



# Annual Summary

Innovation Summary 2020/21

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Gas Transmission

nationalgrid

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# Welcome to our Annual Summary

For 2020/21

**During 2020/21, we continued focusing on innovation activities that will help achieve the Government's Net Zero carbon emissions target by 2050. This included closing out our projects from RIIO-1, to ensure their effective delivery across the business and maximise their value, in preparation for the start of RIIO-2. Throughout the year, we undertook 31 NIA projects, and spent £4.9m, with only two projects being carried forward into 2021/22 due to Covid-19 restrictions.**

Innovation is one of National Grid Gas Transmission's stakeholder priorities, supporting our business to deliver gas reliably and safely to our customers today. We know the future of our network depends on finding a suitable 'green' alternative to natural gas, that will continue to deliver heat and power to homes, businesses and industry. That's why innovation activities that focus on achieving Net Zero are central to our work.

Throughout RIIO-2, we'll be focusing on developing a greater understanding of the potential future of our network, looking specifically at the role hydrogen could play in a decarbonised gas industry. Innovation is at the heart of this challenge and the three RIIO-2 innovation themes; Fit for the Future, Ready for Decarbonisation and Decarbonised Energy System focus not only on improving the efficiency of our day-to-day activities, but also on considering the future technologies that could be used to help us meet our objectives.

We've already made a start on our hydrogen journey, with a series of feasibility studies carried out during 2019/20. Following this, in November 2020, we were awarded £9.7m of funding, through the Network Innovation Competition, to build an offline hydrogen test facility and begin hydrogen testing, as part of the first phase of the FutureGrid programme.

Decarbonising the gas industry is a significant but exciting challenge. Our innovation activities will continue to help our business make the most of the opportunities available to us, and make changes that benefit our customers. I look forward to seeing how our plans develop.

**Mark Lissimore**
**Head of Engineering & Asset Management**

**"Throughout RIIO-2, we'll be focusing on developing a greater understanding of the potential future of our network, looking specifically at the role hydrogen could play in a decarbonised gas industry. Innovation is at the heart of this challenge."**

# 2020/21 in numbers

**31**
NIA projects run this year

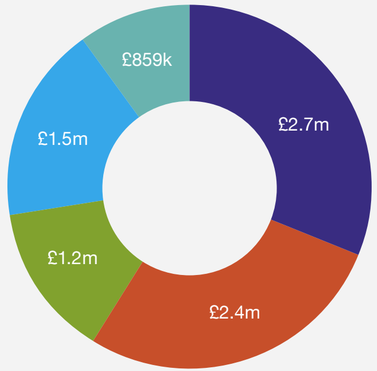
**£4.9m**
spent this year

**11**
collaborative projects

**35**
third parties involved

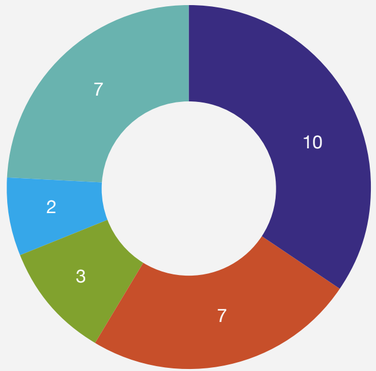
**96**
business experts involved

## Total spend per roadmap portfolio




- Asset development for risk mitigation
- Automation and measurement
- Digital systems and simulation
- Materials and processing
- Business process and management

## Number of projects per roadmap portfolio




- Asset development for risk mitigation
- Automation and measurement
- Digital systems and simulation
- Materials and processing
- Business process and management

**£27.7m**
amount of benefits realised

**£4.7m**
amount of PEA spend

**6:1**
return on investment

**11**
projects originated from another project

**8**
projects focused on hydrogen

**1**
project outcome not as expected

# Delivering our innovation vision

Our innovation strategy, developed in November 2019, consists of three RIIO-2 innovation themes: Fit for the Future, Ready for Decarbonisation and Decarbonised Energy System. Collectively, these themes shape the activities that will help us prepare for a Net Zero future.

Fit for the Future focuses on extending the lifetime of the gas transmission network and enabling its use in a decarbonised future. Ready for Decarbonisation looks at the assets and technologies we'll need for the integration of a blended mix of 'green' gases into the National Transmission System (NTS). And Decarbonised Energy System is about developing the systems and processes we'll need to run a Net Zero gas network.

These themes provide a good roadmap of projects through to 2050. Additionally, building technical capability within our innovation team will be vital to understanding the rapidly developing technological landscape across the globe.

To support the RIIO-2 innovation strategy we developed last year, we've established five innovation technology portfolios, each with its own technology roadmap and specific project pipeline. These technology portfolios are aligned to all three RIIO-2 innovation themes and set the direction for innovation projects we'll deliver throughout RIIO-2.

**The five innovation technology portfolios are:**

- Asset development for risk mitigation
- Automation and measurement
- Digital systems and simulation
- Materials and processing
- Business process and management

We've developed these portfolios following extensive engagement with teams across National Grid Gas Transmission, so we can make sure our future innovation activities align with our wider business priorities and will deliver value.

A core component of our overall innovation portfolio looks at increasing the efficiency of our day-to-day maintenance and operational activities, using innovative tools and methods. Alongside these activities, we have increasingly focused on innovation projects that will help us reach the Government's target of Net Zero carbon emissions by 2050. All five innovation technology portfolios focus on Net Zero in some way, across their project pipelines.

Primarily, these Net Zero projects focus on hydrogen. They build on the feasibility studies we carried out in 2019/20 to examine the suitability of hydrogen as a cleaner alternative to natural gas, and identify what changes may be needed across Gas Transmission to accommodate this.

Throughout the year, collaboration has been an important part of our way of working, so we can maximise understanding and value. Our hydrogen projects are notable examples, with several carried out in collaboration with other gas networks.

As we progress through RIIO-2, we will engage with our stakeholders and potential project partners to further develop our technology portfolios, and deliver innovation projects that focus on the key challenges we face.

# Asset development for risk mitigation

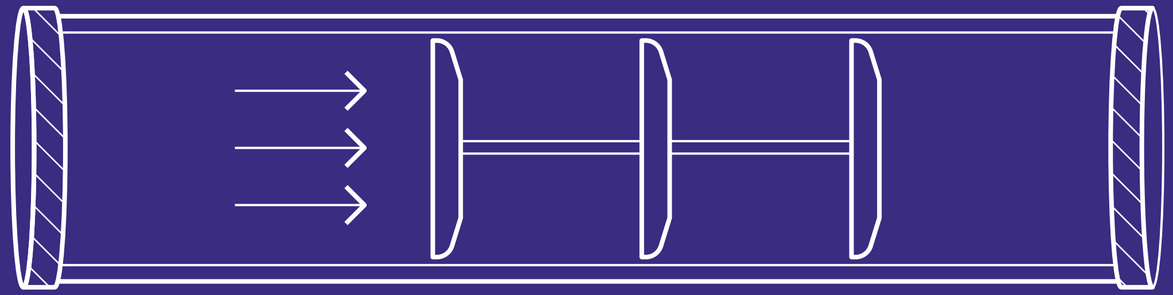
**Asset development for risk mitigation focuses on developing our understanding of our current asset landscape and its capability with future Net Zero gases.**

This includes developing solutions for compression, storage and capture of hydrogen.

This innovation technology portfolio aims to make sure our standards, policies and procedures are suitable for the energy transition. It encompasses projects that will ensure our assets operate efficiently during the transition.

"We know we will not be able to replace the whole National Transmission System with a new network suitable for the introduction of hydrogen. We can, however, begin to prepare for this transition using new innovative tools, techniques and technologies on our existing network that include repair, risk management and resilience to Net Zero gas opportunities."

**Steve Johnstone,**
Senior Innovation Specialist



## In Line Flow Stop

NIA_NGGT0167

Before any work can be carried out on the National Transmission System (NTS), network isolations are needed to stop the flow of gas to specific areas and make it safe for work to begin.

Currently, these isolations involve using the existing valves present on the network.

This often results in large areas of pipeline needing to be isolated to accommodate other operational requirements in the area. Such large isolations result in greater quantities of gas being released or vented, so the work can be carried out.

The process is further complicated as all isolations are allocated by the Gas Network Control Centre (GNCC), according to network availability and the impact on the wider NTS. This sometimes results in delays if the required isolations aren't possible. Our In line Flow Stop project looks at ways to minimise these issues by assessing alternative solutions to isolating and venting large pipeline sections.

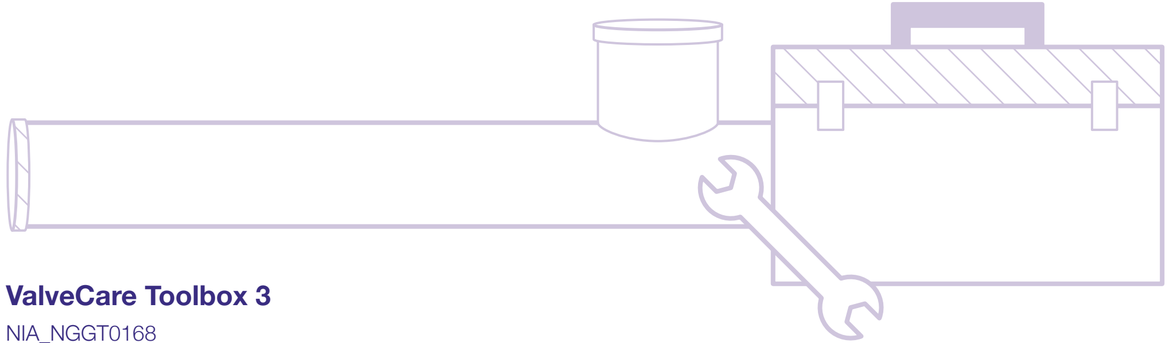
An in line isolation tool can be used to stop gas flow to specific sections of pipeline. It's inserted into the pipework via a pipeline inspection gauge (PIG) trap and is positioned by regulating the flow of gas in the pipeline. Once in position, grips are engaged on the internal pipe wall to prevent the tool from dislodging, creating a 'plug' in the pipeline.

As part of the project, Pipeline Integrity Engineers Ltd (PIE) completed a series of studies that looked at the current range of in line inspection tools and their suitability for use on our pipelines. They also assessed the potential impact using the tool would have on our policies and procedures. As part of this work, PIE liaised with two suppliers on our behalf: STATS Group and TD Williamson.

After considering outcomes from this project, we believe using in line isolation tools on the NTS could reduce both the length of pipeline isolations and the volume of gas vented into the atmosphere. It could result in both environmental and financial savings of around 59.75 tonnes of gas and £32,100 per use of the tool.

We're now planning to conduct a series of field trials, as part of a follow-up project. These trials will be used to develop any requirements for our policy and procedure documents and to identify recommendations for future uses of the technology.





## ValveCare Toolbox 3

NIA_NGGT0168

Our ValveCare Toolbox 3 project aims to find a more efficient way to identify and fix faulty underground valves on our transmission system.

Initially, we were looking for a non-intrusive method of checking the condition of the valves and cleaning and protecting them, without the need for excavation – which is our current approach. Since then, the project has made substantial progress, with three phases now completed.

Phase one involved developing the concepts behind the toolbox and undertaking feasibility studies to determine their suitability for use on the high-pressure gas national transmission system assets.

Phase two moved on to conducting a series of validation exercises, including workshops and live testing of the key concepts.

The solution involves using the existing opening in the top of the valve stem extension to gain access, then using a 'dipstick' to detect the presence of water within the valve. A pump drains this water, before an inspection of the base of the valve checks for corrosion. Specific tools within the toolbox are used to clean the inside of the buried stem extension, including applying a protective coating which protects it from future damage.

During phase three, which has just concluded, we carried out further site trials. Using the findings from both phase two and the phase three trials, we refined the tools, method and technology to make sure the solution is fit for purpose and ready for day-to-day use on the network.

The ValveCare Toolbox 3 solution will enable us to monitor the condition of valves on the network more easily and repair them using a much less intrusive method.

There are several valve replacements planned throughout the RIIO-2 period. Taking into consideration the cost of just 20 per cent of these, using the ValveCare Toolbox 3 approach could result in a potential cost saving of around £3m.

What's more, the solution allows for more targeted planned maintenance using a risk-based approach, ultimately extending the life of the NTS.

Following the success of phase three, we're now reviewing our existing maintenance policy documents, and updating them so we can use the ValveCare Toolbox 3 across our business. We're also developing comprehensive training modules for our operational teams, so they can begin using the toolbox to inspect and repair valves across our sites.


**"Developing the correct technical standards are an important part of paving the way for the UK gas industry's future transition to hydrogen."**

## HyTechnical

NIA_SGN_0165

The ambition to decarbonise the energy industry in the UK has led to major interest in initiatives that look to repurpose existing gas infrastructure to transport hydrogen.

Before this can happen, specific industry standards need to be developed to ensure a consistent approach, and establish safe and secure best practice across all networks.

Such standards are already in place for natural gas, and are used every day as part of the operation and maintenance of the existing National Transmission System (NTS) and other gas networks. These standards are published and managed by the Institution of Gas Engineers & Managers (IGEM).

The HyTechnical project, which is being led by SGN with support from National Grid, Cadent, Wales & West Utilities, Northern Gas Networks and IGEM, has involved assessing the current standards and identifying any changes that are needed to make them relevant to hydrogen.

As part of the work, the project team has completed a literature review, carried out impact assessments, created a risk register and held industry discussions with subject matter experts.

Along with reviewing standards for repurposing gas infrastructure, the project has also been identifying the requirements for constructing new pipelines and assets that can be used to transport hydrogen. This work is a major enabler for the emerging hydrogen economy. Developing the correct technical standards is an important part of paving the way for the UK gas industry's future transition to hydrogen.

Following the work that has been carried out to date, elements of the project will be carried into the RIIO-2 portfolio. The project team will be agreeing the process for updating the required standards, as well as creating a roadmap for any other relevant IGEM standards to be updated, to ensure their hydrogen compatibility.



# CH4RGE

## CH4RGE – Methane Reduction from Gas Equipment

NIA_NGGT0164

Across the National Transmission System (NTS), gas losses occur for various reasons, including planned and emergency venting, or through unforeseen leaks. These losses are classified as fugitive or venting emissions.

Reducing these emissions and paving the way for a carbon-free network is an important aspect of the work we're doing to help meet the UK's Net Zero target.

Our CH4RGE project (Methane Reduction from Gas Equipment) is exploring the potential use of innovative technologies to reduce methane emissions on UK NTS sites.

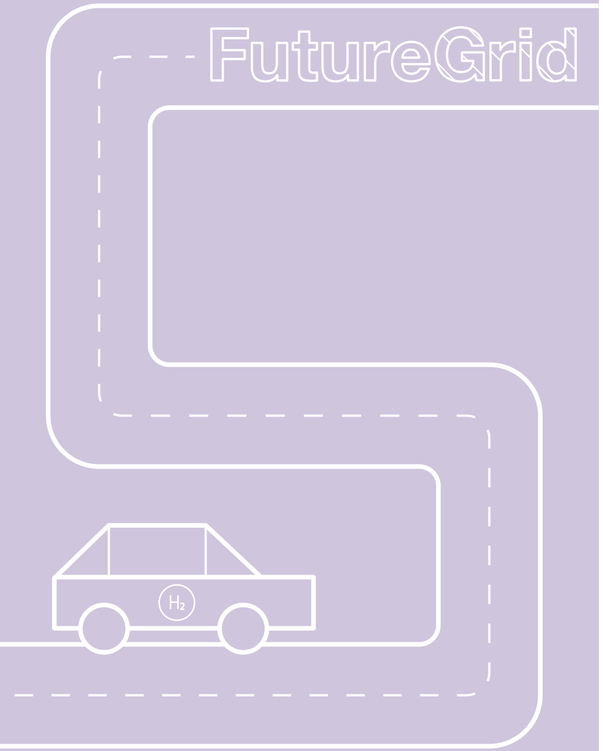
Working with Project Environmental Solutions Ltd (PESL), we've explored a range of potential technology options that could be used to reduce vented emissions from all gas equipment and reviewed which of these could be a viable solution if implemented across the NTS.

The solutions we're exploring, consider emissions from modern dry seal gas turbines and electric drives only. Initial calculations suggest that an investment of less than £10m could provide a technology solution for 10 frequently used NTS sites, where these turbines are already in use.

In addition, using a venting calculator tool, we've looked at the potential cost savings that each solution could realise – based on a value of £45 per tonne of carbon, which is the figure we currently use when making investment decisions and a cost that is likely to increase over time. Deploying such a solution could result in an emissions reduction of approximately 80 per cent of the vented emissions from each site within the project scope or 750,000 tonnes of C02 equivalent, over a 20-year period.

Following this study, we've secured funding for phase two of the project. This involves conducting a further study on the viable solutions identified to date, with the potential for future phases that will look to install the chosen solution at a pilot site.

**"Reducing fugitive emissions and paving the way for a carbon-free network is an important aspect of the work we're doing to help meet the UK's Net Zero target."**




## Roadmap to FutureGrid

NIA_NGGT0166

In November 2020, we were awarded £9.7m of funding through the Network Innovation Competition (NIC), for the first phase of our FutureGrid programme. This looks at the suitability of the National Transmission System (NTS) to carry hydrogen.

Phase one of FutureGrid looks to build a full-scale offline hydrogen test facility and begin initial hydrogen testing, in a controlled environment, with no risk to the safety and reliability of the existing transmission network.

The Roadmap to FutureGrid project focused on the preparatory work needed to support the FutureGrid NIC project. Working with DNV, the principal contractor for FutureGrid, we've focused on three key elements: the detailed facility design, the master hydrogen testing plan, and the materials testing.

Considering the need to safely construct and operate the test facility, we've designed a test network containing decommissioned assets previously found on the NTS. This design includes any additional requirements that will be needed to deliver the master hydrogen testing plan. A process flow model will be used to ensure the design achieves the necessary NTS pressures, flows and temperatures.

To demonstrate the suitability of the NTS to carry hydrogen and natural gas blends, we need to gather relevant evidence. The master hydrogen testing plan sets out which tests and experiments we'll need to achieve this.

Materials testing will involve a series of laboratory-scale tests of different steel grades when exposed to hydrogen. In this case, tests will be conducted with both a blend of 20 per cent hydrogen and 80 per cent natural gas, as well as 100 per cent hydrogen. These studies look at fracture toughness and fatigue crack growth rates in the steel pipes, as a result of the hydrogen exposure.

All three elements of the Roadmap to FutureGrid project will allow for testing of critical NTS assets, including entry and exit points, filters and safety critical components such as valves and meters.

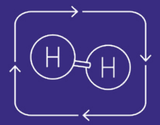
The detailed planning and scoping activities carried out as part of this project will support the delivery of our FutureGrid programme, helping improve our understanding of how hydrogen could be used as a 'greener' alternative to natural gas.



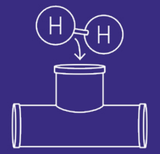
nationalgrid DNV HSE Northern Gas Networks fluxys Durham University

# FutureGrid

An ambitious programme to build a hydrogen test facility from decommissioned assets at DNV's facility in Cumbria to demonstrate the National Transmission System (NTS) can transport hydrogen. Testing will be completed in two parts:




**Offline Hydrogen Test Facility**
NTS assets of different types, sizes, and material grades will be tested with 2, 20 & 100% hydrogen




**Standalone Hydrogen Test Modules**
Standalone hydrogen test modules will provide key data required to feed into the main facility

This will help us understand how hydrogen interacts with our assets, so that we can develop the appropriate safety standards required to operate our network.

Construction is now underway with testing on the main Offline Hydrogen Test Facility set to begin mid 2022.

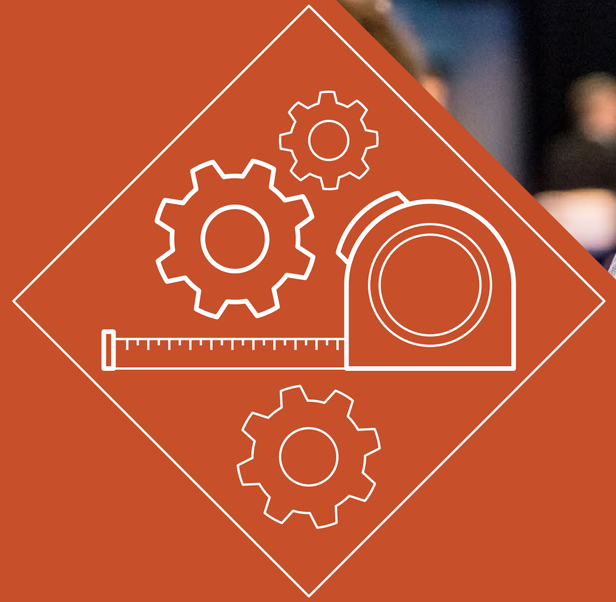
**www.nationalgrid.com/FutureGrid**

# Automation and measurement

**Automation and measurement focuses on all sensing systems within the gas network, as well as assessment methodologies such as the use of pipeline inspection gauges and robotic assessments.**

This portfolio supports the roll out and use of the GRAID (Gas Robotic Agile Inspection Device) system developed in RIIO-1, and looks to further develop this capability with improved autonomy and sensing.

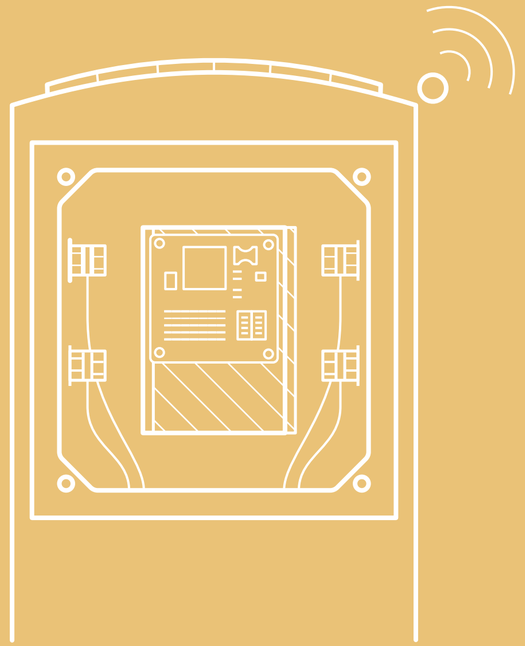
Measurement systems for the energy transition will be key to managing multi gas flows and understanding what is being supplied to customers.




"Innovation is key as we move towards Net Zero and the decarbonisation of the gas industry. Projects within the Automation and Measurement roadmap theme have the potential to help the industry remove emissions and monitor the network like never before, using technology such as Internet of Things (IoT) and machine learning. With this knowledge we can maintain our assets more effectively and make improved asset health decisions as we move into the next chapter of the gas industry."

**David Hardman,**
Innovation Specialist

"The device is easy to fit, simple to use, and fits onto the existing box bases and posts found across the network."



## Combined Cathodic Protection and Pressure (CCP&P)

NIA_NGGT0158

On the National Transmission System (NTS), cathodic protection (CP) and pressure (P) sensors are used to protect our pipelines from corrosion.

These sensors are measured using separate units, which require different installations and maintenance regimes, as well as different batteries and communication systems, where they are remotely monitored.

The current sensors use specialist batteries that can only be sourced and replaced by the manufacturer, a process which is time consuming and expensive. Alongside this, they also use 2G communications, which will likely become inoperable soon.

The Combined Cathodic Protection and Pressure (CCP&P) project trialled the Smart Pipeline Remote Terminal (SPIRET) sensor, which combines cathodic protection and nitrogen pressure monitoring in a single device.

The device is easy to fit, simple to use, and fits onto the existing box bases and posts found across the network. The system also uses newer communications software, which provides future-proofed capability. We've installed the SPIRET sensors at two NTS sites so far. Three units are in place at Wisbech and one has been installed at Loughborough. Two of these devices use off-the-shelf batteries that can be changed by our technicians on site, while the other two use solar power. This has the potential to extend the battery life beyond the typical five-year period.

Technicians have told us that the new sensors are easier to use and will require less operational maintenance time spent changing the batteries. Alongside this, they also provide a more cost-effective method of remote monitoring.

The data gathered by the sensors is now ready to be integrated into our systems, and our project team will be looking at any further testing needed before the sensors can be rolled out to other NTS sites.



## Analytical approach for vegetation management

NIA_NGGT0169

The National Transmission System (NTS) is made up of approximately 7,650km of buried high-pressure pipelines used to transport natural gas throughout the UK.

Most of these pipelines are laid in rural areas, with strict controls on what activities can take place on the land above and adjacent to them. These controls include limitations on which species of shrubs and trees can be planted in the pipeline areas.

While we can control the planting activities in the area, there are instances where shrubs and trees can 'self-seed' and encroach on the pipeline from the surrounding areas.

We carry out regular inspections along our pipeline routes, including aerial surveillance and 'line-walking' patrols to capture a range of information, including potential threats to the pipelines. However, the plant growth data we've captured to date has been inconsistent.

We already have access to high resolution aerial photography. However, there is currently no method to use this resource to improve the quality of plant growth data. This project looks at the ways we could carry out a network-wide assessment using existing aerial imagery.

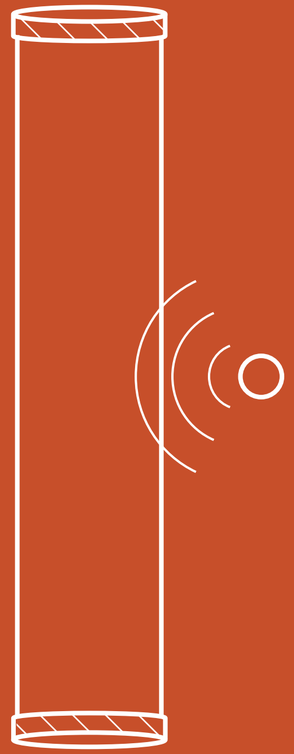
Tests and activities during the project included mapping vegetation locations, assessing the suitability of images for 3D modelling and taking more images with newer cameras.

We found that the existing images taken as part of the aerial surveillance activities can be used to identify vegetation location and species, but not to accurately calculate volume. Another limitation of the current process is that coverage in areas with dense vegetation is lacking, and the images are lower resolution.

For future surveys, with the vegetation application in mind, we can increase the data capture to include multi-directional imagery and focus on areas of potential occlusion. These known locations can then be built into the flight plan for future surveys. Once we've captured the data, we can use the images to determine areas with vegetation issues, which can be generated into 3D models to calculate volumes.

Alongside this, the aerial imagery lends itself to other applications such as Aerial Marker surveys, as all aerial markers should be visible on the images. Using a set of known locations, we can generate a GIS baseline layer of existing, missing and damaged aerial markers, and check future surveys against this. We'll be able to colour code the results to show confirmed, missing and damaged markers.

**"Tests and activities during the project included mapping vegetation locations, assessing the suitability of images for 3D modelling and taking more images with newer cameras."**



## Monitoring of Real-Time Fugitive Emissions (MoRFE)

NIA_NGGT0137

Following the successful work undertaken in 2019/20, we've further developed our MoRFE project (Monitoring of Real-Time Fugitive Emissions) this year.

In collaboration with the National Physical Laboratory (NPL), we've been looking at the development of a cost-effective continuous fugitive emission detection system (FEDS).

Fugitive emissions – unplanned gas losses that occur on the National Transmission System – are becoming an increasing focus for us. The MoRFE project is looking at ways to identify losses happening across the network, by designing and testing a low-cost portable monitoring system that can detect emissions in real-time.

Following tests at Bishop Auckland and Cambridge Compressor Stations, as well as at Bacton Gas Terminal, we've focused on further improving and refining the FEDS developed last year.

The system will generate a heatmap showing the likely source of fugitive emissions within the area being monitored. It can also provide an estimate for the total fugitive emission rate for a specific site.

We'll use this type of monitoring system to support our current leak detection and repair (LDAR) survey process, which we carry out once every four years at each of our sites.

The data generated through this combined process will improve the visibility of fugitive emissions and allow for more targeted leak detection, due to the continuous monitoring capability. The process will also allow our operational teams to carry out emissions-related maintenance on areas and assets that we know have the highest emissions.

While the FEDS system can identify the likely source areas of fugitive emissions, it can't identify the specific asset responsible for the leak. We're looking at combining the FEDS system with optical gas imaging (OGI), which can be used for this purpose.

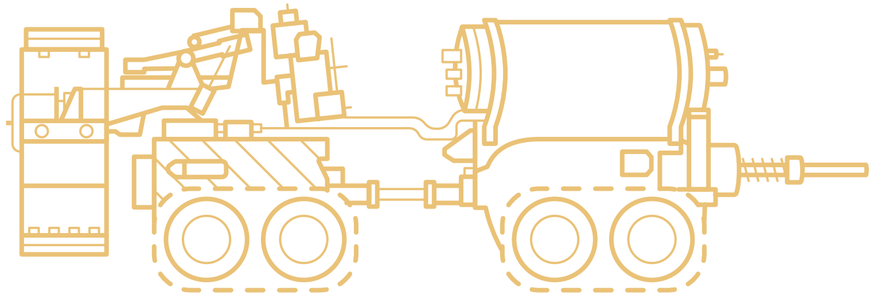
A selection of OGI cameras have been trialled in the field, to test their ability to identify fugitive emissions typical of gas transmission assets. We've built a test rig from redundant assets so that we can test the OGI and other fugitive emission technologies in future.

The original cost benefit associated with the project was based on a figure of 286 tonnes of methane – the estimated amount of annual fugitive emissions identified through the LDAR survey process. This figure represents a controllable emission cost of around £487,000 annually, using 2018 prices.

Following the latest work of the MoRFE project, we're operating the FEDS system at Bacton Gas Terminal for an additional six months from April 2021. We're adopting the outputs from the monitoring system into our leak detection and repair processes, so we can make sure emissions-related maintenance work is focused on higher emissions areas.

We've committed to reducing our methane emissions throughout the RIIO-2 regulatory period. Implementing continuous fugitive emissions monitoring, such as that developed through the MoRFE project, will help us to achieve this.





**"The GRAID ART project built on the foundations laid by Project GRAID, by looking at the ways acoustic resonance technology (ART) could be used to improve the data collected."**

## GRAID ART

NIA_NGGT0145

Using Network Innovation Competition (NIC) funding, Project GRAID (Gas Robotic Agile Inspection Device) successfully designed, built and tested a robotic platform capable of operating within the live environments of our above ground installations (AGIs).

Online and offline testing demonstrated the platform could access harder to reach areas of an AGI, to collect reliable data on the wall thickness from inside the pipe with active gas pressure and flow.

The GRAID ART project built on the foundations laid by Project GRAID, by looking at the ways acoustic resonance technology (ART) could be used to improve the data collected. The project focused on designing, building and testing ART, on top of the original GRAID platform.

The original design uses electromagnetic acoustic transducers (EMAT), which meant data collection was slow, as it needed to contact the pipe wall before sending a signal. Using ART increases the overall quantity and quality of the returned data, as well as increasing the speed of inspection and improving confidence in the condition model that is generated.

Throughout the project, we carried out a series of lab tests and feasibility studies to understand how ART could be used. We also assessed whether the technology would work on coal tar enamel (CTE) coated pipes, which are common on the NTS.

Following this, a new ART sensor arm was fitted to the existing platform, ready for factory acceptance testing.

Due to the impacts of Covid-19, the testing phase of GRAID ART was delayed, so work on the project is still underway. Over the next few months, we'll be carrying out offline trials at DNV's research facility at RAF Spadeadam, to test the sensors on CTE coated pipes.

After this, GRAID will be available to use as part of our business-as-usual inspection activities. We're aiming to carry out 20 inspections throughout RIIO-2, with construction of the necessary connection points due to begin in 2022.

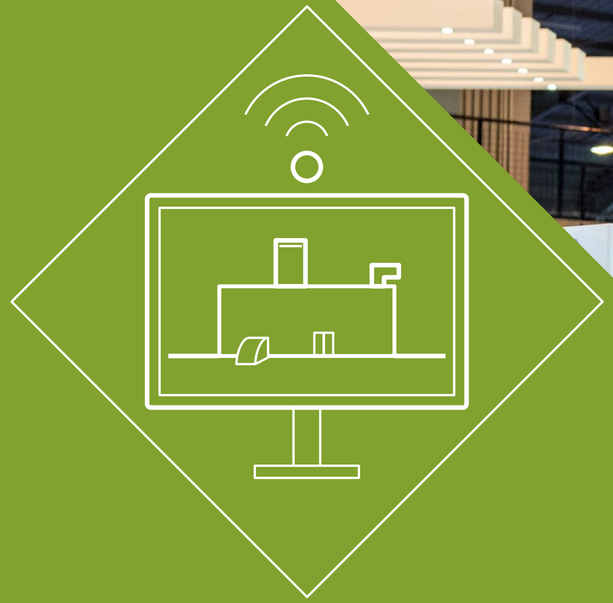
If the ART system is used across these 20 sites, it could save up to £9.2 million, and cut project time from 11 weeks to three days, when compared with using EMAT.

# Digital systems and simulation

**Digital systems and simulation links with automation and measurement, to develop Internet of Things (IoT) solutions that provide real insights for our gas transmission teams.**

It also looks at the future options for digital twin solutions and the use of machine learning (ML) and artificial intelligence (AI).

Our innovation technology portfolio lead works closely with our internal data management and IT teams, to deliver innovative solutions for managing and improving our asset data.




"Innovation for me is about challenging the status quo regarding the way things are done and applying new tools and techniques, no matter how small, to unlock additional value."

**Mathew Currell,**
Innovation Specialist

## Corrosion modelling

NIA_NGGT0159

Due to the age of the National Transmission System (NTS) and its associated assets, we need to carry out regular inspections, so we can determine where we need to undertake remediation work.

Above ground site pipework, such as at our St Fergus terminal, is more difficult to inspect internally, making it harder to monitor corrosion. Intrusively assessing each feature of this pipework would be extremely expensive and resource intensive.

Corrosion is a challenge across the NTS, but the conditions at St Fergus – high winds and rain and its proximity to the coast – mean these issues are exacerbated.

Through the corrosion modelling project, we're looking to move away from reactive asset management activities and adopt a proactive approach that uses predictive corrosion growth and initiation. This will help us address potential problem areas ahead of time, minimising the need for costly repairs.

Using two innovative modelling techniques that look at historic inspection, asset inventory and environmental data, we hope to gain a better understanding of corrosion development at an asset, pipeline and site level.

The predictive nature of the model will help to determine the probability of defect development and its subsequent growth beyond a series of threshold limits. The likely spread of corrosion can be visually displayed, to allow for the identification of potential failure locations before they occur.

We'll use the extensive data gathered throughout the project to support strategic maintenance planning at St Fergus Gas Terminal, focusing specifically on corrosion defects likely to grow significantly during the RIIO-2 price control period.

The project will generate a suitable methodology to ensure that inspections and repairs are prioritised, so we can effectively manage both safety and financial risks. Carrying out proactive maintenance on our key sites using the corrosion modelling tool has the potential for significant savings; estimated at £15m at the St Fergus site.

Further visual inspection activity at St Fergus this year, combined with the release of an updated site model, offers the potential to enhance and validate the outputs of the project, and help inform how they're adopted at other NTS sites.



## i40 (Industry 4.0) connectivity project

NIA_NGGT0165

Remote connectivity to an industrial control system can enable the transfer of information for asset health monitoring, intervention planning and data analytics. However, the same connectivity can also introduce cybersecurity risks, which can affect the safety and reliability of those systems.

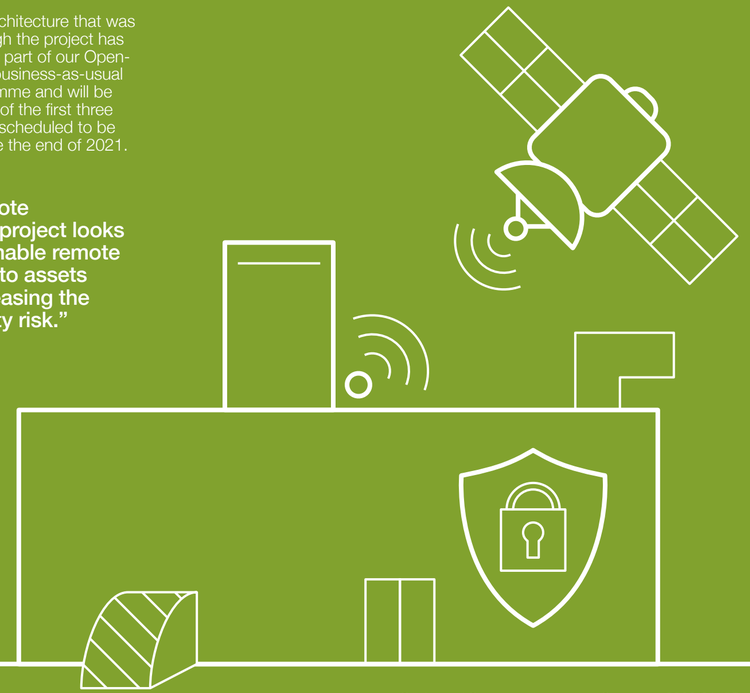
Our i40 remote connectivity project looks at ways to enable remote connectivity to assets without increasing the cyber security risk. It builds on the open-source architecture of previous projects such as Open-Source SCADA.

The project team developed and trialled several viable solutions that can meet both current and future business needs. It successfully demonstrated that using two ruggedized industrial computers alongside a data diode (a hardware device that controls the flow of data) will deliver a secure and maintainable solution.

The project looked at enabling several future data-driven and operational use cases for remote connectivity, which will help the gas industry in its digital transformation.

The enhanced architecture that was developed through the project has been included as part of our Open-Source SCADA business-as-usual transition programme and will be delivered as part of the first three site installations, scheduled to be completed before the end of 2021.

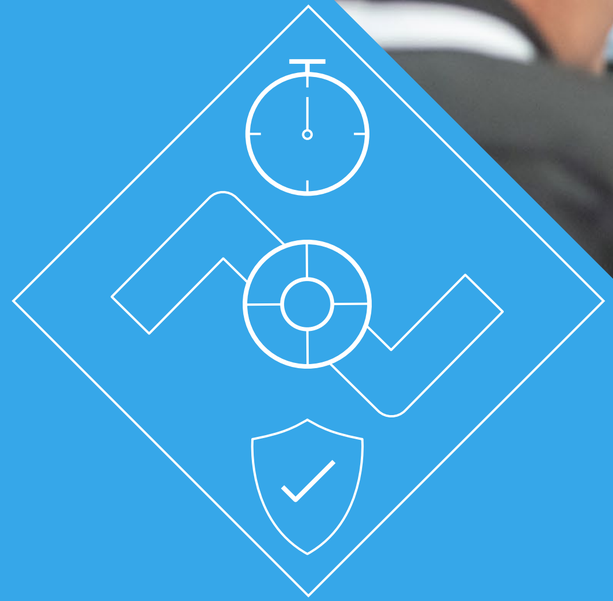
**"Our i40 remote connectivity project looks at ways to enable remote connectivity to assets without increasing the cyber security risk."**



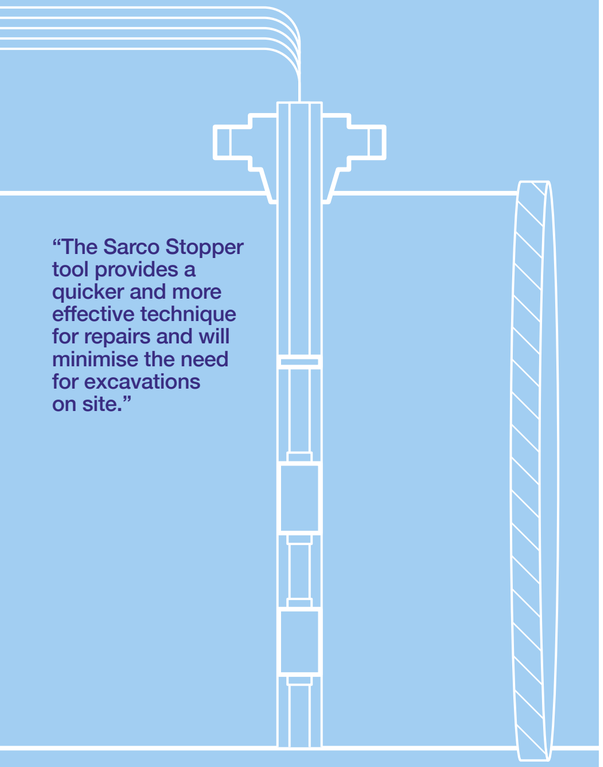
# Materials and processing

**Materials and processing focuses on solutions to help improve our materials resistance for current and future scenarios, while developing novel techniques to repair our National Transmission System (NTS) assets more efficiently and help extend their lifetime.**

This innovation technology portfolio also explores future materials technologies, such as smart materials and links with automation and measurement to review automated repair technologies and in-built sensing.




> “Innovation allows us to improve technology, processes and services to become better, safer and maybe faster. Just think, where would we all be without fire or the wheel.”
>
> **Feona Weekes,**
> Innovation Analyst



**“The Sarco Stopper tool provides a quicker and more effective technique for repairs and will minimise the need for excavations on site.”**

## Sarco Stopper

NIA_NGGT0141

Due to the conditions at St Fergus Gas Terminal – its proximity to the North Sea, the prevailing soil conditions and the age of the assets – corrosion is a common occurrence.

These corrosion issues often occur in areas where the pipework transitions from above to below ground, known as the wind/water line.

When corrosion develops in these areas, sections of the pipework often require replacement as part of ongoing maintenance activities. These replacements are generally accompanied by a need for welding and grinding on the pipe.

Although the pipework can be depressurised to carry out maintenance work, natural gas vapour will often still be present in the pipes, which usually prevents ‘hot work’ of this kind.

Working with Sarco Stopper Ltd, this project looked at designing, manufacturing and proving a bespoke pipework isolation solution that forms a gas vapour barrier within the pipe. This will prevent flammable gases entering the hot work area and allow for welding and other hot works to be carried out.

Throughout the project, the team has undertaken a comprehensive design process and conducted safety studies, before producing a functional prototype. This prototype has been tested in conditions that replicate those on site and has proven to be effective.

The team will now trial the solution in the field under live operational conditions, before looking at ways to introduce it throughout our network.

The Sarco Stopper tool provides a quicker and more effective technique for repairs and will minimise the need for excavations on site. We estimate that between five and 20 excavations of varying size and depth may be needed as part of an alternative repair process, with potential costs of up to £250,000 per excavation, depending on the complexity involved.



## L555 dent tolerance

NIA_NGGT0129

L555 (X80) pipe is made of a higher-grade steel than other pipe used historically on the National Transmission System (NTS). This means it can withstand greater pressures, while still retaining a standard wall thickness.

In 2001, we commissioned the first of our L555 high-pressure pipelines and since then, three more have come into service.

In total, there is now 865km of L555 pipe on our network to safely operate and maintain. The maintenance procedures we have in place to support this work are regularly reviewed and updated, so we can make sure they are fit for purpose.

One of these procedures (T/PM/P/11) looks at the process for inspection, assessment and repair of non-leaking damage for all pipeline types, including L555.

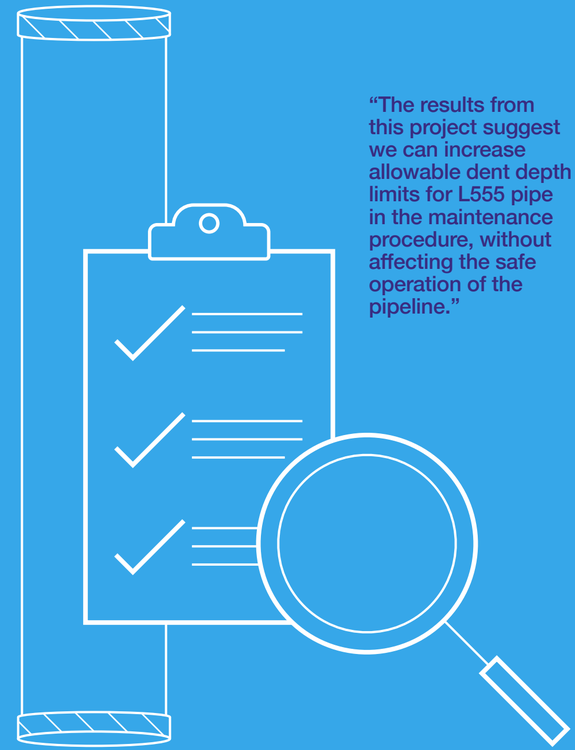
The different metallurgy of the L555 pipe means that dent tolerances are likely to be different to other steels we use, and the depth acceptance limits stated in the document need to be reviewed accordingly. Without this review, several unnecessary repairs are likely throughout the life of the pipeline, affecting supply to customers and incurring significant costs.

Through this project, we’ve assessed the characteristics of the L555 pipe, to gain a better understanding of the tolerance of the higher-grade steel when subjected to dent damage. We conducted a series of full-scale burst and fatigue tests to identify where dent defect acceptance criteria could be updated to minimise costly excavations and unnecessary work.

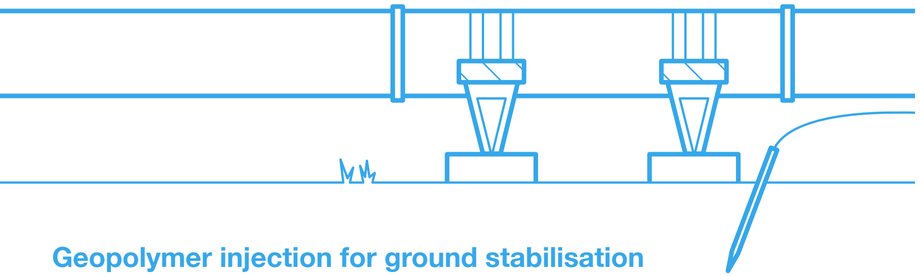
The results suggest we can increase allowable dent depth limits for L555 pipe in the maintenance procedure, without affecting the safe operation of the pipeline.

This means unnecessary excavations and inspections can be avoided, saving approximately £200,000 per excavation. Decreasing the number of excavations also has considerable environmental and safety benefits.

We’re now carrying out further reviews before we update the management procedure. The project team will make recommendations to relevant industry bodies, so that wider standards for L555 grade pipe can be amended.



**“The results from this project suggest we can increase allowable dent depth limits for L555 pipe in the maintenance procedure, without affecting the safe operation of the pipeline.”**



## Geopolymer injection for ground stabilisation

NIA_NGGT0160

Ground settlement and subsidence are common issues at many of our National Transmission System (NTS) sites. This can lead to stress on our pipework, resulting in potential structural damage.

Through initial work carried out on our Geopolymer project in 2019/20, we identified a cost-effective and minimally disruptive solution. Geopolymer resin, a cement-like material that expands, can be injected into the ground to fill spaces and compact the soil.

Following initial tests and a comprehensive desktop technology review, the project team carried out an on-site trial using decommissioned pipework at Kings Lynn Compressor Station. The trial showed that the resin was effective at stabilising and relevelling the pipework.

Using this technique could increase the load bearing capacity of the surrounding ground, without the need for large excavations or more expensive solutions, such as concrete underpinning.

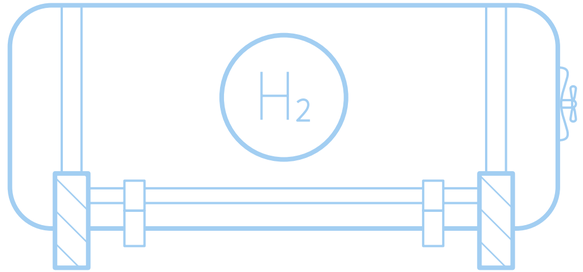
Throughout the project, we assessed the sustainability of the solution, so we could gauge the potential environmental impact of injecting the resin, including assessments of the potential for groundwater contamination and the carbon footprint associated with the Geopolymer solution. We found the approach is more favourable than many other typical ground stabilisation techniques.

Finding a more cost-effective solution not only increases the reliability of our network, but has the potential for significant cost savings. Based on using the Geopolymer solution at just one site, there is a potential cost saving of around £664,500 over a 10-year period. What's more, the solution minimises the need to use concrete to stabilise the ground, which also results in a carbon saving.

The trial and the findings from the Geopolymer project provide a basis for future use of the technology on gas transmission assets and at other sites.

**"Using the Geopolymer solution could increase the load bearing capacity of the surrounding ground, without the need for large excavations or more expensive solutions such as concrete underpinning."**






## HyScale

NIA_SGN_0164

Alongside a number of technologies, hydrogen is expected to play an important role in achieving Net Zero emissions for the UK.

We know our industry needs to do more work to better understand the impact of hydrogen on existing UK natural gas network storage ability, and to explore the critical role hydrogen storage will likely play for the localised development of hydrogen networks.

Through the HyScale project, we've collaborated with SGN, Cadent and Wales & West Utilities to examine the technical and commercial feasibility of deploying liquid organic hydrogen carrier (LOHC) technology to store, transport and release hydrogen at bulk scale in the UK.

The study looked at the feasibility of LOHC technology for long-term storage of bulk quantities of hydrogen. It also explored the feasibility of bulk transport of LOHC to demand locations. Additionally, the study assessed the cost advantages of implementing LOHC technology, considering a range of UK use-cases for the technology.

The project has provided a comprehensive overview of the techno-economic feasibility of using LOHC technology for the capture, storage, transport and release of hydrogen at bulk scale in the UK. It will provide beneficial information to ongoing hydrogen development work, including our Union and FutureGrid projects.

# Business process and management

**Business process focuses on the operation of the National Transmission System (NTS), and builds an understanding of how this may evolve with market changes through the energy transition.**

This innovation technology portfolio considers the skills and competencies required for the transition, and how we best support industry and transport in the UK.


> **“Through innovation we can challenge the “norm” and prepare for a future by identifying different methods. By challenging the existing business processes, we can build stronger relationships within our business that will support the Net Zero target.”**
>
> **Matthew Nevin,**
> Innovation Analyst

"The project has delivered a fully integrated model for forecasting heat decarbonisation in both domestic and non-domestic buildings."

## Spatial GB clean heat pathway model

NIA_NGGT0154

If we are to meet the Government's target of Net Zero carbon emissions by 2050, we need to find a suitable approach to decarbonising heat. There are several potential options that are being considered by the gas networks, each of which will have different implications for the UK energy industry.

Our Spatial GB clean heat pathway project looked at creating a cross-vector model of the whole heating system within Great Britain, with the aim of improving our understanding of the different decarbonisation pathways and their potential effects on both the gas networks and consumers.

In 2019/20, we focused on defining the scope of the model, which takes into consideration several factors, including the wide range of competing low carbon heating technologies, regional differences across the UK, and consumer behaviours which may impact the uptake of different solutions.

This year, the focus has been on building the initial model, assessing the results and making improvements to the final version. As such, multiple decarbonisation scenarios were generated and compared quickly and easily.

The project has delivered a fully integrated model for forecasting heat decarbonisation in both domestic and non-domestic buildings. Although the project only focused on the decarbonisation of heat, the model could be further developed to assess other energy demand scenarios.



## Initial Hydrogen Supply Strategy

NIA_NGN270

Across the different gas networks, projects are underway looking at the potential to convert the whole UK gas system to hydrogen. One such project is Northern Gas Network's (NGN) H21 100% hydrogen project, which looks to convert the gas distribution network so hydrogen can be used in customers' homes.

In order to carry out live trials, or develop any future conversion projects, NGN will need to source enough hydrogen to operate the Local Transmission System (LTS), undertake the initial conversion and still supply natural gas to those customers not yet able to use hydrogen.

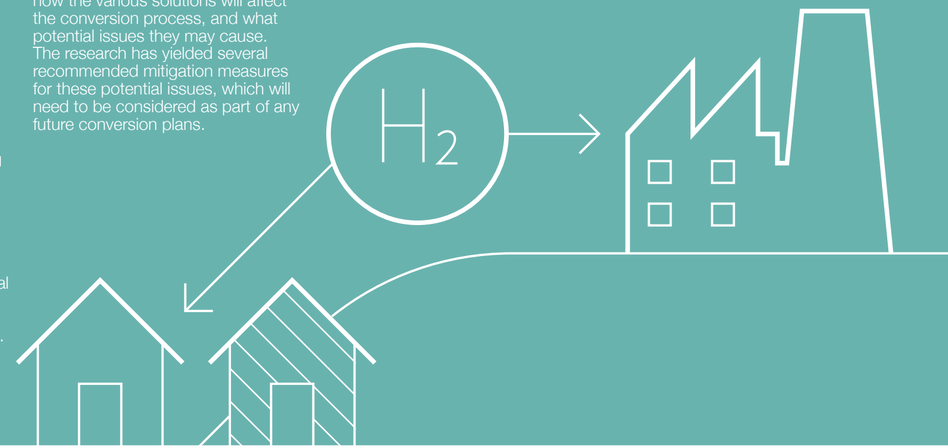
At present, the strategy for providing hydrogen to the LTS network, to allow for a staged conversion, has not been fully developed. The Initial Hydrogen Supply Strategy project, undertaken collaboratively by NGN, National Grid and Wales & West Utilities, has investigated the potential sources of hydrogen and how it will be supplied, in order to meet both conversion and supply requirements.

Through the project, DNV completed a review. It looked at the current innovation projects that focus on supplying hydrogen to LTS networks, as well as other potential supply options, including local storage. These have been assessed to understand how they may be applied to the NGN network.

The project has also focused on how the various solutions will affect the conversion process, and what potential issues they may cause. The research has yielded several recommended mitigation measures for these potential issues, which will need to be considered as part of any future conversion plans.

The findings of this research have been documented in a report that also highlights the main elements of relevant work being carried out by other gas networks and industrial clusters. The report also looks specifically at the technical aspects of a hydrogen conversion and will feed into the wider work being undertaken by NGN under their H21 and Future of Gas programme.

By repurposing the UK gas networks to carry hydrogen, there is the potential to save £46bn, with minimal disruption for gas customers, when compared with other decarbonisation solutions. Projects such as this are helping to build our understanding of hydrogen, moving us closer to reaching Net Zero by 2050.




## Gas Transport Transition Pathways

NIA_CAD0060

The transport sector was the largest contributor to UK greenhouse gas emissions in 2019, accounting for 27 per cent of emissions. After passenger cars, heavy goods vehicles (HGVs) were the second greatest emitter of the transport sector.

In June 2019, the UK government set into legislation a target of reaching Net Zero carbon emissions by 2050. If we are to achieve this, we need to focus our efforts on decarbonising the transport sector, particularly in harder to abate segments like HGVs. HGVs are already transitioning away from fossil fuels and moving towards greener fuels such as biomethane, where significant emissions reductions can be realised compared to diesel. Zero emission fuels like hydrogen will be essential to achieving the 2050 target. And the use of biomethane is an enabler towards the transition to hydrogen and other zero emission technologies.

The Gas Transport Transition Pathways project set out a narrative for the transition of the whole GB economy in a Net Zero future by 2050. It focused on the role of green gases, such as biomethane and hydrogen, in HGVs. The project, delivered by Element Energy, was a collaborative effort between National Grid Gas Transmission, Cadent (the lead network for the project), SGN, Northern Gas Networks, Wales & West Utilities and Gas Networks Ireland. It looked at how green gas production and use could scale up, as well as their evolving role and interactions to 2050.

Findings showed that green gases can play a key role in decarbonising the economy. There is an immediate role for biomethane to decarbonise the HGV segment, enabling early emissions reductions, before later transitioning to hydrogen. Hydrogen demand from other sectors, like heat and industry, drives a scale-up in production, bringing down the cost of hydrogen. As we look at the potential of transitioning our existing gas network to transport hydrogen, networks could support economic decarbonisation of HGVs and other transport segments by delivering green gases to refuelling stations.

The final report, with all the key findings, was published in March 2021, supported by a launch webinar for key stakeholders across the industry, including policy makers. Engagement across the wider industry helped to inform and develop the analysis, strengthening overall findings and shaping the final recommendations. The report outlines clear actions required from policy makers and a range of stakeholders and has given all gas networks a clear view of the action required to achieve this vision. The report provides the foundation for future work, including areas such as hydrogen purity, a key factor when looking at how hydrogen from the gas grid can be used in fuel cells.

**“The project set out a narrative on the transition of the whole GB economy today to a Net Zero future in 2050, focussing on the role of green gases in heavy goods vehicles.”**



## Zero 2050 South Wales

NIA_NGTO040

Zero 2050 South Wales was a hugely collaborative project that set out to develop decarbonisation pathways for the whole energy system in South Wales.

Collaborating with Wales & West Utilities, we explored the role hydrogen and carbon capture usage and storage (CCUS) could play in enabling a Net Zero whole energy system for South Wales.

We carried out detailed analysis on a range of hydrogen production technologies, as well as CCUS technology, to explore their role in the decarbonisation of a variety of energy demand in South Wales to 2050.

Alongside this, we explored which locations could be best suited for initial CCUS infrastructure and bulk hydrogen production, and analysed potential requirements for hydrogen storage. We also explored the potential to reuse existing gas infrastructure, including sections of the National Transmission System (NTS), to connect potential hydrogen hubs in South Wales to potential hydrogen hubs in the north west of England.

We identified many tangible outputs from the project to support further decarbonisation pathways for South Wales. One important conclusion is that it is likely hydrogen and CCUS will be critical to the Net Zero energy future of South Wales. Additionally, the wealth of natural resources and existing gas infrastructure makes South Wales an attractive option for the development of bulk low-carbon energy.

**“Through the project we identified that it is likely hydrogen and CCUS will be critical to the Net Zero energy future of South Wales.”**

# Engaging our stakeholders

**We conducted a review of our engagement approach at the start of the year, which involved looking at using different channels for engaging with our stakeholders.**

We've moved away from more traditional methods, such as newsletters, and taken a social media-based approach, using our LinkedIn page to share updates and learning with our followers.

This has led to an increase in followers and stronger engagement statistics. We plan to further develop our use of LinkedIn throughout RIIO-2, with plans to broaden the content we share and further increase the frequency of posts.

Our engagement activities in 2020/21 were affected by the Covid-19 pandemic, limiting our normal approach of face-to-face events. Consequently, we've been using digital engagement methods to continue informing our stakeholders on the progress of our work.

Online webinars have included sessions on our innovation technology portfolios and our hydrogen activities. Both received positive feedback and were well attended, allowing us to reach more than 100 stakeholders.

We've continually evolved our online events and through stakeholder feedback, we recognise that a variety of speakers at each session is more interesting for attendees. We chose these webinar-style events, as they have a dynamic and engaging format and directly respond to stakeholder requests for online events that focus on specific topics.

We are now planning to run hybrid events (that combine online and face-to-face activities) beyond the pandemic, so that we can offer our stakeholders greater flexibility.

Alongside external engagement activities, we have focused on improving our internal stakeholder engagement and have developed an annual engagement process, looking at our project roadmaps and associated project pipelines. We carried out specific engagement sessions with each Gas Transmission team, so we can understand their challenges and identify areas of opportunity that would benefit from innovation support.

Through these discussions, we generated a series of problem statements that were prioritised with support from teams across the business. These statements have been used to create project scopes to address them, and have directly shaped the project pipelines for each technology roadmap. We'll replicate this process annually, so we can continually shape our project plans, according to what brings most value to our customers, consumers and the business.

# Energy Networks Innovation Conference

**Following attendee feedback on the Low Carbon Networks & Innovation Conference (LCNI), the Energy Networks Association (ENA) decided to overhaul and rebrand the event, leading to the creation of the Energy Networks Innovation Conference.**

The first event was held across two days in December 2020.

Due to the Covid-19 pandemic, the planned face-to-face event was changed to virtual, and featured online presentations, as well as virtual exhibition stands for sponsors to showcase their innovation projects and activities.

Our presentations focused on Project GRAID and the work carried out to date, the FutureGrid programme and introducing the offline hydrogen test facility, as well as two of our environmental emissions projects: MoRFE (Monitoring of Real-Time Fugitive Emissions) and CH4RGE (Methane Reductions from Gas Equipment).

We used our exhibition stand to launch our innovation technology portfolios and introduce our hydrogen projects. We also created a series of short video interviews that we hosted on our stand, providing an overview of some of our key projects, including In Line Flow Stop, ValveCare Toolbox 3 and Open-Source SCADA.

The event was very successful, and we received great feedback through the post-event survey, with attendees rating the overall event 4.4 out of 5.

Feedback from the survey is now being used to develop the 2021 event, which will also be hosted virtually. We've started planning our content for this event, looking at which projects we want to showcase both in the agenda and through our exhibition stand.



# Embedding our innovation value

**Innovation is vital to help us deliver a safe, efficient and reliable Gas Transmission network that meets the needs of our stakeholders.**

Over the last year we've closed out the RIIO-1 projects and focused on further developing our strategy for the RIIO-2 period. We're now working on ensuring these innovations are implemented and rolled out as business-as-usual activities.

The National Transmission System (NTS) has a vital role to play in linking up the whole UK gas energy network and has the potential to transport a variety of decarbonised gases around the country. We have started our journey in the RIIO-1 period to a Net Zero NTS and will further develop and demonstrate this throughout the RIIO-2 period, by implementing emissions systems and demonstrating asset capability with decarbonised gases.

In RIIO-2, we plan to build on and further develop our innovation work completed in RIIO-1, by deploying our successes and learning from our failed projects. We'll do this while ensuring that collaboration and dissemination across the utilities grows and flourishes. Over the past year, we've continued to embed our innovations within our key processes and standards, while reviewing all the activities in RIIO-1 for further opportunities in RIIO-2. Our NIA projects are currently in various stages of implementation, with some already in use across Gas Transmission, and others running through final business-as-usual demonstration and testing.

We're expecting to see an increase in our value tracking figures from RIIO-1 innovation projects through the RIIO-2 period, as our projects reach more investment programmes. At the end of 2020/21, our updated value tracking position is £27.7m benefits delivered.

Through the RIIO-1 period, we've made sure the key technologies we've developed have been disseminated through working groups, conferences and stakeholder sessions. The working groups provide a forum for sharing knowledge, allow us to seek funding contributions and give us access to a wide range of research and development programmes. We aim to provide value across the energy networks through sharing learning and through collaboration wherever we can.

**"In RIIO-2, we plan to build on and further develop our innovation work completed in RIIO-1, by deploying our successes and learning from our failed projects."**

# Our live projects in 2020/21

## For more information about the projects we worked on during 2020/21, please use the links below to be taken to the ENA smarter networks portal.

| Reference | Registered title | ENA Portal Link |
|---|---|---|
| NIA_NGGT0155 | Hydrogen Injection into the NTS | https://smarter.energynetworks.org/projects/nia_nggt0155/ |
| NIA_SGN0107 | IGEM GQWG extension | https://smarter.energynetworks.org/projects/nia_sgn0107/ |
| NIA_NGGT0164 | CH4RGE – Methane Reduction from Gas Equipment | https://smarter.energynetworks.org/projects/nia_nggt0164/ |
| NIA_NGGT0165 | i40 (Industry 4.0) Connectivity Project | https://smarter.energynetworks.org/projects/nia_nggt0165/ |
| NIA_NGN_270 | H21 Initial Hydrogen Supply Strategy | https://smarter.energynetworks.org/projects/nia_ngn_270/ |
| NIA_SGN0164 | HySCALE - Feasibility study of the use of LOHCs for bulk hydrogen storage and transport | https://smarter.energynetworks.org/projects/nia_sgn0164/ |
| NIA_NGGT0166 | HyNTS Roadmap to FutureGrid | https://smarter.energynetworks.org/projects/nia_nggt0166/ |
| NIA_SGN_0165 | HyTechnical | https://smarter.energynetworks.org/projects/nia_sgn0165/ |
| NIA_NGGT0168 | ValveCare Toolbox 3 | https://smarter.energynetworks.org/projects/nia_nggt0168/ |
| NIA_NGGT0169 | Analytical Approach for Vegetation Management (AAVM) | https://smarter.energynetworks.org/projects/nia_nggt0169/ |
| NIA_NGGT0167 | In Line Flow Stop | https://smarter.energynetworks.org/projects/nia_nggt0167/ |
| NIA_NGGT0156 | Hydrogen Deblending in the GB Gas Network | https://smarter.energynetworks.org/projects/nia_nggt0156/ |
| NIA_NGGT0158 | CCP&P remote monitoring 2 | https://smarter.energynetworks.org/projects/nia_nggt0158/ |
| NIA_NGTO040 | Zero-2050: South Wales (Whole system analysis) | https://smarter.energynetworks.org/projects/nia_ngto040/ |
| NIA_NGGT0159 | Corrosion Modelling | https://smarter.energynetworks.org/projects/nia_nggt0159/ |
| NIA_CAD0060 | Gas Transport Transition Pathways | https://smarter.energynetworks.org/projects/nia_cad0060/ |
| NIA_NGGT0161 | EPRG 2020/21 | https://smarter.energynetworks.org/projects/nia_nggt0161/ |
| NIA_NGGT0162 | PRCI (Pipeline Research Council International) 2020 | https://smarter.energynetworks.org/projects/nia_nggt0162/ |
| NIA_NGGT0163 | Risk Assessment Methodologies for Pipelines and AGIs 2020 | https://smarter.energynetworks.org/projects/nia_nggt0163/ |
| NIA_NGGT0141 | Sarco Stopper | https://smarter.energynetworks.org/projects/nia_nggt0141/ |
| NIA_NGGT0137 | Monitoring of real-time fugitive emissions (MoRFE) | https://smarter.energynetworks.org/projects/nia_nggt0137/ |
| NIA_SGN0140 | Derivation of a Risk Based Approach to High Pressure Filter & Pig Trap Closure Inspection Frequencies | https://smarter.energynetworks.org/projects/nia_sgn0140/ |
| NIA_WWU_045 | Above and Beyond (Eye in the Sky) | https://smarter.energynetworks.org/projects/nia_wwu_045/ |
| NIA_NGGT0142 | ValveCare Toolbox 2 | https://smarter.energynetworks.org/projects/nia_nggt0142/ |
| NIA_NGGT0154 | Spatial GB Clean Heat model | https://smarter.energynetworks.org/projects/nia_nggt0154/ |
| NIA_NGGT0126 | In Pipe NTS Liquid Monitoring Systems | https://smarter.energynetworks.org/projects/nia_nggt0126/ |
| NIA_NGGT0145 | GRAID ART | https://smarter.energynetworks.org/projects/nia_nggt0145/ |
| NIA_NGGT0134 | Condensate Tank | https://smarter.energynetworks.org/projects/nia_nggt0134/ |
| NIA_NGGT0160 | Geopolymer Injection for Ground Stabilisation | https://smarter.energynetworks.org/projects/nia_nggt0160/ |
| NIA_NGGT0129 | L555 Dent Tolerance | https://smarter.energynetworks.org/projects/nia_nggt0129/ |
| NIA_NGGT0148 | Gas Quality Blending Services | https://smarter.energynetworks.org/projects/nia_nggt0148/ |
| NIA_NGGT0147 | Flow Loop | https://smarter.energynetworks.org/projects/nia_nggt0147/ |

## We are looking for projects that:

- Demonstrate customer value
- Accelerate the development of a low carbon energy sector
- Directly impact the gas network
- Avoid duplication
- Share learning and intellectual property
- Are innovative – requires a project to demonstrate effectiveness

## Get in touch

If you have an innovation idea, questions about any of our projects, or you would like more information, please contact the team at **box.GT.innovation@nationalgrid.com**

## Or find us on social media:

- @nationalgriduk
- Innovation at National Grid
- @NationalGridUK
- www.nationalgrid.com/gasinnovation