDS
CITY GATE



FOCUS AREA:

FUTURE ROLE OF
GAS

PARTNER

ORGANISATIONS:

MANY PARTNERS
SPANNING LOCAL
AND CENTRAL
GOVERNMENT,
ACADEMIA AND
BUSINESS SECTOR

NIA FUNDING:

£266,400

Hydrogen is an exciting prospect as a fuel for the future. Burn it, and it generates heat and water – and nothing else.

With the UK seeking affordable ways to deliver clean, reliable energy to power homes and businesses, hydrogen could have a big role to play.

Our H21 Leeds City Gate project aims to power the great city of Leeds using hydrogen, and in the process, pave the way for more UK hydrogen networks.

The project has already attracted worldwide attention, and there is a lot more to come.

PROJECT SUMMARY:

THE H21 LEEDS CITY GATE PROJECT (H21 LCG) WAS A MASSIVE UNDERTAKING – AND HAS IDENTIFIED A FURTHER 60 PROJECTS INCLUDING A £15M 2017 NIC BID.

In 2016/17, H21 LCG comprehensively showed that a conversion of the UK gas grids to 100% hydrogen is technically and economically viable.

The conclusion? It can be done, at a realistic cost and with minimal customer disruption.

But this is just the beginning. Working from our new dedicated H21 project office at Leeds City Council, we're now using NIA funding to drill down into greater detail and fill evidence gaps. Current projects are focused on:

- **Hydrogen safety:** we are leading a collaborative GB gas distribution network £15m bid into Ofgem's Network Innovation Competition to prove that 100% hydrogen networks represent a comparable risk to today's natural gas networks.
- **What it means for your meter:** can existing gas meters (including new smart meters) measure hydrogen use accurately already, or do they need modifications? Our study will find out.
- **Producing and storing hydrogen:** we know there are lots of ways to generate and store hydrogen but what are the most technically and economically viable for large scale gas grid conversion? We're working with global energy company Statoil to find out.
- **Showing that natural gas and hydrogen can mix:** we've recently completed an initial NIA funded study to support the H21 project, which has shown that 20% hydrogen mixed with natural gas can theoretically work with existing pipes and domestic appliances. We have now launched a bigger project with Cadent and Keele University to put this theory in practice.
- **Going beyond Leeds:** we understand from the H21 LCG project what conversion to 100% hydrogen could look like for Leeds but what about other major urban centres and cities? We're working with our fellow Gas Distribution Networks to examine the implications across the UK.



In conversation with...

DAN SADLER,
PROGRAMME DIRECTOR (H21)



Why is H21 such an important project for the UK energy sector?

To make sure homes and businesses have clean, affordable and reliable energy supplies in the decades to come, we have to be imaginative.

Over 80% of the UK population uses gas for heating and cooking. By using the existing gas network to transport hydrogen we can help meet climate change targets in a way that is technically achievable within the timescales available and will cause minimal disruption to customers versus alternative solutions.

Can it really work?

Of course. Hydrogen is an extremely versatile source of energy, and all the evidence so far indicates existing gas networks can be used to transport it.

A conversion to 100% hydrogen would represent the single biggest contribution to climate change but we still need all the other options as well including renewables, energy efficiency, nuclear and some district heating where appropriate.

The fact that the Government has recently announced a £25 million project to look at using hydrogen for heating homes shows that there is real momentum developing.

BENEFITS

- Hydrogen leaves no carbon footprint. It's the ultimate clean fuel.
- Using existing gas networks to transport hydrogen can save billions of pounds as the UK moves to a decarbonised future.
- Hydrogen is extremely versatile, and could be used for heating, cooking and powering vehicles and decentralised and centralised electrical generation.

PARTNER INSIGHT

"We're already looking at cutting emissions in a variety of ways, so transforming Leeds into a hydrogen city would be a bold step. It represents a massive opportunity for the city and the north of England to lead a transition to a clean, low carbon economy."

"Leeds is the ideal city to test the concept as we're in the perfect location with a wealth of research, innovation and skills on our doorstep."

Councillor Lucinda Yeadon, Leeds City Council Deputy Leader and Executive Member for Environment and Sustainability.

30%

OF UK CARBON EMISSIONS
COME FROM DOMESTIC
HEATING AND COOKING

THOUSANDS

OF NEW JOBS COULD BE CREATED IN THE
NORTH OF ENGLAND IF THE UK'S HEAT
NETWORKS ARE DECARBONISED.





DEVELOPMENT & IMPLEMENTATION

Turning the tide on water ingress

PROJECT NAME:
WATER INGRESS
DETECTION,
PREVENTION AND
EXTRACTION



**FOCUS
AREA:**
ASSET AND
NETWORK
MANAGEMENT

**PARTNER
ORGANISATIONS:**
ROSEN, CAPTURE
GREEN

**COMBINED
NIA FUNDING:**
£257K

Water can find its way into the gas network for all sorts of reasons – from a water main burst to an ageing pipe. And when it does get in, it's hugely disruptive for our customers, causing low gas pressure or loss of supply.

We're continuing to push the boundaries of technology to come up with new ways of detecting and extracting water from our network – saving time, money, and reducing disruption.

PROJECT SUMMARY:

WE HAVE A NUMBER OF PROJECTS IN AN ADVANCED STAGE OF DEVELOPMENT TO HELP SPEED UP THE PROCESS OF IDENTIFYING AND REMOVING WATER FROM THE NETWORK.

Identifying 'at risk' pipes: we've been cross-referencing Ordnance Survey maps and Environment Agency flood data with our own network plans to identify low-lying gas pipes that are most at risk of water ingress. This will allow us to install mitigating measures, such as 'intelligent' syphons (see right).

Calculating the scale of an incident: water ingress incidents can be extremely resource-intensive for our engineers, and hugely disruptive for customers. New network modeling techniques will allow us to quickly calculate the amount of water in the network, helping us to plan our resources and forecast the likely duration of an incident.

Pinpointing the water: when water gets into the network, it often travels around as a vapour. That's why we are dusting off 20 year-old sensor technology and using it to help us identify where the water is – reducing the number of exploratory holes we need to dig. These portable sensors were originally used

to measure the calorific value of gas, but their ability to accurately identify concentrations of water vapour means we can put them to a whole new use.

Clever syphons: some parts of our network suffer from continual, low-level water ingress. We're trialling 'intelligent' PE syphons that not only extract residual water, but also have sensors that will alert an engineer, via text message, that the syphon needs emptying – preventing low gas pressure.

Removing impurities: water that has been extracted from a gas main is often contaminated and can't be disposed of in the public sewers. We're developing a filtration system that can be integrated into our existing water extraction kit. This will decontaminate the water on site, avoiding the need to tanker it away. If successful, we're hoping the filters can be used with our intelligent syphons – providing an entirely self-operating solution.



In conversation with...

STEVE PIGOTT, CUSTOMER
OPERATIONS AREA MANAGER



Why is water so difficult to get out of the network, once it gets in?

Water has an irritating habit of moving around in our gas pipes! It's not uncommon to find water several miles from the original point of entry. That's why it's so time-consuming to remove.

How can these new projects help speed up the process?

First off, they will help us identify pipes that are most at risk, so that we can put preventative measures in place. And if there is an incident, technology such as water vapour sensors and filtration systems means we can get the water out more quickly and efficiently.

When will you have finished the trials?

We're expecting to finish all the trials by summer 2017. This is good news for our customers, as it means we're another step closer to a more resilient network.



BENEFITS

- Network modelling allows us to identify and protect vulnerable parts of the network.
- Extraction and detection technology means water can be spotted, and removed more quickly – saving money and reducing customer disruption.
- We're giving old sensor technology a new lease of life to help us detect water vapour. It's a cost-effective approach.
- New filtration kit to remove impurities will save more than £77,000 per year.

SUPPLIER INSIGHT

"We've been working with NGN for the past three years on technology and techniques to tackle water ingress.

"The collaboration is helping NGN to identify vulnerable parts of the network and to locate pockets of water more quickly and efficiently when there is an incident."

Simon Daniels,
Principal Engineer, Rosen



190

HOMES AND BUSINESSES IN
THE NORTH OF ENGLAND WERE
AFFECTED BY WATER INGRESS
THROUGHOUT 2016/17

£77,000

PER YEAR CAN BE SAVED
BY FILTERING IMPURITIES
FROM EXTRACTED WATER
ON SITE.

THE ALREADY DEVELOPED AND IMPLEMENTED
WATER EXTRACTION KIT IS ALREADY DELIVERING
SIGNIFICANT BENEFITS. IT WAS USED
EXTENSIVELY AT AN INCIDENT IN THE QUAYSIDE
AREA OF NEWCASTLE EARLY THIS YEAR,
WHERE WE ESTIMATE THAT IT SAVED £42,000
MEASURED AGAINST PREVIOUS METHODS.



DEMONSTRATION & IMPLEMENTATION

Digging without the damage

PROJECT NAME:
BACK BLADE
PROTECTOR



**FOCUS
AREA:**
ASSET AND
NETWORK
MANAGEMENT

**PARTNER
ORGANISATIONS:**
CHIPPINDALE
PLANT LTD.

NIA FUNDING:
£11,642

At any given time, we have around 80 mini-diggers working across our network.

Until recently, the use of 'back blades' to stabilise each digger during operation caused scarring of roads and footpaths. Engineers would often have to return weeks later to rectify this cosmetic damage, at great cost.

Working with our supplier, we've developed a protector for these back blades which means road scarring could soon be a thing of the past.

£300,000

PER YEAR CAN BE SAVED BY USING
BACK BLADE PROTECTORS.

40

REINSTATEMENT JOBS IN 2016 HAD TO
BE REDONE DUE TO ROAD SCARRING.

PROJECT SUMMARY:

A BACK BLADE PROVIDES AN ANCHOR FOR A MINI-DIGGER, KEEPING IT STABLE DURING OPERATION.

Unfortunately, the blades can cause unattractive markings on the highway or pavement. In 2016, there were more than 40 occasions where our engineers had to return to site to carry out further reinstatement, due to this scarring.

Together with our supplier, we've developed a protector for the blades, made from recycled digger tracks.

The protectors were trialled over an eight-week period and modifications made, to ensure it was robust enough to be used on the network day in and day out.

We now plan to retrofit the final design to all our diggers – reducing disruption and unlocking major cost savings.



In conversation with...

JOHN PICKERING,
NGN INNOVATION
IMPLEMENTATION MANAGER



How much of a problem do back blades cause the industry?

It's a really big issue, both from a financial and a reputational point of view. Last year, we had several jobs where the cost of additional reinstatement was more than £10,000. And of course, having to return to site and dig up the road again does not endear you to customers or stakeholders.

How did the field trials go?

Really well. They allowed us to make a few important modifications, such as improving the visibility of the protectors, so that they don't present a trip hazard. The original design was also adapted so that it works across more types of mini excavator.

What is the unit cost of the final product?

About £400, which represents tremendous value when you consider that we can save in the region of £300,000 each year by having the protectors on every digger. And the reduction in disruption for our customers makes this a great all round solution.



BENEFITS

- Expected savings of £300k per year – based on fitting the protectors to 80 mini-diggers.
- Fewer customer complaints.
- Improved relationships with key stakeholders such as local authorities.
- A sustainable solution: protectors are made from 80% recycled materials.

SUPPLIER INSIGHT

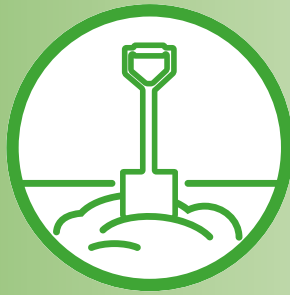
"I'll never forget the day that John from NGN called into our office to see if we could help with the issue of road scarring.

"What followed was an 18 month process of testing and tweaking the back blade protector, and it's great that the product is now ready to hit the streets.

"We're already getting interest from other utility companies, so it does seem to be a product with a wide potential use. It's been a great experience working with NGN."

Lee Hobson, Depot Manager, Chippindale Plant Ltd.





DEVELOPMENT & DEMONSTRATION

Leaving gas with nowhere to hide

PROJECT NAME:
OPTOMOLE



FOCUS
AREA:
ASSET AND
NETWORK
MANAGEMENT

PARTNER
ORGANISATIONS:
EIC, OPTOSCI,
CADENT, WALES
& WEST UTILITIES

NIA FUNDING:
£62,553

Trials are underway of a clever probe that can detect gas in underground telecoms ducts.

The probe is longer and more accurate than anything currently on the market, allowing us to find the gas more quickly and cost effectively.

Hopes are high that it will become an industry game changer as a result of this collaborative project.



PROJECT SUMMARY:

IF THERE IS A LEAK ON OUR NETWORK, GAS CAN OFTEN FIND ITS WAY INTO UNDERGROUND DUCTS USED FOR INTERNET AND TV CABLES.

Being able to take gas readings from ducts helps our engineers to be more clinical in tracking down the source of the leak.

Unfortunately, existing gas probes are not ideal for the job. Their short length means we need to dig lots of exploratory holes to insert them along the length of a duct – a costly and disruptive process.

The OptoMole is a new fibre optic probe

attached to a cable which can be extended up to 100 metres. It can be inserted along the full length of a duct, avoiding the need to dig trial holes.

Unlike current industry models, the new probe also provides instant readings, so that gas can be detected with pinpoint accuracy.

The clever gadget is now being trialled by NGN, alongside Wales & West Utilities and Cadent.



In conversation with...

JOSH HAMPSHIRE, NGN'S CONSTRUCTION SERVICES AREA MANAGER



Why does the product have so much potential, Josh?

The current detectors are hand-held wands about a metre in length, that aren't really designed for this purpose. We have to dig holes along the length of a duct, and drop the probe in.

The new design means we can open a manhole, insert the probe at one end of the duct, and push it right through to the other side.

So that means fewer holes in the highway?

Yes, fewer holes and less traffic disruption delivering greater value for money.

When can we expect to see the OptoMole on the streets?

Our engineers are now putting it through its paces in field trials, once this has been completed we will then be in a position where we can prepare a final report to support a potential business case.



BENEFITS

- Can detect gas in ducts without the need to dig trial holes.
- Minimises disruption for residents, businesses and motorists.
- Helps identify source of gas leaks more quickly.
- The optical sensor presents no spark risk, ensuring safety of the public and engineers.

SUPPLIER INSIGHT

"OptoMole builds on OptoSci's existing technology used to detect methane over long distances in coal mines and service tunnels. To develop OptoMole, we had to convert a system of fixed sensors and a large, office-based control unit into something small, durable and portable. To fit in the confined space of a duct, the sensor had to be miniaturised whilst retaining the quality of light transmission. It also had to withstand mud and water and there could be no electrical components in the sensor because of the risk of igniting gas.

"Trials are at an advanced stage, and it's fantastic to see that OptoMole is performing so well."

Iain Mauchline, Engineering Manager, OptoSci Ltd.





IMPLEMENTATION

Dig up the driveway? No, just put a stopper in it

PROJECT NAME:
ALTERNATIVE ECV
EXCHANGE KIT



FOCUS
AREA:
CUSTOMER SERVICE

PARTNER
ORGANISATIONS:
EIC, ALH SYSTEMS,
WALES & WEST
UTILITIES

NIA FUNDING:
£11,855

Emergency Control Valves (ECVs) are designed to shut off the gas to a property in an emergency – just like a stop tap shuts off the water supply.

From time to time, however, the ECVs themselves can be prone to leaks, and need replacing.

Two NGN colleagues identified the potential for this project. We then worked in collaboration with WWU and the EIC to develop a clever new process to carry out tricky ECV replacement jobs more efficiently – saving time, money and customer headaches.



PROJECT SUMMARY:

TO REPLACE AN ECV SAFELY, THE GAS TO THE PROPERTY NEEDS TO BE SWITCHED OFF AT THE OUTSIDE METER.

However, when the meter is partially buried, an engineering team has to dig up a customer's garden or driveway to isolate the supply. Needless to say, this is a disruptive and costly process.

Two NGN colleagues, supported by the Energy Innovation Centre and Wales & West Utilities, have developed a stopper that can be threaded into the service pipe to the home and then

inflated – capping off the gas without the need to dig down. Crucially, the stopper can be inserted even when the meter is buried.

The job can be carried out by a single engineer, reducing the time that the customer is without gas and saving money.

Having performed well in trials, the alternative ECV exchange kit has now been implemented at NGN as business as usual.



In conversation with...

BRIAN BENNETT,
NGN EMERGENCY
SERVICES TECHNICIAN



Why can ECV jobs be so problematic?

An engineer going out to a gas escape often won't know what type of meter box they will encounter until they get there. If the box is buried, the engineer usually needs to call in a second crew to dig down to isolate the supply. This obviously takes time, and increases customer disruption, so we needed an answer.

Who came up with the solution of an inflatable stopper?

My colleague, Mark English, an emergency response engineer at NGN, came up with the idea, and I worked with him to develop it. We're both delighted that the device is working so well. It's already proved its worth on more than 20 jobs.

Will it be rolled out to the rest of the network?

Yes, that's the intention. We have about 200 of these jobs each year, so that's a saving of £60,000. And of course, we're reducing inconvenience for our customers. It's good news all round.



200 JOBS

PER YEAR INVOLVE BURIED GAS METERS.

£60,000

PER YEAR CAN BE SAVED BY NEW INFLATABLE STOPPERS.

4 HOURS

TIME SAVED PER JOB.

BENEFITS

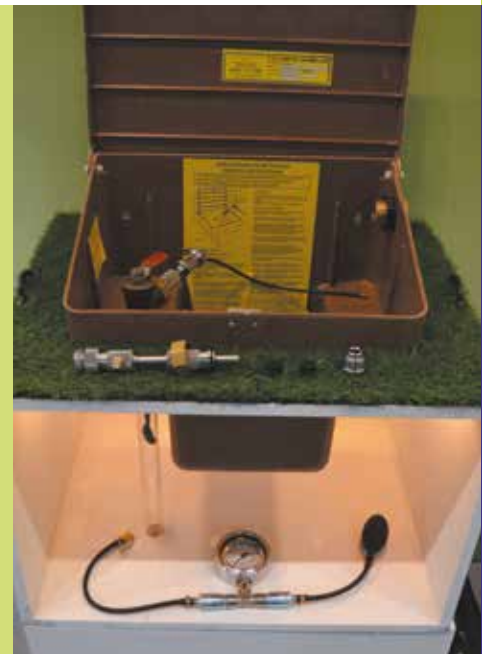
- Prevents the need to dig up a customer's property – even when the gas meter is buried.
- Reduces duration of each job by around 4 hours.
- Saves £300 per job – that's around £60,000 per year.
- Jobs can be performed by a single engineer, without the need to bring in a second crew.

SUPPLIER INSIGHT

"NGN came to us with a great suggestion for an inflatable stopper, and we are thrilled to see it now being used on live jobs.

"Semi-concealed meters tend to have service pipes which run at an angle. The great advantage of an inflatable stopper is that it can fit round the corner, without the need to dig."

Andy Vine, ALH Systems





DEVELOPMENT

Wearing **safety** on our sleeves

PROJECT NAME:
HEALTH & SAFETY
MONITOR



FOCUS
AREA:
SAFETY AND
ENVIRONMENT

PARTNER
ORGANISATIONS:
EIC, J3llyh34d
1ndu5tr135

NIA FUNDING:
£193,333

Exposure to noise and vibrations from handheld tools such as road breakers and rock drills is a common cause of industrial deafness and Hand Arm Vibration Syndrome (HAVS).

The exposure to extreme physical environments is an element that will also be assessed through this project, making sure the health, safety and welfare of network operators is effectively managed to

ensure consistent, efficient delivery of service for our customers. We want to protect the long-term health of all our colleagues, so are working with a specialist supplier to develop a bespoke health monitor.

The wearable device will measure exposure to vibrations, noise and heat, and transmit data to a central hub – ensuring operational colleagues stay within safe limits.

PROJECT SUMMARY:

WEARABLE HEALTH MONITORS MAY BE FASHIONABLE AMONG GENERAL CONSUMERS, BUT THE MARKET FOR SOPHISTICATED INDUSTRIAL VERSIONS IS STILL IN ITS INFANCY.

Traditional methods to monitor exposure to vibration and noise rely on workers filling in forms to record their hours. However, advances in technology mean wearable monitors, providing real-time data, are now a possibility.

We're working with a specialist supplier to adapt sensor technology already in use by the fire service, so that we can monitor exposure to noise and vibrations, as well as measuring body heat.

The wrist-worn device will work in tandem with an engineer's mobile phone to transmit data back to base for review.

If trials prove successful, we are hoping the device will ultimately become a standard-issue piece of kit, helping to protect the long-term health of our colleagues.



In conversation with...

DEREK FIELD, NGN'S HEALTH, SAFETY AND ENVIRONMENT COMPLIANCE MANAGER



How much of an industry problem are conditions such as HAVS and industrial deafness?

Unfortunately, they are a very common issue. Latest data from the Health and Safety Executive reveals that nearly two million people are at risk from HAVS, and once the damage is done, it is permanent. Last year, 20,000 UK workers suffered noise induced hearing loss.

Why will this new monitor also measure body temperature?

We tend to see a spike in workplace accidents during the warmer summer months, and our suspicion is that dehydration could be a contributing factor. Body temperature is therefore a really important metric for us.

When can we see the prototype monitor being tested by NGN colleagues?

We're hoping to begin trials in earnest this autumn. We think this project has massive potential, and are looking forward to putting the device through its paces.

2 MILLION

UK WORKERS ARE AT RISK FROM HAVS.

20,000

UK WORKERS SUFFERED NOISE INDUCED HEARING LOSS IN 2016.



BENEFITS

- Accurate, real-time data on exposure to noise and vibration.
- Will help protect colleagues against common industrial and occupational diseases.
- Making SMART use of sensor technology to help drive efficiency and protect the health and welfare of our colleagues.

SUPPLIER INSIGHT



"We're very excited to be working with NGN on such an important project to safeguard the long-term health of workers."

"We have a long history of working with emergency services, defence and aerospace industries, and it's great to be able to apply this expertise to the utilities sector."

"This will be an extremely sophisticated wrist-worn device, packed with latest technology, to provide accurate real-time measurements."

Simon Twigg, Managing Director, J3llyh34d.



RESEARCH

Siloxanes: setting the standard

PROJECT NAME:
SILOXANE IMPACT
STUDY



FOCUS
AREA:

SAFETY AND
ENVIRONMENT

PARTNER
ORGANISATIONS:
DNVGL, CADENT,
SGN

NIA FUNDING:
£50,260

Siloxanes are silicon-based chemicals that can be found in biomethane.

If siloxane levels are too high, household appliances such as boilers can burn inefficiently, presenting a health risk.

There had never been a rigorous, scientific UK-based study into safe

limits for siloxane – something that needed to be remedied.

Alongside other GDNs we have collaborated and worked with a specialist supplier to carry out a year-long study, resulting in a recommended safe limit that we hope will become a new industry standard.

PROJECT SUMMARY:

BIOMETHANE IS A GREEN, SUSTAINABLE GAS DERIVED FROM WASTE PRODUCTS. IT CAN BE TRANSPORTED TO HOMES AND BUSINESSES USING OUR EXISTING GAS NETWORK.

When biomethane is manufactured from certain raw materials, such as food waste and sewage, siloxane can be present.

Too much siloxane, and gas boilers and fires can start to burn inefficiently. This can result in the creation of the poisonous gas Carbon Monoxide (CO).

To determine a safe siloxane limit, we went to some extraordinary lengths! Several different models of gas boilers and household gas fires

were run 24/7 in a warehouse for a year, with differing quantities of siloxane put through them.

The result was a new recommended safe limit: 0.23 mg of siloxane per cubic meter of gas. Interestingly, the figure we arrived at is lower than the current European limit.

We are now sharing results with the wider industry, and hope that 0.23mg will become the new recognised UK standard.



In conversation with...

BEN HANLEY,
NGN LEAD ENGINEER



Now you have determined a safe siloxane level, what happens next?

We're sharing the results with the wider industry, and ultimately, would like to see it become the new UK standard. Biomethane production continues to grow, so it's important that there is clarity and consistency on this issue.

What are the implications for biomethane producers?

It could mean that some producers need to invest in more sensitive measuring equipment, and carry out additional 'scrubbing' to remove additional siloxane.

Here in the North of England, all biomethane plants connected to our gas network generate next to no siloxane, as our requirements have always been very demanding on this point. So there should be no practical implications for these producers.

0.23mg Si/m³n

THE RECOMMENDED SILOXANE LIMIT,
BASED ON OUR YEAR-LONG STUDY.



BENEFITS

- Rigorous, scientific study to determine safe siloxane limits.
- Provides vital guidance for the industry, as the number of biomethane grid injection projects increases.
- Keeps our customers safe and sound, by guarding against CO risk.



Revisiting last year's projects

Many of the NIA funded projects featured in our 2016 innovation report are going from strength to strength – delivering major cost savings and making life easier for our customers.

Here are some of the highlights:

Stub end abandonment

A new technique to cap off small diameter gas pipes, without leaving a short 'stub' of live pipe, is now being used extensively across our network.

The technique, which sees a foam bag inserted into the pipe, prevents the need to have to dig up these stubs.

In 2016/17, more than 150 jobs were carried out using the technique, saving more than £667,000.

Compressed Natural Gas (CNG) vehicles

Over the past year we have been putting two CNG powered work vans through their paces, to compare their performance to our diesel vans.

The gas powered vans have been performing well, and we will be publishing a final report this summer, along with recommendations for the next steps in CNG vehicles within our fleet.

Separately, we are working with Leeds City Council on a project to build the UK's largest CNG refuelling station – a site for which has now been selected.

Water ingress kit

A combined CCTV camera and pump, small enough to fit inside gas pipes, is proving an effective tool to tackle water ingress.

The equipment was used successfully during a localised incident in the Quayside area of Newcastle in early 2017, when a burst water main flooded our network and caused 285 properties to lose gas supply.

The combined camera and pump helped us locate and remove pockets of water in the pipes without the need to dig exploratory holes – allowing us to restore supplies more quickly.

Our own Rob Arthur, network technician, developed the prototype and is proud as punch to see his idea now being used on the network.

A nose for success

We've recently completed a fascinating trial to see if dogs' exceptional sense of smell can be used to sniff out gas leaks.

Trained sniffer dogs were able to locate leaks in real-life situations with uncanny accuracy.

We are looking to progress this into a phase three where we plan to identify where exactly we could use this and the commercial viability of introducing the new technique.

Pre-rolled pipe

We're big fans of a pipe renewal process known as Subline Structural, in which a new plastic pipe is reduced in size so it can be inserted into an old pipe, then expanded to form a tight lining.

The traditional technique, which involves bringing a rig to site to squeeze pipes into place, is expensive, so we've been working with our supplier, Radius Systems, to develop pre-rolled pipe.

Initial field trials of the pre-rolled pipe have been completed and a bespoke trailer for the pipe has also been developed. Further tests, to examine the impact of changing weather conditions on the molecular structure of the pipe, are underway.

Motoring with McLaren

We've continued to work closely with Formula 1 icons McLaren, and KPMG, one of the world's biggest auditing firms, to improve our approach to asset management and make smarter network investment decisions.

Tapping into McLaren's world beating expertise in performance analytics has helped us revise our investment model for mains repairs, savings of £62.5k per year up until the end of RIIO GD-1.

Spending wisely

Our Network Innovation Allowance (NIA) funding is aligned to our Innovation Strategy. Below are the key strategic business objectives that stimulate our appetite to deliver improvement through innovation:

- Collaborate with innovative partners
- Be efficient, effective and deliver value for money
- Deliver a portfolio that makes us reliable and safe
- Optimise innovation investment to deliver benefit to our customers
- Be socially and environmentally responsible

Our NIA funding is focused on four core areas

This shows how what we've invested in each area is driving improvement towards achieving the key SBOs



Asset and network management



Safety and environment

Recommended spend for 2016/17:	35%
Actual spend:	38%
Projected spend for 2017/18:	35%

Recommended spend for 2016/17:	20%
Actual spend:	14%
Projected spend for 2017/18:	20%



Customer service



Future role of gas

Recommended spend for 2016/17:	10%
Actual spend:	11%
Projected spend for 2017/18:	10%

Recommended spend for 2016/17:	35%
Actual spend:	37%
Projected spend for 2017/18:	35%