

# Redcar Hydrogen Community

**Detailed Design Phase of the Hydrogen Village Trial**

**Date: 11<sup>th</sup> April 2023**



## Project Detailed

Project Details	
<b>Organisation Name:</b>	Northern Gas Networks
<b>Charity No. or Companies House Registration No.</b>	Northern Gas Networks Limited (05167070). Northern Gas Networks Operations Limited (03528783). Northern Gas Networks Holdings Limited (05213525). Northern Gas Networks Pensions Trustee Limited (05424249). Northern Gas Networks Finance Plc (05575923). Registered address: 1100 Century Way, Thorpe Park Business Park, Colton, Leeds LS15 8TU. Northern Gas Networks Pension Funding Limited Partnership (SL032251). Registered address: 1st Floor Citypoint, 65 Haymarket Terrace, Edinburgh, Scotland, EH12 5HD.
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## Summary of Northern Gas Networks aims and objectives

Northern Gas Networks (NGN) is proud to be the North of England's gas distributor. By transporting gas to homes and businesses across the North-East, Cumbria and much of Yorkshire, NGN provides an essential service to 6.8 million customers.

Our priorities are to provide a safe and reliable service at the right price, deliver outstanding customer service, provide support for those customers in vulnerable situations, and continue to respond to the pressing issue of climate change by developing green forms of energy and reducing the carbon footprint of our day-to-day operations.

NGN's current Business Plan is the most ambitious to date. It builds upon a bold and imaginative programme of service delivery and reinvention which began in 2005.

Highlights of our 2021 to 2026 business plan include:

### **Reducing customer bills**

NGN recognises that affordable bills are a priority for our customers, and NGN will deliver a 6% real-terms reduction in bills from 2021.

### **Continued investment in our networks and delivering for the environment**

NGN will invest close to £800 million in our assets to maintain the high standards of safety and reliability our customers expect.

### **Delivering an outstanding customer experience**

NGN will continue to enhance the customer experience, to maintain our position as the industry's leader in customer satisfaction.

### **Help for those who need it most**

NGN will support customers who are struggling financially, or in vulnerable circumstances, through an enhanced support programme, and through partnerships with expert organisations.

### **Developing green forms of energy**

NGN will support the UK's carbon reduction ambitions, by continuing our industry-leading work to develop green forms of energy and supporting integrated energy solutions.

With the UK tasked with reaching net zero emissions by 2050, there is an urgent need to develop affordable, renewable energy solutions.

During RIIO-1 NGN have been a UK leader in the research and development of green, renewable forms of gas, such as hydrogen. Our H21 programme, to assess the practical, environmental and safety considerations around converting existing gas networks to hydrogen, has galvanised the industry, and attracted international attention.

NGN have also championed the cause of integrated energy solutions and smart networks, involving gas, electricity, renewables, and transport. NGN launched InTEGReL in conjunction with Powergrid and Newcastle University – an incubator for integrated energy system technology – allowing utilities and businesses to test their whole-system ideas in real-world conditions, and on a large scale.

From the launch of the current regulatory Business Plan in 2021, NGN has built upon this industry-leading work. Key next steps will be to move to real-world trials across our portfolio of projects, whilst engaging and working with our partners to explore the commercial applications of the technology and the most effective delivery models.

Our stakeholders have told us that the commitments set out in this plan will deliver the safe, reliable, and sustainable services they require at a price that represents good value for money. NGN is confident that, whilst these commitments present significant challenges, NGN can successfully deliver. We look forward to once again rising to these challenges and, in doing so, setting new benchmarks in many areas for the delivery of services – not just in the energy sector, but across the wider economy.

## Partners for this joint / consortium bid

Wales & West Utilities Limited, Wales & West House, Spooner Close, Coedkernew, Newport, South Wales, NP10 8FZ

Wales & West Utilities is the company that look after the pipes that keep the gas flowing to heat the homes and power businesses of 7.5m people across Wales and south west England. The company operates the gas emergency service, connect new homes and businesses, and upgrade the gas network so it's safe today and fit for the future.

Wales & West Utilities is investing £400m between 2021 and 2026 to deliver a Net Zero ready gas network by 2035, while looking after the most vulnerable in communities across Wales and south west England.

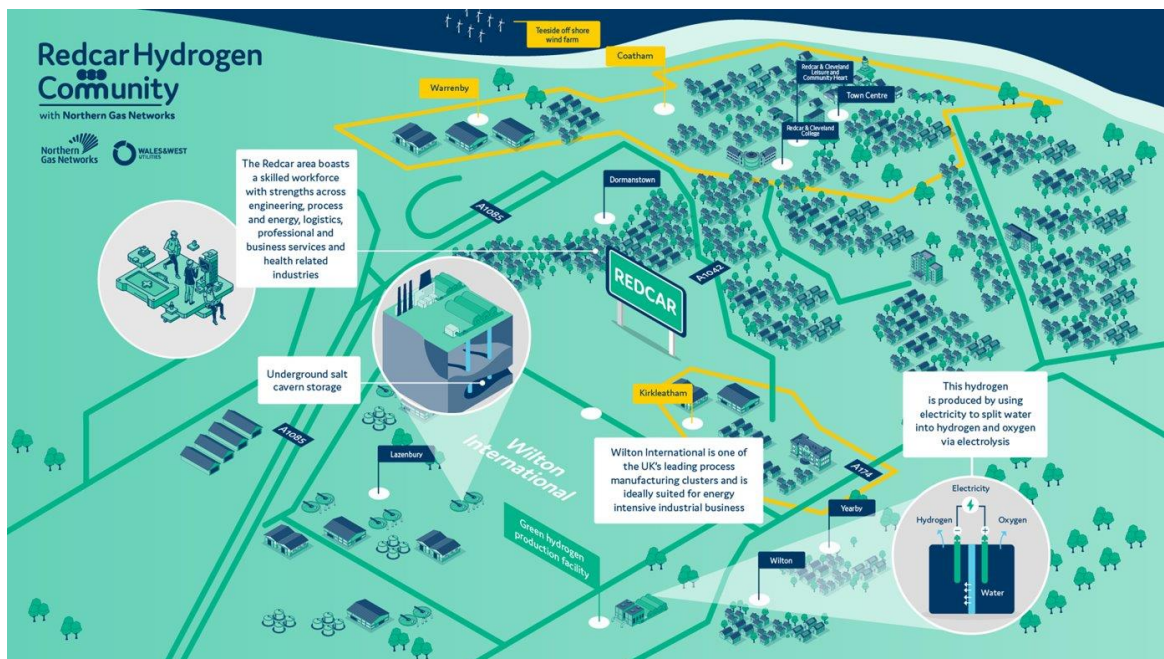
# Project Overview

## Project Location:

Teesside is at the heart of the UK's green industrial revolution with significant hydrogen production facilities under development by major industrials, world-leading natural assets for storage, and a range of industries seeking to decarbonise with hydrogen. With the vision for the development of a hydrogen economy through East Coast Hydrogen, Redcar is ideally placed to deliver an effective Hydrogen Village Trial (HVT).

The Redcar Hydrogen Community (RHC) Project comprises residential and commercial sites in the Warrenby and Coatham areas of Redcar, and an industrial site at Kirkleatham in Redcar. The total population of the project area is 5,866, and includes a diverse building stock including homes, shops, leisure facilities and light industrial units.

The figure below outlines the trial area and identifies the location of supporting activities, including hydrogen production and storage.



Following significant investment by Ofgem for research into network conversion to hydrogen, the RHC Project will provide UK Government and industry with further evidence that it is possible to convert an existing network to 100% hydrogen through a planned conversion programme. The primary objectives of the RHC Project are therefore both to determine consumer acceptability of hydrogen and to provide robust and transparent evidence to the UK Government, public and stakeholders that conversion to 100% hydrogen is economically and operationally viable.

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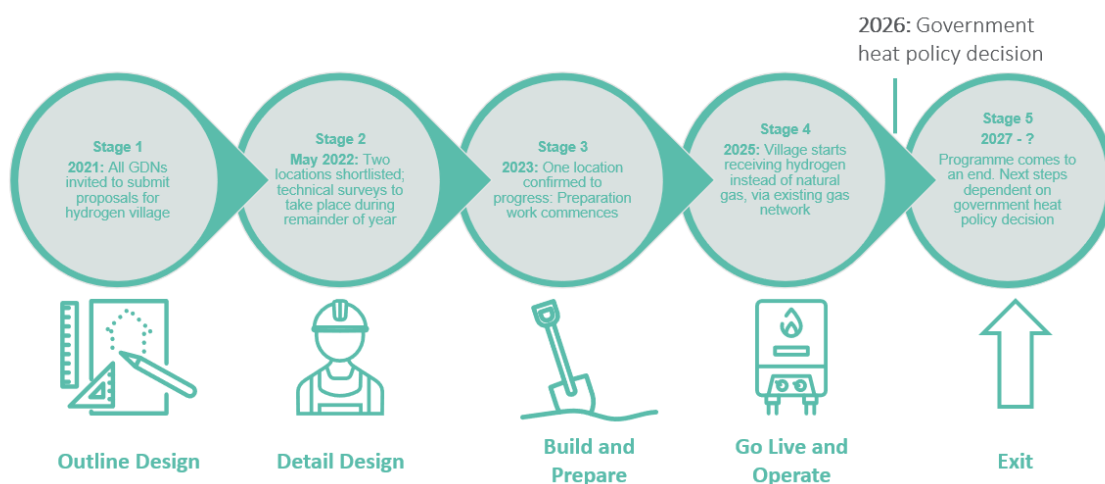
The RHC Project comprises residential and commercial sites in the Warrenby and Coatham areas of Redcar, and an industrial site at Kirkleatham in Redcar. The total population of the project area is 5,866 and includes a diverse building stock of 2,677 properties including homes, shops, education establishments, leisure facilities and light industrial units.

The RHC Project area covers a total of 2,157 meter points consisting of 1,949 domestic and 208 industrial and commercial customers including hospitals, care homes, schools, shops and offices, hotels, pubs, restaurants, and industrial users. The local housing stock covers a range of building types from Victorian terrace houses through to large, detached homes. Initial local engagement has shown a very positive response to hydrogen for heating with 89% of the 699 residents, business operators and landlords surveyed indicating that they would choose a hydrogen heating option.

The RHC Project will convert this area – including its existing gas infrastructure and homes – from natural gas to 100% hydrogen. Hydrogen-ready appliances will be installed in participating properties before converting the existing infrastructure to 100% hydrogen. Hydrogen-only appliances will be installed during the period of conversion. The live trial will run for a minimum of two years to ensure that evidence over two consecutive heating seasons is generated.

The hydrogen supply to the RHC will come from two main suppliers, both of whom will produce low carbon hydrogen through electrolysis. The hydrogen will then be transported via a high-pressure pipeline to the above ground storage and above ground installation (AGI) facility as well as to the below ground storage. The intention of the above ground storage is to meet the individual peak day demand for the morning and evening loads – intraday demand (diurnal storage) – and will consist of 10 pressure vessels operating at 30 barg. The below ground storage, in the form of a salt cavern, is to ensure sufficient storage capacity in 1-in-20 winter peak demand can be met, providing several days' contingency.

The project has been broken into five stages and these are summarised as follows:



# Evidence Base

In support of our submission at the end of stage 2, significant evidence has been generated that has informed our proposal and this is summarised below:

## Monitoring and evaluation evidence for consumer engagement:

Additional evidence gathered from consumer engagement relates to 'fairness' of the trial:

- Any additional cost or financial disadvantage incurred through participating in the trial was repeatedly referenced as being unfair.
- During in-depth interviews, business owners said they considered the project to be fair, or more than fair, to businesses.

In terms of fairness, during in-depth interviews, some landlords told us that they wanted the project to provide assurances that tenants would be adequately compensated for their involvement, as it is they who would experience disruption in their homes, use new appliances, and pay energy bills. Some landlords expressed the importance of giving tenants the same level of service that would be afforded to property owners.

## Gas distribution network design and build for hydrogen

During Stage 2, a series of network analysis projects have been undertaken to generate evidence on the approach to convert the gas distribution network. These have identified the following considerations: the most appropriate location for sectorisation valves; required reinforcement on the LP network to ensure minimum pressures are met; the reinforcement required to deliver hydrogen from the AGI; as well as optimal location of district governors.

The Sectorisation Plan has also provided insight into the methodology of purging the network and required valves to undertake sector purging. The Plan also identified the need to physically isolate the NG and hydrogen networks.

## Other additional evidence

The RHC project has investigated the use of electrical appliances as an alternative option to existing natural gas appliances, including an assessment of the electrical infrastructure in the trial area. Working alongside Northern Powergrid (NPg) using their network analysis predictions, the reinforcement required on the electricity grid has been assessed based on the estimated percentage of domestic customers that choose an electrical alternative. The required service upgrades have also been assessed. For the industrial and commercial customers several individual assessments have been undertaken to show how an uptake of electrical appliances would impact the electrical network. This has identified that to reinforce the electrical network, an investment of approx.

As the RHC project progresses, a variety of evidence will be generated at different stages. The trials evidence framework sets out several categories against which evidence is expected to be generated. These evidence strands have been incorporated into the work done as part of Stage 2 – Detailed Design. Each of the evidence subsets as detailed below has been considered when designing the approach to undertaking Stages 3–5.



### **Design, Maintenance and Repair**

Evidence on the design of the network has been generated via network analysis for the trial area, and additional infrastructure that is required has been incorporated into the design. The maintenance and repair data for the network will be monitored through established processes such as reported leaks, poor pressures identified, repairs undertaken etc. From an end-user perspective, all appliances installed will have full maintenance reports throughout the trial to compare performance against natural gas equivalents.

### **Conversion & viability**

As part of the conversion, additional monitoring equipment will be installed on the network. Additional low-pressure loggers will be installed at extremity points as well as gas quality monitoring within the trial area. Evidence on required upskilling, as well as the updating of policies and procedures will also be collected and disseminated.

### **Training and skills**

Identifying and providing training and upskilling required for the workforce throughout the trial will be a key piece of evidence. Work has already been undertaken to identify all personnel that will be affected by the conversion. Several collaborative projects are ongoing to set the framework required to train against. The scale of training required will help inform plans for further rollout. The RHC project is partnered with local training facilities to ensure that training providers are involved at every opportunity and can feed into evidence generation.

### **Risks and mitigations**

A detailed risk register has been kept throughout Stage 2 and will continue in Stages 3 to 5. The risks are closely monitored, and mitigation measures put in place. A series of risk workshops has already taken place for the RHC project to identify potential risks in Stages 3 to 5. These risks will be monitored, and any additional risks added to the risk register with proposed mitigations. Should any of these risks materialise, the effectiveness of the mitigations will be assessed. Learning will be disseminated to all relevant stakeholders to help inform policy, as well as town pilot and further rollout.

As the above evidence is generated for the different categories the outputs will be shared with Government, other GDNs and all relevant stakeholders where appropriate. This evidence – as well as the evidence generated by the counterfactual of electrifying heating for a subset of consumers and the associated electricity network work required – will support a better understanding of the timescales, costs, consumer attitude, regulatory requirements, safety and operational requirements of a Net Zero heating solution, which will help inform heat policy decisions. Frequency of reporting against the different evidence strands will vary, depending on agreed outputs, as well as the body of evidence expected from each category.



**Key lessons**

Some of the key lessons that are expected to be realised throughout the trial include the relationship and interface between the production of hydrogen and the ongoing operation of the GDN's wider business, identification of the resource requirements, evidence on the time and cost to undertake activities and supply chain readiness. The domestic and I&C surveys have already provided key lessons in understanding the appliance requirements and have highlighted the supply chain restrictions / requirements and plans to resolve. As the consumer choice is confirmed, the impact on the electricity network will also provide valuable information on the interdependencies between gas and electrical networks. The impact on the electrical network has been assessed and the required upgrades based on the uptake of electrical alternatives.

Several collaborative workstreams have been initiated to examine the common areas that will affect all GDNs in delivering hydrogen projects. Several of these collaborative projects will continue for the coming years. As the village trial progress, the evidence generated will be fed into the appropriate collaborative workstreams and shared with further stakeholders.

# Detailed Plan for Evidence Generation in Stages 3-5

## Safety

Collaborative safety work and other projects (H100, Hydrogen Homes, H21 etc) have established fundamental safety evidence on the use of hydrogen for heat. The trial will demonstrate the application of this on a converted gas distribution network and its customers. The RHC project will evidence the effectiveness and reliability of the system, safety communications and training given to participants.

## Delivery and learning for town pilots & hydrogen roll-out:

Evidence across the following subsets will be generated:

1. Viability of converting the gas network to hydrogen
2. Design/maintenance/repair requirements of a hydrogen network
3. Time/costs associated with conversion to hydrogen
4. Emergency response, to leaks reported outside of homes etc.

Evidence provided will be:

- Design/FEED study into network conversion
- Itemised list of equipment needing replacement
- Housing surveys
- Maintenance and repair schedule
- Real-time network operation data
- Costed project schedule

The project timelines will track the timing of every aspect of the trial. Where possible, costs will be included. Separate cost evidence will also be collected on a line-by-line basis.

**Detailed Design (Stage 2) / Prepare and Build (Stage 3):** The design work necessary and the best approach to the conversion process will be evidenced. This will include HP pipeline and storage interface detailed design, grid entry unit detailed design, network reinforcement and sectorization plan. Housing surveys will evidence the nature/proportion of homes already suitable for hydrogen operation, those requiring additional work, as well as a bill of materials for appliances within the different premises.

**Go-live and Operate (Stage 4):** Differences in operating a hydrogen grid against the existing network will be identified by comparing real-time network operations data with natural gas equivalents. Current maintenance/repair schedules (including time and cost) will be modified to reflect hydrogen network requirements. Flexibility to meet seasonal demand will be evidenced by monitoring frequency of storage use as well as volumes of hydrogen entering the network from the production facility.

## Commercial and Regulatory:

Evidence across the following subsets will be generated:

1. Commercial, regulatory and billing considerations for converting to hydrogen.
2. Additional training and skills needed.
3. Commercial and regulatory risks associated with converting to hydrogen, including associated mitigations.

Evidence provided will be:

- Collaborative GDN work
- Supplier engagement and contracts/questionnaires
- Regulatory plan
- Consumer
- Energy usage data
- Installer interviews/surveys
- Risk register
  
- **Detailed Design (Stage 2) / Prepare and Build (Stage 3):** The maturity of the end-to-end hydrogen appliance supply chain and its ability to deliver equipment to schedule will be demonstrated. This will be assessed through supplier engagement. Further gaps in product offering and/or snags in equipment delivery will be recorded. Employed installers will be interviewed and/or surveyed to understand retraining/upskilling work necessary, and best practice for overcoming skills gaps.
- **Go-live and Operate (Stage 4):** Consumer evidence sources will be leveraged to indicate the effectiveness of the chosen billing method. Energy usage data will indicate the effectiveness of metering billing.

The ongoing collaborative GDN work “Commercial, billing and settlement arrangements to support the conveyance of hydrogen to customers in GB” will provide a common approach to inform the regulatory plan.

In all cases, evidence will be assured by independent, suitably qualified bodies. Ongoing customer surveys will continue to be designed by an external organisation with input from the RHC team. The RHC project plans to have engineering oversight in Stages 3 to 5 to assure network design and storage evidence. Safety evidence, as well as other evidence where appropriate, will be shared among GDNs for collaborative review.

Evidence will be shared with competent bodies and relevant institutions such as Institute of Gas Engineers and Managers (IGEM). The RHC project will take a common approach to evidence generation, ensuring a clear methodology is set out with QA processes in place.

## **Data Protection**

The project will collect a variety of data throughout the different stages. Much of the data will be collected from the network activities and will be stored in NGN's core systems such as SAP and GIS mapping systems. Pressure data, maintenance and repair information and all other network information will be collected measured and assured through the normal BAU processes. This data can then be extracted and reported on to help inform the Evidence Management System being developed.

Consumer evidence will be collected through feedback activity, which includes consumer surveys, panels and interviews. It will be collected by an independent agency with consumer consent. NGN will work with these independent agencies to ensure that consumer information is only stored where essential and will be deleted within an agreed timeframe.

Any evidence or data held by the project will be kept in line with NGN data protection policies set out by the Data Protection Officer. Data will be appropriately stored in Excel, PowerPoint, Word or PDF formats so that it is accessible to users.

# Infrastructure and Delivery

Work undertaken includes the plan to provide resilient supply and has been considered over as follows:

## Hydrogen Transportation and Storage Design

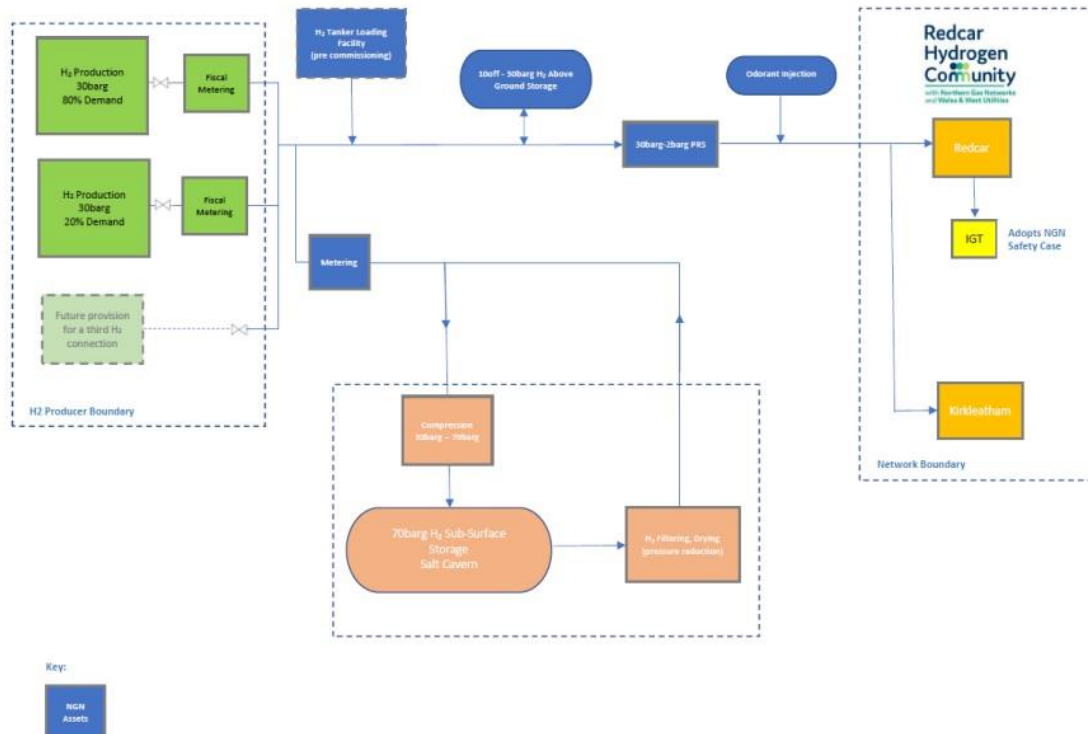
The design philosophy for RHC is to provide a resilient hydrogen supply which has been enabled by the utilisation of connections to two production facilities, as well as above ground and below ground storage to manage the inter day and inter seasonal peaks in demand.

## RAM Study

A Reliability, Availability and Maintainability (RAM) Study covers the availability assessment of the proposed hydrogen supply chain, including the following:

- Hydrogen production (by electrolysis from two different suppliers – 80% / 20%).
- NGN AGI – including ground storage bullets, pressure reduction system, odorant injection and metering.
- Salt cavern storage – including associated compression (injection) and gas treatment (withdrawal) facilities.
- Supply mains line to H2 distribution network.

A schematic of the proposed facilities is presented below:



The RAM study is split in to two phases due to timescales and the availability of information from the producers and salt cavern operator.

DNV conducted the RAMS utilising their TARO software. The software predicts the performance of a system using a Monte Carlo simulation technique.

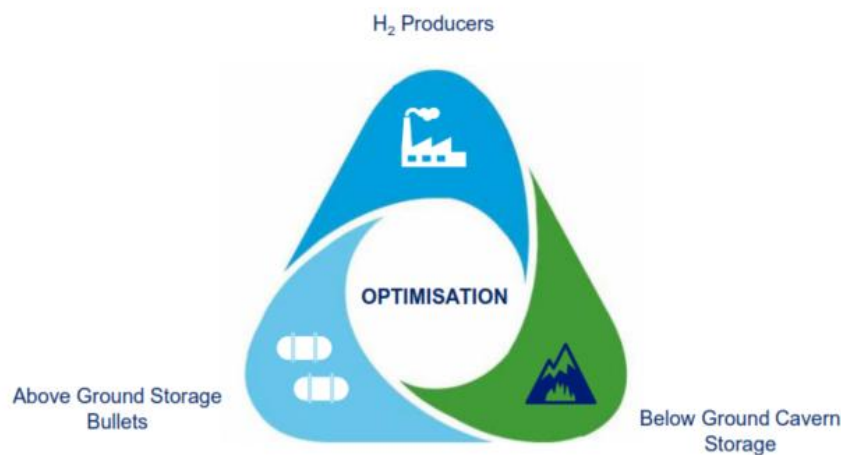
## Phase 1:

Phase 1 of the study is a high-level RAM assessment of the hydrogen supply chain against the assumption of the full demand scenario (i.e. supply all sectors within the scheme, while accounting for seasonal and daily variations during the trial period).

- There were two extremes used: Base and Sensitivity cases – the sensitivity case is the worst case, in that the producers could only provide a flat rate of hydrogen throughout the year. The project is working with both suppliers on various predicted supply scenarios on the last 5 years' demand profile.
- Availability is 99.995% and 99.973% respectively, which meet the minimum requirements on worse case.

## Phase 2: (Future planned work)

- More detailed representation of all facilities to reflect the updated designs.
- Performance optimization analysis, to investigate the performance impact of varying a range of model input parameters that are of particular interest to the project.



## Outage Duration

There are no specific natural gas outage targets for planned and unplanned outages. However, NGN have agreed with Ofgem that we will aim to have an average unplanned interruption duration of less than 11 hours.

For the trial we are aiming to meet the same target agreed with Ofgem and anticipate no change in the achievement of this with hydrogen. Presented below is the data for last year's outages for information.

Planned and unplanned interruptions are reported yearly by NGN and included on RRP Table 9.03 (Planned and Unplanned – Non-major) and RRP Table 9.04 (Unplanned – Major Incident >250 homes). The average interruptions for last year were:

- Planned = 286 minutes (59,467 interruptions totaling 17,045,671 minutes).
- Unplanned (Non-major) = 300 minutes (10,508 interruptions totaling 3,155,504 minutes).
- Unplanned (Major) = 2,784 minutes (3,143 interruptions totaling 8,750,112 minutes).

For planned interruptions as per RRP Table 9.03, we report this yearly; and last year the network average planned interruption was 286 minutes (59,467 interruptions totaling 17,045,671 minutes).

With regards to unplanned interruption (Non-major Incident) as per of RRP Table 9.03 we report this yearly; and last year the network average unplanned interruption (Non-major Incident) was 300 minutes (10,508 interruptions totaling 3,155,504 minutes).

Unplanned interruption classified as a Major Incident (>250 homes) as per RRP Table 9.04, we report this yearly; and last year the network average unplanned interruption (Major Incident) was 2,784 minutes (3,143 interruptions totaling 8,750,112 minutes).

The time periods above relate to the interruption duration measured only from start of interruption to gas returned to the ECV. This is currently all that Ofgem requires the networks to measure and report upon. Therefore, as a network NGN currently do not include the time take to restore gas to the appliances in measurement of the interruption period.

Specific protections for vulnerable customers registered on the Priority Service Register (PSR) during any unplanned interruptions are detailed within the Stakeholder Engagement and Customer Proposition sections.

### **System Control**

Changes to NGN's system control function have been assessed and planned for. To enable minimal change, a new Local Distribution Zone (LDZ) will be created on the Business Administration system, which will be managed in a way similar to that in which a biomethane injection point on the network is managed. Quotes for implementing this change to the system are currently being gathered.

For demand forecasting, NGN propose to utilise the existing forecasting tool which indicates the percentage of total demand that the prevailing LDZ demand estimate represents, before applying this to the RHC. The demographic of the consumers involved in the trial has been analysed further to refine demand turndown for the project. Additionally, extra resource for the forecasting of demand and allocation of this to Shippers and Producers will be put in place.



# Design and Plan for Grid Conversion

## Below 7 bar Network Conversation

For network conversion, the project has determined the following is required:

- New Medium Pressure (MP) mains and associated valves.
- Four new and one repurposed district governor.
- New Low Pressure (LP) pipework for reinforcement and metallic mains replacement.
- Isolation from the existing natural gas network.
- Replacement of metallic services.
- Sectorisation into 21 sectors for conversion.

Further details are provided below and within the Network Design Plan and Sectorisation Plan.

### Medium Pressure Mains

A new medium pressure, MP, main will be connected to the new pressure reduction station, laid to the trial site area and connected to new district governors.

The medium pressure main will be constructed using new 250mm diameter, SDR21 PE 100 HDPE pipe, which is commonly used in the gas industry and suitable for hydrogen, as evidenced by SGN and reviewed by the HSE. The new MP main will be constructed under standard New Roads and Street Works opening notices in agreement with Redcar & Cleveland Borough Highways Services. The new MP main will split to the North side of Redcar to feed Coatham, and to the south to feed the Kirkleatham area.

The new MP main will be connected to four new district governors and one repurposed existing district governor in Kirkleatham.

Strategic isolation valves will be installed every 800 m, in accordance with industry standard IGEM/TD/3, to allow efficient isolation of the MP main in the event of third-party interference or escape. All valves will be double block and bleed and will be installed with pressure points and purge/bypass points installed either side of the main.

### Isolation from Natural Gas Network

In total there are five locations with extremity to the natural gas network, requiring four extremity valves and one VIA cap end. The extremity valves are needed to provide positive isolation to separate the hydrogen network from the natural gas network.

### Governors

The project will require four new district governors and one repurposed existing governor. A Technical Proposal has been produced identifying a selection of suitable products, initial P&ID drawings and estimated procurement period of 12–14 weeks. The new district governors will also require an enclosure and will be installed on a concrete plinth.

At the network extremities the minimum operating pressure will be at least 23 mbar and average pressures with remote profiling will be kept to circa 27 mbar.

## **Reinforcement**

In order to sectorize the trial area, additional reinforcement is required on the local network to allow hydrogen conversion in sectors. This includes pipes to allow hydrogen to be brought into the trial area sector by sector and also to allow sectors to continue to be fed with natural gas until conversion.

There is also additional reinforcement needed on the existing natural gas network to maintain minimum pressure on the network of customers outside the trial area, during and post conversion of the trial area.

## **Replacement**

In reference to the HSE Paper for Hydrogen Heating Programme on Cast Iron Use with Hydrogen (July 2022) the project has reviewed the requirements to replace all metallic pipes within the trial area. If a recognised standard is not in place to allow repurposing of metallic mains, the project would look to replace all metallic pipes in the trial area except for two sections of metallic mains, pending HSE approval. In total, 35 metallic mains would require replacement with PE pipe.

## **Services**

NGN propose to replace all the metallic services with a diameter  $\leq 2$ " with PE pipe. Initial assessment shows that 72.5% of services are PE and 27.5% are metallic.

The allowable pressure drop across services with diameters less than 63 mm were assessed and it identified that 17 of the existing PE services will need to be replaced with a larger diameter pipe.

An assessment of the suitability of <63 mm PE services has been carried out and the preliminary review shows that potentially 31% of the services will require individual assessment. The condition and suitability of all services will be assessed in detail in Stage 3.

## **Sectorisation**

An RHC gas network model has been developed using the updated Synergi software for hydrogen, to allow the project to assess the network when operated on 100% hydrogen. Using the model, the trial area has been engineered into a total of 21 conversion sectors.

## **Considerations of any key dependencies**

The project is in initial discussions with landowners for the locations of the district governors, currently sited on local council-owned land.

The majority of the project pipelines/mains and valves will be installed under the New Roads and Streetworks Act. An easement crossing is currently in discussions with the landowner. The district governors and associated kiosks will require local authority planning permission.

# Regulatory Model

To assess the requirements of the regulatory framework and associated supporting arrangements for the Hydrogen Village Trial (HVT) a collaborative workstream was established with representatives from all of the GDNs, Xoserve, and with periodic representation from both Ofgem and DESNZ. Element Energy were contracted by the GDNs to support thought leadership / development, provide PMO support, and were tasked with a set of interim and final deliverables.

In the work group interim report delivered Dec 2022, Element Energy framed the question of the appropriate arrangements for the HVT by considering how the market in which hydrogen is delivered to homes and businesses might develop. For example, they highlighted the need for contractual and regulatory simplicity to facilitate trials and the roll-out process, followed by a period of evolution during which hydrogen is separated (commercially) from natural gas.

The report makes a number of key recommendations for the regulatory framework for the HVT, as outlined below:

- A minimal change approach is recommended, using the existing market frameworks, i.e., Uniform Network Code (UNC) and requiring all supplier participation
- Use of a 'passive' entry shipper is proposed in order to fulfil necessary functions under the UNC (e.g., posting of nominations), whilst recognizing that the GDN will require the ability to direct flows of hydrogen into the distribution network.
- Deferral of any decision in respect of billing solution is recommended at this time, pending further investigatory analysis. Currently, two options are being explored to determine the most appropriate proposal for a billing solution to ensure that shippers and consumers are charged accurately.
  - The first is the Multiplication Factor (MF) solution which is currently favoured by the neighborhood trial.
  - The second is the Correction Factor (CF).

An approach to support a final decision has been outlined.

- The concept of a set of rules or Code of Practice for suppliers (and shippers) is proposed, in support of the recommendation of all supplier participation within the trial and in recognition of the fact that GDNs do not have a direct contractual relationship with suppliers.
- A dedicated meter conversion programme is recommended, again in support of the recommendation for all supplier participation. This is seen as the most practical approach with a dedicated workforce carrying out the conversion and providing metering services to suppliers during the trial.

Details of the approaches considered, impacts on codes & license and analysis of billing options, along with a set of business rules for metering and supplier participation are all included within the final report. These are supported by the Commercial Assurance Framework and Commercial Change Framework which set out the assurance activities and high-level plans for the proposed changes required to facilitate these recommendations.

The workstream has considered a wide range of topics and processes in developing its thinking, ensuring engagement with Ofgem and DESNZ along the way to ensure a no-surprise approach. For example, there has been ongoing discussion in respect of established Gas

Standards of Performance (GSOPs) with GDNs providing assurance of a BAU approach being both appropriate and proportionate for the HVT.

Areas considered include but are not limited to:

- Market / Commercial Framework
- Production-side arrangements
- Storage
- Settlement and billing (including impacts on central systems administered by the CDSP and supplier billing)
- Metering Conversion
- Supplier participation
- Legal considerations including licence, industry codes and regulations
- Interactions with other government policies and programmes

It flags the deferral of decision in respect of billing methodology and clearly articulates a plan for final decision in the CCF and CAF.

It highlights the limited influence of GDNs on supplier behaviours and recommends the development of a Code of Practice for suppliers.

# Consumer Protection Plan

## Ensuring transparency

It is critical that consumers have full understanding of the trial, its aims, and its impacts. Our Stakeholder Communications & Engagement plan has been developed to maximize consumer reach with various engagement methods for different consumers, recognizing potential vulnerabilities and consumer situations. To ensure full accessibility, we will work with third-party organisations to reach consumers and ensure the required support.

To ensure transparency, we are taking a personalized approach to consumer offers and, following property survey, consumers will be presented with options available to them. To help consumers gain a full understanding of the technology available, we are opening Caretaker's Lodge at Redcar & Cleveland College where consumers will be able to interact with the options available, supporting informed decision.

All communication will cater to accessibility requirements of our consumers and stakeholders.

To ensure we adhere to the transparency principle, we will seek independent review, periodically, by a third party who will assess our ongoing plans and outputs and provide recommendations for improvement. We will share this with DESNZ to demonstrate ongoing progress.

Throughout the trial, we will continue to test the efficacy of the communication and engagement approach by capturing consumer feedback before reflecting this in appropriate changes to the communications approach. We are also considering how to make data rights, data capture, and data use more accessible to consumers, to ensure any decisions made by consumers are fully informed.

## Appropriate oversight and redress

Our existing complaints procedure will serve to manage complaints arising from the trial. Complaints are taken through a three-tier escalation process, then referred to the Ombudsman in case deadlock is reached. Through ongoing engagement with the Ombudsman Service, we have provisionally agreed how trial-specific scenarios will be treated to ensure they can serve an effective, defined role for complaint resolution throughout the trial.

Where existing procedures are not appropriate for example where the complaint relates to the general policy of the trial, which is a government decision, we will assess the complaint to determine the most appropriate route. We will explore other suitable agencies for complaint referral and reach a decision in Stage 2.5.

Irrespective of the trial, as per existing obligations, we will continue to measure and track complaint volume against Ofgem's complaints metrics and internal targets. We will regularly review all trial complaints and where themes emerge, take appropriate action to target the source for the ongoing complaint type. We will ensure full transparency in all complaints and compensation cases, providing consumers with a breakdown of decision-making criteria and redress provided.

## **Fair treatment for all**

We have conducted extensive engagement with consumers, including additional research to understand vulnerability in the trial area.

We are using the Ofgem definition for vulnerability, which is intentionally broad to capture all consumers who need additional support. We have developed potential circumstances and characteristics that may make a consumer vulnerable, many of which are included on the PSR.

More work is required to understand the number of vulnerable consumers in the trial. As a minimum there are 595 from the PSR, but this does not cover the full extent of vulnerable trial consumers. The number of vulnerable consumers will change throughout the trial as circumstances change, so our vulnerability strategy will evolve and adapt alongside consumer needs.

To help us engage and support other vulnerable consumers we will work with local organisations (charities, local authority bodies, etc.) who are already trusted by the consumers and can advise on how best to engage and face into challenges.

During planning for the trial, we do not foresee any unusual or trial-specific challenges which may impact our ability to ensure compliance with existing obligations on other parties.

## **Quality of service**

We have put processes and procedures in place to ensure best practice for hydrogen and electric installations will be followed throughout the trial, including the principles outlined in GSOPs. All engineers utilized on this trial will be fully qualified and Gas Safe registered. Depending on requirements at individual participating properties, we may also use secondary trades such as electricians or specialty builders. These will usually be sub-contractors and will be suitably qualified. We recognize that we will always be responsible for work they undertake at any property as part of the trial.

As part of our preparations, we are considering how our existing processes and procedures for construction and in-home visits may be adapted to ensure we absolutely minimize disruption to properties in the trial area (both those directly affected, and those indirectly through any construction work).

We are working with the HSE to ensure that the trial is carried out in full accordance with their guidance. We will maintain a relationship with them throughout the trial to ensure we continually improve our processes and increasing consumer safety.

We will also engage with the Hydrogen Skills and Standards for Heat Programme and the HSE before and during the trial, this ensures we identify changes to skills requirements and updates for standards so we can roll these out to the deployed engineering workforce at the earliest opportunity.

We will obtain external validation from an independent third party periodically throughout the trial to monitor the quality of service, keeping a log of ratings provided and actions taken to correct shortfalls identified.

Quality of service includes our support services. Having established our vulnerability strategy, we are working towards establishing a support network with local and national organisations to ensure that we have appropriate expertise within the project to provide tailored consumer support.