SGN

Innovation Annual Summary

2024/25

Live document links

This document includes live links on the contents list, to aid navigation and elsewhere throughout the text pages to signpost extra related information, saved elsewhere.

Contents

Introduction

01 Foreword from Antony Green, Chief Strategy and Regulation Officer
02 SGN at a glance

Innovation Activity

04 SGN innovation overview
06 How we fund our innovation activity
07 The energy networks' innovation strategy
08 Progress on the RIIO-GD3 price control period determination
09 Future Energy Networks
10 Our project partners
12 Event attendance and collaboration 2024/25
14 SGN Future of Energy strategies
– Hydrogen evidence
– System transformation

Featured Projects

18 H100 Fife
20 LTS Futures

Key Project Showcase

22 Ofgem NIA funded projects
41 Ofgem SIF funded projects
45 Price Control Deliverables

46 Glossary of key terms

Foreword from Antony Green, Chief Strategy and Regulation Officer

The energy sector is undergoing a significant transformation, driven by technological innovation, sustainability imperatives, and evolving regulatory demands.

Driving a cleaner energy future with SGN

At the forefront of this change, SGN is committed to leading the transition toward a cleaner, more efficient, and resilient energy future.

Guided by a clear strategic vision, SGN is prioritising emerging technologies, industry collaboration, and forward-looking policies to reshape the gas distribution network. With operations spanning Scotland and southern England, SGN is addressing regional challenges while capitalising on local strengths to support the UK's net zero goals – 2045 for Scotland and 2050 nationwide.

SGN's approach is both ambitious and collaborative. By engaging with stakeholders across the sector and beyond, the Company aims to pioneer practical, scalable solutions that contribute meaningfully to national and global climate goals. This includes replacing traditional natural gas with greener alternatives across its pipeline networks.

In the months ahead, we will be addressing some of the key challenges currently facing our industry. Our focus will be on driving innovation to develop solutions that support the energy transition for our customers.

It is important to recognise the progress already being made. Our flagship projects – H100 Fife and LTS Futures – represent significant milestones, with the potential to shape the future of our network and play a pivotal role in the transformation of the energy system.

As SGN moves forward, the organisation remains committed to delivering long-term environmental and community benefits. With a strong foundation of innovation and co-operation, SGN is poised to play a critical role in shaping the energy systems of tomorrow.

The future of energy presents tremendous opportunities – and SGN is ready to lead the way, driving impactful change for generations to come.

Antony Green.

Antony Green
Chief Strategy and Regulation Officer

SGN is focusing on emerging technologies, industry partnerships, and forward-thinking policies to reshape the gas distribution network.

SGN at a glance

Who we are and what we do

Our award-winning engineering organisation designs, builds, operates and maintains energy systems. We efficiently and safely deliver natural and green gas through our network to millions of homes and businesses.

75,347km of pipes

We operate and manage one of the UK's largest gas distribution networks, which provides energy across southern England, Scotland and Northern Ireland.

Over 6m customers

We transport natural gas from the national transmission system (NTS) and green gas from local biogas plants to over six million homes and businesses.

24/7 response

We respond to thousands of reported gas escapes each year, working day and night, making essential repairs to our pipes so everyone stays safe and warm.

4,800 colleagues

Our diverse and talented workforce is committed to providing world-class customer experiences and a seamless delivery of heat and power.

Modern infrastructure

We replace hundreds of kilometres of old metal pipes with modern infrastructure each year, ensuring our network is safe and can support the energy transition long into the future.

Decarbonising homes

We are harnessing green gases and undertaking pioneering projects to ensure that we can help all our customers play their part in reaching our climate goals.

Our purpose

Serving our communities by keeping everyone safe and warm.

Our values

Where we operate

SGN manages three gas network areas across the UK, safely distributing gas to over six million customers.

Scotland
Our network distributes gas to 1.8 million Scottish homes, including in remote areas operated by our SIUs.

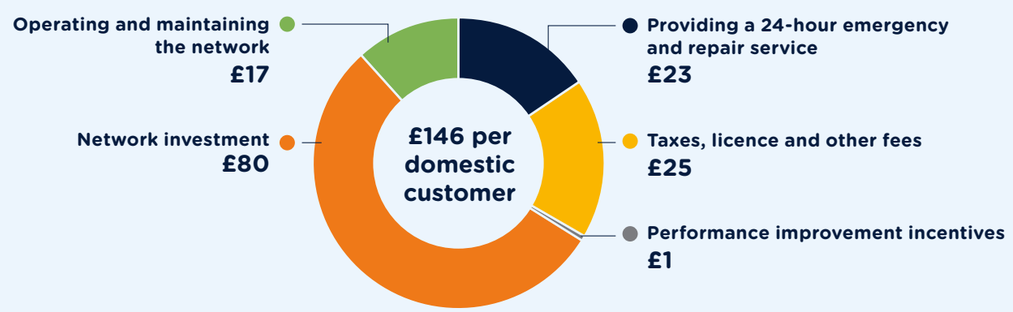
Southern England
We distribute gas to over 4.0 million homes in south and south-east England.

Northern Ireland
Nine towns are connected to our Evolve network in the west of Northern Ireland.

How we deliver value

In 2024/25, an average household paid £146 for our services.

SGN customer bill breakdown 2024/25



Figures used for customer bill analysis represent core network charges and therefore exclude Supplier of Last Resort (SoLR) costs recovered on behalf of the industry and NTS Exit Charges (ECN). They reflect the forecast of revenue used when setting the tariffs and also include the impact of actual/forecast inflation.

SGN innovation overview

SGN is committed to shaping the future of gas distribution by developing networks that perform reliably today and are ready to meet the challenges of tomorrow.

Our approach prioritises smarter, more efficient, and sustainable networks while actively exploring emerging technologies to achieve the sector's long-term ambitions to net zero.

Innovation at SGN is driven by two main streams: Core Innovation and Futures Innovation. Core Innovation focuses on enhancing the current gas network by prioritising safety, sustainability, and operational efficiency. Futures Innovation, on the other hand, explores transformative possibilities within the sector. It addresses broad themes such as customer focus, decarbonisation of heat supply chains, and the reduction of industrial and commercial emissions.

With operations spanning Scotland and the south of England, we recognise the importance of region-specific strategies. In Scotland, our work focuses on harnessing the country's vast renewable energy resources to drive innovation. In southern England, efforts are centred on upgrading infrastructure to lower emissions and boost performance. Together, these regional strategies support our wider ambition of enabling a net zero energy system.

As we transition through the final year of the RIIO-GD2 regulatory period, we are actively preparing for RIIO-GD3. This involves building capabilities, strengthening networks, and generating insights to meet future regulatory, environmental, and customer service expectations.

Over the past 12 months we have continued growing our innovation network, teaming up with new collaborators, and building even stronger relationships across the various industries and sectors. With the continued backing of our project partners, we're getting closer to overcoming technical challenges and moving towards a cleaner, greener industry.

Simon Joyce
Head of Innovation

By working closely with partners, universities, and innovators, we're making real progress on key projects that are helping to transform today's reliable gas network into a cleaner and efficient one for tomorrow.

Meet the Innovation team

Stuart Sherlock
Role: Governance & Performance

Stuart, a chartered mechanical engineer with the Institute of Gas Engineers and Managers (IGEM), leads the Governance & Performance division within the Innovation team. With a decade of experience in the gas industry, Stuart ensures that SGN's Innovation project portfolio adheres to governance and compliance standards. The Governance team focuses on managing innovation activities according to the correct processes, while effectively reporting performance. They also play a key role in maintaining operational control, ensuring that each step in the innovation process aligns with funding regulations and best practices.

Oliver Machan
Role: Core Innovation

With over 20 years of experience in the gas industry, Ollie has developed a strong expertise in key business areas such as distribution network strategy, innovation, and the integration of new technologies. Throughout his career, he has led numerous initiatives focused on business improvements, asset risk management, IT, and strategic planning. Ollie is passionate about building a dynamic innovation portfolio to support the industry's transition and boost SGN's operational efficiency. His skills in strategy development, service excellence, and leveraging cutting-edge innovation help unlock value and deliver impactful services, platforms, and capabilities that drive both operational and enterprise success.

Ryan Smith
Role: Hydrogen Evidence and Transition (HEAT), Team Lead

Ryan has extensive experience in the gas industry but over the past two years has led SGN's 100% hydrogen for heat conversion programme as defined by DESNZ. Ryan's background in Design and Engineering, along with his significant experience in engineering assurance, governance and policy, means he has the skills necessary for ensuring compliance and effectiveness of future proposed hydrogen operations and to manage a team of project managers aligned to SGN's strategic objectives.

Gordon McMillan
Role: Insights

As a graduate of chemical engineering and business leadership, Gordon is the Innovation scouting and discovery lead. Through research and creative exploration, Gordon translates key insights into actionable strategies and plans. These opportunities inform the foundation of the innovative projects, support SGN energy transition and bring value to day-to-day operations. Having spent just under a decade in the gas industry, Gordon has had various roles from innovation management and project engineering to network strategy and design. He has experience in all aspects of innovation management, from concept creation to implementation.

Mohanvir Singh-Saran
Role: Futures Innovation

Mohanvir leads the Futures Innovation portfolio at SGN. His role is focused on executing innovative projects that will allow SGN to deliver a sustainable energy transition and support existing and future customers. The Futures portfolio discovers, defines and develops new and emerging strategic opportunities in areas such as CCUS, Whole Energy System Transition and Customer Decarbonisation. The team consists of innovation managers and PhD specialists with experience across nuclear, academia and innovation consulting. Previously, Mohanvir led 5G and IoT Innovation at BT Group plc, worked in product innovation and start-up incubation at Telefónica and delivered consulting engagements at Grant Thornton LLP.

How we fund our innovation activity

Innovation is at the core of our commitment to a smarter, more sustainable energy future. By leveraging a diverse mix of funding streams, we continue to accelerate the development of cutting-edge solutions that benefit our customers and support the UK's net zero ambitions.

Reflecting back on 2024/25 we have:

43

projects currently being led by SGN
(29 solely led by SGN and 14 led by SGN with network collaboration and support)

23

non-lead collaboration projects

Driving continuous innovation

Our innovation efforts are supported by diverse funding sources, with a strong emphasis on two key initiatives: the Network Innovation Allowance (NIA) and the Strategic Innovation Fund (SIF). Through these programmes, our projects continue to advance, delivering significant benefits for our customers and playing a crucial role in achieving net zero emissions.

Ofgem Network Innovation Allowance (NIA)

The NIA has been a cornerstone of innovation since RIIO-GD1 and remains essential in RIIO-GD2. It funds a wide range of projects focused on assisting vulnerable customers and accelerating the transition to net zero.

NIA projects help identify critical knowledge gaps, generating robust evidence to support the conversion of the UK's energy networks. In alignment with the Energy Innovation Strategy challenges, we have undertaken numerous projects to bridge these gaps. These initiatives provide essential insights that drive progress toward a sustainable, net zero future while also supporting vulnerable communities.

Further details on our NIA projects are available on **pages 22 to 40**.

Throughout 2024/25, we have continued to foster a strong culture of innovation, working closely with our business operations to keep customer needs at the heart of our efforts as we move towards net zero.

Ofgem Strategic Innovation Fund (SIF)

The SIF, established under the RIIO-GD2 network price control, provides funding for the Electricity System Operator, Electricity Transmission, Gas Transmission, and Gas Distribution sectors. Its primary objective is to decarbonise energy distribution and transmission networks, delivering tangible benefits to consumers.

This competitive funding mechanism is structured in three progressive phases, increasing investment from initial concept development to full-scale implementation.

Further details on our SIF projects can be found on **pages 41 to 44**.

Additional funding

Beyond NIA and SIF, a portion of our innovation activities is funded through third-party contributions and alternative business sources. These additional resources drive efficiency improvements and optimise processes across SGN's operations, enabling the development and deployment of advanced technologies at higher readiness levels.

Throughout 2024/25, we have continued to foster a strong culture of innovation as we move towards net zero.

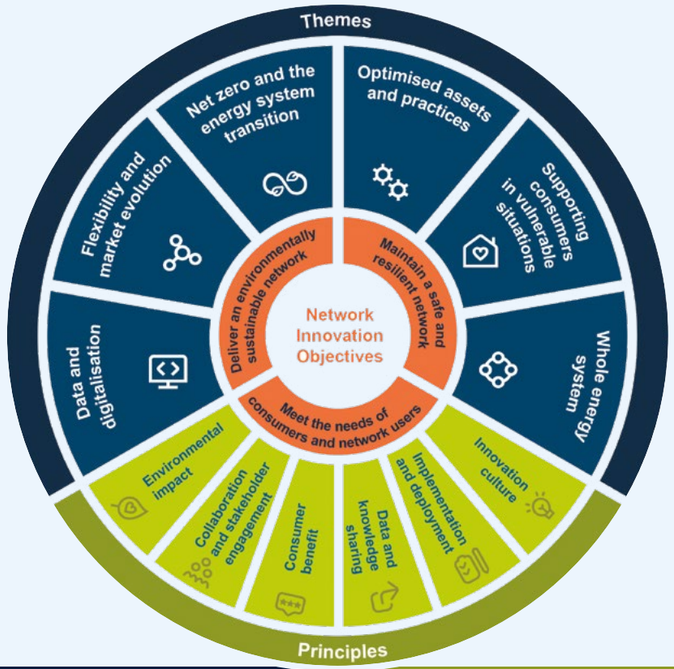
The energy networks' innovation strategy

Building on the progress made in previous years, the Gas Distribution Networks (GDNs) have continued to work closely with the Electricity Networks and the Energy Networks Association (ENA), alongside the newly formed Future Energy Network (FEN), to maintain strong alignment with the innovation strategy developed last year. This strategy provides a clear framework to guide network operators in developing solutions that support the transition to net zero.

Designed to be both flexible and ambitious, the strategy encourages innovation while avoiding excessive constraints. At its core are three Network Innovation Objectives, which are displayed at the centre of the graphic opposite. These objectives align with the three consumer-oriented outcomes established by Ofgem and form the foundation of all network innovation efforts.

The network-agreed 'Themes' and 'Principles', also shown in the graphic, set clear priorities for all networks and foster a unified strategic direction. Innovation projects must align with these themes to ensure efforts are focused on addressing the sector's most significant challenges. A detailed breakdown of the themes and principles is presented on the right.

Network innovation objectives



Themes

Data and digitalisation
Developing new data services and applying data science methods to harness the power of digitalisation to solve both system operation and wider stakeholder challenges.

Flexibility and market evolution
Developing and testing market-based solutions to increase the flexibility and efficiency of the energy system; accelerating the adoption of low carbon solutions.

Net zero and the energy system transition
Facilitating and accelerating the UK's transition to net zero greenhouse gas emissions.

Optimised assets and practices
Developing and implementing industry-leading techniques for optimising assets and practices.

Supporting consumers in vulnerable situations
Exploring how best to support the needs of consumers who find themselves in vulnerable situations, today and in the future, to enable a just transition.

Whole energy system
Develop joined-up approaches across sectors and energy vectors.

Principles

Environmental impact
Innovation plays an important role in the UK achieving net zero-carbon emissions.

Collaboration and stakeholder engagement
Collaboration is key to ensure we continue to maximise value of our projects and delivery to our customers.

Consumer benefit
We aim to focus our innovation activities to deliver clear benefit to our customers.

Data and knowledge sharing
Collaboration is important in ensuring that we meet the needs of our customers, therefore we aim to make all information and data available where possible.

Implementation and deployment
With completion of innovation projects, it is important to take the learning and output forward into the business.

Innovation culture
Network companies and regulators aim to adopt an innovation-driven culture across their operations to enhance their capacity for delivering groundbreaking transformations.

Progress on the RIIO-GD3 price control period determination

SGN is largely a regulated business, governed by Ofgem and funded through price control periods under a mechanism called RIIO (Revenue = Incentives + Innovation + Outputs).

In December 2024, we submitted our business plan proposal for £4.5bn to be invested in RIIO-GD3, the next price control period that will run for five years, starting from April 2026.

Our priority for RIIO-GD3 is the efficient operation of a safe and reliable gas network for our customers. To do this effectively, in the context of Great Britain's transition to net zero, working towards affordable clean energy, we have made 15 commitments that we will deliver for our customers in RIIO-GD3. These commitments sit under four overarching regulatory outcomes:

- High-quality service from regulated firms;
- Secure and resilient supplies;
- Infrastructure fit for a low-cost transition to net zero; and
- System efficiency and long-term value for money.

Strategic investment to deliver customer commitments

In order to achieve these commitments, our proposed investment sets out various programmes of work, ranging from £1.8bn investment to replace nearly 5,000km of metallic mains with plastic pipes that are safer, reduce emissions and are ready to transport green gas, to £23m investment on projects that will increase the amount of biomethane within our network that will save at least 1,100KtCO$_2$e per year.

Within our overall proposal we have also included £51m on innovation that will enhance safety, efficiency and sustainability of our service today and contribute to the net zero goal. Our specific commitment for innovation is to understand our consumers' needs and preferences in greater depth and breadth, as well as maintaining strong relationships to support decarbonisation, while our assets preserve energy security. To deliver our innovation plans we are focused on the development of today's network, a co-ordinated approach to the transition, and supporting a low-carbon energy transition for the future network.

Regulatory engagement and the path to final determinations

Ofgem will publish draft determinations on all the gas networks' business plan proposals in June 2025 and final determinations are expected around December 2025. Between these dates SGN will have the opportunity to counter the draft determinations to Ofgem to get the best outcome for our customers for the next five years.

Regulatory and RIIO-GD3 outcomes

High-quality service from regulated firms

- Our customers receive industry-leading service
- More vulnerable customers will receive high-quality, targeted support
- Our investment creates more social value for customers and communities

Secure and resilient supplies

- Our network transports gas safely and reliably to meet the demands of our customers in all scenarios
- Our network is ready to transport clean energy to our customers
- We are resilient to a range of external shocks and stresses

Infrastructure fit for a low-cost transition to net zero

- We adopt a whole-systems approach to delivering net zero
- More people will have access to biomethane
- Harnessing green gas will help remote Scottish communities contribute to net zero
- We will be ready to accept blended hydrogen onto our network to supply customers
- We will reduce the impact our operations have on the environment

System efficiency and long-term value for money

- We will deliver value to customers through efficient investment and delivery
- Innovation will deliver improvements and efficiencies that benefit customers
- Digitalisation and the effective use of data will enhance network performance and support the transition to net zero
- We will build a more resilient workforce that works efficiently to deliver more value to our customers

Future Energy Networks

Established in summer 2024, Future Energy Networks (FEN) represents those in the energy industry seeking to understand and enact the changes needed to deliver the energy networks of the future.

Membership and scope of work

FEN's current members include the owner and operator of the GB gas transmission network, National Gas, and the four Gas Distribution Networks (GDNs) – Cadent Gas, Northern Gas Networks (NGN), SGN and Wales & West Utilities (WWU).

FEN's work spans maintaining the effective running of today's networks through to dealing with the strategic, policy and regulatory questions facing gas networks as they evolve to deliver Clean Power by 2030 and Net Zero by 2050.

Driving an equitable energy transition

We believe in an equitable and affordable energy transition for all, with the world-class quality and reliability of our extensive gas networks fundamental to meeting our ambitious decarbonisation goals as a nation. FEN is leading this change through bringing together the expertise of stakeholders across the energy industry to build the evidence base in support of decision-making, while our member companies invest in the infrastructure required to transport low carbon energy – such as biomethane and hydrogen – from producers to consumers.

Support services and strategic focus

The FEN team offers members policy, communications, research and innovation support, with in-house experts working across these disciplines. Working with members and stakeholders to co-ordinate the effective management of today's networks while transitioning towards the energy networks of the future, our scope covers:

- Technical: Facilitating working groups on behalf of our members to contribute to the safe and reliable operation of their networks.
- Policy: Leading joint policy thinking amongst our members and wider industry, while also supporting government policy development.
- Regulation: Working with our members and with key stakeholders through the regulatory compliance and price control process.
- Strategy: Co-ordinating our members to develop and deliver a shared strategic direction for them as an industry.

FEN in partnership with IGEM and ENA

FEN is a company within IGEM, the global professional engineering institution for the gas industry. Our two organisations work closely together, benefitting from the shared expertise of both teams, individual members, and the wider IGEM community. In addition, FEN collaborates actively with the Energy Networks Association (ENA) to support cross-industry co-ordination, share best practices, and contribute to the development of future-ready energy networks.

Meet the FEN team
Working with the gas networks to enact the changes required to deliver the energy networks of the future.

Our project partners

Thanks to the unwavering support of our project partners, we are working towards transformative breakthroughs – pushing the boundaries and unlocking new possibilities.

white space STRATEGY A PALLADIUM GROUP COMPANY

"White Space Strategy is delighted to partner with SGN in exploring opportunities that support new roles in the UK's future energy system. Our team has loved working on decentralised energy, combining technical rigour and creative thinking from our cross-industry experience to identify ways a gas network can deliver local and national resilience. We're proud to bring a fresh perspective while staying sharply focused on SGN's organisational needs and long-term strategic goals."

Nick Edwards
Managing Director
White Space Strategy

PA

"PA is delighted to have worked with SGN to assess their potential role in the transition to low carbon heating for Multi-Occupancy Buildings. By combining PA's expertise with SGN's engineering experience and commitment to decarbonisation, we brought together a unique blend of skills and insight. Led by PA, the team collaborated closely on this innovative initiative, navigating complex, interdependent elements and pushing the boundaries of thinking in this important area."

Anthony Legg
Partner
PA Consulting

University of Strathclyde Glasgow

"At the Centre for Energy Policy, University of Strathclyde, we see the Electrolyser Horizons project as a vital step in understanding how hydrogen can support a just and economically sustainable transition to net zero. Our collaboration with SGN is helping to generate evidence that can inform policy, guide investment, and ensure that future energy infrastructure delivers both environmental and societal value. We're proud to be part of this innovative and impactful initiative."

Dr Christian Calvillo
Senior Research Fellow
Centre for Energy Policy

STATS GROUP

"STATS Group is proud to partner with SGN on the LTS Futures Project. SGN has shown leadership and innovation by selecting the BISEP – the world's safest, most sustainable line stopping technology – offering fail-safe, leak-tight double block and bleed isolation. With a strong global track record across hydrocarbons, CO_2, and steam, the project now focuses on qualifying the BISEP for hydrogen use, helping ensure the best technology is ready for this important new energy frontier."

Neil Mackay
Senior Business Development Manager
STATS (UK) Ltd

element

"Element Materials Technology is proud to support SGN on the Cominglo Project, drawing on our growing hydrogen testing capabilities developed to aid the Energy Transition. The project explores blending hydrogen and other gases within the network, using CFD predictive modelling, followed by rig design, build, and testing to create a tool SGN's Innovation Team can apply more widely. It's been a pleasure working with SGN, and we look forward to continued collaboration as they progress through network decarbonisation."

Dr Mark Eldridge
Director of Hydrogen
Element Materials Technology

ROSEN

"In the past year ROSEN has worked with SGN on their Hydrogen in MOBs feasibility project and their LTS Futures project. Both hydrogen projects are undertaking vital research and developing essential evidence that will help to ensure future safety for employees and for members of the public. Collaboration between project partners and leadership provided by SGN has been vital to the ongoing success of these projects and all of us at ROSEN look forward to further collaboration in the future."

Simon Daniels CEng MIMechE
Principal Engineer
ROSEN

Humata

"It has been great working with SGN to create a user friendly interface ensuring accessibility for everyone, making critical information available when every second counts. The team is eager to innovate, very responsive, and has a positive outlook that fosters a collaborative working relationship."

Lev Ingman
Head of GTM
Humata.ai

DNV

"I've worked with SGN as the lead organisation on major collaboration projects like the SIF Beta Phase Velocity Design with Hydrogen and the Hydrogen Asset Interventions Database. SGN's project management team brings strong innovation, clear planning, and effective communication – key to moving complex projects from concept to delivery. Across each project, SGN fosters a supportive, goal-driven culture that motivates the whole team and ensures we're aligned in contributing to the growing hydrogen conversion evidence base."

Ben Smith
Principal Consultant
DNV

DieDraw

"Die Draw Ltd is proud to support SGN in exploring the potential of repurposing existing steel pipelines for transporting hydrogen and hydrogen-methane blends. Leveraging our expertise in thermoplastic lining systems, we delivered a detailed technical review on the feasibility of using the Die Draw® process with both conventional and barrier-layer liners. This work supports SGN's broader innovation and asset resilience efforts, and we're pleased to contribute to the safe, sustainable transition to low-carbon gas networks."

Dr Steve Brogden
Managing Director
Die Draw Ltd

UNIVERSITY OF SURREY

"My research team at the University of Surrey has been privileged to work closely with SGN on energy projects involving renewable gases like biomethane and hydrogen through Network Innovation Allowance projects. This collaboration has brought our academic work closer to real-world application. SGN's commitment to future-proofing their network and delivering innovative solutions is clear. We've learned a great deal from their inspiring team, who consistently build world-class, collaborative research partnerships to tackle both current and future energy challenges."

Dr Michael Short
Associate Professor
Institute for Sustainability,
University of Surrey

Steer Energy

"We have been delighted to support SGN in their drive to improve the safety and efficiency of their live gas operations during this past year. We have provided additional High Volume Gas Escape Toolkits – aimed at enabling operatives to safely stem leakage events, reducing emissions – as well as provided evidence for the acceptance of new drilling techniques for barholing operations, to reduce potential injuries."

Iain Chirnside
Director
Steer

Goal7

"We worked with SGN's Innovation team to identify key areas of potential hydrogen demand and supply across their regions and sectors. It was a great collaborative experience, focused on optimising the existing gas network and exploring future expansion to connect hydrogen producers and users. By combining our technical knowledge, mapping capabilities, and SGN's data and hydrogen insights, we contributed to a meaningful project. At Goal7, we're passionate about solutions that balance progress with sustainability – and this project truly reflected that."

James Robinson
Co-Founder Director
Goal7

Event attendance and collaboration 2024/25

Throughout the year, the innovation team participated in key industry events. These engagements facilitated exposure to cutting-edge technologies, evolving regulatory frameworks, and strategic partnerships – fuelling forward-thinking initiatives across the organisation.

Utility Week Live

The conference explored the evolving role of the UK's gas networks in a net zero energy future, focused on the transition to hydrogen and biomethane, the need for supportive policy on hybrid heating, and the development of technical standards for hydrogen use. It highlighted the complexity of decarbonising heat and industry, and the collaborative efforts needed to ensure a secure, affordable, and low-carbon energy system.

Opening of H100 Fife demo homes

First Minister John Swinney officially opened Scotland's first hydrogen demonstration homes, with SGN's CEO Simon Kilonback and Chief Strategy and Regulation Officer, Antony Green. The homes showcase how hydrogen appliances can provide a zero-carbon heating and cooking experience. The project will connect its first green hydrogen customers in late 2025.

SIF Community Forum

Stuart Sherlock, Innovation Governance and Performance Lead at SGN, attended the SIF Community Forum in Edinburgh – a key event for innovation leaders in the energy sector. There, he shared insights from SGN's cutting-edge projects, including the Intelligent Gas Grid and Predictive Safety Interventions, both supported by the SIF Beta funding to drive cleaner, safer, and more efficient energy solutions.

International Pipeline Conference

Max Koronka participated in the International Pipeline Conference (IPC), an event organised by the American Society of Mechanical Engineers with support from volunteers from leading international energy corporations, pipeline associations, and regulatory bodies. Held in Calgary, Canada, the conference featured the submission of LTS Futures' papers and presentation of one by Max, offering a comprehensive overview of the project and sharing valuable insights with a global audience.

No-Dig Live 2024

Members of our team attended No-Dig Live 2024, an event focused on trenchless technologies that enhance efficiency and safety in operations. These innovations, such as horizontal directional drilling and microtunneling, help reduce disruption, speed up projects, and minimise environmental impact, aligning with SGN's commitment to sustainability and improving customer outcomes.

Energy Innovation Basecamp

The Innovation Basecamp, hosted by ENA in Birmingham, brought together experts from across the gas and electricity networks to explore innovative solutions for decarbonising operations, improving infrastructure, and maximising existing assets. The event featured presentations, networking, and plans for future workshops – inviting ideas from across the energy sector to help build a cleaner, safer, and more sustainable energy system.

Predictive Safety Interventions (PSI) at Westminster

SGN attended an event at the Houses of Parliament where Tom Jackson, Oliver Machan and Simon Joyce presented their AI-powered project, PSI, developed with FYLD. The project uses AI to analyse data – from past incidents to real-time conditions – to predict and prevent safety risks for frontline workers in sectors like energy, aiming to make workplaces safer through early intervention and smarter decision-making.

All-Energy Exhibition & Conference

Members of SGN's Strategy & Regulation team hosted a stand at the Glasgow event, engaging with industry peers on renewable energy. The conference featured sessions on decarbonising heat, transport, and industry, plus enablers like hydrogen, grid expansion, and storage. It offered a platform to explore technologies, connect with partners, and reinforced SGN's commitment to innovation and collaboration in the transition to a low-carbon energy system.

Biomethane Connect Europe

Simon Joyce attended Biomethane Connect Europe in Paris, gaining insights into biomethane progress across Europe. The EU promotes collaboration among farmers, networks, and regulators to unlock its potential. France leads with 700+ active sites. SGN, a UK leader, can grow further by strengthening frameworks, investing in infrastructure, and fostering long-term, cross-sector co-operation.

Energy Innovation Summit

At this year's Energy Innovation Summit, SGN showcased its commitment to innovation. Gordon McMillan explored advancements in hydrogen and smart networks, connecting with peers and gaining insights into pioneering energy projects. The event highlighted the value of collaboration, reinforcing SGN's drive to build partnerships for a more sustainable energy future.

Innovation Zero

At Innovation Zero in London, SGN's Innovation and Future of Energy teams engaged with climate leaders to explore solutions for achieving net zero. The event offered early insights into emerging technologies and policy trends, helped forge new partnerships, and showcased SGN's progress in hydrogen storage, decentralised resilience, and green gas – key pillars of our long-term energy strategy.

Future of Utilities Summit

At the Future of Utilities Summit 2024, Nancy Thomson delivered a keynote speech on the LTS Futures project, which explores the potential to repurpose a 30km mothballed pipeline between Grangemouth and Granton to carry hydrogen. The event focused on transforming how energy is distributed, managed, and consumed, aligning closely with the project's aim to test the compatibility of the Local Transmission System (LTS) for hydrogen transport.

SGN Future of Energy strategies

Hydrogen evidence

Hydrogen as a decarbonisation vector

As we move towards a net zero future, exploring the role of hydrogen – as one of the green gas options – presents an opportunity to assess and optimise existing gas network infrastructure to deliver optionality for the energy consumers.

Upgrading and repurposing gas network assets to transport hydrogen has the potential to enhance network efficiency and reliability, ensuring a resilient integration of hydrogen to meet net zero requirements.

As we have been evidencing as part of any hydrogen potential conversion proposals, safety has been the paramount consideration. Throughout the year we have continued to develop robust supporting evidence and viable mitigations to the perceived risks associated with consumer adoption. This evidence also supports the enabling aspects for commercial and largescale industrial adoption of hydrogen. This approach was defined as part of Department for Energy Security and Net Zero (DESNZ) to ensure consistency for all consumers and creating future potential green gas opportunities for the communities we currently serve.

Collaborative leadership in hydrogen network transition

We have been leading the way and working in collaboration with the other UK GDNs generating evidence to demonstrate the safe conversion and long-term transition of our gas networks to hydrogen as a potential future solution for home heating informing DESNZ who is tasked with making the UK policy decision by 2026. DESNZ is being supported in this process by the Health and Safety Executive (HSE) who is reviewing the evidence gas networks are producing.

Comprehensive assessment and stakeholder engagement for hydrogen readiness

SGN has undertaken a significant body of work as part of the Comprehensive Formal Assessment (CFA) process for hydrogen. As shown in this report the projects we are working across a wide range of hydrogen evidence areas with the targeted goal of demonstrating future viability by addressing evidence gaps identified within the HSE Safety Demonstrations framework to show how it could potentially be done.

As part of providing the evidence for a potential use of hydrogen, we need to ensure consumer readiness, network integrity, and efficiency, while mitigating potential risks associated with large-scale industrial and commercial decarbonisation as a viable future opportunity.

The transition of community-based domestic and commercial gas customers to net zero solutions will require a range of solutions and hydrogen and it is therefore vital we provide the evidence base to show it can be done. By developing a structured framework for hydrogen adoption and implementing targeted infrastructure upgrades based on network conversion priorities and consumer demand, we can create new opportunities for Industry and Commerce (I&C) consumers while supporting job growth and economic development through the transition.

The primary objective of this initiative is to support the development of clear and effective government policies that align with industry best practices. By integrating comprehensive stakeholder engagement – particularly with key safety partners – we aim to ensure alignment with regulatory standards and proactively address emerging concerns. This collaborative approach is essential to fostering trust and co-operation throughout the net zero transition. At the same time, we remain firmly committed to our customers, ensuring their safety and comfort are maintained.

Link to more information

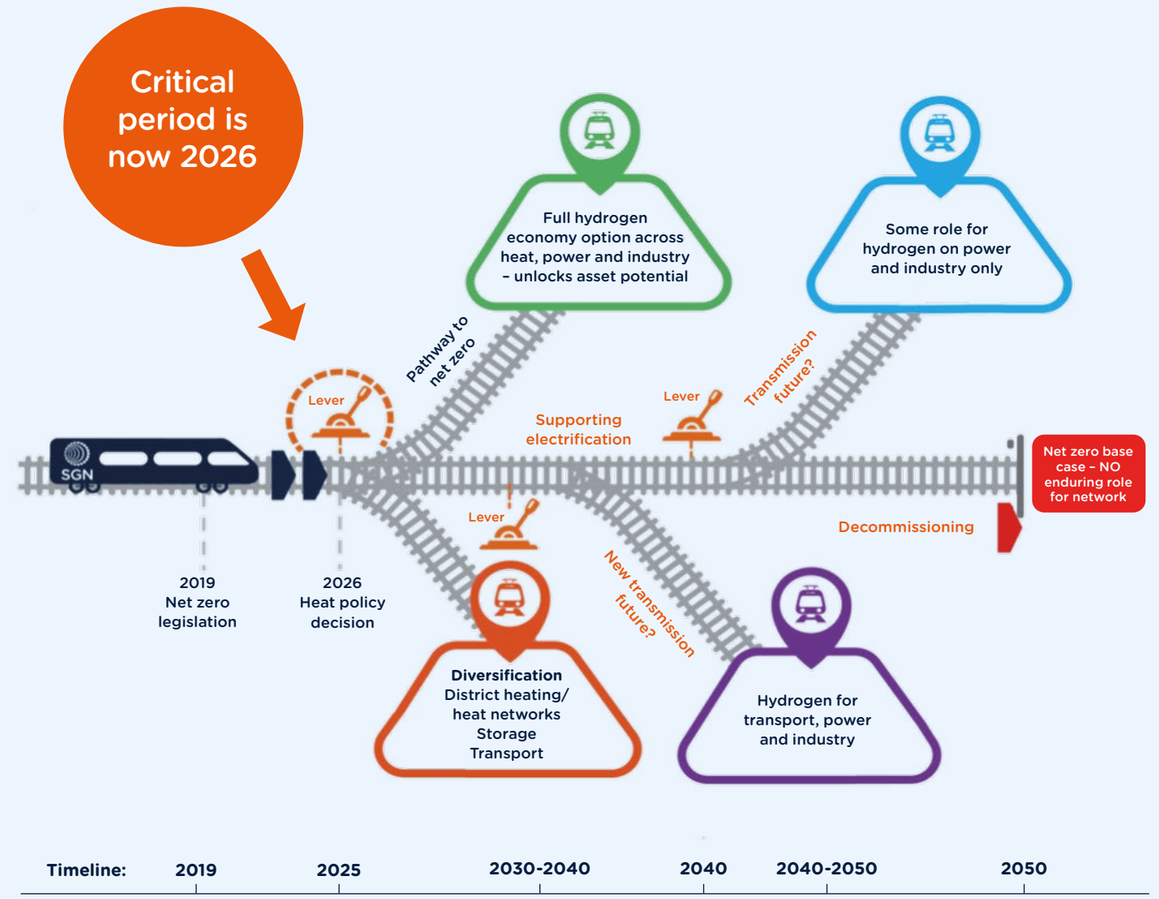
gov.uk/government/publications/hydrogen-heating-overview/hydrogen-heating-overview--2

Safety and evidence framework for hydrogen policy decision-making

HSE considerations for policy decision	Evidence category
System architecture	D1-D6
Conversion strategy	D7-D9
Network suitability (materials and components)	D10-D20
Public behaviour	D21-D26
Risk assessment	D27-D39
Controls	D40-D45
Capability and training	D46-D48
Standards and procedures	D49-D53
Policy and regulation	D54-D65

SGN hydrogen evidence project activities.

Hydrogen heating evidence programme framework



SGN Future of Energy strategies (continued)

System transformation

Towards a net zero gas grid

Achieving a net zero gas grid could be achieved through a combination of low carbon technologies including the blending of green gases, helping to maximise the value of our existing gas infrastructure. A gradual lowering of gas demand – driven by the adoption of solutions such as heat networks and heat pumps – creates an opportunity to use hydrogen alongside other green gases such as biomethane to support the decarbonisation of heat.

LTS Futures: repurposing the gas network for hydrogen

As part of our long-term strategy, LTS Futures is demonstrating the feasibility of repurposing the Local Transmission System (LTS) – the high-pressure backbone of our gas network – to safely and reliably transport hydrogen. This is a crucial step in demonstrating existing infrastructure can be adapted to deliver low-carbon gases, reducing the need for new pipelines and significantly lowering the cost and disruption of the energy transition for consumers. The project is also helping to build the evidence for regulatory and policy decisions, proving that a hydrogen-ready LTS could play a vital role in delivering regional and national net zero goals by enabling bulk hydrogen transport to businesses and industrial users.

Hydrogen blending: cutting carbon using existing infrastructure

Hydrogen blending is an important step in SGN's strategy to decarbonise the gas network. Blending up to 20% hydrogen with methane can remove significant amounts of carbon from the grid, while stimulating an immature hydrogen economy, utilising existing gas infrastructure and appliances without significant modification.

Decarbonising industry: H2 Caledonia

Alongside this, we're working to support the decarbonisation of industry through projects such as H2 Caledonia, which aims to unlock low-carbon hydrogen production and supply for industrial users across Scotland. By connecting hydrogen producers and users via new or repurposed network infrastructure, H2 Caledonia can help large energy users transition away from fossil fuels – reducing emissions, supporting green investment, and creating new opportunities in a low-carbon economy.

Scaling up biomethane

Biomethane is already playing a key role in helping SGN decarbonise the gas network, by supplying homes and businesses with a renewable gas that can be used with no changes to existing appliances or infrastructure. By 2026, we aim to increase this to supply the equivalent of 450,000 households, with a longer-term stretch target of 1 million homes by 2031.

Decarbonising remote networks: Scottish SIUs

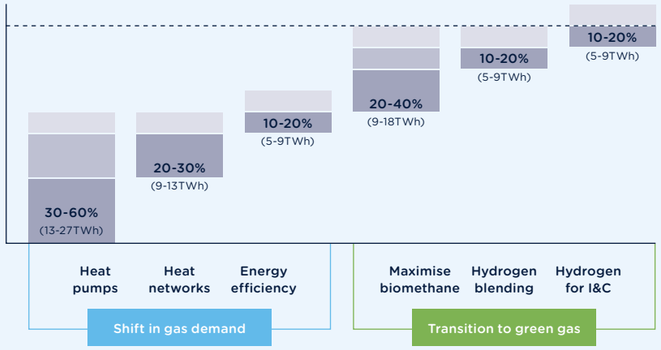
The mainland Scottish Statutory Independent Undertakings (SIUs), networks not fed off the National Transmission system and subsequently fed by road and rail tankered LNG, represent a challenging area of the network to decarbonise. Designs are underway for delivering locally sourced Bio-CNG to two of these sites (Wick and Thurso) with a view of extending designs to the remaining two sites in RIIO-GD3.

A whole-system approach to decarbonisation

Together, these technologies and projects demonstrate SGN's commitment to delivering a whole-system approach to decarbonisation – one that leverages existing infrastructure, reduces emissions across multiple sectors, and supports a cost-effective and just transition to net zero.

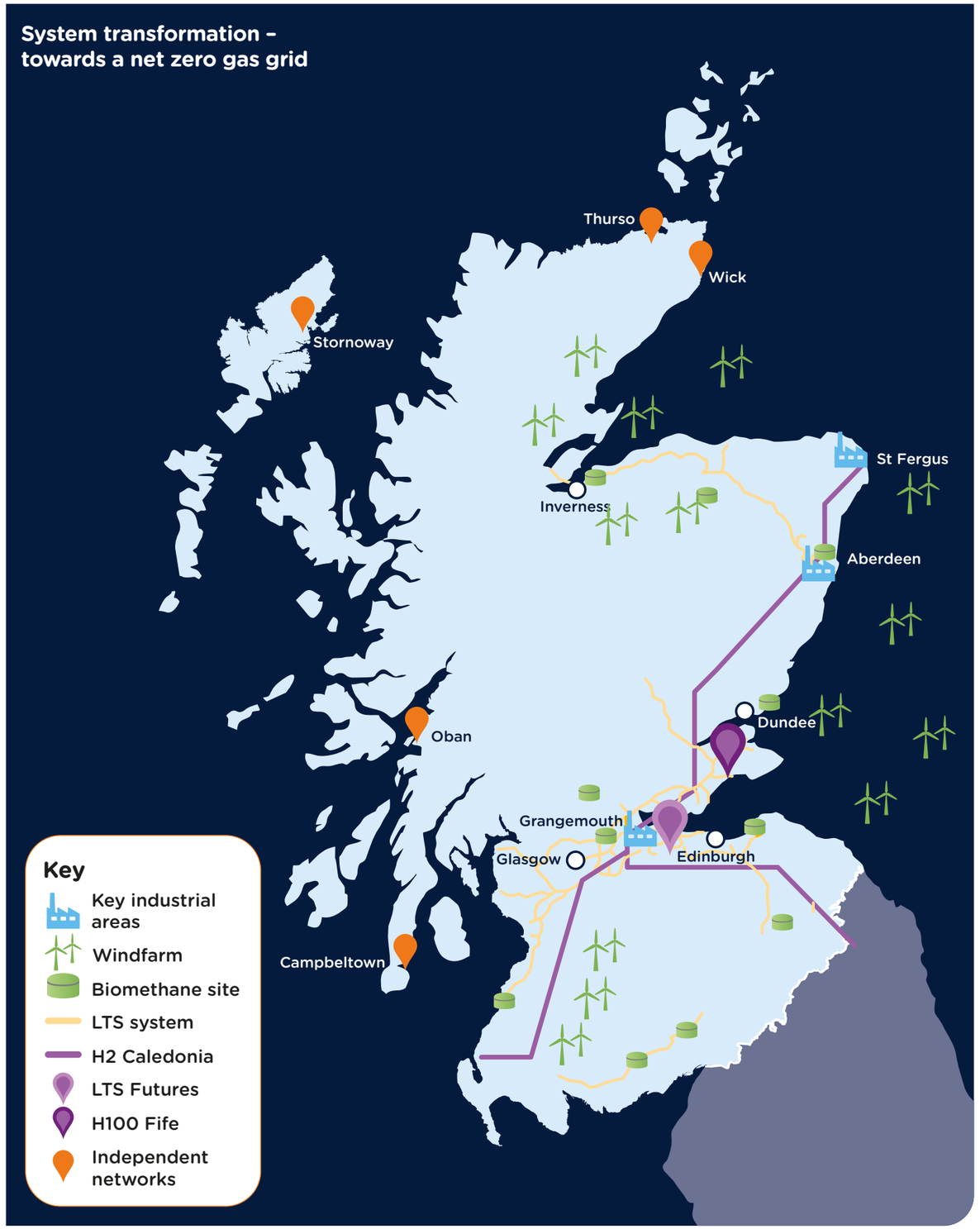
Decarbonising our network in Scotland

Achieving a net zero gas grid could be possible through a range of technologies and blending of green gases to maximise the value of an existing asset.



Link to more information

sgn.co.uk/news/sgn-and-ngt-accelerate-hydrogen-plans-scotland-and-southern-england



H100 Fife

H100 Fife is a pioneering end-to-end green hydrogen demonstration project, showcasing the production, storage, and distribution of 100% hydrogen directly to customers' homes.

Overview

The project has achieved considerable progress over the past year and is now progressing plans for its operational phase, where it will supply green hydrogen through a dedicated network.

Significant progress has been made in Energy Park Fife in Levenmouth, home to our hydrogen production and storage (P&S) site. Our teams and contractors have reached some key milestones including the completion of the electrolyser building and the exterior of the management building from which the entire site will be controlled. Work is also well underway on the internal electrolyser systems, keeping the project on track for delivery.

The construction of the hydrogen distribution network marked another major success. The 8.4km polyethylene (PE) network was completed in August 2024 and is now commissioned with natural gas.

Progress

Construction of our Hydrogen Demonstration Homes finished in January 2025. The interior design and furniture fit-out was also completed including the installation of new hydrogen boilers from leading manufacturers Bosch and Baxi and hydrogen hobs from Bosch Home Appliances.

Scotland's First Minister John Swinney joined us to officially launch the homes in February 2025. He said:

"Scotland's net zero future depends on our ability to create innovative solutions to tackle climate change; and the H100 Fife project is a shining example of this ambition.

"These demonstration homes offer residents a glimpse of the role that hydrogen can play in delivering warm and comfortable homes with zero carbon emissions.

"I welcome this significant milestone in the project's journey and look forward to its completion."

Customers are now visiting the homes to interact directly with hydrogen appliances and find out more about the changes that will be made to their homes when the project goes live.

We're currently focussed on the next phase of our customer journey, providing our customers with all the tailored information they need to know about their own home installation scheduled later this year.

Hydrogen training centre

In May we celebrated the opening of the UK's first hydrogen training centre for gas engineers alongside our partners Fife College.

The facility, located at Fife College's Levenmouth Campus, will train over 100 Gas Safe registered engineers this year, equipping them with the skills needed to safely convert homes from natural gas to hydrogen and to undertake servicing and maintenance activities. This training is essential for the engineers who will be involved in H100 Fife.

Gary Smith, General Secretary of GMB, the UK's largest energy union, who visited the college during a trip to H100 Fife in May, welcomed the launch. He said:

"The opening of this hydrogen training centre is a milestone for the gas industry and its workforce. As we transition to a net zero economy, it's vital that we not only protect jobs but also ensure that workers are upskilled for the future.

"This centre will empower today's engineers to safely work with hydrogen while preparing them for roles that will shape the transition to green energy. It's a testament to the resilience of the workforce and their ability to adapt to the changing energy landscape."

Training for the SGN engineers providing the emergency response for the dedicated hydrogen network is also nearing completion, with around 150 SGN colleagues being upskilled.

Read more about H100 Fife here.

8.4km

network will carry green hydrogen to hundreds of households


ORE Catapult

Hydrogen for heating and cooking
Our hydrogen demonstration homes showcase hydrogen appliances, meterboxes and pipework.

LTS Futures

The LTS Futures project forms part of the UK's National Hydrogen Research Programme to deliver a net zero decarbonisation solution for customers.

30km

pipeline repurposed to test compatibility with hydrogen

Overview

We're testing the compatibility of the Local Transmission System (LTS) to transport hydrogen, by repurposing a mothballed 30km pipeline which runs from Grangemouth to Granton. We are working to provide evidence that the pipeline can carry 100% hydrogen instead of natural gas. The project will culminate in a first of its kind live trial in 2025.

Progress

Project construction is well underway with several key milestones achieved. Ofgem Stage Gate 2 has now been completed, caveated with requirement for HSE no objection to the Case for Safety allowing progression to live trial scheduled in June 2025.

Live trial design and construction

The 30km repurposed live trial pipeline will be supplied by a newly constructed 1.2km tie-in hydrogen supply pipeline connected to current hydrogen producer, INEOS. Construction of this new asset has now completed.

Before entering the 30km live trial pipeline, hydrogen will pass through an entry unit specifically designed and constructed for the trial. The entry unit includes pressure and flow control, odorisation and instrumentation for recording key parameters of the trial. Fabrication of our entry unit has completed and the asset is now at DNV Spadeadam site for SGN operative training prior to the live trial.

At midpoint of the Grangemouth to Granton pipeline is our Newton block valve site. At this site, new bypass pipework with pressure control and instrumentation will be installed. Fabrication of the bypass and construction at the site is well underway.

The termination point of our live trial pipeline at Granton ties into an enclosed flare stack with instrumentation, pressure and flow control to control live trial operations. The flare stack allows the trial to mimic a flow through the pipeline to enable live trial operations such as live welding to be carried out. Our flare stack and control centre for the site have both been installed with above ground pipework installation due to commence in April.

The project continues to maintain the Grangemouth to Granton pipeline through maintenance procedures including completion of above ground surveys and investigative digs to ensure cathodic protection and coating are suitable on the pipeline.

Offsite testing

Natural gas pipeline material from the 1960s and 1970s is undergoing testing in hydrogen at project partners TWI Cambridge and DNV Spadeadam test sites. The material has been taken from the live trial pipeline and elsewhere on the SGN LTS asset base.

Small-scale testing at TWI provides an understanding of how hydrogen affects vintage materials. Full-scale burst and fatigue tests at DNV Spadeadam assessed materials with defects, cracks and dents, and small-bore branch connections have been completed and are in progress. At DNV, UK-first live welding and hot-tapping operations have been carried out on the Grangemouth to Granton pipeline material transporting hydrogen. This has developed operational procedures for the live trial. An ex-natural gas pressure reduction installation will be tested with 'typical' and high hydrogen flow rates.

Live trial

The live trial will encompass flowing gas operations including purging, venting, flaring and live hot works. Several work instructions for typical and new operational activities have been completed feeding into training packages for SGN to upskill operational staff to become competent for working on live trial activities.

Emergency response workshops with key stakeholders and resilience partners are underway. Factory Acceptance Tests with Hot Works partners TD Williamson and STATS Group are well underway and will feed into the development of SGN method statements for completion of works. Quantitative Risk Assessments (QRAs) have been completed for the new hydrogen supply pipeline and repurposed live trial pipeline. The project Case for Safety has been submitted to the HSE.

Next steps for the project include the completion of construction at our sites, ongoing training of SGN operatives and all required documentation including Management Procedures and Work Instructions for completion of the trial.

Read more about LTS Futures here.

Supplying hydrogen for the trial
A 1.2km hydrogen supply pipeline, links our 30km trial pipeline to a hydrogen source at INEOS' Grangemouth facility.

Ofgem NIA funded projects

Hydrogen in Multi-Occupancy Buildings (MOBs)

Background

Our MOBs project examined the decarbonisation challenge of transitioning MOBs to hydrogen. This feasibility study has delivered an understanding of the safety, cost and practicality of converting MOBs from natural gas to hydrogen.

The problem we are trying to solve

Most research to date has focused on converting smaller, simpler systems, such as single- and two-storey homes to hydrogen. However, there are unique challenges with the feasibility of converting more complex buildings to hydrogen. MOBs encompass a wide range of building types and gas installations. GDNs must assess the safety risks associated with these buildings, identify mitigation measures to reduce those risks in line with current risk levels and evaluate the cost and practicality of conversion. Understanding these factors is essential for determining whether hydrogen could be a viable option.

Our solution

SGN completed a feasibility study to understand if hydrogen is a decarbonisation solution for MOBs. The study involved desktop and laboratory testing, feeding into a QRA that identified risks and mitigation strategies for conversion. Findings informed recommendations for a hydrogen supplement to the IGEM/G/5 standard and a draft management procedure. The project delivered an understanding of the feasibility of conversion for most MOBs.

Our partners on this activity

- DNV
- ICS
- ROSEN
- Steer Energy

Links to more information on this innovation project

ENA Smarter Networks Portal

Data Analysis Phase 1:
smarter.energynetworks.org/projects/nia2_sgn0023

Asset Information Review Phase 2:
smarter.energynetworks.org/projects/nia2_sgn0033

QRA and Testing Phase 3:
smarter.energynetworks.org/projects/nia2_sgn0043

Standards and Procedures Phase 4:
smarter.energynetworks.org/projects/nia2_sgn0047

Multi Occupancy Building being surveyed.

Cominglo – Blended CV Measurement Point

Background

To ensure accurate measurement of energy content in a blended gas grid, Cominglo seeks to model the optimal distance downstream of an injection point to install Calorific Value (CV) measurement devices. This will be achieved by determining co-mingling points where different gas mixtures (natural gas, hydrogen, biomethane) are completely mixed, in turn helping to design blending systems, enhancing decision-making and ensuring regulatory compliance.

The problem we are trying to solve

The blending of green gases such as biomethane and hydrogen into the grid is expected to play a crucial role in gas grid decarbonisation. Today, gas customers are billed based on the volume of gas delivered to them, with the total energy content being determined using the CV measured at a separate location. To ensure fair and accurate billing, CV measurements must be taken at a point where the gases in the system are known to be fully mixed ('co-mingled'), so the sample used for measurement is representative of the whole. However, mixing of gases is not straightforward with different flow regimes and layered flows possible. Gas mixing is influenced by gas characteristics, network design features and operational conditions. Given the wide range of infrastructure across the gas network, it is extremely challenging for the gas network to identify suitable measurement points.

Our solution

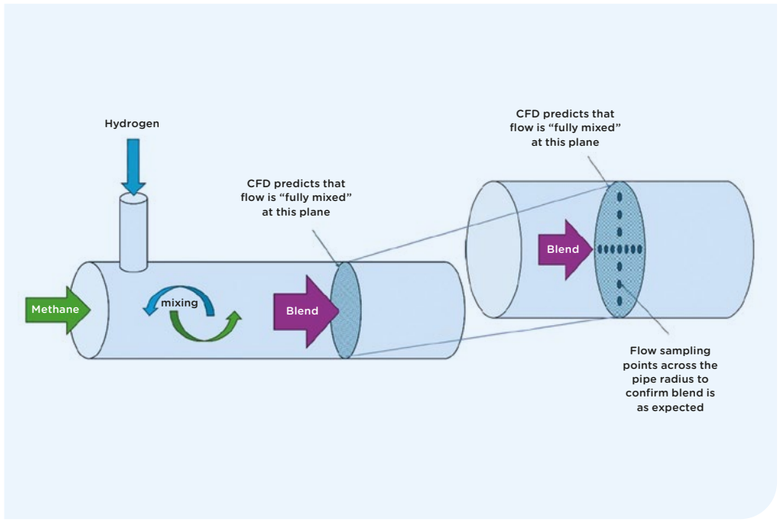
The project involves in-depth analysis of mixing efficiency using Computational Fluid Dynamics (CFD) to simulate and evaluate gas flows under various conditions. Simulation and analysis of the effects of commercially available mixing elements will also be included. Results will be validated through laboratory experiments. A purpose-built, versatile tool will be developed to allow users to input specific characteristics of blending scenarios, such as gas types, pipe diameters, materials, geometries, flow rates, pressure conditions, and temperature profiles. This project aims to optimise gas mixing and CV measurement, ensuring regulatory compliance.

Our partners on this activity

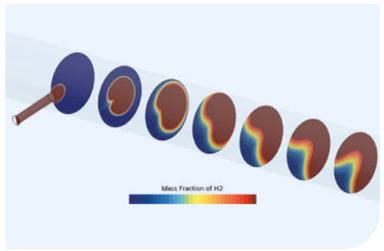
- Element Digital Engineering

Link to more information on this innovation project

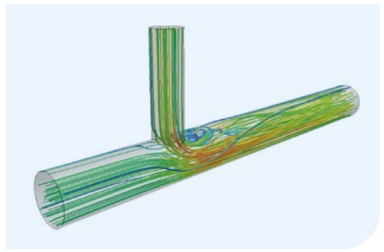
FEN Innovation Portal
portal.futureenergynetworks.org.uk/content/projects/nia2_sgn0053



Mixing efficiency diagram.



Computational fluid dynamics.



Ofgem NIA funded projects (continued)

Heat Network Transition Study

Background

Through our heat network transition study we evaluated SGN's potential role in the net zero transition by identifying energy solutions that are both technically feasible and commercially viable, while aiming to leverage existing assets.

The problem we are trying to solve

The UK Government's 2021 Heat and Building Strategy targets heat networks to supply around 18% of UK heat by 2050, up from the current 2% to 3%. To achieve this, an estimated £60bn to £80bn investment is needed. However, the high upfront costs and long payback periods of heat networks pose significant barriers to deployment, with existing business models transferring too much risk to developers, undermining their viability. The absence of a clear process for GDNs, other than disconnection for safety reasons, limits their potential. SGN has assessed heat network opportunities but the current business models do not adequately support a gas-to-heat network transition for MOBs. Engaging with key stakeholders is now critical to identify solutions and ensure that government targets are met, or the potential of heat networks in the transition will not be realised.

Our solution

This study explores the potential for SGN to repurpose existing assets for net zero heating solutions and evaluating alternative options if repurposing is not feasible. Each potential solution is being assessed from an economic perspective to determine its commercial viability. Additionally, the study examines whether there is value in reusing, recycling, or reselling the original assets to help offset the costs of transition. The findings will provide a comprehensive understanding of how to effectively support the transition to low-carbon heating while ensuring commercial sustainability and regulatory compliance.

Our partners on this activity

- PA Consulting

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0071

Multi Occupancy Building assessment.

RTSM – Phase 1 – Methodology Development

Background

The Real-Time Settlement Methodology (RTSM) Phase 1 project aims to produce a fair, equitable, accurate, and feasible settlement and billing methodology that will enable network flexibility and provide effective routes to the decarbonisation of the gas network while increasing the opportunity of injection of low-carbon gases. The project strives to overcome technical and operational challenges by maximising benefits for the minimum outlay while establishing an environment of certainty for low-carbon gases ramp-up.

The problem we are trying to solve

The uptake of green gases like biomethane and hydrogen is key to decarbonising the gas network. However, these gases have a lower CV than natural gas, presenting a challenge for billing customers under existing regulations. The Flow Weighted Average Calorific Value (FWACV) method currently governs how consumers are billed, and it requires CV capping to ensure the lowest CV in the Local Distribution Zone doesn't fall more than 1 MJ/m^3 below the average. While this prevents billing discrepancies, it limits the volume of hydrogen that can be injected into the grid and requires biomethane to be enriched. To unlock the full potential of green gases, it is necessary to update the current methodology and regulations to ensure fair and equitable billing for customers and help facilitate the transition as we move toward net zero.

Our solution

This project will help to enable increased uptake of green gases by enabling a flexible gas billing solution that negates the need to cap the CV. This project will also determine the feasibility and outline the requirements for implementation to ensure optimal outcomes for stakeholders. This will be done by undertaking comprehensive market research and technological assessment, development of the basis of design of a modelling solution, feasibility analysis, and completion of a comprehensive roadmap for implementation. A rollout strategy for demonstration will inform subsequent phases of the RTSM programme.

Our partners on this activity

- Cadent
- Chaucer Group (BIP)
- Correla
- National Energy System Operator
- National Gas Transmission
- Northern Gas Networks
- Ofgem
- Wales & West Utilities
- Xoserve

Links to more information on this innovation project

Project video
youtube.com/watch?v=_iGoVb15fK0

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0046

Cooking at home using green gas.

Comparing the market.

Ofgem NIA funded projects (continued)

Materials Qualification for Hydrogen TD1 Pipelines

Background

A primary threat to steel pipelines in hydrogen service is the ingress of hydrogen into the steel structure and the resulting degradation of material properties. Current standards for hydrogen pipelines (ASME B31.12 and IGEM/TD/1 Edition 6 Supplement 2) specify that pipeline material is qualified for hydrogen service to enable efficient pipeline design and use of material, but currently a standard approach to material qualification is not available. Material qualification requires that material testing is carried out to determine the change in material properties due to exposure to hydrogen. IGEM/TD/1 Supplement 2 does not specify the types of tests required to qualify material. SGN has therefore initiated a project funded by the Ofgem NIA to develop a material process qualification (MPQ) procedure for linepipe for hydrogen service.

The problem we are trying to solve

The fracture toughness testing of materials for hydrogen service must be carried out in accordance with European Pipeline Research Group (ERPG) Guidelines to ensure test results are comparable and repeatable.

A proposed approach for the development of a procedure for qualification of new linepipe for hydrogen service is presented, acknowledging the current limitations on the capacity and capability for testing in hydrogen and that current research does not verify the use of material parameters measured in air for deriving material parameters in hydrogen.

The approach involves the application of an agreed MPQ procedure in an industry study to derive in-hydrogen material properties and establish a relationship between lower bound fracture toughness in hydrogen and data for standard in-air material tests.

Co-operation between pipeline operators and pipe manufacturers is necessary to balance the requirements of design and material producibility and qualification.

Our solution

Industry study should be conducted in order to:

- Share fracture toughness in hydrogen data to include in a published database;
- Conduct a programme of material tests to be undertaken during manufacture using an agreed, generic MPQ procedure;
- Analyse the data obtained through application of the generic MPQ to establish a lower bound fracture toughness values in-hydrogen and the relationship with relevant in-air measurements;
- Assess the value of H2Pipe Joint Industry Project (JIP) recommendations for use in sour service linepipe metallurgy;
- Identify the most efficient and economic test requirements for inclusion in MPQ procedures and specifications for purchase of linepipe for hydrogen service.

A detailed, costed scope should be agreed with gas network operators to inform MPQ procedures and linepipe specs for hydrogen service. Minimum fracture toughness should be based on flaw sizes matching API Spec 5L acceptance criteria. The calculation method must be agreed. IGEM/TD/1 Supplement 2 and related standards should adopt this toughness value, allowing lower values if justified by further analysis.

Our partners on this activity

- John Wood Group
- PIE

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0039

Example of LTS system.

Biomethane Islands

Background

A Biomethane Island (BI) constitutes an isolated area of the gas network where the sole supply of gas will be provisioned by low carbon biomethane for all customers. This concept supports the development of self-sufficient, low-carbon energy systems that contribute to the decarbonisation of the gas network. However, several challenges need to be addressed to ensure their successful implementation and support the broader transition to a greener energy system.

The problem we are trying to solve

As of 2024, approximately 100 embedded biomethane sites inject enriched biomethane into the national gas network, meeting approximately 2% to 3% of the UK's total annual gas demand. Despite this progress, several challenges limit its full potential, including feedstock availability, gas quality variations, grid capacity, demand variation, and regulatory constraints that require biomethane enrichment, undermining its green credentials. With these obstacles, producers may need to curtail injection and explore more profitable markets.

While the Green Gas Support Scheme supports biomethane production in Great Britain, there is a need for further incentives and schemes to boost unpropanated biomethane uptake. A comprehensive value creation model is essential to address these challenges, ensuring biomethane can play a more significant role in the UK's energy transition.

Our solution

The project will evaluate the feasibility of converting three locations into BIs, focusing on key aspects to ensure sustainability metrics, including site suitability, gas network adjustments, feedstock availability, carbon intensity, waste management, and potential environmental impacts. It will incorporate production optimisation and storage solutions to ensure security of supply, accounting for demand variations. Additionally, the project will assess financial aspects, including funding options and regulatory compliance. As a result, a comprehensive framework will be created, enabling replication across Great Britain, paving the way for future BIs.

Our partners on this activity

- Axis P.E.D
- Green Giraffe Advisory
- NNFCC
- University of Surrey

Links to more information on this innovation project

FEN Innovation Portal
portal.futureenergynetworks.org.uk/content/projects/nia2_sgn0072

Biomethane silos.

Ofgem NIA funded projects (continued)

Electrolyser Horizons

Background

Hydrogen, when produced through renewable methods, is projected to have a key role in decarbonisation of the nation's energy system. Electrolyser Horizons aims to develop a comprehensive methodology to assess the techno-economic feasibility of sustainable electrolytic hydrogen production in Great Britain. Focus areas will include the potential of different electrolyser technologies to support the rollout of a hydrogen economy and the social, environmental and economic impacts of electrolytic production.

The problem we are trying to solve

Legacy hydrogen production is inherently carbon intensive as methods typically use fossil fuels as their input. Utilising electrolysers, a technology that applies the process of electrolysis (passing an electric current through water to split it into pure hydrogen and oxygen), to produce 'green' hydrogen is viewed as a more sustainable alternative. UK Government incentives such as the first Hydrogen Allocation Round (HAR1) prove vital financial support for green hydrogen projects. However, the energy industry has yet to fully tap into the potential and opportunities available for green hydrogen production, and there is currently no detailed analysis considering existing assets and infrastructure. A clear view of available opportunities both now and in the future is essential to inform strategic decision-making, investment, and policy decisions for electrolytic hydrogen production. This will accelerate the uptake of green hydrogen, supporting the decarbonisation of the gas grid and wider industry.

Our solution

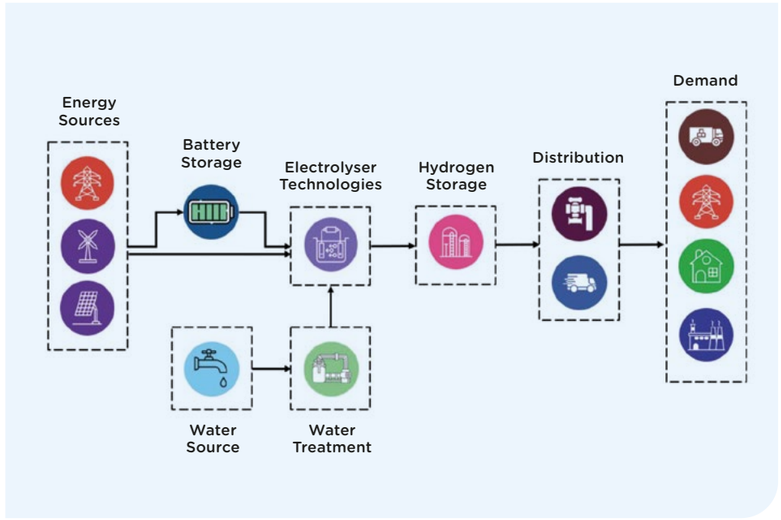
This project evaluates the potential for electrolytic hydrogen production by first undertaking a comprehensive literature review of the current energy landscape and available electrolyser technologies. This will inform techno-economic optimisation modelling that will perform technology selection, system design, and techno-economic assessment of a renewable energy-powered electrolyser system capable of meeting dynamic gas demands. A Social Cost Benefit Analysis will assess the long-term economic viability of hydrogen electrolysers by considering key social, environmental and economic factors. An interactive Geographical Information System (GIS) database will visually present the results to stakeholders.

Our partners on this activity

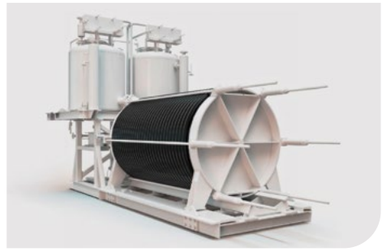
- National Energy System Operator
- PNDC
- University of St Andrews
- University of Strathclyde (Centre for Energy Policy)
- University of Surrey

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0062



Model/system architecture.



Electrolysers for green hydrogen production.

MASiP H2 – Technical Development

Background

Following from the results of Phase 1, the project will progress the technical development outcomes from Phase 1 gap analysis work identifying the required repair techniques, tight radius bends and increased safety factors for hydrogen transportation. The qualification plan will highlight the key testing requirements and will be aligned to industry standards. The primary standard will be API 15S due to having more difficult testing parameters, supplemented by other UK and international standards.

The problem we are trying to solve

Main focuses of the project included the development of a robust repair technique, tight radius bends and increased safety factors for hydrogen transportation. Other challenges included making the product viable for the higher-pressure ratings used in gas transmission pipelines, which included testing on a variety of Multi Agency Strategic Planning (MASiP) pipe diameters.

The result includes Finite Element Analysis (FEA) design for tight bends, analysis of the manufacturing processes, and detailed method statements for each qualification test and test programme design. The material of the pipeline was reinforced for larger pressure tiers and designs for the subassembly modifications were developed. A collaboration with leading pipeline repair specialists enabled a repair approach to be developed for wall thinning, dents and gouges.

Results of this FEA analysis seemed to indicate that carbon fibre repairs on wall thinning defects had a stabilising effect on adjacent sections of the pipe. When carbon fibre repairs were applied to dents and gouges it indicated that they were likely to be effective, although grouted steel sleeves may remain the preferred option.

Our solution

A comprehensive set of test plans was developed to address repair procedures for corrosion, dents, and gouges. During this phase, base case qualification tests were established in alignment with API 15S standards. These included critical assessments such as burst testing for both straight and bend pipe sections.

A strategic, risk-informed methodology was employed throughout the design and engineering process. This included FEA, preliminary validation testing, and witnessed qualification trials to support the deployment of new technology within the gas infrastructure sector.

This approach enabled the extension of the core reinforcement technology, increasing the steel strip thickness from 0.75mm to 1.0mm. As a result, the calculated restrained burst pressure capacity was enhanced from 120bar to 200bar. The same methodology has been applied to the development of defect repair procedures, following the principles outlined in standards such as P11 and P/20.

Our partners on this activity

- Sustainable Pipeline Systems

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0068

MASiP pipeline system is a low carbon, intelligent pipeline solution to efficiently and cost effectively deploy a net zero transmission network.

Ofgem NIA funded projects (continued)

Hydrogen Entry Unit Design

Background

As the gas network evolves to support future energy needs, there is a growing requirement to accommodate changes in gas composition, including potential blends of alternative gases. One key challenge is ensuring the network can handle these changes safely and accurately, particularly during transitional periods.

Currently, the infrastructure at network entry points is designed for natural gas. These sites include a range of monitoring and metering equipment used for custody transfer between the National Gas Transmission (NGT) and GDNs. Any future strategy that introduces gas blends will require updates to this equipment and processes.

The problem we are trying to solve

There is uncertainty about how small changes in gas composition affect the performance and accuracy of existing network assets. For example, even a minor variation in gas mix can impact flow and energy measurement beyond the accepted tolerances defined in NGGT T/SP/ME/1.

Accurate monitoring is essential, especially at high-pressure sites where small changes can have significant effects. In Scotland, 18 National Offtake sites – particularly St Fergus – play a major role in national supply, meaning any changes at these points could affect the wider GB network.

Upgrades to SGN's offtake sites were identified in the RIIO-GD2 Business Plan. These include improvements to odorisation systems, gas analysis, hazardous area zoning, and compliance with safety regulations. These upgrades are also linked to broader policy initiatives aimed at modernising the gas network.

Our solution

Upgrading SGN's offtake sites is a key step in preparing the network for future gas compositions. This work depends on safety assessments and regulatory updates, including potential revisions to GS(M)R and approvals from Ofgem for updated gas analysis systems.

Key deliverables included:

- Reviewing and updating metering and gas quality procedures (e.g., SGN/GQ/8, SGN/ME/13, SGN/GQ/3)
- Ensuring portable equipment meets current ATEX safety standards
- Assessing site capacity and system performance under varying gas compositions, which may affect:
  - Calorific Value
  - Volume correction factors
  - Volumetric flow rates
- Evaluating the suitability of existing technologies such as orifice and turbine meters
- Implemented output designs into SGN core system

Our partners on this activity

- Kelton Engineering

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0018

Gas infrastructure.

Accessible CO alarm (Phase 1)

Background

We are developing a smarter, more accessible carbon monoxide (CO) alarm to protect vulnerable people – particularly those with visual, auditory, or cognitive impairments – who may not hear or understand traditional alarms. The device uses voice alerts and smart technology to improve home safety and provide peace of mind.

The problem we are trying to solve

Carbon monoxide is a colourless, odourless, and fatal gas. Traditional CO alarms rely on beeping sounds or flashing lights, which can be missed or misunderstood by people with disabilities or cognitive impairments. This creates a serious gap in protection for many vulnerable individuals who may not be able to act in time.

With an ageing population and increasing numbers of people living independently with support needs, there's an urgent need to ensure CO alarms are inclusive, intuitive, and usable by everyone – regardless of physical or cognitive ability. Current options on the market are limited, costly, and often not tailored to the specific needs of these users, meaning many people go unprotected.

Our solution

Our solution is to develop a CO alarm with clear spoken voice alerts and IoT (smart home) connectivity, making it easier for users to understand and respond to CO threats. Designed with input from people with lived experience of disability, the alarm will include features that improve accessibility, usability, and reliability. It will also offer remote alerts for carers and family members, ensuring wider safety coverage.

Our partners on this activity

- Bournemouth University
- FireBlitz Extinguisher
- Policy Connect

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0083

We are developing a smarter, more accessible carbon monoxide (CO) alarm to protect vulnerable people – particularly those with visual, auditory, or cognitive impairments.

Development of a CO alarm.

Ofgem NIA funded projects (continued)

NDT fatigue crack growth rate of hydrogen pipelines

Background

The UK LTS consists of 11,000km of high-pressure pipelines delivering gas from NTS offtakes to towns and cities across the country. The SGN LTS Futures project will result in a blueprint methodology for converting LTS pipelines from conveying natural gas to hydrogen. A first of its kind repurposing trial and demonstration will be undertaken providing critical insight into operational activities, repurposing standards, and conversion techniques. A large volume of offsite testing is being undertaken at DNV Spadeadam to provide further evidence including Hot Works Trials, Burst and Fatigue Testing, Venting and Flaring and Pressure Regulating Station (PRS) Testing.

The problem we are trying to solve

In order to repurpose the LTS network assets for hydrogen in a safe manner, it is critical that the behaviour of pipeline defects in a hydrogen environment is understood. An exact measure of the internal crack fatigue growth rate of pipelines in hydrogen has not been measured on a full-scale test, although several studies have been conducted on a laboratory scale. These include using Non-Destructive Testing (NDT) instrumentation to measure fatigue crack growth rates of internal defects on higher alloy steel (X70). A gap in knowledge exists for lower alloy steels such as X52, which comprises a large part of the LTS network and correlates in providing additional deliverable to the LTS Futures scope of works.

Fatigue vessels have been fabricated using vintage pipe sections taken from SGN's existing LTS network. One vessel will be tested hydrostatically and the other pneumatically with hydrogen to provide a reference and determine any difference when using hydrogen.

Our solution

The number of cycles to failure will be measured for each pipeline defect and compared with values from the counterpart hydrostatic test vessel. The fatigue crack growth rate of the external crack defect will be measured in situ using a clip gauge. Strain gauges will also been positioned around defects allowing the stress concentration to be measured.

It is proposed using NDT to measure the fatigue crack growth rates on these vessels. Time of Flight Diffraction (ToFD) is one of the most reliable NDT methods for inspecting welds and defects. This is an ultrasonic method that is used in several industries including petrochemical, chemical, oil and gas, power generation and fabrication.

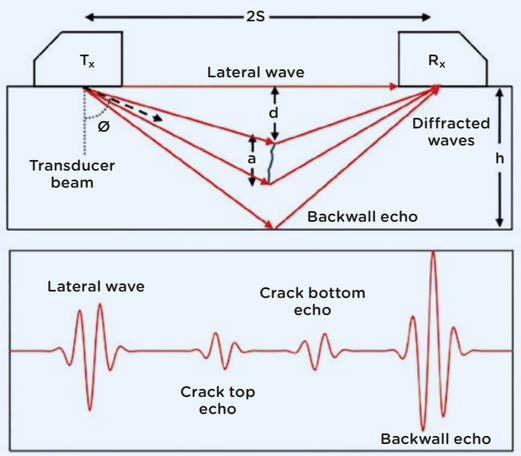
Our partners on this activity

- DNV
- PIE

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0065

Testing models.



Interventions for Hydrogen by Asset Group Phase 3

Background

Over the course of the government's Hydrogen Heating Programme, the gas networks produced a considerable amount of evidence on the feasibility of converting the gas network to 100% hydrogen. The original 'Asset Interventions' project consolidated all this evidence within a single database, which was then analysed to identify remaining knowledge gaps. Phase 3 continued to improve upon this work, added new evidence into the central repository, and undertook additional assessments.

The problem we are trying to solve

Together, the GB gas networks have produced an extensive body of evidence to demonstrate the suitability of natural gas networks for hydrogen conversion. As the number of projects and amount of evidence produced increased, it became challenging to keep track of the overall progress of the research. The original 'Asset Interventions' project created a centralised database aimed at facilitating a thorough assessment of evidence to identify remaining gaps, propose interventions to close these gaps, and avoid duplication of projects. The database was designed to be a live document, with new evidence added and assessed to ensure gaps were continually being addressed. However, due to the volume of information contained in the database – asset categories, projects, evidence, assessments, proposed interventions, and more – navigating through the database became challenging.

Our solution

Phase 3 of 'Asset Interventions' added new evidence that had been produced since the end of the previous phase. Each relevant asset was re-assessed in light of the new evidence, and scores were updated to reflect the progress of the research.

The project also improved upon the design of the original database by introducing a navigating pane, extracting all results and consolidating them into a single table, coding macros into the file, and streamlining the data.

Our partners on this activity

- Arup
- DNV

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0056

Asset intervention database.

			Phase 3 *(Averages calculated from Pressure Tiers)*					Phase 2 *(Averages from Phase 2 for info)*				
L2 References	**Sub-requirement**	**Workstream**	**NTS**	**LTS**	**IP**	**MP**	**LP**	**NTS**	**LTS**	**IP**	**MP**	**LP**
D04N13	Assessment of safety of velocity and saltation to increase system capacity	All	3.00	2.67	2.67	3.00	3.00	3.00	2.67	2.67	2.50	3.00
D04N16	Assessment of pressure management systems to increase system capacity	All	2.00	2.00	3.00	3.00	3.00	2.00	2.00	2.33	2.33	2.33
D10N01	Characterisation of condition of existing PE	Distribution	N/A	N/A	5.00	5.00	5.00	N/A	N/A	5.00	3.60	3.60
D10N02	Characterisation of condition of existing cast iron	Distribution	N/A	N/A	5.00	5.00	5.00	N/A	N/A	3.40	3.31	3.31
D10N03	Characterisation of condition of existing steel	All	4.10	4.21	4.73	5.00	5.00	3.44	3.42	4.15	4.47	4.47
D10N04	Characterisation of condition of existing other metals	All	N/A	N/A	4.78	4.79	4.83	N/A	N/A	4.80	4.55	4.55
D10N05	Characterisation of condition of existing other materials	All	3.40	3.50	4.14	4.00	4.47	3.00	2.57	4.00	3.25	3.25
D10N06	Characterisation of condition of repaired materials	All	N/A	4.50	2.50	3.00	3.33	N/A	3.67	2.50	2.50	2.50

Rating (1 to 5):

- 1 = No research undertaken, many key knowledge gaps
- 2 = Limited research undertaken, many key knowledge gaps remain
- 3 = Some research undertaken, several remaining knowledge gaps
- 4 = Significant research undertaken, few knowledge gaps remain
- 5 = Fundamentally all research has been completed
- N/A = Where the asset type does not apply to the Pressure Tier or has been assessed elsewhere

Ofgem NIA funded projects (continued)

Internal Sharp Defect Burst Testing in Hydrogen

Background

In LTS Futures' nine burst tests on different defects (smooth dent, external sharp, external blunt, external dent and gouge, internal sharp) in vintage pipeline material were conducted at DNV Spadeadam. Comparative testing via hydrostatic and pneumatic (gaseous hydrogen) methods was performed. The testing noted no significant difference in the burst pressure of external pipeline defects when tested hydrostatically compared to pneumatically with hydrogen. The vessel containing an internal crack failed at a lower pressure than expected with natural gas, highlighting a potential effect of hydrogen.

The problem we are trying to solve

The lower-than-expected burst pressure of the internal sharp defect merits further investigation to provide confidence in the results, evaluate the effect of defect dimensions and develop further understanding of pre-conditioning defects.

The burst pressure of the internal defect in the LTS Futures project corresponds to a design factor of 0.3 (using nominal dimensions as per IGEM TD/1). Much of the LTS network operates at or above this design factor and the results are therefore of significant note for repurposing existing LTS pipelines to hydrogen.

Further full-scale burst tests with internal sharp defects have been proposed to evaluate:

- Effect of preheating;
- Shallower defects;
- Repeatability of results; and
- Overpressure generated at during defect failure.

Additional small-scale material testing will be conducted by ROSEN to characterise the mechanical properties of the pipe.

Our solution

The additional burst tests shall be conducted on internal sharp defects via the same process as in LTS Futures. The aim of the additional burst tests is to:

- Gather additional learning on the initial internal crack LTS Futures test result;
- Evaluate the effect of preheating vessels;
- Evaluate internal defects of different dimensions; and
- Measure overpressure generated during defect failure.

Two programmes have been specified from the same length of pipe:

Programme 1

- Hydrostatic burst test
- Pneumatic hydrogen burst test (three-month soak with 96 hours' heating)
- Pneumatic hydrogen burst test – no soak

Programme 2

- Hydrostatic burst test (smaller defect)
- Pneumatic hydrogen burst test (three-month soak with 96 hours' heating and smaller defect)

Our partners on this activity

- DNV
- PIE
- ROSEN

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0070

Pipe sample testing.

Hydrogen Ignition Risk from Static & Autoignition – Stage 2a

Background

Evidence gaps relating to ignition risk from static and autoignition were identified through Asset Interventions and previous NIA projects. To provide a robust assessment of safety and risk these evidence gaps must be better understood. Initial stages of this programme undertook literature reviews to prioritise key problem areas. Stage 2a looks to understand the risk of static generated by particulates in flowing gas.

The problem we are trying to solve

A key challenge when considering the transition to hydrogen is its lower minimum ignition energy when compared to natural gas. This has raised some concerns that a level of static generation which is inconsequential for natural gas could pose a threat to operations using hydrogen by increasing the likelihood of ignition. Therefore, an understanding of whether static generation rates from particulates in flowing gas differ between gases would allow for appropriate mitigations to be developed or new mitigations proposed if necessary. The project will use outputs from the SIF Beta Velocity Design with Hydrogen project to determine whether there is an increase in particle transportation between natural gas and hydrogen.

Our solution

This project looked to undertake experimental testing to understand the behaviour of static generation as well as the potential impact to ignition risk due to discharge of this static energy.

The testing was carried out by Steer Energy and consisted of the development of a testing rig and initial test data. The outputs of this work will feed directly into Stage 2b, where the rig will be used to further validate findings and provide a view on how static generation rates differ between gases, and assess current and proposed mitigations.

Our partners on this activity

- Steer Energy

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0064

The study investigates whether static from particulates in flowing gas poses a greater ignition risk in hydrogen systems than in natural gas.

Lab testing with Steer Energy.

Ofgem NIA funded projects (continued)

Below 7 barg PRI Suitability Assessment

Background

Evidence gaps exist around the suitability of existing natural gas Pressure Regulating Installations (PRIs) for use with 100% hydrogen. Gaps around system asset performance and gas delivery were highlighted in the Asset Interventions Phase 2 project evidence review by DNV. A number of projects were identified for review as well as other industries who currently use pressure regulating equipment with 100% hydrogen.

The problem we are trying to solve

The project looked to address evidence gaps around the suitability of existing natural gas PRIs for use with 100% hydrogen. There have been a number of projects providing evidence towards the suitability of materials and assets with 100% hydrogen. However there are gaps in the evidence around the performance of PRIs specifically from a control system, pressure relief, and pressure management perspective.

A number of trials utilising PRIs have been undertaken by the gas networks but the outputs have often been focussed on operational activities rather than the performance of PRIs. However this information was monitored as standard during these trials and they often involved the utilisation of PRIs previously used on the natural gas network.

Our solution

The project undertook a literature review of the existing evidence from previous trials that utilised natural gas PRIs with 100% hydrogen including work done by NGN at DNV Spadeadam and South Bank, Middlesbrough. Research was conducted on pressure regulators and related equipment currently used for 100% hydrogen in other industries. This comparative analysis aimed to assess the functionality and performance of such equipment against those currently on the gas network.

Our partners on this activity

- Long O Donnell Associates

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0054

➔ PRI assessment.

Thermoplastic liners for Transmission Feasibility

Background

SGN is currently exploring opportunities to build a green future and start working with hydrogen in blends up to 100%. One of the issues is that hydrogen permeates materials used in underground assets and can cause embrittlement of steel, resulting in potential compromised asset integrity. This project was a feasibility study looking at the possibility of applying thermoplastic lining technology and examined whether it could be used in hydrogen transportation.

The problem we are trying to solve

Due to hydrogen molecules' small size they can permeate steel at high pressures, altering its properties and potentially leading to a small amount of embrittlement. Studies have also found that hydrogen accumulates in the edges of steel cracks and faults in the steel. Therefore, a number of solutions are being considered, one of which is incorporating a thermoplastic liner as a barrier layer to reduce or prevent permeation of gas. A feasibility study needed to be carried out, to examine the technical background, previous usage cases and risks specific to the operation of this technology in the gas industry.

Our solution

SGN conducted a feasibility study of Die Draw liner technology, producing a literature review and a technical design assessment. From this project, it became clear that the current PE 100 materials have exceptional crack resistant properties which ensure integrity in service. Although there is a potential risk of collapse of liners due to permeation of gas, this study demonstrated that it is predicted and mitigated against using appropriate venting methods.

Further study into installation techniques is required.

Our partners on this activity

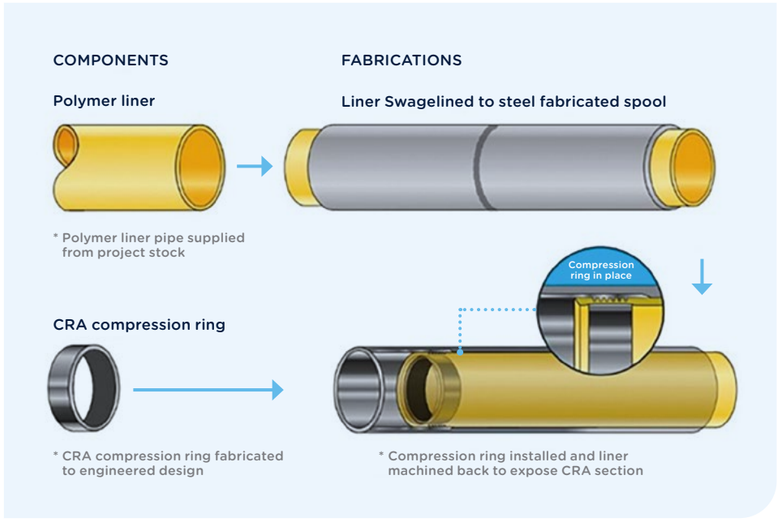
- Die Draw

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0049

We are assessing the use of thermoplastic liners to prevent hydrogen permeation and maintain the integrity of underground steel assets.

➔ Example of pipeline setup.



Ofgem NIA funded projects (continued)

Hazardous Areas Impact Mitigation (HAIM) Phase 2

Background

Undertake real world testing of a range of gas releases on representative above ground installations to assess the impact of a conversion from natural gas to hydrogen on each installation's hazardous areas. Comparisons will also be made between different industry modelling software to determine any discrepancies between horizontal and vertical dispersion distances.

The problem we are trying to solve

Differences in the flammability limits and gas characteristics of hydrogen and natural gas mean that how gas releases from vents and purge stacks are managed, including the relevant hazardous area calculations, need to be assessed. An initial NGN study found that some of these hazardous areas increased by up to six times when the current version of the hydrogen industry supplement was used. The HAIM project was commissioned to look at these calculations and provide empirical data for a possible update to the industry supplement. Phase 1 undertook small scale workshop tests on representative releases and determined that there were significant differences between the calculated results in the hydrogen supplement and initial empirical tests. Phase 2 will look to undertake further representative testing on larger scale releases and incorporate the effect on wind on releases and additional vent types.

Our solution

Phase 2 of this project will undertake further workshop tests incorporating the effect on wind on the previous releases assessed in Phase 1 and will also undertake larger scale offsite testing to try and address the full range of test cases from the initial NGN study. The project will also incorporate the findings from the modelling software and undertake a series of stakeholder engagement activities to discuss the findings with a view to informing the update of the IGEM/SR/25 hydrogen supplement.

Our partners on this activity

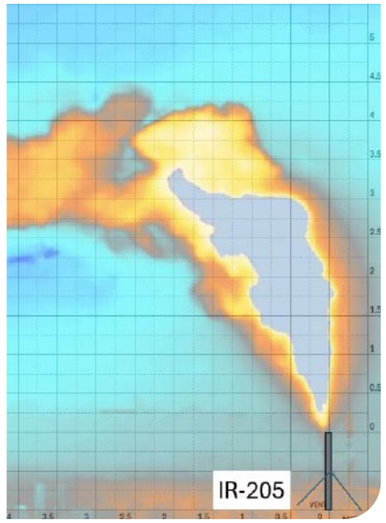
- DNV
- Steer Energy

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0051

Project team.

Workshop testing.



Fairer Warmth Hub

Background

The Fairer Warmth Hub (FWH) addresses key barriers to a just energy transition, including exclusion of vulnerable groups, fragmented resources, and high engagement costs. It offers a scalable solution through trained community champions, digital tools, and physical hubs to support inclusive local energy planning. Phase 2 will expand tool development for schools and healthcare, implement demonstrators in Fife and the Isle of Wight, and prepare for national scaling with added support from WWU, NGN and Cadent, officially joining as partners on the project.

The problem we are trying to solve

The project FWH aims to address:

- Misaligned priorities: Consumer priorities for simplicity and affordability often conflict with top-down policy and energy network goals, leading to challenges in implementing equitable energy transition plans.
- Exclusion of vulnerable groups: Consumers in Vulnerable Situations (CIVS) and digitally excluded populations often lack access to tailored support, preventing their participation in the transition.
- High costs of engagement: Current energy transition consultation and planning processes are manual, costly, and often fail to reflect local complexities and stakeholder needs.
- Fragmented resources: Existing tools and resources are disconnected, making it difficult for communities and organisations to plan and deliver effective energy transitions.
- Underrepresentation in decision-making: Local voices, especially those of small enterprises, schools, social healthcare and communities, are not adequately included in strategic energy planning.
- Uneven transition: Lack of inclusive planning risks creating disparities in energy access and affordability, exacerbating existing inequalities and fuel poverty.

Our solution

The project combines technical, community-led, and commercial strategies to deliver a scalable, inclusive energy transition. It will enhance the Fairer Warmth App, develop tailored tools for small businesses, schools, and healthcare providers, and implement local demonstrators to test solutions in real-world settings. A robust, technology-agnostic Monitoring and Evaluation Framework will track effectiveness and outcomes. This integrated approach ensures practical, data-driven support for diverse stakeholders, especially those in vulnerable situations, while enabling national scalability.

Next steps include refining tools, testing sustainable funding models, and establishing a robust evaluation framework to ensure measurable benefits for consumers and the wider energy system.

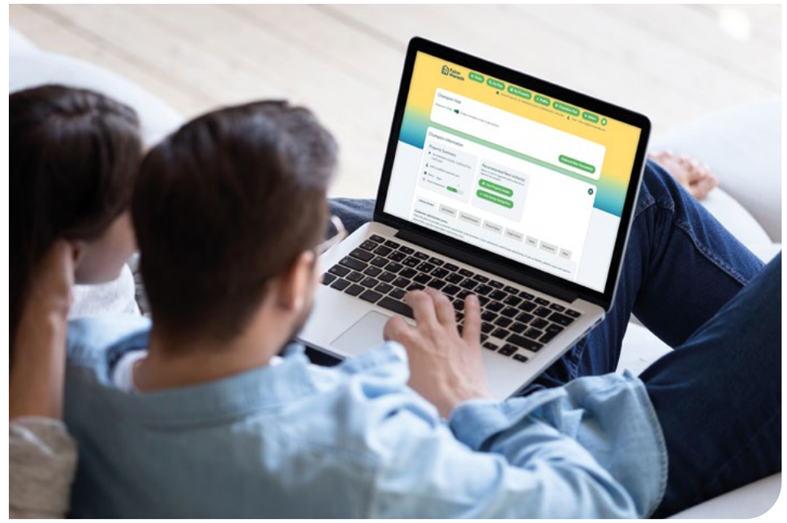
Our partners on this activity

- Awel Aman Tawe
- Cadent
- CEE
- Challoch Energy
- East Durham Trust
- Energy Friends – Durham
- Exeter Community Energy
- Fal Energy Partnership
- Fife Council
- Green Isle of Wight
- Growing Mid Wales
- Northern Gas Networks
- Smart Denny
- Wales & West Utilities

Links to more information on this innovation project

FEN Innovation Portal
portal.futureenergynetworks.org.uk/content/projects/nia2_sgn0073

Customers interacting with Fairer Warmth Hub.



Ofgem NIA funded projects (continued)

BISEP Live trial with LTS Futures (Phase 2)

Background

Building on Phase 1, the project aims to validate the use of the BISEP flow-stopping technology within the ongoing LTS programme through a field assessment test at Spadeadam. This includes testing the installation of grouted tees, hot tapping operations, and achieving leak-tight isolation under live conditions in a 100% hydrogen pipeline. Successful deployment will enable safe and efficient pipeline maintenance without disrupting flow, providing a proven solution for flow stopping in hydrogen transmission systems.

The problem we are trying to solve

The objectives for this second phase are to complete 100% hydrogen validation for installation of a grouted tee, hot tapping operations and flow stopping technology within the LTS Futures' live trial. To achieve the above deliverables the project is divided into work packages and the time sequencing and interaction between the work packages are shown in detail in the following paragraphs:

- Swarf Demonstration: The key challenge identified from Phase 1 was swarf management due to the horizontal deployment and low flow conditions. STATS presented an operational tool to blow it away from the sealing area.
- Factory Acceptance Test with Helenite: The full operation was demonstrated on a helenite test vessel as part of the technical assurance process prior to deployment within the LTS live trials.
- Test site deployment at Spadeadam with 100% hydrogen: As per the Factory Acceptance Test (FAT), full deployment was demonstrated and independently observed at Spadeadam.
- Live pipeline deployment with LTS Futures: Being completed in the Summer of 2025.

Our solution

Two separate FATs were completed prior to the testing at Spadeadam. STATS however, demonstrated continual improvement of both processes ensuring safety when deploying into hydrogen environments as well as tool modification to address emerging issues is commendable.

The lessons learnt from these FATs highlighted to the project team the complexities and potential issues of the operation to be undertaken. Utilising the FAT to fully trial and improve the process, gave sufficient assurance that the operational deployment of the BISEP can be conducted without undue risk normally associated with breaking containments of the pipeline.

The issues around flow stop and sealing isolation plug continue to develop for horizontal which is the non-preferred method for this type of intervention. However, the lessons learnt are improving operational process(es) for both traditional as well as the non-preferred options.

Our partners on this activity

- PIE
- STATS UK

Links to more information on this innovation project

ENA Smarter Networks Portal
smarter.energynetworks.org/projects/nia2_sgn0052

BISEP product testing being carried out.

Ofgem SIF funded projects

Intelligent Gas Grid

Background

The Intelligent Gas Grid (IGG) project looks at understanding the potential network benefits from using data driven algorithms and decision making (Artificial Intelligence (AI) and/or Machine Learning (ML)) to control the gas network autonomously and intelligently. This project builds on learning from an earlier NIA project, Pressure Control & Management (PC&M), which saw the successful delivery of Utonomy's Remote Control Pressure Management Electronic Actuator System.

The problem we are trying to solve

IGG has identified three problems that need to be resolved in gas networks.

The first issue is leakage reduction, where the current technology of profiling is most relevant. However, this system is problematic because low pressures create multiple alarms.

The second problem is anomaly detection, where the current practice is manual and reactionary. Escapes are mostly detected by the public smelling gas or experiencing boiler and/or other domestic faults. Governor faults are often investigated by the network owner after downstream knock-on effects have occurred.

Thirdly, IGG aims to address the issue of biomethane injection. The current practice involves annual seasonal adjustments being made at Medium Pressure supply governors to facilitate contractual minimum injection rates. However, these adjustments are manual, costly, and time-consuming, and the timing of changes is sensitive to unseasonal weather in shoulder months.

Our solution

This project aims to explore potential solutions for the network by integrating AI/ML autonomous control with Utonomy's remote control pressure management technology by:

- Enhanced network performance and pressure management to reduce methane emissions.
- Anomaly detection for early identification and diagnosis of networks' faults like water ingress, gas leaks, and asset malfunctions.
- Biomethane injection, allowing for efficient feed-in of biomethane plants to the network.

Overall, the integration of AI/ML technology with Utonomy's remote control pressure management system holds promise for enhancing the efficiency, sustainability, and reliability of the UK gas network.

Our partners on this activity

- Cadent
- DNV
- National Gas Transmission
- Northern Gas Networks
- Utonomy
- Wales & West Utilities

Links to more information on this innovation project

Project video
youtube.com/watch?v=gnQbpZjeHYo&t=31s

ENA Smarter Networks Portal
Discovery phase:
smarter.energynetworks.org/projects/10027183

Alpha phase:
smarter.energynetworks.org/projects/10037416

Beta phase:
smarter.energynetworks.org/projects/10063754

Project team onsite.

Ofgem SIF funded projects (continued)

Velocity design with hydrogen

Background

This SIF Beta is an innovation project focused on addressing the current limitations placed on velocity in the gas network. This phase will expand on earlier phases by developing a full-scale test rig at DNV Spadeadam to investigate the opportunities and challenges associated with converting the gas network to 100% hydrogen. The outputs of this project will provide evidence to amend the current industry standards governing gas network velocity.

The problem we are trying to solve

Velocity limits have traditionally been set by the industry to ensure the safe design and operation of the gas network. These measures help maintain network integrity by preventing issues caused by excessive particle transport, erosion, noise, and vibration.

Hydrogen carries roughly one-third of the energy per volume compared to natural gas, creating a challenge for network conversion. To deliver the same energy to customers, flow rates must increase. This can be achieved by either raising pressure, enlarging pipe size, or increasing velocity. Maintaining current velocity limits while operating with 100% hydrogen would lead to estimated reinforcement costs of £832m for low-pressure systems, plus an additional £1,644m for service connections. Hence increasing velocity is the most cost-effective and practical option – provided it does not negatively impact the integrity of the gas network.

Our solution

A full-scale test rig has been built at DNV Spadeadam to validate modelling from earlier project phases, with ongoing testing to include the following key areas. The Erosion and Particle Transport rig will assess how increased velocity affects debris movement and material impact on PE, steel, and cast iron. The Noise and Vibration rig will examine how higher velocities influence noise and vibration in various network configurations and features. CFD modelling will support the physical testing, evaluating current velocity limits and potential cost savings with 100% hydrogen.

Our partners on this activity

- Cadent
- DNV
- IGEM
- National Gas Transmission
- Northern Gas Networks
- UKRI
- Wales & West Utilities

Links to more information on this innovation project

Project video
youtube.com/watch?v=sEfTQfuTra8

ENA Smarter Networks Portal
Discovery phase:
smarter.energynetworks.org/projects/10027185

Alpha phase:
smarter.energynetworks.org/projects/10037659

Beta phase:
smarter.energynetworks.org/projects/10068217

Velocity presentation at EIS.

Test rig at Spadeadam.

Predictive Safety Interventions

Background

Predictive Safety Intervention (PSI) is a pioneering, AI-driven safety initiative created to revolutionise risk assessment and hazard management for SGN. With funding from Ofgem and the UKRI's SIF, PSI has evolved through Discovery and Alpha phases, now being fully implemented in its Beta stage (2024). Delivered in partnership with FYLD, the project harnesses AI, real-time data analytics, and historical insights to proactively detect and mitigate risks across SGN's operations.

The problem we are trying to solve

Within the utility sector – especially gas networks – maintaining operational safety is a top priority. Conventional risk assessment approaches tend to be reactive, reliant on paper-based processes, and often lack historical insights or location-specific intelligence necessary to prevent incidents before they happen. This project addresses the urgent need for a proactive safety management strategy. By harnessing advanced data analytics and digital technologies, the initiative empowers teams to autonomously anticipate potential safety issues, facilitating timely interventions and supporting engineers in the field to assess risks more effectively. Ultimately, the project aims not only to improve workplace safety but also to cultivate a forward-thinking culture of pre-emptive risk management, better protecting both employees and critical utility infrastructure.

Our solution

This project introduces PSIs, combining advanced object recognition, natural language processing, and fatigue detection to anticipate and help prevent safety incidents. PSI employs ML to analyse real-time and external data from gas networks, spotting hazards and recommending preventive actions. By shifting from reactive to proactive safety, PSI creates a safer workplace, lowers risk, and boosts operational efficiency – driving innovation in the utility sector.

Our partners on this activity

- Cadent
- FYLD
- National Gas Transmission
- Northern Gas Networks

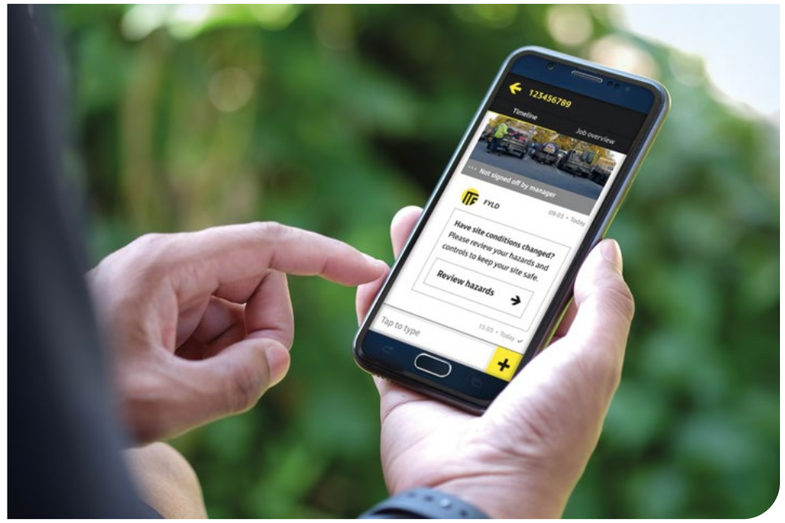
Links to more information on this innovation project

Project video
youtube.com/watch?v=UI2UUREKcN0

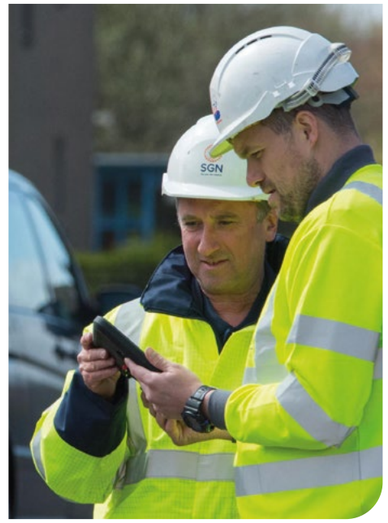
ENA Smarter Networks Portal
Discovery phase:
smarter.energynetworks.org/projects/10027191

Alpha phase:
smarter.energynetworks.org/projects/10037420

Beta phase:
smarter.energynetworks.org/projects/10068173



The PSI system identifies site hazards automatically and prompts engineers to re-evaluate risks during the job as conditions change.



Ofgem SIF funded projects (continued)

HyScale

Background

HyScale is an innovative project that aims to access curtailed wind generation to create green hydrogen as a storage medium for renewable energy. Working with a consortium of British and European partners, HyScale is investigating opportunities to use Liquid Organic Hydrogen Carriers (LOHCs) to capture, store and release hydrogen into a gas network.

The problem we are trying to solve

As the proportion of renewables in a decarbonised energy system increases, so too does the challenge of balancing supply with demand. The output of renewables can't be controlled in the same way as traditional power plants which can be turned up or down to meet energy needs. In renewable powered energy systems, unfavourable weather conditions (no wind or sun) can result in insufficient supply. Conversely, surges in wind and solar generation can also overload transmission networks when supply exceeds demand. This can lead to grid congestion and curtailment.

Our solution

A potential solution to reduce curtailment is to use excess electricity to produce hydrogen via electrolysis. The hydrogen can then be stored and converted back to electricity when required. It can also be transported through a repurposed gas network to provide heat to industrial, commercial and domestic consumers helping to balance inter-seasonal energy demands.

While it is widely accepted that the most suitable option for the large scale storage of hydrogen is likely to be geological, there is also a need to access alternative storage solutions. This is especially important in areas where geological storage may not be possible, as is the case in several UK regions.

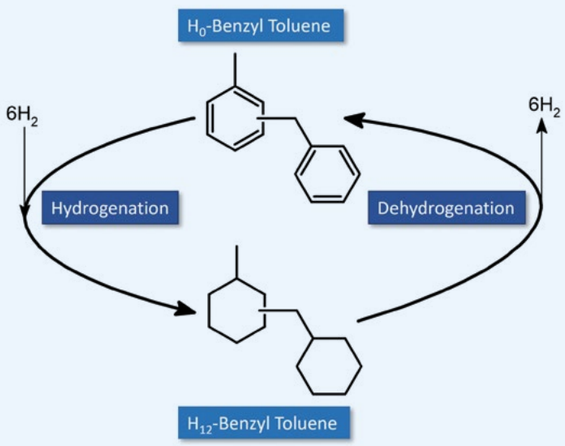
A promising alternative for non-geological long duration hydrogen storage is the use of LOHCs, simple and readily available chemicals. Using a reactor, hydrogen can be chemically bonded to LOHCs and released from the carrier when needed. During this SIF Alpha project, the financial and environmental benefits of using LOHCs were determined. The technical and commercial opportunities of coupling a hydrogen production plant with LOHC technology were defined. Plans for a demonstration project to provide the evidence base to support larger scale development were also produced.

Our partners on this activity

- Blue Abundance
- Cadent
- ERM
- Forschungszentrum Jülich
- Framatome
- National Gas Transmission
- Northern Gas Networks
- Wales & West Utilities

Links to more information on this innovation project

ENA Smarter Networks Portal
Alpha phase:
smarter.energynetworks.org/projects/sif_sgn0022



LOHC reaction cycle.

HyScale model example.

Price Control Deliverables

The Gas Escape Reduction Project is moving ahead on schedule, supporting a full rollout of new equipment and methods across Scotland and southern England during the remainder of the RIIO-GD2 period.

Overview

This initiative focuses on reducing gas emissions through advanced tools and techniques, while also improving safety for our field operatives when managing gas escapes.

New equipment is currently being manufactured and delivered to our regional stores, with training underway to ensure teams are confident in using the solutions. Early feedback from operatives has been positive. While large-scale gas escapes are rare, they can pose serious safety risks and disrupt supply to customers, often requiring significant resources to manage. This project addresses those risks head-on.

Key to this initiative is the Stent Bag and High Volume Gas Escape Toolbox (HVGET) solutions. These innovations offer safer, more efficient alternatives that maintain gas supply to downstream customers during emergency response.

Stent Bag

Developed from earlier NIA projects, the Stent Bag system allows a sealing stent to be inserted and pushed internally along the pipe to the leak site, where it expands to contain the escape. Unlike traditional methods, it maintains flow to customers during repairs.

HVGET

HVGET includes four purpose-built tools designed for various gas escape scenarios, offering flexible, rapid, and cost-effective repair options – significantly improving response times and safety in the field.

HVGET being trained by operatives.

Stent Bag on site.

Glossary of key terms

AI – Artificial Intelligence
ASME – The American Society of Mechanical Engineers
BI – Biomethane Island
CCUS – Carbon Capture, Utilisation and Storage
CFA – Comprehensive Formal Assessment
CFD – Computational Fluid Dynamic
CFD – Computational Fluid Dynamics
CIVS – Consumers in Vulnerable Situations
CO– Carbon Monoxide
CO_2 – Carbon Dioxide
CV – Calorific Value
DESNZ – Department for Energy Security and Net Zero
ECN – Exit Capacity
ENA – Energy Networks Association
EPRG – European Pipeline Research Group
FAT – Factory Acceptance Test
FEA – Finite Element Analysis
FEED – Front End Engineering Design
FEN – Future Energy Networks
FWACV – Flow Weighted Average Calorific Value
FWH – Fairer Warmth Hub
FYLD – Digital, mobile platform, using speech and image recognition
GDN – Gas Distribution Network
GIS – Geographical Information System
GSMR – Gas Safety (Management) Regulations
H2Pipe – a Joint Industry Project
HAIM – Hazardous Areas Impact Mitigation
HAR1 – Hydrogen Allocation Round
HEAT – Hydrogen Evidence and Transition
HP – High Pressure
HSE – Health and Safety Executive
HVGET – High Volume Gas Escape Toolkit
I&C – Industry and Commerce
IGEM – Institute of Gas Engineers and Managers
IGG – Intelligent Gas Grid
IoT – Internet of Things
IP – Intermediate Pressure
IPC – International Pipeline Conference
IT – Information Technology
JIP – Joint Industry Project
LOHC – Liquid Organic Hydrogen Carrier
LTS – Local Transmission System
MASiP – Multi Agency Strategic Planning
ML – Machine Learning
MOB – Multi-Occupancy Building
MPQ – Material Process Qualification
NDT –Non-Destructive Testing
NGN – Northern Gas Network
NGT – National Gas Transmission
NIA – Network Innovation Allowance
NTS – National Transmission System
Ofgem – Office of Gas and Electricity Markets Ofgem is responsible for regulating the gas and electricity markets in the UK to ensure customer' interests are protected
P&S – Production and Storage
PC&M – Pressure Control and Management
PE – Polyethylene
PPE – Personal Protective Equipment
PRI – Pressure Regulating Installation
PRS – Pressure Regulating Station
PSI – Predictive Safety Intervention
QRA – Quantitative Risk Assessment
RIIO-GD2 – The price control period that will run from 1 April 2021 to 31 March 2026
RIIO-GD3 – The price control period that will run from 2028 to 2033
RTSM – Real-Time Settlement Methodology
SIF – Strategic Innovation Fund
SIUs – Scottish Independent Undertakings
SoLR – Supplier of Last Resort
ToFD – Time of Flight Diffraction
TWI – The Welding Institute
UKRI – UK Research and Innovation
WWU – Wales & West Utilities

Designed and produced by Thunderbolt Projects

SGN
St Lawrence House
Station Approach
Horley, Surrey
RH6 9HJ

Axis House
5 Lonehead Drive
Newbridge
Edinburgh
EH28 8TG

0800 912 1700

sgn.innovation@sgn.co.uk

@sgngas

sgn.co.uk

If you smell gas or are worried about gas safety you can call the National Gas Emergency Number on **0800 111 999**

Carbon monoxide (CO) can kill. For more information visit **sgn.co.uk/help-and-advice**