Appendix A9 – Pre-Trigger Proposal and Ofgem Trigger Confirmation

Northern Gas Networks

Smell gas?
Call the National Gas Emergency Service
on 0800 111 999

Northern Gas Networks
Date: 21/ 12/ 2023

Ofgem
Network Directorate, RIIO Price Controls
[redacted]

[redacted]

Net Zero Pre-Construction Work and Small Net Zero Project (NZASP) Pre-Trigger Proposal

Please find attached to this letter a proposal from Northern Gas Networks which establishes the needs case for the Front-End Engineering Design (FEED) of the East Coast Hydrogen (ECH2) study relevant to Northern Gas Networks operational area. We provide this information pursuant to Special Condition 3.9 of the Gas Transporter Licence and the associated Net Zero Pre-construction Work and Small Net Zero Projects Reopener Governance Document, to enable Ofgem to trigger the NZASP reopener which was created to allow gas transmission and distribution companies to undertake early design, development, general pre-construction work, and net zero facilitation capital projects.

Northern Gas Networks (NGN) has worked in collaboration with National Gas Transmission (NG) and Cadent Gas over the last year to engage extensively with Ofgem to provide the Authority with confidence and understanding of the ECH2 FEED project scope and needs case, including its wider strategic alignment with government targets, project timeline and consumer funding justification. We consider this activity is sufficient to meet the pre-trigger engagement requirements outlined in the Governance Document.

The ECH2 programme seeks to build 100% Hydrogen Transmission and Distribution Network to decarbonise the industrial and commercial (I&C), and power sectors in the East Coast region. The ECH2 Pre-FEED project, completed under the Use It or Lose It funding mechanism, clearly demonstrates the need and the methodology to create this network. To ensure that a UK hydrogen network can be operational in time to meet the UK Governments Net Zero plans and decarbonisation of I&C and power sectors, it is now necessary to conduct a FEED study.

Our previous engagement with Ofgem has identified NZASP Re-opener as the most appropriate method of funding the next stage of ECH_2 and the attached document provides information to meet the requirements outlined in the aforementioned NZASP Governance Document Version 1.2, to trigger this re-opener process.

The attached document includes the following:

1. How the project fits with strategic and policy goals.
2. Outline ECH_2 FEED needs case.
3. ECH_2 FEED project scope.
4. Outline ECH_2 FEED project cost.
5. Key ECH_2 FEED project dates.
6. Why should all gas consumers pay for the ECH2 FEED?
7. How the ECH_2 FEED funding should be treated from a regulatory point of view.
8. Ofgem engagement to date.
9. Conclusion.

we are the network

Additional details on the wider project are also available in the ECH_2 delivery plan that is available here https://www.eastcoasthydrogen.co.uk/our-east-coast-hydrogen-phase-2-launch/.

We look forward to receiving the NZSAP reopener trigger notification from Ofgem to progress the ECH2 FEED study, and welcome advice or suggestion for any additional information that is required to enable Ofgem to trigger the proposed reopener. If you require any further information please contact [redacted] who will be able to deal with your query.

Yours sincerely,

[redacted]

Director of Regulation & Strategic Planning

NGN East Coast Hydrogen NZASP Pre–Trigger Proposal

1 How the project fits with strategic and policy goals

1.1 Introduction

The East Coast region is home to UK's two largest industrial emission clusters (Tees Valley & Humber), hosting concentrated industrial energy demand, significant gas storage and abundant offshore wind power.

The East Coast Hydrogen (ECH_2) project is a first of its kind, 15-year mega infrastructure programme established by Northern Gas Networks (NGN), Cadent and National Gas (NGT), along with a supporting consortium group comprising of partners across the full hydrogen value chain. The ECH_2 network will be an anchor in creating and catalysing the UK low-carbon hydrogen economy by connecting locations of hydrogen supply, demand, and storage through a mixture of repurposed and new pipelines.

ECH_2 will support UK Government policy and Net Zero legislation enabling green job creation, reducing emissions, and creating resilience in the whole energy system. The ECH_2 programme has identified approximately 88 TWh of annual hydrogen production in ECH_2 the region, and over 58 TWh of annual industrial, commercial, and power demands potentially materialising up to 2037.

ECH_2 will enable decarbonisation of industrial and commercial (I&C) and power customers located within industrial clusters as well as those that are scattered outside of the clusters which represent 50% of UK's I&C emissions. It will also offer future optionality to decarbonise transport and heating sectors through effective utilisation of large-scale hydrogen infrastructures, thereby delivering better value for investment.

1.2 Strategic & Policy Alignment

The ECH programme will enable timely attainment of UK Government's hydrogen production targets described in the Hydrogen Strategy (2021) which sets out the aim to achieve 10 GW of low carbon hydrogen production by 2030, with at least 1 GW of production capacity by 2025, potentially supporting over 9000 UK jobs and over £4 billion in investment. It also supports development of 8 projects selected through government's Net Zero Hydrogen Fund (NZHF) and Hydrogen Allocation Round 1 (HAR1), and the CCUS cluster competition within the region which facilitates blue hydrogen generation.

Hydrogen is the most credible decarbonisation pathway for high temperature (>400°C) industrial processes where electrification is unsuitable or uneconomic, and where carbon capture is not feasible. Consequently, hydrogen infrastructure will need to rapidly develop to economically achieve the UK's Net Zero target. Low-carbon hydrogen is also expected to play an essential role in achieving Net Zero across the commercial, power, transport, and heating sectors according to Committee for Climate Change and National Grid's Future Energy scenarios.

Since indicating the ambition to develop a world leading low-carbon hydrogen economy in its Ten Point Plan for a Green Industrial Revolution (2020), the UK Government has continued to develop on its vision for developing industrial 'Super Places' as hubs for renewable development.

The Government's Industrial Decarbonisation Strategy (2021) clearly highlights the ambition to reduce industrial emissions by at least two-thirds by 2035 and 90% by 2050. The ECH_2 programme facilitates decarbonisation of I&C and power sites within and outside of the clusters through a phased and customer driven pipeline routing strategy. This also involves connecting blue hydrogen facilities within the East Coast Cluster and Viking CCUS clusters, enabling 8.9 TWh I&C demand to fuel switch from natural gas to hydrogen in the 2030s. Furthermore, ECH_2 can help deliver the benefits of switching 15.7 TWh of natural gas usage to low-carbon hydrogen by 2032, abating up to 7% of total UK I&C emissions. The Teesside and Humber Industrial Cluster Plans (2022) articulate their vision to establish the UK's first net zero industrial cluster by 2040 with hydrogen fuel switching playing a critical role in decarbonising industries such as Steel and Refining, for which alternate fuel switching option such as electrification is not viable.

Figure 1. UK Hydrogen Strategy and Policy Timeline

The ECH_2 programme will be the cornerstone for bolstering growth of a hydrogen economy by building hydrogen Transport and Storage (T&S) at scale and helping develop the nascent hydrogen market into a mature and competitive one by stimulating private investment. ECH_2 will enable the UK to diversify its energy supply by harnessing its offshore wind power and catalysing the production of 'home grown' energy in alignment with the British Energy Security Strategy (2022).

The National Infrastructure Commission (NIC) recommends development of a core hydrogen pipeline network by 2035. The ECH_2 programme can facilitate this ambition by joining the Humber and Teesside industrial clusters with other clusters in the UK. The Net Zero Strategy: Build Back Greener (2021) states all electricity generation to be decarbonised by 2035. ECH_2 will facilitate decarbonisation of 12% of the UK's electricity from natural gas, helping to abate over 6 $MtCO_2$/year within the East Coast region. In addition, the programme will provide a network to help fuel switch 58 TWh of power sector natural gas demand by 2037.

In alignment with the government's Energy Bill (2023), the ECH_2 programme will inform the future system operator (FSO) on how to strategically build out hydrogen assets within the region, utilising networks' customer relationships and insights on volume and timing of demand and production. The Hydrogen Transport and Storage Pathway (2023) forecasts up to 180 TWh of UK industrial and power demands by 2050, along with up to 90 GW of hydrogen to power (H2P) capacity.

Funding the ECH_2 FEED study represents a low regret opportunity to achieve regional and national decarbonisation ambitions. It is essential that a clear plan for transportation and storage of hydrogen is developed to provide certainty for those across the hydrogen value chain to make investments. Progressing to FEED stage now is critical to ensure deployment in time to unlock whole system decarbonisation benefits and achieve the UK's 2030 and 2050 Net Zero Target.

2 The outline needs case for ECH_2 FEED

In this section we summarise the needs case that has been previously presented in our joint engagement sessions and detailed in the ECH_2 delivery plan. Within this document we focus more closely on the needs case related to the NGN area.

2.1 Hydrogen Demand

While there are multiple routes to decarbonisation in different sectors of the economy, the availability of low-carbon hydrogen is essential for hard-to-abate industrial, power, and large commercial operations.

Reasons why industrial and commercial entities will take up low-carbon hydrogen as a decarbonisation medium include:

- **Technical feasibility of available alternatives** such as space constraints, technology maturity, readiness, and scalability (which often vary on a specific site level basis).
- **Industrial dependency on natural gas as a feedstock** or for high-temperature thermal processes makes it hard to abate.
- **Cost-effectiveness of using alternative fuels** or capital investment cycles to refit/convert industrial equipment.
- **Lack of electricity capacity** to electrify industrial processes.

Energy profiles from the top 250 users of gas in NGN's network show there will be a demand of 3.7 TWh of low-carbon hydrogen, exponentially growing to 42.7 TWh by 2037. This would equate to 8.2 Mt/CO_2 emissions being avoided a year by 2037 through fuel switching. This excludes any potential demand for hydrogen from aviation fuel, road transport, domestic heating, and additional direct production connections.

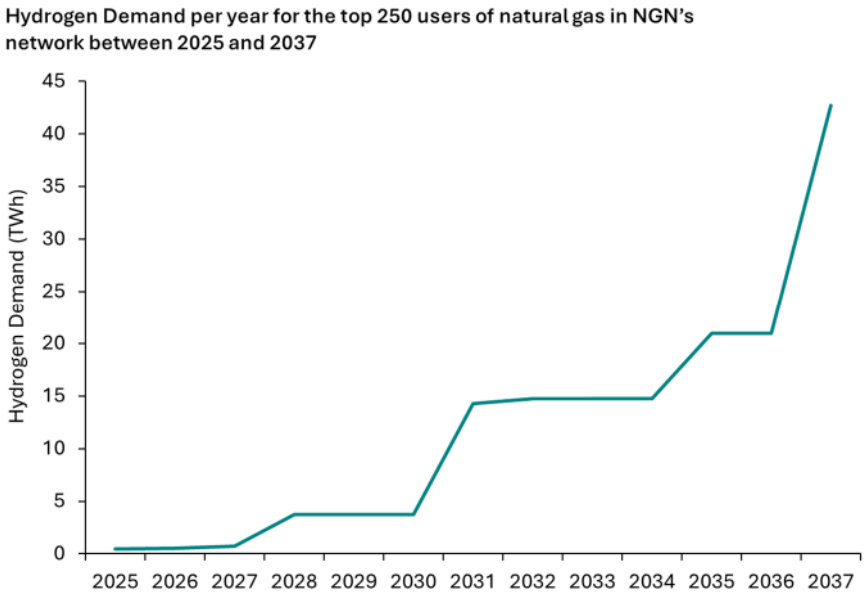


Figure 2. Calculated usage of hydrogen through fuel switching between 2025 and 2037 in NGN area.

Looking at the spread of this demand over the NGN region, critical centres of natural gas consumption are present in the hydrogen production clusters, such as the Humber (22%) and Teesside (16%). However, significant demand for hydrogen is geographically dispersed throughout the region in North Yorkshire (10%), West Yorkshire (34%), Tyneside (10%) and Cumbria (8%). While pipeline infrastructure is required to connect assets within clusters, networks are crucial in transporting hydrogen from the clusters to the gas users in the broader region and allowing them to decarbonise.

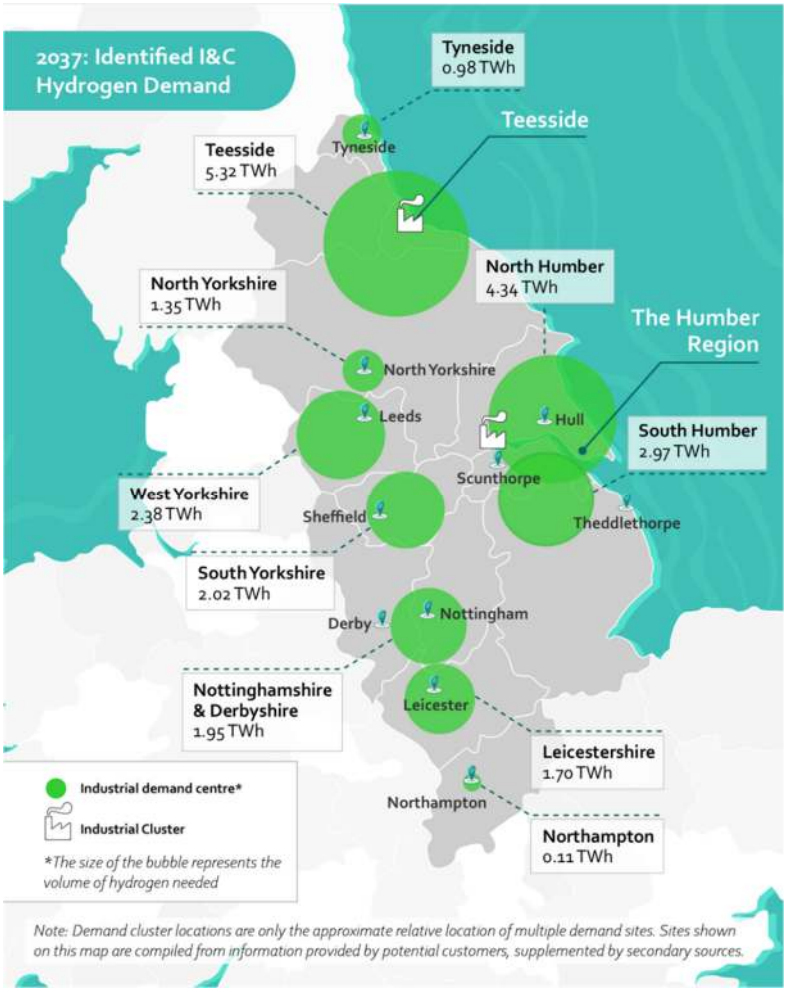


Figure 3. Hydrogen demand clusters in the ECH₂ region.

To calculate the demand described above, NGN set out to determine the following through the Pre-FEED:

- What proportion of industrial and large commercial gas users within the network need hydrogen to decarbonise their industrial processes?
- What would the uptake of low-carbon hydrogen be over time for these users?
- What is the demand profile for hydrogen uptake and natural gas decline for 2028, 2032 and 2037, assuming a hydrogen pipeline is available?

Gas usage trends were plotted to determine the number of users connected to NGN's network likely to use hydrogen to decarbonise. This trend for the top 1000 users can be seen in Figure 4.

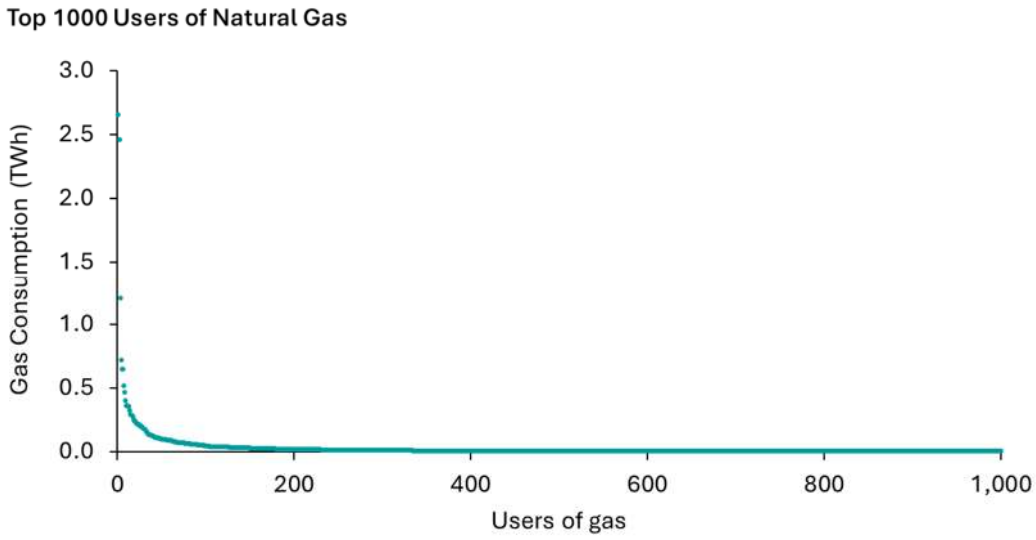


Figure 4. Top 1000 users of Gas in NGN's network.

Figure 5 Figure 5 demonstrates that the top 250 users account for the majority of consumption on the NGN network, and they are most likely to rely on low-carbon hydrogen for decarbonisation.

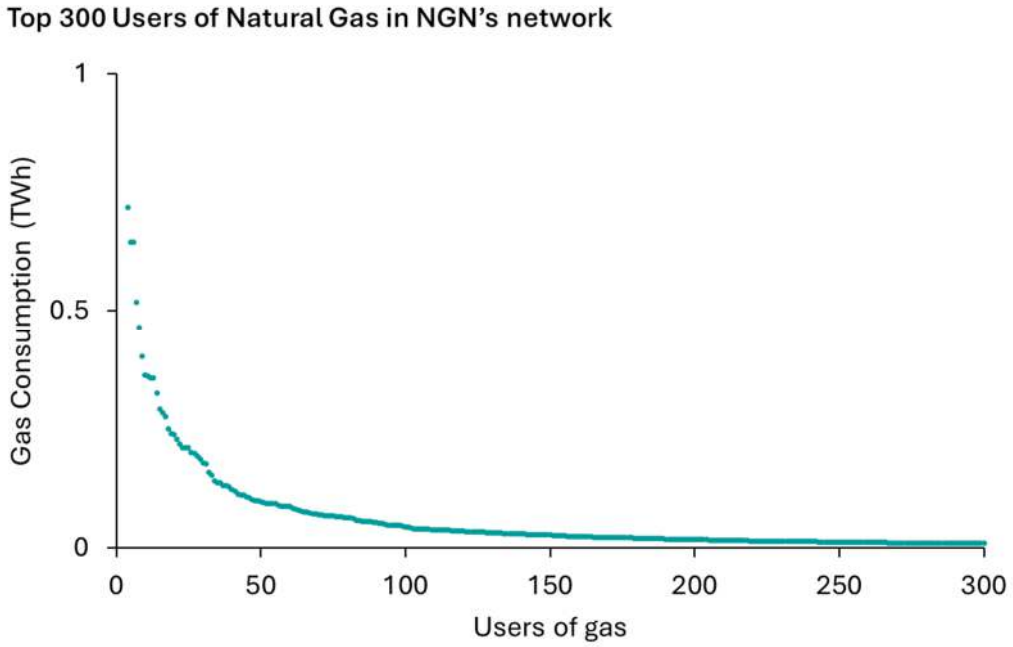


Figure 5. Top 300 users of Gas in NGN's network.

To determine the potential reliance of these top 250 users on hydrogen, today's availability and cost of technology were modelled, along with:

- Sector decarbonisation commitments from industry associations or UK government reports.

- Industrial dependency on natural gas, e.g., feasibility and cost-effectiveness of implementing alternative technology.
- Users strategic priorities for decarbonising, collected through primary data from the top 250 gas users and secondary resources.

To obtain primary data, NGN held meetings with 103 I&C and Power users to discuss their Net Zero plans, of which 91% have stated they want to use hydrogen. In the NGN area, 27 have become ECH_2 consortium members and most have provided detailed data on their forecasted natural gas/ hydrogen usage. This engagement with users is ongoing and will continue to be updated to inform the reopener submission.

The information described above, as well as the information collected through user engagement, was used to create the energy profiles shown at the beginning of this section.

2.2 Low Carbon Hydrogen Production

ECH_2 has the potential to connect over 8GW of hydrogen production by 2030, utilising most of the government's 10GW production target in a single region.

To determine the forecasted production of hydrogen in the NGN area, ECH_2 collected primary and secondary quantitative and qualitative data from 22 announced production projects. Most of these projects have provided Letters of Support for ECH_2 and engaged heavily with NGN to inform the development of their Pre-FEED and FEED studies.

All identified projects have been broken down into phases where applicable to enable a more granular forecast of potential hydrogen production to be developed. Forecasts have been considered in the greater context of the UK government's targets to produce 10GW of low-carbon hydrogen by 2030.

Data collection is ongoing, and forecasts are working models that are being updated as more information becomes available.

There are two major production hubs within NGN's region (Teesside and the Humber), adding up to 8.27 GW of announced hydrogen capacity by 2037. This means NGN's area alone could majorly contribute to the 10GW hydrogen production target set out by the UK Government.

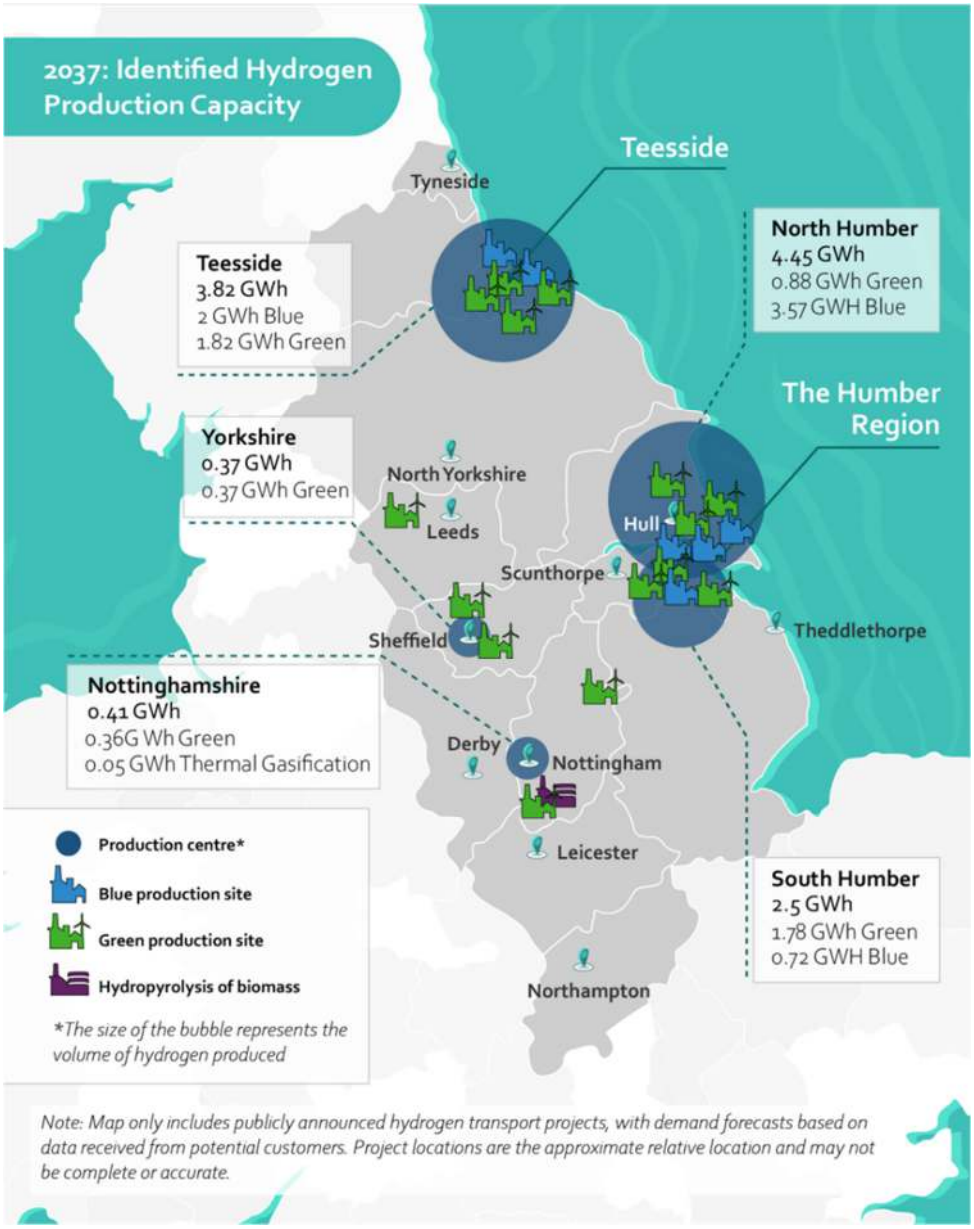


Figure 6. Identified hydrogen production hubs in the ECH₂ region.

Furthermore, as shown in the graph below, there is sufficient announced low carbon hydrogen production to satisfy the area's industrial and large commercial hydrogen demand, unlocking the route for many high CO_2 emitters to decarbonise before 2037.

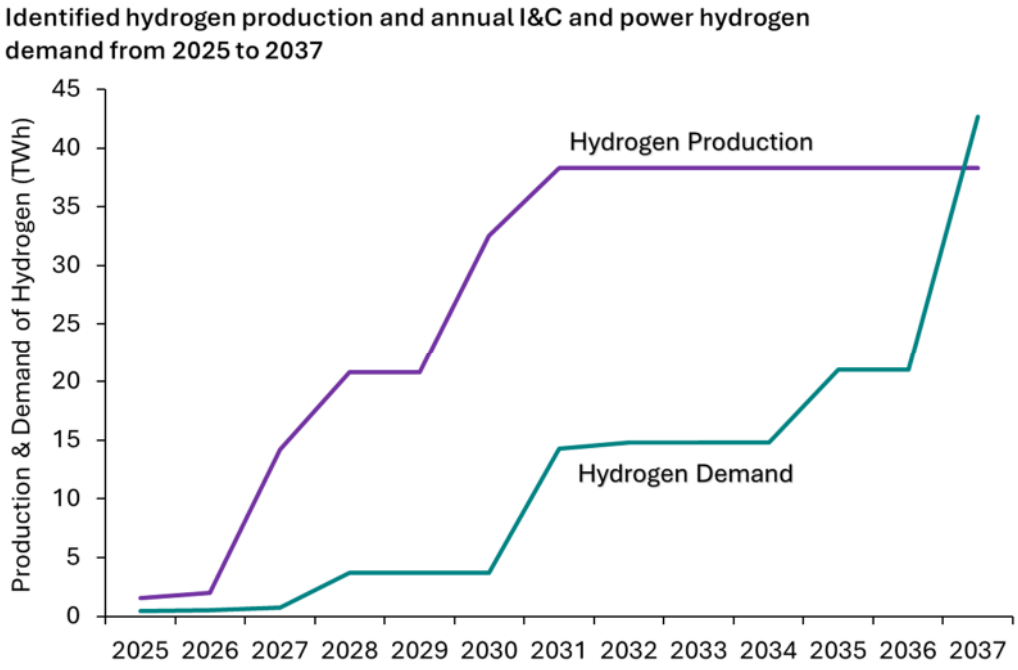


Figure 7. Hydrogen production and demand in NGN's region from 2025 to 2035

ECH_2 has support from 15 prospective hydrogen producers within the region, many of which have indicated they would depend on connecting into a network to provide flexibility and resilience of supply to their customers.

By providing further routes for low-carbon hydrogen producers to connect and deliver hydrogen to additional customers, ECH_2 can enable the early development of hydrogen transport and storage infrastructure, thereby consolidating and aggregating demand and accelerating the development of the hydrogen economy.

2.3 Hydrogen Storage

Hydrogen storage is required in almost every independent third-party Net-Zero scenario for the UK. Hydrogen storage capacity will be necessary for:

- Balance the grid by storing excess electricity as hydrogen for later use in peak energy periods.
- Energy security through the ability to store energy as hydrogen at scale and across seasons, improving energy security.
- Support the development of an efficient tradable hydrogen market.
- Provide sufficient resilience to customers with multiple direct connections to give off-takers confidence in switching.

The East Coast region is well placed geologically for hydrogen storage, with high availability of existing natural gas reservoirs and salt caverns.

ECH_2 has collected primary quantitative and qualitative data from eight announced storage projects. This includes four off-site storage facilities that are co-located with production projects. These projects are in the early stages of development and are looking to secure funding or obtain planning.

There are plans for up to 0.7 TWh of announced salt cavern storage by 2037, with 3.3 TWh expected from Rough by 2030 and a further 10 TWh by 2050. ECH_2 will, therefore, be able to address and connect up to 19% of the UK's 2050 storage requirements to regional producers and demand centres.

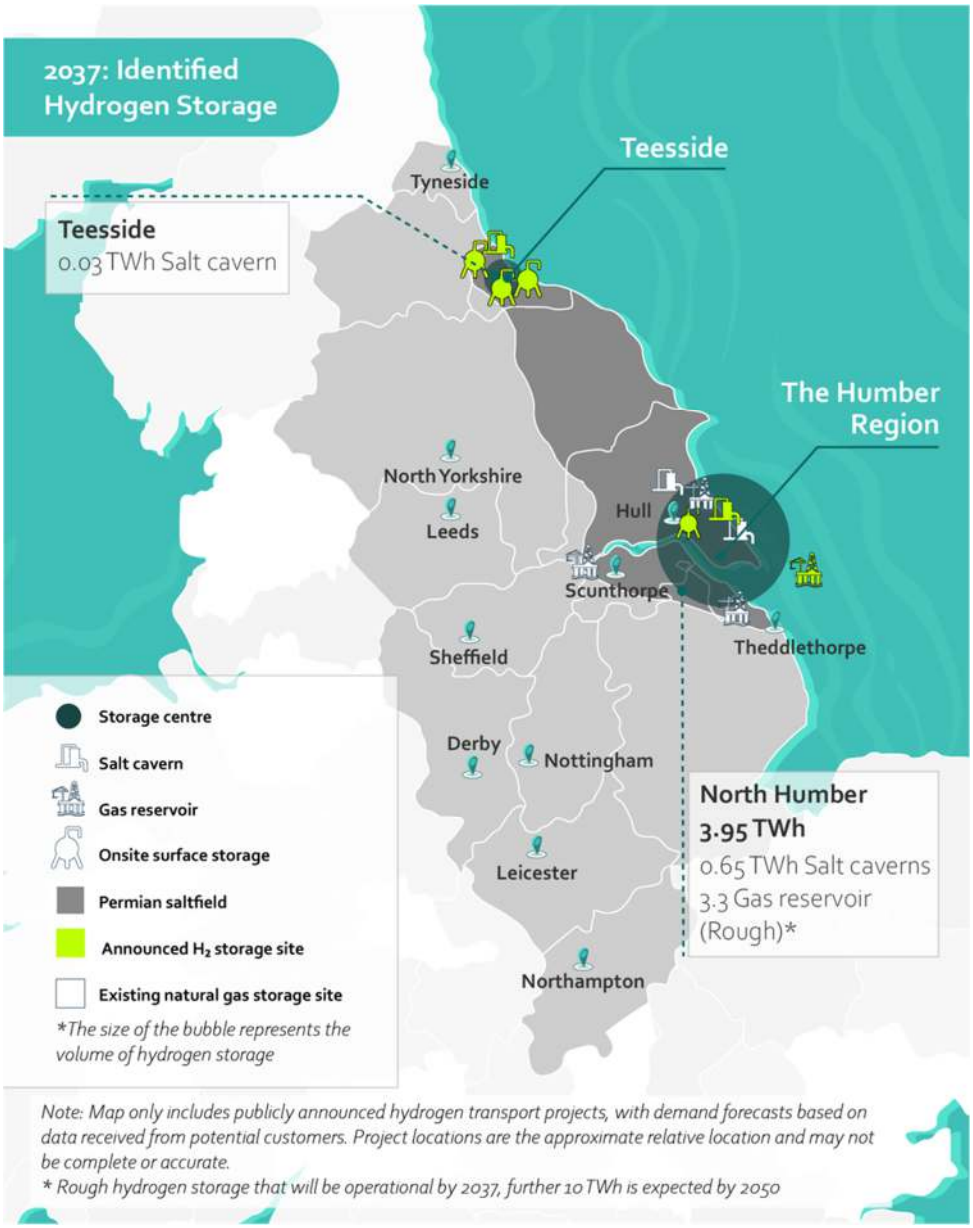


Figure 8. Identified hydrogen storage hubs in the ECH_2 region.

2.4 Wider System Benefits

2.4.1 Project Union Enabler

National Gas's flagship conversion project, Project Union, aims to repurpose the transmission feeders that provide Local Distribution Zones (LDZs) from natural gas to hydrogen. Within NGN's region, Feeder 7 will be the first transmission pipeline to be repurposed. For this to happen, NGN must modify the existing Off-Takes and AGIs that connect to Feeder 7. The first phase of ECH_2 will support this phase of Project Union and then connect the first spurs of NGN's hydrogen network to this feeder. ECH_2 is, therefore, a key enabler for Project Union.

2.4.2 Facilitator of Transport Decarbonisation

Transport is the UK's largest carbon emitting sector, accounting for 27% of the UK's total Green House Gas (GHG) emissions, with a saving of 1,300-1,800 Mt CO_2e between 2020 and 2050 from transitioning away from fossil fuels.

NGN's region is home to multiple pilots and research projects to demonstrate the potential of decarbonising transport, with the first multi-modal hydrogen transport hub and various announced Sustainable Aviation Fuel (SAF) production projects in Teesside.

SAF production could require 0.6-3 TWh of low-carbon hydrogen, increasing to 5-20 TWh depending on the final mandate. With five SAF projects announced just in Teesside, ECH_2 would be the key to enabling large scale SAF production in the North East.

2.4.3 Conversion Blueprint

ECH_2 could act as a blueprint for regional network conversion to hydrogen, supporting the broader ambitions to create a UK-wide hydrogen network and a UK hydrogen economy.

It would also inform the UK Future System Operator (FSO) on how to build out hydrogen assets to develop a mature, well-functioning hydrogen market through the lessons learned in the strategic network planning of the East Coast region.

2.4.4 Economic Growth

ECH_2 would support the continued growth of local and regional economies by maintaining the current skilled workforce in manufacturing, by transitioning to low-carbon hydrogen.

Manufacturing is the largest sector within the East Coast region, generating £48.5bn for the UK in 2021. Food Beverages and Metal Products were the highest earning sectors, producing £13.6bn, up to 14% of the manufacturing sector, and aligning to industries forecasting the need for 6.1 TWh of low-carbon hydrogen by 2037. It is vital for manufacturing companies to smoothly transition to a low-carbon alternative while maintaining market competitiveness. Within the top 250 users of gas in the NGN area, 71% of the gas usage comes from companies that are owned by non-UK entities.

If the infrastructure to support the transition of these hard-to-abate sectors is not developed, the region risks seeing jobs and investment move either out of the area or abroad, putting the local economy at risk.

2.5 Approach to the needs case

2.5.1 Strategies for developing the H2 network

To ensure value for money, network concepts were developed for each area, which aimed to link up the production, storage, and users with the NGT hydrogen backbone. These include the following locations:

- Teesside
- Bishop Auckland to Pannal
- Leeds and Bradford
- Towton to Asselby
- Humber and Tyneside

Three options for network concepts are established: repurposing, private distribution networks, new build pipelines.

2.5.1.1 Repurposing

The primary aim is to repurpose as much of the existing network as possible, as this has on average a 20% lower CAPEX than new-build pipelines and would provide less disruption to the public. To initially assess the feasibility of this, a repurposing assessment was undertaken to establish if the chosen route had sufficient capacity to provide hydrogen to the identified users. Where this was acceptable, the routes were then modelled further to assess the impact on the existing natural gas network and determine the work required to separate the line to be repurposed.

2.5.1.2 Private Distribution Networks

As part of the hydrogen business model funding, low-carbon hydrogen producers must build their own distribution pipelines to supply their customers with hydrogen. This has been necessary for the producers to enable a robust business case without a wider-reaching hydrogen network. Throughout the project, NGN has engaged with these producers to ensure no duplication occurs between the routes that NGN and producers take. Furthermore, discussions have taken place on how these private lines would be able to connect to ECH_2. Later stages in the development of the hydrogen transport and storage model will clarify what body will own and operate these private lines.

2.5.1.3 New Build Pipelines

Building new licensed pipelines has been considered when pipelines cannot be repurposed, or private lines cannot be utilised.

2.5.2 The minimum option

The minimum option for NGN would be not to develop its network to support hydrogen transportation. This may lead to the development of duplicated private networks that are not interconnected, not supporting the UK Government's decarbonisation policies and targets regarding the establishment of a hydrogen economy.

2.5.3 Delaying Proposed Work

Although the RIIO-2 price control was finalised before ECH_2 could be incorporated, delaying ECH_2 to the following price control could significantly impede the attainment of UK's net zero targets. ECH_2 is required to enable other major UK hydrogen project infrastructure, linking Teesside and Humber industrial clusters, and connecting 7GW hydrogen production capacity to gas users and storage in the North-eastern and Yorkshire regions.

2.5.4 The work undertaken to prepare for optioneering

Having established the likely hydrogen users on the network, as described in Section 1.3, it was necessary to develop a hydrogen network able to connect to as many users as possible. Due to NGN's extensive coverage area, the region was divided into six distinct sections:

- Teesside
- Bishop Auckland to Pannal
- Leeds / Bradford
- Towton to Asselby
- Humber

- Tyneside

Some regions, such as Cumbria and Northern Northumberland, were not initially assessed in depth due to the lack of firm plans on production and uncertainty of which NGT feeders would be converted.

Within each section, Optioneer™, a linear infrastructure tool, was used to determine possible routes that could be taken for the hydrogen network. The tool considers route options via a constraint weighting and automated AI routing methodology that holistically considers constructability, environmental and consenting criteria. This allowed routing options to be swiftly generated, iterated, and then assessed against multicriteria analysis to identify the most efficient route. Some of these multicriteria included performance against, security of supply, land interests and total installed cost.

2.5.5 Market based options

There are no practicable market-based options available for consideration at this time. Market-based options may be appropriate where a network operator is considering reinforcing a network to address a peak in demand. However, in this case, the proposal is to develop an entirely new class of assets for hydrogen transportation. Market-based options will continue to be considered as the project develops.

2.5.6 Why do we need to do a FEED

Now that the Pre-FEED has allowed NGN to establish initial routing for the network, progressing to a FEED study will let us define a final route, allowing NGN to determine a more specific project cost estimate and, therefore, allowing a Final Investment Decision.

3 Description of Front-End Engineering Design Scope

3.1 FEED Proposal

After Pre-FEED to design an initial network, FEED is required to refine the project scope while identifying and mitigating potential project risks. This will result in greater success during project execution while reducing the likelihood of cost and schedule overruns.

FEED will encompass all work required to produce quality process and engineering documentation with sufficient detail, defining all project requirements necessary for project execution, including detailed design, procurement, build & construction, commissioning etc.

The goal of FEED is to:

- Produce a total installed Association for the Advancement of Cost Engineering (AACE) class III project cost estimate that is +/- 10-15% accurate. This will enable the project stakeholders to decide on full funding of the project.
- Develop engineering packages that can be used to bid a lump sum Engineering, Procurement & Construction (EPC) contract, or utilised to provide the foundation for the detailed engineering.
- Evaluate any potential design options that may improve Return on Investment (ROI).
- Conduct hazardous operation reviews to improve safety outcomes.
- Support stakeholder funding approval processes.
- Provide a framework that can be referenced and checked against as the project progresses through the engineering and construction phases of the project.

3.1.1 FEED Scope

The scope will be divided into five packages and will be delivered as a complete FEED study at the end of this project phase.

Each package will have deliverable lists that will be developed and delivered as a set of reports, drawings or schedules as per the requirements.

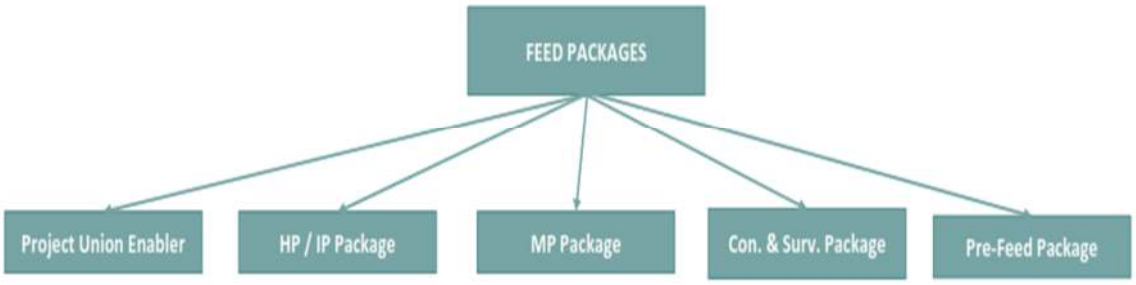


Figure 9. FEED Packages.

A typical deliverable list for a new pipeline will have the following:

- New pipeline corridor routing assessment report
- Pipeline sizing calculations
- Pipeline corridor alignment/routing drawings
- Environmental Impact Assessments
- List of major crossings and assessments (rail, rivers, roads, bridges etc.)
- Full risk assessment of corridors (including crossings) with mitigations
- Construction approach and methodology
- Long lead Item identification / schedule
- Cathodic Protection design and report

The above list is not exhaustive and for example only. A detailed list is under development and will be submitted during the detailed Re-Opener submission.

Similar deliverable lists will be developed and presented for the AGIs and other assessments for re-purposed pipelines.

The details of the proposed FEED packages are described below.

3.1.2 Project Union Enabler

Project Union is responsible for the transmission of hydrogen to different LDZs throughout the country. While attempting to develop a hydrogen transmission network, Project Union will repurpose and, in some cases, develop new assets.

To enable the work of Project Union, NGN will have to modify the existing Offtakes and AGIs or build new Offtakes and AGIs. The modification will also require sections of new natural gas pipeline and AGIs for re-purposing of transmission and distribution system to hydrogen.

The scope of this package will include the design of:

- Disconnecting existing offtake connections from the Feeder7 and connecting to new natural gas feeders.
- Building new natural gas HP/IP pipelines and AGIs to enable re-purposing of existing NGT pipelines and new build pipelines for H_2 transportation.

3.1.3 HP/IP Package

During the Pre-FEED study, NGN has re-purposed its assets where possible to create a new hydrogen network. Where it is not possible, new pipelines are considered for the hydrogen network.

The scope in this package includes the FEED of the new hydrogen network including the following:

- High Pressure (HP) pipelines
- Intermediate Pressure (IP) pipelines
- Pressure Reduction stations
- Block Valve stations
- Modification of existing AGIs to enable hydrogen to flow through them.

3.1.4 Consultation / Survey Package

This package will consider all the survey works that are required for environmental and planning requirements as well as the survey requirements for the existing pipeline, which will be re-purposed for hydrogen transportation.

The scope of this package includes the following:

- Carrying out all the survey works on the proposed H2 re-purposed pipelines to check that they are fit for purpose.
- Carrying out the survey works required for the new pipelines and new AGIs.

3.1.5 MP Package

This package will consider the FEED for new Medium Pressure (MP) pipelines and Pressure Reduction Modules for hydrogen.

The scope includes the FEED for the following:

- MP pipelines
- MP to Low Pressure (LP) Pressure Reduction Modules (PRMs)
- End capping of MP lines where required
- Re-use of existing MP/LP PRMs with minimum modifications

3.1.6 Pre-FEED of Tyneside, Cumbria and other industrial customers which are not considered in the current Pre-FEED

Tyneside and Cumbria regions have not been fully explored, due to the uncertainty of Project Union's hydrogen transmission lines to these areas. Further customer engagement will explore these areas in more detail.

Due to the nature of the new network and the adverse proximities of some consumers from the developing hydrogen network, some of the customers were not connected. A Pre-FEED study should consider how to connect these customers in a cost-effective manner.

The scope in this package will include:

- Pre-FEED study for the Tyneside and Cumbria regions
- Pre-FEED study for the spurs to the consumers which were not connected in the main Pre-FEED study

The output of this Pre-FEED study will be a subsequent reopener for an additional FEED study covering the wider role out of the hydrogen network to these areas.

4 Cost Proposal

NGN has developed two separate cost packages as part of the Pre-FEED study.

Overall project cost to upgrade the NGN network and construct the hydrogen distribution network.

- FEED cost for upgrading the NGN network. The overall project cost includes direct and indirect costs. The direct costs include the procurement, fabrication, and installation costs of pipelines and associated AGIs, including the costs of repurposing or modifying existing facilities. The indirect costs include the engineering, project management and commissioning.
- FEED cost estimation is based on the actual cost of delivering the engineering and design of each package, including the associated project management costs.

The overall estimated cost for ECH_2 within the NGN network is in the region of [redacted]. This cost is for the developed ECH_2 network at this stage. This cost doesn't include the yet to be developed regions around Cumbria and Tyneside and the industrial customers that would not be connected in this stage. The details of the costing will be submitted with the Re-Opener application.

The FEED cost for upgrading the NGN network for ECH_2, as detailed in section 3 above, is estimated to be in the region of [redacted]. A robust review and challenge of the costs is ongoing, and a firmer proposal will be submitted, with appropriate risk thresholds (P10/P90), as a part of the formal application should the reopener be triggered.

The following table shows the breakdown of the estimated costs based on work undertaken through the Pre-FEED study.

[redacted]

Table 1. FEED Cost Breakdown.

A final cost along with a detailed breakdown of the costs will be submitted with the Re-Opener application.

5 Key Project Dates

5.1 East Coast Hydrogen Overall Plan

NGN has mapped out the overall ECH_2 scheme, dividing into five stages:

- Stage 1 Production & Storage
- Stage 2 Transmission Development
- Stage 3 NGN Core Network Development
- Stage 4 Town Rollout (If required following heat decision)
- Stage 5 Expansion of NGN Hydrogen Network

The FEED Study is key to the further development of the ECH_2. It will be the initial stage required to allow for both the Transmission Development (Stage 2) and NGN Core Network (Stage 3) to be undertaken.

During the above period NGN will undertake a Pre-FEED Study to assess those areas which are situated furthest away from the backbone network. These areas are Tyneside and Cumbria, but the study will also assess those customers that have not been captured within Stage three. This will be to allow for Stage five to proceed.

The following plan as below outlines the wider ECH_2 Project.

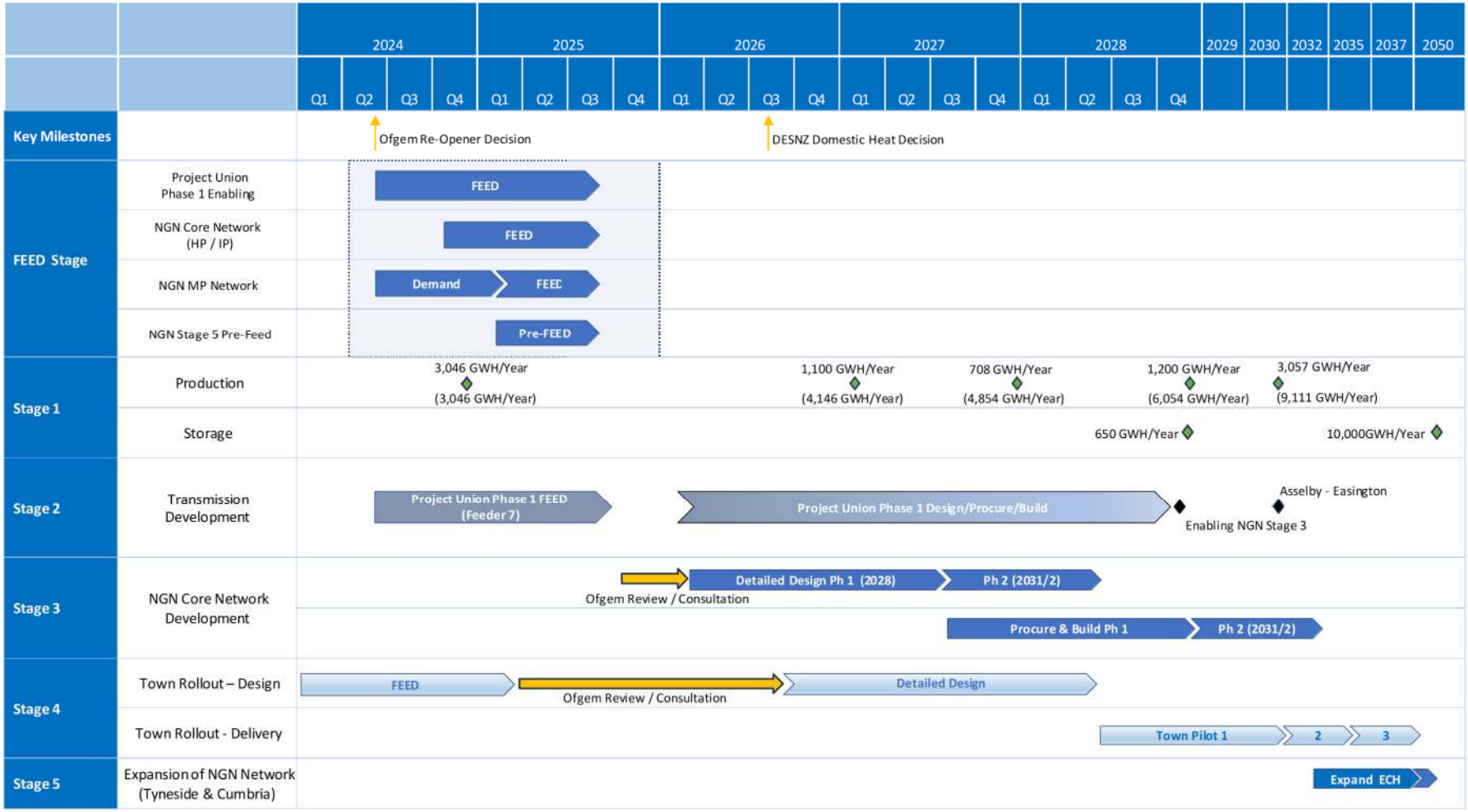


Figure 10.10 Overall ECH_2 Plan.

5.2 East Coast Hydrogen FEED Plan

NGN will submit a NZASP Re-Opener Licensee application at the end of Q1 2024

It is anticipated that the detailed assessment phase will take place from Q2 2024 and that Ofgem will make a reopener funding decision by Q3 2024.

NGN intend to immediately commence a series of FEED projects aimed at determining the costs, risks and timescale of the proposals contained within the Pre-FEED documents.

NGN intends to divide the FEED into five packages aimed at ensuring the expertise available is focused in the relevant area. The packages will be as per section four:

- Project Union Enabling Works
- NGN HP/IP Package – The Core NGN Hydrogen network
- NGN MP Package – Spurs to reach industrial clusters
- Consultation / Survey Package - Supporting all other packages
- Pre-FEED of Tyneside, Cumbria & other industrial customers – The wider role out

NGN will commence asset data gathering for the Project Union Enabling Works along with further defining the demand data for the NGN MP network. It is intended that the FEED study for Project Union Enabling will begin early 2025 and complete by July 2026.

The FEED for both the NGN core network (HP/IP) and the NGN MP network will commence by mid-2025 and will be completed by mid-2026, following the initial works of the Project Union Enabling Works.

The Pre-FEED for the wider NGN network will commence late 2025 once greater understanding of the core network and the MP network has been achieved.

The Project Management not mentioned as a package above and the Consultation Packages will span the proposed FEED plan period.

The following plan as below outlines the plan FEED programme.

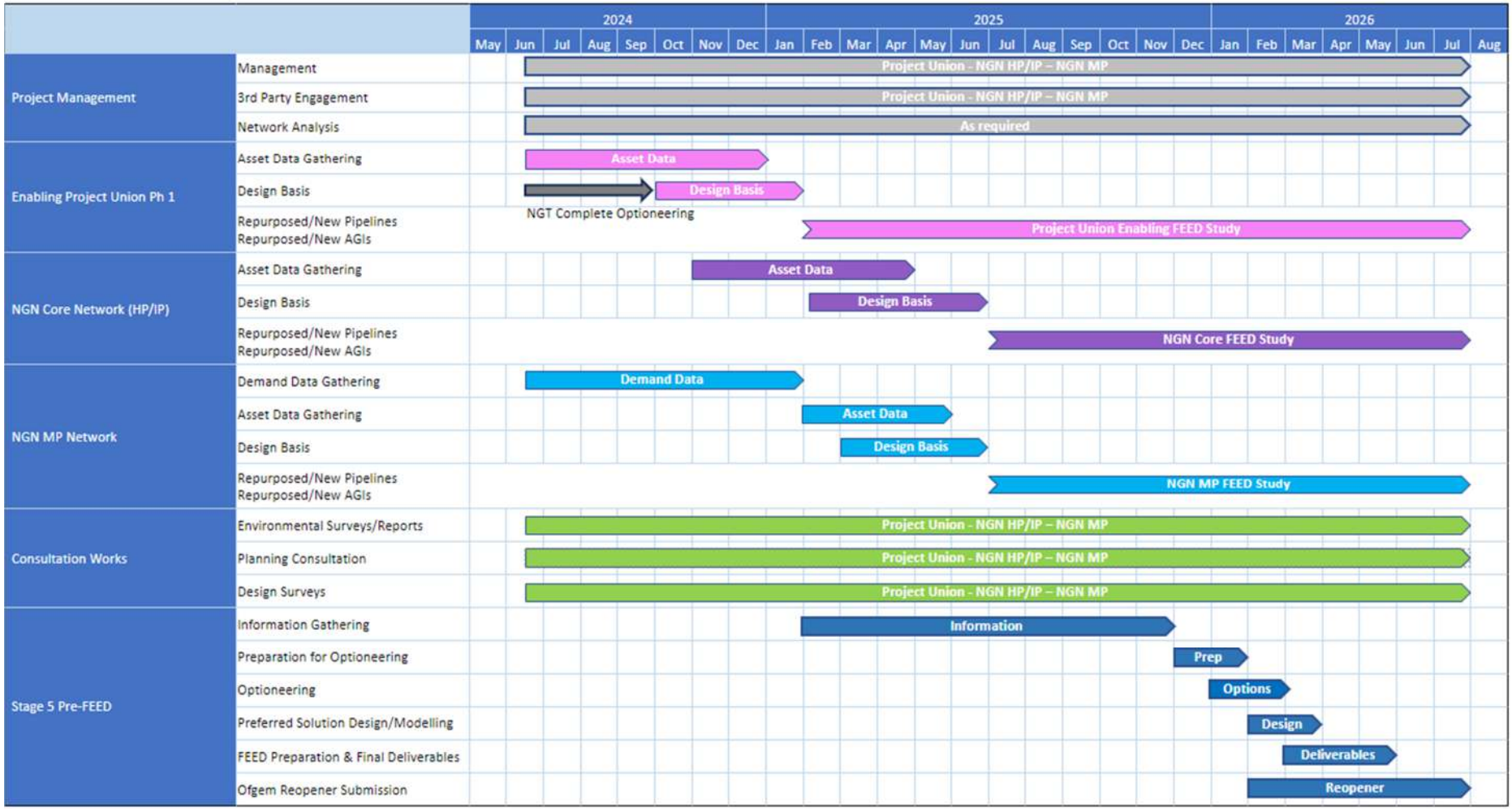


Figure 11.11 ECH2 FEED Plan.

6 Why should all gas consumers pay for the East Coast Hydrogen FEED Study?

6.1 ECH_2 addresses national net zero challenge

ECH_2 is a national infrastructure project that covers approximately two thirds of the UK gas industry network (i.e. NGN, Cadent and NGT), and seeks to address a legally binding commitment to achieve Net Zero carbon emissions by 2050. Cognisant of the UK's levelling up agenda, spreading the cost of ECH_2 FEED study across all gas consumers and over time enables fair treatment of decarbonisation, whilst benefiting all consumers at a national level, including those not directly involved in hydrogen fuel switching.

6.2 ECH_2 benefits all gas consumers

An interconnected and at scale hydrogen system, enabled by ECH_2 will ensure competition, minimise overall system costs and deliver value-for-money as well as improve the UK's resilience and security of supply of 'home grown' energy. Access to affordable, low carbon hydrogen allows I&C and power sectors to further invest and grow, protecting and enhancing local as well as national jobs. This could also catalyse export opportunities of UK produced low carbon hydrogen or low carbon industrial products to international markets.

Targeting FEED costs to a specific consumer group would create a 'post-code lottery' for consumers, potentially providing a negative market signal to UK I&C and power sector to delay their decarbonisation plans. Investing early and spreading costs across all bill payers will keep all options for Net Zero open, and avoid the UK embarking on high first-mover costs and decarbonisation technology lock in.

6.3 ECH_2 seeks to minimise volatile and unpredictable gas bills

Socialising FEED study costs across all consumers avoids complex, volatile, and unpredictable gas bills for a minority group of consumers. Funding for similar infrastructure project scoping studies such as HyNET FEED, Project Union Pre-FEED, have already been socialised across all gas payers.

6.4 ECH_2 seeks to enable an affordable and secure whole energy system

The ECH_2 project scope includes re-purposing the natural gas grid, focussing around Teesside, West Yorkshire, and Humber regions, which helps reduce future gas bills by extending the useful life of the gas network. This also helps reduce the potential risk of asset stranding and associated accelerated asset depreciation cost, resulting in in higher consumer bills.

Hydrogen provides a flexible, dispatch ready source of energy during Dunkelflaute when renewable electricity generation is low. Hydrogen infrastructure built by ECH_2 will play a vital role in facilitating a Net Zero power grid by 2035 and an overall affordable and secure UK energy system.

7 Regulatory Treatment of FEED Funding

There are several available approaches to Regulatory Treatment of Funding for ECH_2 FEED phase. The table below summarises the potential options and their relative strengths and weaknesses.

Funding Mechanism	Pros	Cons
Ex-Ante Allowance (Additional Totex)	Flexible allowance. Simple / low regulatory burden. Incentive to outperform cost forecasts and share benefit with customers through the Totex Incentive Mechanism (TIM). Network is liable for 50% of any overspend.	Limited protection for customers from uncertainty in forecasts. Not ringfenced / no mechanism to claw back if underspend beyond TIM.
Use It Or Lose It (UIOLI)	Accounts for Cost Uncertainties. Flexible Mechanism. Low Regulatory Burden. Customer gets all of underspend back.	Lack of incentive to outperform costs / drive efficiencies. Network liable for any overspend, may encourage conservative cost forecasts. Project in over threshold for singe project.
Price Control Deliverable	Unused allowances automatically returned to customers. Specific deliverables linked to funding.	Lack of incentive to outperform costs / drive efficiencies. Network liable for any overspend, may encourage conservative cost forecasts. Requirement to demonstrate deliverables increase regulatory burden, plus challenges in measurement.
Volume Driver	Not appropriate in this case, due to discrete large-scale project.	No unit cost / standardised variable volume.
Delay to next price control	No bill impact in GD2.	Against GD2 / Net Zero commitments/ ambitions. Risks delay, increasing Net Zero costs for industry / UK as per needs case.

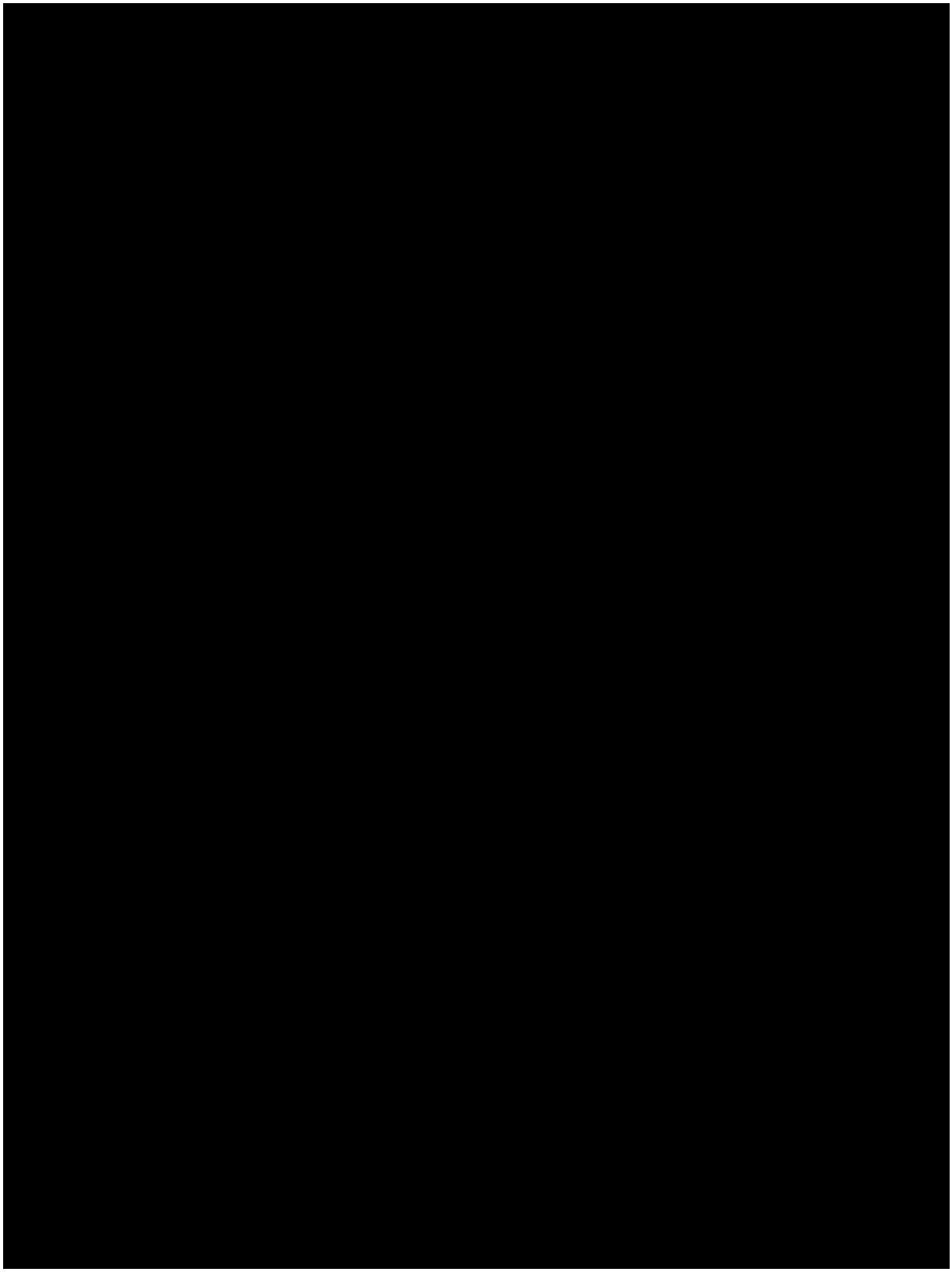
We support the selection of the simplest and least burdensome way to approach Regulatory Treatment of Funding for ECH_2 FEED Phase, which fairly shares the risks between networks and customers, and incentivises efficient delivery. We would welcome engagement with Ofgem, project partners and wider stakeholders to determine the most appropriate approach prior to submission of the re-opener itself, to ensure alignment and full consideration of pros and cons of alternatives on this matter.

In addition to the choice funding mechanism itself, there is the application of that mechanism to the partners to recover costs of the project. NGN support having the mechanism applied to NGT and for them to recover the costs through NTS charges on customer bills as outlined in a NGT presentation to Ofgem on 11th December 2023. This will socialise costs across Great Britain which ensures minimal impact on individual customer bills, as discussed in Chapter 7. This project will ultimately benefit the UK by enabling a more cost-effective transition to Net Zero and is therefore a fair approach.

Regardless of the regulatory treatment chosen, we think it is appropriate to have a close out report summarising delivery and that ECH_2 FEED has met the objectives of the project and criteria outlined in the efficiently. This will also aid in dissemination of learnings and knowledge to industry and stakeholders from the project and related projects. As part of ex-post reporting requirements, there could be a commitment to a stakeholder event to present the findings and outputs to interested parties.

Along with other partners, NGN is considering private contribution towards the FEED project and lower the cost passed onto consumers. Any contribution will be assessed and provided, consistent with the criteria outlined in section 2.10 the NZASP governance document.

8 How each of the pre-trigger evidence requirements have been met through engagement sessions.



As discussed in our engagement with Ofgem on the 11th of December the key points of agreement were:

- That the NZASP reopener is the correct funding mechanism for the ECH2 FEED study.
- That a standalone Engineering Justification Paper is not required but a signposting document that details where the required evidence is located is acceptable.
- That the needs case and cost benefit analysis will not include any domestic heat requirements.
- That a reopener submission from NGN by late February/Early March would be acceptable to Ofgem.
- That the required requirements of Pre-Trigger engagement had been completed.

9 Conclusion

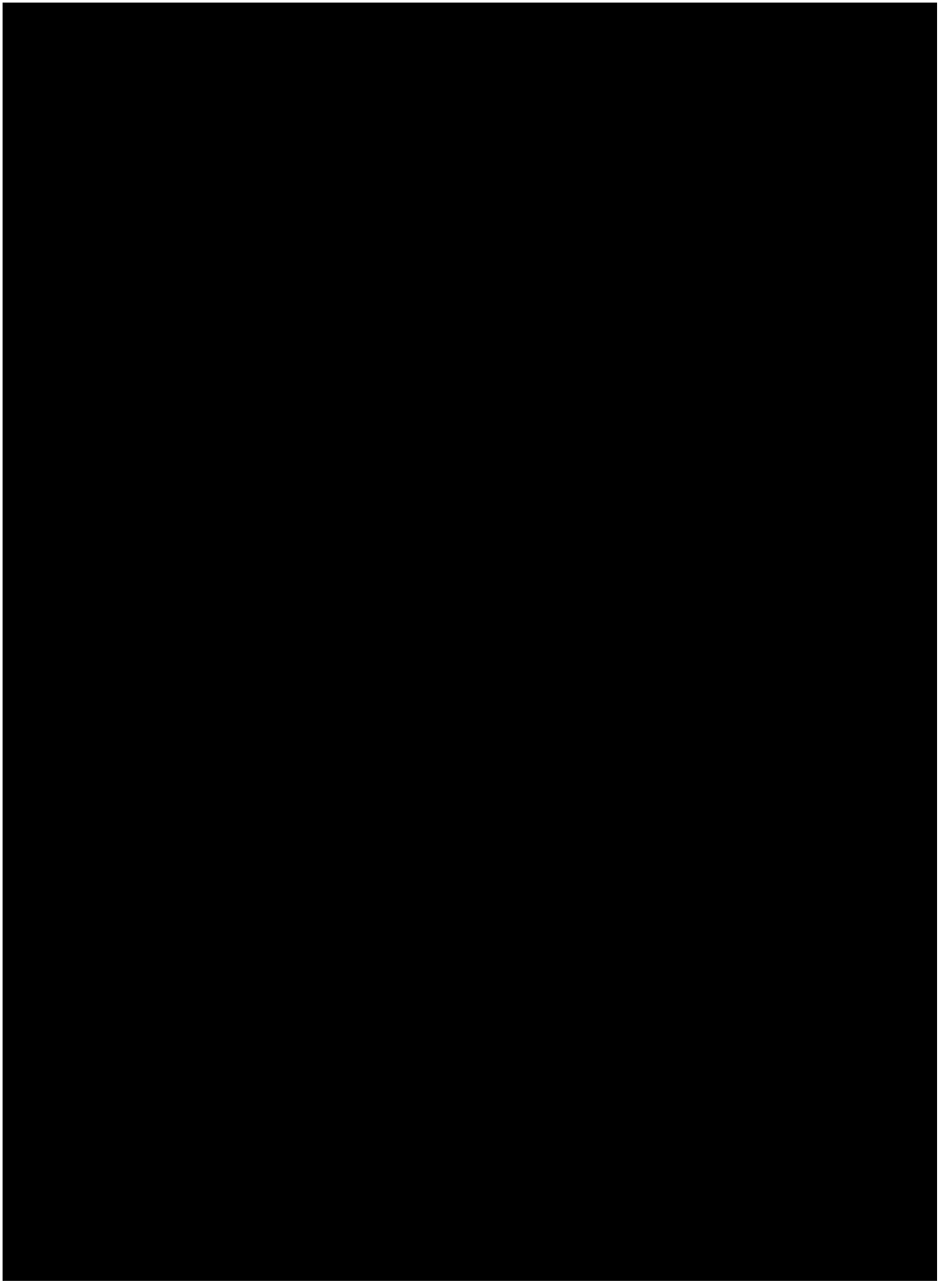
This document, along with engagement over the 12 last months, the required information for Ofgem to trigger a NZSPA reopener process for NGN proposal for a FEED study relating ECH_2.

The key elements of proposal are:

- NGN's network configuration allows a significant percentage of the network to be repurposed, providing a cost-effective solution while maintaining the supply of natural gas to all areas.
- NGN area is uniquely positioned for the development of the first large scale hydrogen network due to the combination of: -
    - Industrial clusters and the concentration of potential hydrogen demand.
    - The geology for large scale underground storage.
    - Access to renewable energy including the world's largest offshore wind farms.
    - Existing Transmission Feeders available for repurposing which link the major industrial clusters.
- The project will enable the first stage of NGT's Project Union.
- The project will enable investment in onshore hydrogen projects.

The Pre-FEED work has been carried out in support of the current government Hydrogen strategy and we believe the proposed reopener will allow the future hydrogen strategy and hydrogen network pathway proposals, as detailed in the recent announcements, to be achieved.

We look forward to receipt of reopener trigger notification from Ofgem and would welcome any detailed feedback on the information provided that would help ensure a successful reopener submission.



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