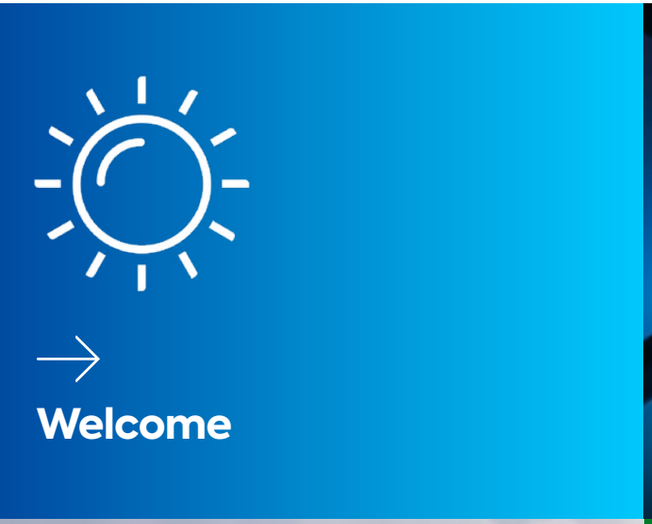
national gas transmission

Gas Ten Year Statement 2024



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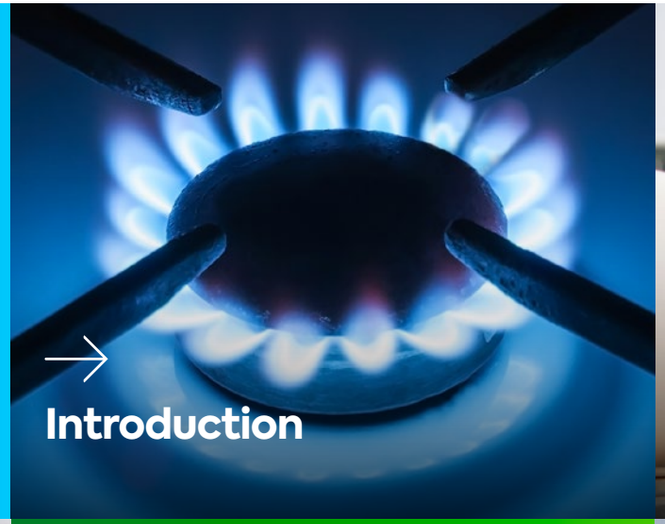

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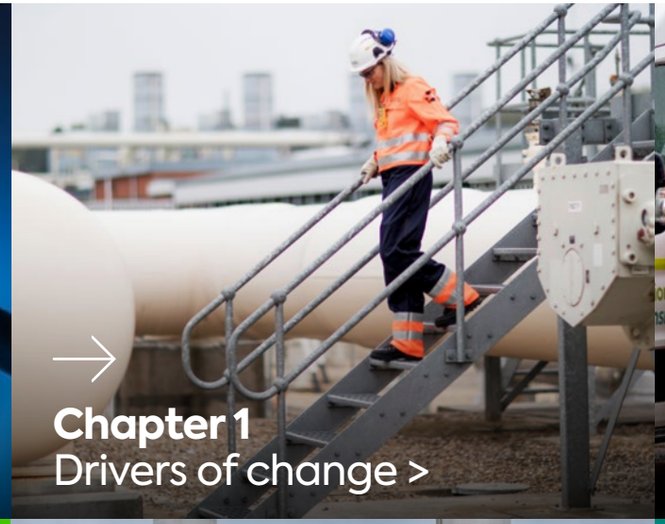

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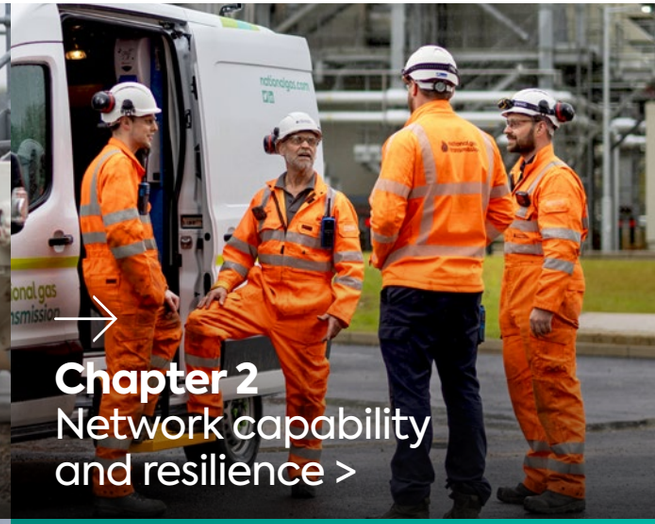

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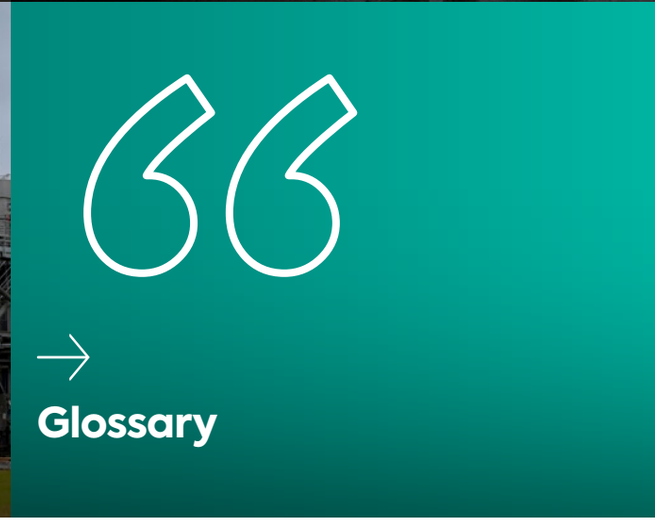


Glossary

Welcome

How to use this document

We have published the Gas Ten Year Statement 2024 as an interactive document.

Home

This will take you to the home page.

Enlarge/reduce

Hover over the magnifying icon to make charts bigger or smaller.

Arrows

Click on the arrows to move backwards or forwards a page.

'Linked' content

Words in green and underlined have links to other pages in this document, or are URLs.

Welcome to this year's Gas Ten Year Statement

The energy sector is constantly evolving. Whether it's changes in the economic landscape, developments in technology, or changing consumer behaviour; there's a constant need to remain mindful of our energy needs today, tomorrow and in the future.

Whilst there is still a significant focus on today's energy infrastructure and markets due to the impacts of the war in Ukraine, it's important to look to (and prepare for) the future.

The Gas Ten Year Statement (GTYS) is published annually. It aims to encourage and inform debate amongst our stakeholders and the wider industry, leading to changes that ensure a secure, sustainable and affordable energy future.

As the name suggests, this publication takes a look at the next ten years for Gas Transmission, explaining the investments and improvements we're making, and plan to make, to the National Transmission System (NTS). We do this to ensure we can continue to provide a safe, secure network that meets the needs of our customers.

In this publication, we also share the progress we're making towards the transition to net zero by 2050 and how any changes to legislation have impacted this.

You may notice that some content has been removed from this year's GTYS. Following the creation of the National Energy System Operator (NESO), some obligations have changed – both for National Gas and the newly created NESO. One of the new NESO obligations is publication of the Gas Network Capability Needs Report (GNCNR), which will supersede a number of the elements of GTYS we have removed. GNCNR was published by NESO on 6th December 2024, we are currently assessing this report and will be preparing our Strategic Planning Options Proposal (SPOP) in due course.

We recognise that DESNZ have commissioned NESO to provide advice on how to reach the clean power by 2030 (CP30) target and we look forward to working with NESO in this space. Given the NESO report on CP30 was recently released and the detailed work in this area is in the very early stages it is not explicitly considered in this document.

Introduction

Introduction

Our role

We are the owner and operator of the gas NTS in Great Britain – our licence is established under the Gas Act 1986.

Post the implementation of NESO, we are still required to develop, maintain, and operate economic and efficient networks as well as facilitate competition in the supply of gas in Great Britain. Our primary responsibility is to transport gas safely, efficiently and reliably across the NTS, managing the day-to-day operation of the network. This includes maintaining system pressures within safe operating limits, ensuring gas quality standards are met and acting as the residual balancer for supply and demand if there is a market imbalance.

As the system operator, we are responsible for progressing the long-term needs of the network and our customers. As transmission owner, we make sure our assets are fit for purpose and safe to operate.

Along with the DEZNZ and Ofgem, we continue to work closely with the National Energy System Operator (NESO) in establishing its roles and responsibilities following its establishment on 1 October 2024. The creation of the NESO is an important step forward in the development and coordination of a whole energy system view to drive towards net zero in a safe, affordable and energy secure way that benefits everyone. It is essential that the NESO has a clear focus on whole energy security for the end consumer and that the energy networks are maintained and developed appropriately to provide the resilience required in an affordable way.

This GTYS sets out the challenges on the gas network now and into the future, and provides our current view of the development that should be undertaken to provide the required level of resilience.

Our network

The NTS plays a vital role in the secure transportation of gas and the facilitation of a competitive gas market. It includes approximately 7,630 km of pipelines, presently operated at pressures of up to 94 bar.

Our network transports gas from entry terminals and storage facilities to exit points, where gas is transferred to four distribution networks (DNs) for onward transportation, or to directly connected customers such as storage sites, power stations and large industrial consumers.

The NTS also exports gas to Ireland and continental Europe via connecting pipelines referred to as interconnectors.

Our Network Development Process

One of our key aims for this publication is to make our investment decisions as transparent as possible by outlining the various stages of our Network Development Process (NDP).

The NDP defines and manages our project life-cycles from inception through to closure. The process defines our methodology for optioneering, developing, sanctioning, delivering and closing projects that address our drivers of change.

The aim of this process is to deliver the best value, fit for purpose solutions for identified challenges or opportunities. The process also ensures we consider how we meet the needs of regulatory/legislative requirements, our customers and our stakeholders, as well as our own.

The NDP is central to our planning activities and informs the work that we carry out on the NTS. We therefore structure this publication in line with this process, with chapters covering: drivers of change, network capability and resilience, options and development.

We also provide information on our transition to net zero and the work we are undertaking with methane emissions, hydrogen and carbon capture and storage.

Figure 1
Our Network Development Process.

1 Drivers of change

1.1 Introduction

This chapter describes the drivers of change that can trigger stage 1 of our NDP (figure 2).

Figure 2
Drivers of change that can trigger our NDP (Roll over the magnifying glass icon to find out more information).

Customers' immediate and future needs

Asset management

Legislative change

Net zero by 2050

Gas Network Capability Needs Report (GNCNR)

1.2 Customer needs (continued)

1.2.1 Future supply/demand pathways

We utilise Future Energy Scenarios (FES) and other industry information as the starting point for all our future network planning. This year's FES Framework has evolved from 'scenarios' to 'pathways' to explore narrower ranges and strategic, credible choices to propel us on the route to decarbonisation. This transition has also been reflected in a new publication name – Future Energy Scenarios: NESO Pathways to net zero.

The high-level FES Framework has been amended and now comprises four pathways:

– Counterfactual
– Electric Engagement
– Hydrogen Evolution
– Holistic Transition.

Figure 3
The 2023 FES scenario framework.

1.2 Customer needs (continued)

1.2.2 Annual gas demand

Figure 4 shows how annual gas demand changes by scenario out to 2050. The 2023 and 2024 FES data is included to show how the FES scenarios have evolved; scenarios are now termed pathways, with naming also changed to reflect an increased focus on the strategic choices to be made to achieve decarbonisation.

2022 saw overall demand increase significantly. This was driven by high exports to Europe, which were greater than the falls in domestic demand due to very high energy prices. There have been some small increases in domestic demand as prices have started to fall, but the declines in exports have been greater. This has gone some way to bringing the short-term trend back in line the pre-2022 trend.

The significant change in FES terminology to pathways reflects a narrower range of outcomes compared to the previous scenarios. However, the previous scenarios are still broadly comparable to the new pathways.

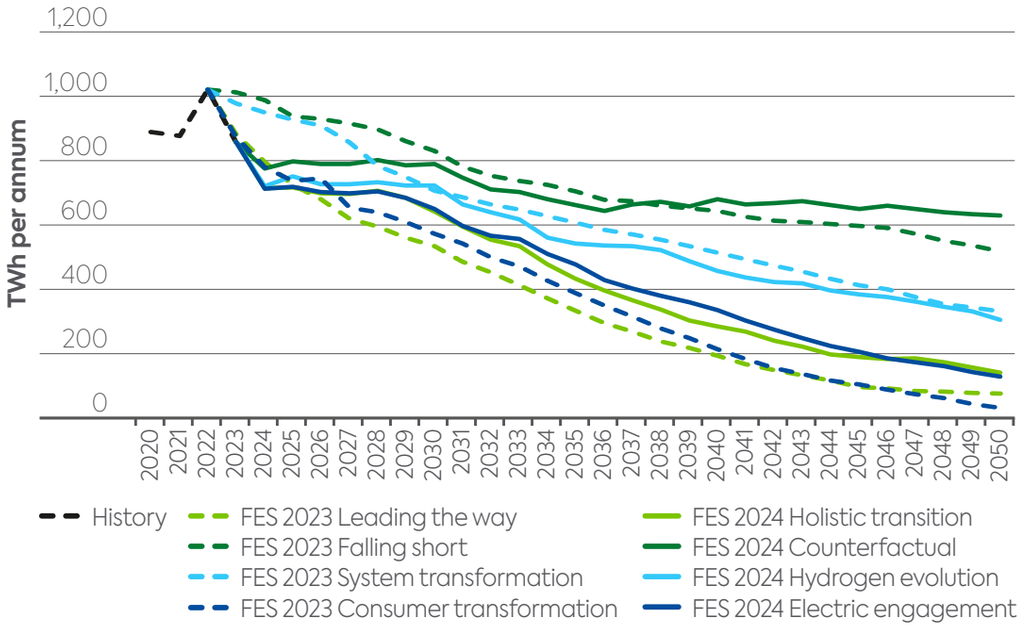
Hydrogen Evolution (previously System Transformation) requires the least societal change of the net zero pathways. Hydrogen is favoured for decarbonisation.

Electric Engagement (previously Consumer Transformation) sees high levels of societal change and a move to the electrification of heat.

Counterfactual (previously Falling Short) continues the current rate of change, has the slowest decarbonisation and is the only pathway that does not meet the 2050 net zero target.

Holistic Transition (previously Leading the Way) assumes the highest levels of societal change to achieve the quickest and largest reduction in natural gas demand up to 2045.

Figure 4
2023 FES and 2024 FES annual demand comparison.



1.2 Customer needs (continued)

1.2.3 Peak daily demand

Gas peak day (1-in-20) demand is illustrated in figure 5. As with the annual demand assessment, the 2023 and 2024 FES data is included to show that over the next 10 years there is little change in the predicted reductions for FS/Counterfactual and ST/Hydrogen Evolution, but for CT/Electric Engagement and LW/Holistic Transition there has been a shift between the two publications, with greater peak demand than forecast last year.

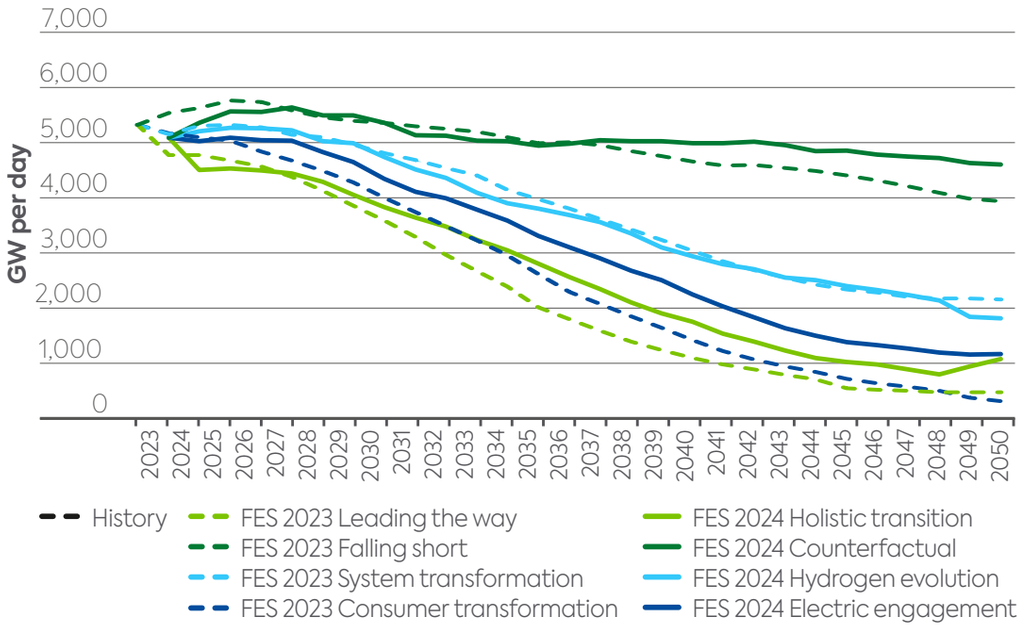
Trends in peak natural gas demand generally mirror annual natural gas demand in each pathway, as many of the factors which influence annual demand also influence peak demand, but the declines are not as rapid.

On cold winter days peak demand will continue to be high while large numbers of homes still rely on gas boilers. As the heat sector decarbonises in the net zero pathways, with greater use of technologies such as heat pumps and hydrogen boilers, the peak demand for natural gas is expected to reduce.

Gas is still required as an essential electricity generation source when intermittent power generation is producing less. It is also used for heating in gas boilers, hybrid heating systems (electric heat pumps with gas boilers for peak load) and hydrogen production, depending on the pathway.

We are currently working through the findings of a review of the Gas Demand Forecasting Methodology, with a change to the Uniform Network Code (UNC)* to be implemented. The changes being proposed will be included in the production of the 2025 FES.

Figure 5
2023 and 2024 FES peak day (1-in-20) gas demand.



*Amendments to UNC to align with Gas Demand Forecasting Methodology | Joint Office of Gas Transporters – Gas Governance

1.2 Customer needs (continued)

1.2.4 Gas supply

We have diverse sources of supply onto the NTS, provided by eight entry terminals (figure 6). These deliver natural gas from the UK Continental Shelf (UKCS), the Norwegian Continental Shelf (NCS) and Europe, and liquefied natural gas (LNG) from the world market.

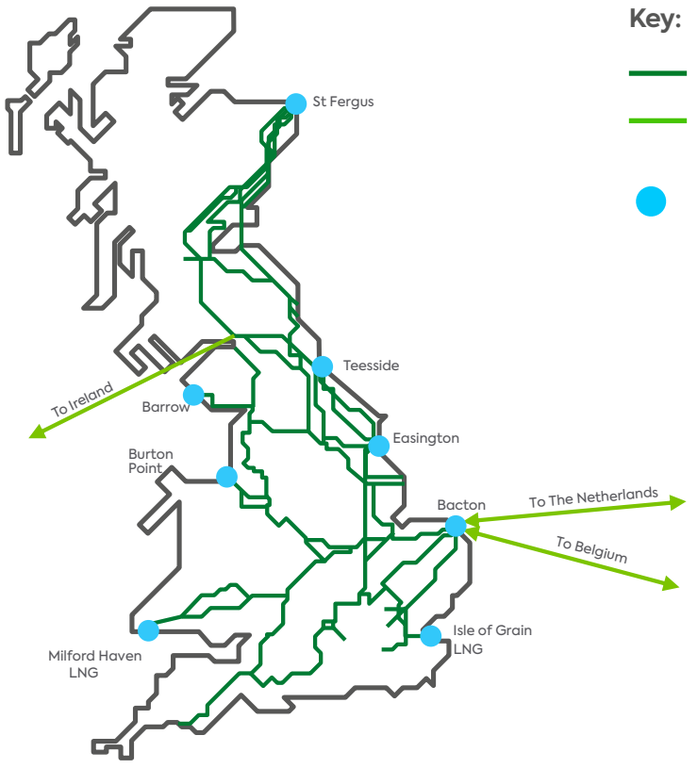
2022 saw a significant increase in gas demand, which was driven by high exports to the European continent. This resulted in an increase in UKCS nd LNG supplies, and a reduction in supplies from Norway and Europe. Whilst gas demand reduced in 2023, it remains higher than it was pre-2022. We therefore expect a continuation of increased LNG supplies to offset reduced imports from, and increased exports to, Europe.

GB is dependant on imported gas and this dependency is increasing over the next ten years. As imports increase the use of our network changes, with a greater proportion of supply entering the network in the south.

We are reviewing our asset capability and resilience to maintain exit pressures in Scotland as supplies at St Fergus continue to decline and demand to Ireland increases.

We are now seeing a greater reliance on the compression that supports the flexible supply import terminals in the south at Bacton, Isle of Grain and Milford Haven. With some of the compression supporting these terminals impacted by emissions legislation and the need for greater levels of asset health work, it is critical we retain the correct level of network capability and resilience going forward.

Figure 6
NTS gas supply terminals.



1.2 Customer needs (continued)

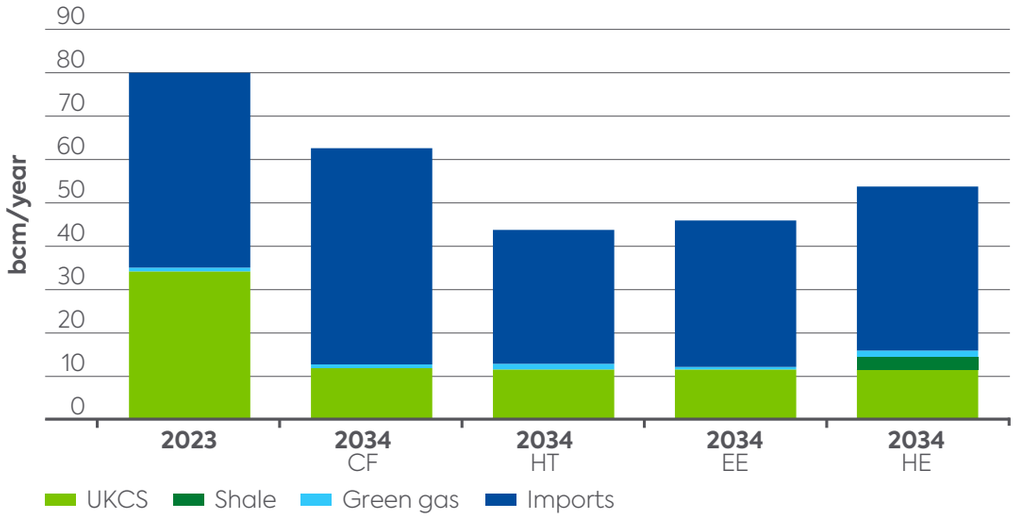
1.2.4 Gas supply (continued)

The domestic supply in all four FES pathways is very similar in 2034. UKCS is marginally higher in the Counterfactual and there is a 1 bcm difference between the lowest projection for green gas (Electric Engagement) and the highest Hydrogen Evolution).

In 2034, the levels of anticipated imports flex to meet demand. Import dependency ranges between 71% in the Holistic Transition pathway up to 80% in the Counterfactual pathway.

Secenarios (bcm/yr)	2023	2034 CF	2034 HT	2034 EE	2034 HE
UKCS	34	11.7	11.4	11.4	11.4
Shale	0	0	0	0	0
Green gas	1	0.8	1.3	0.5	1.5
Imports	45	50	31	34	38

Figure 7
2023 FES and 2024 FES supply comparison.



1.2 Customer needs (continued)

1.2.5 Peak supply

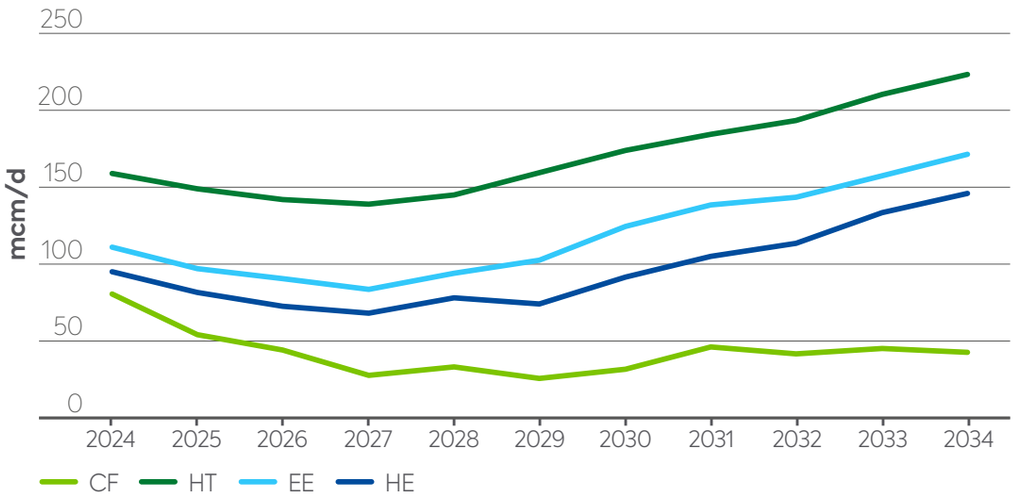
In each pathway, we assess whether the NTS has sufficient supply capability to meet peak demand*. To make sure that demand can be met, even if there is a failure in the network, we carry out an assessment assuming that the single largest piece of infrastructure we have is not available. This is known as the N-1 test and is used by the Government in assessing the security of gas supply.

In figure 8, we show the margin of supply over peak demand under N-1 conditions. The figure shows this margin remains positive over the next 10 years. For the net zero pathways, the margins decline slightly over the first few years but then increase at the end of the period.

In the Counterfactual pathway, the margin declines rapidly over the next few years because UKCS declines while peak demands remain stable. As demands fall from 2030, the margins begin to widen but remain tighter than today's levels. This highlights the importance of maintaining the resilience of the network to ensure all supply sources are able to fully contribute at times of peak demand.

This national assessment is supplemented by more detailed zonal network capability assessments that assess whether the NTS retains sufficient entry capability as supply profiles evolve over time. This is particularly relevant as UKCS continues to decline and our need to import LNG may therefore increase. These assessments are described in more detail in the network capability chapter of this publication.

Figure 8
Peak supply margin under N-1 conditions.



*The calculation in the GTYS has been completed in line with the methodology set out in Gas (Security of Supply) Regulation EU 2017/1938, incorporated into UK law by the Gas (Security of Supply and Networks Codes) (Amendment) (EU Exit) Regulations 2019. The quoted numbers differ from those seen in the Winter Outlook publication which take into account shorter-term intelligence on the level of demand and supply along with considerations of operational constraints which could impact the winter ahead.

1.2 Customer needs (continued)

1.2.6 Summary

From figures 4 and 5, it can be seen there is a broad range of potential pathways to net zero in 2050, with three of the pathways achieving the target. Therefore, in terms of supply and demand it is important that we plan for all eventualities and invest and maintain the gas network to deal with the expected range of demands, including the worst-case higher demand pathway such as Counterfactual.

Under our licence we are required to plan and develop the pipeline system to meet the peak aggregate daily demand, the peak 1-in-20 demand. In Ofgem's Business Plan Guidance (BPG) we were asked to consider two FES 2024 pathways, Holistic Transition (HT) and Counterfactual (CF). HT is the fastest likely pathway to net zero while CF provides for a probable pathway where net zero is not met.

CF provides the most challenging demand forecast. There is progress on decarbonisation compared to today, however it is slower than in the other pathways and fails to meet the UK net zero target by 2050. As a prudent operator, the system should be planned for the most challenging demand pathway to ensure we remain compliant with our licence.

As UKCS and NCS supplies decrease with uncertain import levels from Europe, there will be increased reliance on imported LNG supplies via Milford Haven and Isle of Grain. It is therefore important that we invest in our assets to ensure the resilience and flexibility of the network to deal with the changing flows across the network, and the need to be able to respond flexibly to deal with an increased range of flow requirements day to day.

1.3 Asset management

The age of the NTS means that levels of asset health maintenance need to increase, with many parts of the network being more than 50 years old. Carefully managing our asset health is an increasingly important driver of change and trigger for our NDP.

We have developed Asset Maintenance and Asset Health programmes to maintain the health of the NTS. Our Asset Maintenance programme focuses on delivering routine maintenance and monitoring the health of our assets. The Asset Health programme addresses assets that are either at end of life or have failed, and usually involves refurbishment or replacement once we have assessed that the asset is still required. These programmes ensure that we can consistently deliver a safe and reliable system to meet the needs of our customers and stakeholders.

Figure 9 describes the measures of risk that comprise our monetised risk-based asset management approach. This framework, now called Network Asset Risk Metrics (NARMs), is being used to consistently assess and prioritise all our asset health investment and ensure that we deliver the work that is most beneficial to our customers and stakeholders.

1.3.1 Developing our asset management approach

Our approach to asset management is based on the ISO 55001 Framework. This sustainable, risk-based approach to managing assets is crucial for ongoing realisation of value for money for customers and consumers.

During 2023/24, we have utilised our decision support tool software (Copperleaf) to develop our RIIO-GT3 plan. The investments within this plan have been thoroughly validated against our NARMs Methodology. Copperleaf has facilitated cost-benefit analysis across multiple investment options:

- **Portfolio delivery analysis:** After loading the plan into Copperleaf, we conducted delivery optimisation to ensure the proposed plan is feasible and can be efficiently executed. This process also identified opportunities to adjust resources and coordinate outages, minimising the impact on customers.
- **Risk optimisation:** We applied risk constraints aligned with the Service Risk Measures, shown in figure 9. This allowed us to determine the necessary scope of work required to meet customer-driven risk thresholds. Additionally, we conducted risk-stabilising optimisations, which directly informed the development of the RIIO-GT3 plan.

Figure 9
Measures of risk.

Category	Service risk measure
Safety	Health and safety of the general public and employees
	Compliance with health and safety legislation
Environment	Environmental incidents
	Compliance with environmental legislation and permits
	Volume of emissions
	Noise pollution
Availability and reliability	Impact of network constraints
	Compensation for failure to supply
Financial	Shrinkage
	Impact on operating costs
Societal and company	Property damage
	Transport disruption
	Reputation

1.4 Legislative change

This section summarises the key legislative changes that can trigger our NDP, as these changes will impact how we plan and operate the NTS over the next ten years.

1.4.1 Emissions legislation

The Industrial Emissions Directive (IED) is the mandatory minimum emission standard for large combustion plant (> 50 MWth) that all European countries must comply with by 2023, and applies to our larger gas-powered compressors.

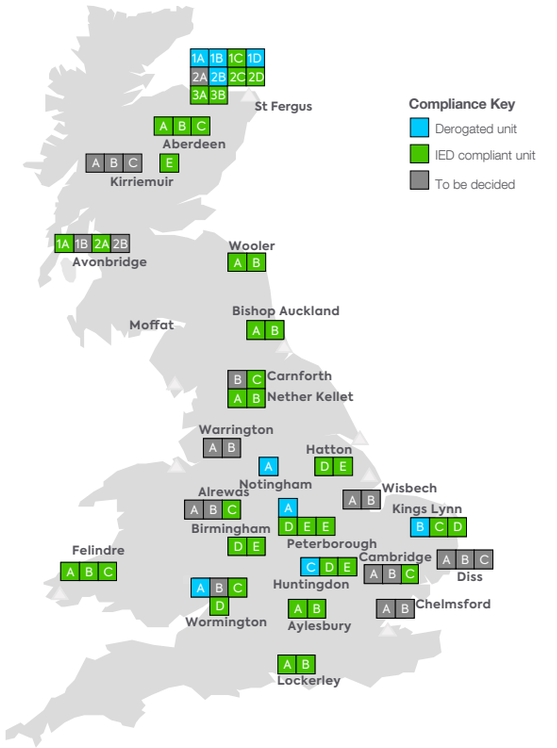
The Medium Combustion Plant Directive (MCPD) has a compliance date of 1 January 2030 and applies to the remainder of our gas-powered compressors (> 1 MWth and < 50 MWth).

All of our compressors are compliant with current legislation, but many of our compressors require intervention to ensure compliance with new legislation. These interventions include decommissioning, replacement with new compliant units, having emission abatement technology fitted, or being put on Emergency Use Derogation (i.e. having strict run hour limits).

Work is in progress at several sites to deliver projects under IED legislation, with more to be delivered in RIIO-GT3. Details on decisions and progress we have made at individual sites are available in the options and developments section of this publication.

Figure 10, shows the units where funding is yet to be agreed, or further analysis is required in grey (these proposals are included in our RIIO-GT3 submission). Units which have already been included in past RIIO submissions and are likely to be derogated at this point in time are shown in blue. Green denotes units that are compliant with future emissions legislation and do not require intervention.

Figure 10
Compressor fleet status as of 1 Jan 2030 (MCPD compliance date).



1.4 Legislative change (continued)

1.4.2 Cyber security

The 2022 review of the UK Network and Information Systems (NIS) Regulations (under the previous Government) saw reforms put forward which would update NIS, moving the UK regime closer to the EU's NIS2 Directive. The Government's introduction of a Cyber Security and Resilience Bill in the 2024 King's Speech means that it is set to incorporate some of the recommended changes to ensure the UK's security regulations keep pace with global threats, technology change and EU directives.

As part of our programme of security investments, we have continual close engagement with Ofgem, the DESNZ, the National Cyber Security Centre (NCSC), the National Protective Security Authority (NPSA) and other relevant agencies, where necessary and appropriate. As an operator of Critical National Infrastructure (CNI), we are investing in our security resilience in a proportional manner as part of our RIIO Business Plans and in accordance with the Cyber Assessment Framework (CAF) and other relevant security standards and frameworks.

The broader security environment remains challenging. Our network is subject to a multitude of security threats, which are ever-changing and increasing in sophistication and persistence. These threats include criminality, espionage, sabotage, activism, terrorism and insider action. A mixture of technologies of varying maturity levels are introducing new complexity at the very moment when energy transition is accelerating, and security of supply continues to come under pressure. Together these changes can create new vulnerabilities or magnify existing weaknesses, making them more exploitable.

We are investing to be in a strong position to protect National Gas, and detect and respond to security threats – both in the current security climate and in future years – given the energy sector's increasing significance as a central component of CNI and national security.

For example, the Physical Security Scope of Works (PSSW)* is a DESNZ led national programme to enhance physical security at critical sites. PSSW commenced in RIIO-1 and in RIIO-T2 our investments cover the latest phase of sites agreed with the Government. Additionally, given the lifespan of the hardware and technical assets, we have continued with a rolling Asset Replacement programme to ensure that all PSSW sites have state of the art security solutions commensurate with known vulnerabilities and the prevailing threat.

*Previously known as the Physical Security Upgrade programme (PSUP).

1.4.3 Gas quality

In January 2022, the Health and Safety Executive (HSE) published a consultation and impact assessment on proposals to change the Gas Safety (Management) Regulations 1996. Following a review, in April 2023, the Gas Safety (Management) (Amendment) Regulations 2023 entered into force. For full details see Appendix 2.

1.5 Net zero

Climate change is the defining challenge of this generation – the decisions we make now will influence the future of our planet. To meet our vision of being at the heart of a clean, fair, and affordable energy future, we are constantly monitoring and evolving our organisational capability. We have already made good progress on reducing our emissions – by 68% since 1990. This is well ahead of our original target of 45% by 2020. With the need for cleaner energy, new changes to legislation and the target of clean power by 2030, net zero is becoming a bigger focus for National Gas. We plan to lead the way in the decarbonisation of gas, investing in a range of solutions such as renewable natural gas, using blended hydrogen in our network and carbon offsetting. Continuing projects such as ProjectUnion and FutureGrid are key to achieving this target and we're exploring carbon capture through SCO_2T Connect and Carbon Roadmap work.

1.5.1 Hydrogen

Today, natural gas plays a key role in the energy landscape: delivering three times as much energy as electricity; keeping 85% of the UK's 28 million homes supplied with electricity and fuelling many industrial and manufacturing processes. Hydrogen has been identified as a potential low carbon replacement for natural gas. Converting our network to carry hydrogen would be a lower-cost, less disruptive option for customers and consumers than replacing our entire network.

The UK's Hydrogen Strategy estimates that 250-460 TWh of hydrogen could be needed in 2050 to meet net zero, which would make up 20-35% of final energy demand. The hydrogen policy landscape continues to evolve, some targets include:

- 2 GW of hydrogen production capacity by 2025 and 10 GW of hydrogen production capacity by 2030, with over 50% of this coming from electrolytic hydrogen.
- the first 100% hydrogen village by 2025 and the first hydrogen town by 2030.

10 GW
of hydrogen production capacity by 2030

100%
hydrogen village by 2025

1.5 Net zero (continued)

1.5.2 Building the evidence base for hydrogen

Over the RIIO-T2 period (2021-2026), we are building technical and safety evidence to enable the transition to hydrogen. This allows us to be ready to start the conversion to hydrogen by 2026, as committed to in our RIIO-T2 Business Plan.

We are doing this through several mechanisms, including our Innovation programme, FutureGrid and through industry-wide collaboration. All these activities will enable us to start the transition from natural gas to hydrogen, which is being delivered via ProjectUnion, our proposed hydrogen backbone and through blending activities. The FutureGrid project has built a hydrogen test facility from a representative range of decommissioned assets. Flows of hydrogen and natural gas blends (up to 100% hydrogen) have been tested at transmission pressures, to better understand how hydrogen interacts with the assets.

You can find more information on FutureGrid here.

1.5.3 Collaboration across the industry

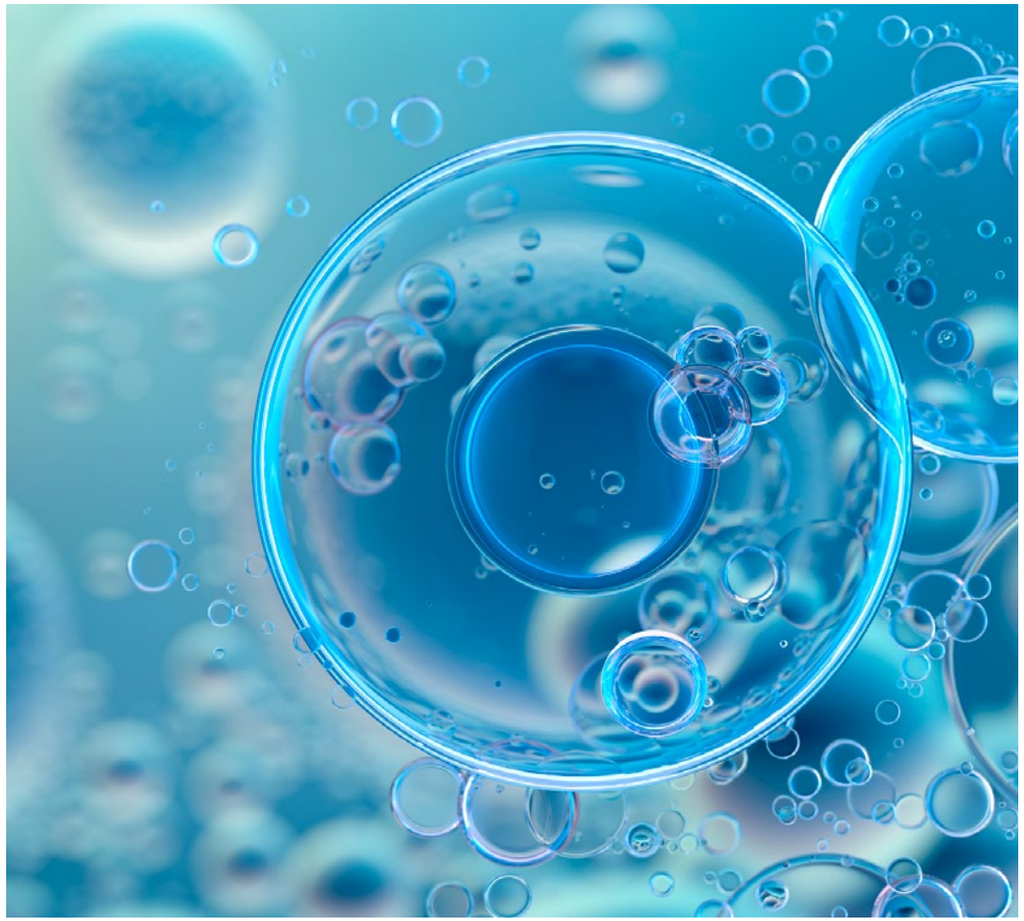
Gas Goes Green

The Energy Networks Association's (ENA) Gas Goes Green (GGG) programme launched successfully in April 2020, bringing together all five of Britain's gas networks to deliver the world's first zero-carbon gas grid. The Gas Goes Green Pathway to net zero sets out the actions required to achieve this. Since the launch of the programme, several joint reports have been published including:

- Britain's Hydrogen Network Plan
- Britain's Hydrogen Blending Delivery Plan.

European Hydrogen Backbone (EHB)

The EHB initiative consists of 31 gas infrastructure companies, across 28 countries, working collaboratively to develop a vision of how dedicated hydrogen infrastructure would develop. Additionally, we are collaborating with our European and global counterparts on the challenge of net zero through forums such as the Hydrogen Gas Asset Readiness Group (H2GAR). This group brings together European transmission operators to discuss and collaborate on demonstration projects or dissemination of research findings.



1.5 Net zero (continued)

1.5.4 Innovation

Over the past three years, we have increased our focus on hydrogen related projects to help reach our target of net zero by 2050. This has now accelerated due to the Labour Government's ambitious 2030 target. As part of this, we have undertaken several projects in FY2024 with £8.5m in funding from the Network Innovation Allowance (NIA).

In RIIO-1, we delivered several projects looking into the capability of the National Transmission System (NTS) to transport hydrogen, and we've continued building on this work, undertaking a wide range of projects that explore the opportunities surrounding hydrogen as an alternative to natural gas.

This includes looking at the possibility of transporting blends of natural gas and hydrogen, identifying the available technology options for 'deblending' hydrogen and exploring whether our existing compressor units can successfully operate with hydrogen. In addition to this, we've also looked at ways in which our asset data will need to improve and explored the digital technologies currently available to support us with this improvement.

Alongside our NIA projects we regularly submit applications for the Strategic Innovation Fund (SIF) and are delighted to be awarded funding for them. These projects focussed on gaining a better understanding of some of the challenges associated with the use of hydrogen, and included:

Realistic modelling of power to gas operability
– Enhancing our understanding and optimisation of power to gas operability

Carbon and hydrogen and transportation to SAF production facilities
– Looking at optimisation of transportation of carbon and hydrogen energy to aviation fuel production facilities.

HyNTS maritime
– Pioneering advancements to reduce emissions for a cleaner maritime industry.

B-Linepack+
– Developing innovative storage solutions for hydrogen.

Look NorthH2
– Aimed at exploring the potential of hydrogen with a specific focus on the North Sea.

1.6 Gas Network Capability Needs Report (GNCNR)

Following the introduction of the Energy Act 2023, the National Energy System Operator (NESO) has been formed and will be engaging in the area of network capability for the gas network as part of its strategic planning activities. NGT has been actively engaging and will continue to engage with NESO to ensure that the organisation is able to deliver on its accountabilities in relation to strategic planning, including the production of the GNCNR. We will no longer be producing and publishing the Annual Network Capability Assessment Report (ANCAR).

We understand from the Gas System Planner Licence sections 8.4–8.10 that the GNCNR will include:

- NESO's view of the physical capability and system needs for the NTS that both conforms to the Energy Act 2023 and can be applied to NGT optioneering requirements.
- A summary of engagement with interested parties, as well as views or information from engagement.
- A more detailed view on network capability linking back to the FES pathways and also looking at 5 year and 10 year timeframes.

In response to any identified need highlighted in the GNCNR, NGT will produce the Strategic Options Planning Proposal document (SPOP) which will include:

- Our view of any options in response to the system needs in GNCNR, including commercial or physical options that may involve construction, expansion, reinforcement, repurposing, replacement or decommissioning as well as cost, cost breakdown and deliverability of options.
- Explanation on how we've had regard for and responded to the most recent GNCNR.

As we will no longer be producing and publishing ANCAR, we have not included updated network capability flame charts for FES24 in this edition of GTYS. We may publish our view on network capability in future publications, including GTYS and SPOP.

Further details and information on GNCNR can be found within the Independent System Operator and Planner Gas System Planner Licence Conditions.

2 Network capability and resilience

2.1 Introduction

This chapter explores the second stage of our Network Development Process (figure 11). Here, we give details of how we analyse and assess the required capability of the NTS to address the drivers of change in each zone.

The Network Capability Process enables us to demonstrate the physical capability of the NTS and how that capability compares to the needs of our customers, now and into the future.

This assessment is carried out against a range of future supply and demand pathways using the Future Energy Scenarios (FES): pathways to Net Zero.

Figure 11
Our network capability & resilience process.

2.2 Network capability assessment & network resilience

Since 2021, we have published an Annual Network Capability Assessment Report (ANCAR) in June of each year. The document includes information at entry and exit zone level, for both the level of physical network capability and the level of network capability that can be delivered using commercial tools.

Our most recent ANCAR was published in June 2024.

Our Network Capability Process enables us to calculate and demonstrate the physical capability of the National Transmission System (NTS) and how that capability compares to the needs of our customers now and into the future. This assessment is carried out against a range of future supply and demand patterns. The output of this assessment helps inform and evaluate potential changes to physical assets through the Network Development Process to ensure continued safe and economic operation of the NTS in meeting our customers' needs.

ANCAR also assesses network resilience by highlighting individual asset availability and from this calculating the availability of full network capability (intact), as well as showing a capability level which would very likely be achieved at all times. Using this process, several areas have been highlighted where, although intact capability is sufficient, the likelihood of this capability being achieved with current or expected asset availability figures is relatively low. Where this occurs, options can be assessed via our Cost Benefit Process to highlight if investment would be beneficial.

Investment in improving network resilience is crucial to ensure we can maintain safe and efficient operation of the network, meet our customer requirements and associated obligations. We therefore included a heavier focus on network resilience in ANCAR 2024.

The specific projects currently being undertaken in each zone are summarised on the next page and further information about each individual project can be found in the options and developments section. However, as the RIIO-GT3 Business Planning Process is not yet complete, the proposed projects that are being considered as part of that submission will not be outlined in this publication, but will be explored in future GTYS publications.

2.3 Summary of changes by zone

Scotland and the North (zone 1)

The trend of supplies into the St Fergus entry terminal continues to reduce over the coming years, which could result in low pressures or exit constraints. We continue to review our compressor strategy in Scotland and the North.

North East (zone 3)

There are no significant changes driven by our network capability assessment, however there is a legislative compliance project at Hatton compressor station.

South Wales (zone 4)

Due to forecast LNG supply increases at Milford Haven, there continues to be a growing number of occurrences where supply may be above capability. This zone has the strongest indication that there may be a need for increased capability. We will continue to review our compressor strategy in the region. There is a legislative compliance project at Wormington compressor station.

South West (zone 5)

There are no significant network capability changes in this zone, however we are delivering legislative compliance projects at Peterborough and Huntingdon: compressor stations.

East Midlands (zone 6) and South East (zone 7)

There continues to be some uncertainty about the level of exit flows we may see going forward via the Bacton interconnectors. This will be a key area of focus for us and a number of projects are ongoing, including the: Bacton Asset Health Campaign. We are also continuing to assess the level of need at the King's Lynn site.

3 Options and development

3.1 Introduction

This chapter summarises the options and developments stages of our Network Development Process (NDP), where options are identified and the preferred option is progressed to address the drivers of change (figure 12). The chapter focuses on specific project details and their current development status.

Stage 3 of our NDP comprises the identification of options using a mix of rules (industry frameworks), tools (commercial arrangements and operational strategies) and assets (physical solutions to ensure we retain the required level of network capability). Each option can have a mixture of solutions, with elements of asset solutions alongside both rules and tools.

Stage 4 of our NDP is only reached if the optimal solution to a driver of change cannot be found within our existing network capability. The aim of this stage is to further develop the preferred options based on the direction of travel decided in stage 3. It may be necessary to progress multiple options at the same time to ensure the optimal final solution is progressed to completion.

Figure 12
Our Network Development Process.

3.2 Zone 1: Scotland and the North

Project: St Fergus terminal
Category: Legislative change

Background

St Fergus terminal is an entry point into the UK in the north of Scotland. The terminal was built in 1975 in a coastal environment which accelerates corrosion degradation. Across the site, investment continues to be made across a number of workstreams to address existing issues that may pose a potential safety risk, while in parallel retaining appropriate levels of compression availability and capability and meeting environmental targets.

Status

Our RIIO-T2 plan for St Fergus seeks to optimise investment aligned with manageing safety and reliability risks on ageing assets with the efficient delivery of our future compression strategy for the terminal. We submitted an Uncertainty Mechanism in 2023 seeking funding for three new units and trial of a retrofit emissions compliance solution with associated asset health investments, which was approved by Ofgem.

Next steps

Proceed to final cost submission in 2025.

Install three new units.

3.3 Zone 3: North East

Project: Hatton compressor station
Category: Legislative change

Background

Hatton compressor station provides network entry capability in the North East and supports network exit capability in the South East and South West. The station consists of one electric unit and three gas-powered units.

Units B and C have had an extension agreed to operate the units on a limited life derogation until 31 March 2026. This was granted as there is a concern that during the commissioning of the new Unit E faults and issues may be identified which could delay the operational acceptance of Unit E further.

Status

Funding was awarded through RIIO-T2 final determination for a single large gas-powered compressor and decommissioning two older non-compliant units.

Next steps

The investment will be completed during the RIIO-T2 period. The new compressor is now planned for operational acceptance in May 2025. Work is still currently ongoing – construction is nearing completion and commissioning is due to start.

More information about our Hatton Gas Compressor Upgrade programme can be found on our website.

3.4 Zone 4: South Wales

Project: Wormington compressor station
Category: Legislative change

Background

Wormington compressor station supports network entry and exit capability in South Wales. The station consists of one electric unit and two gas-powered units. The latter two units are within scope of the MCPD and therefore will need to be decommissioned or operate with restricted running hours by January 2030 in order to remain compliant.

Status

In August 2022, through the Wormington Uncertainty Mechanism, we submitted proposals to achieve MCPD compliance. In March 2023, Ofgem subsequently published confirmation of the final preferred option, comprising the installation of a new gas turbine compressor unit (approximate size 15MW) commissioned before 1 January 2030. The new unit will be installed within the existing boundary of Wormington compressor station. The existing Avon units will be retained under the 500-hour Emergency Use Derogation, with significant asset health investment to improve unit availability. There is potential for the electric unit to be re-wheeled and will be considered going forward. Ofgem have also confirmed that if an emissions reducing option that will permit unrestricted operation of all units at Wormington compressor station becomes available, then this should be progressed subject to agreement of additional funding by Ofgem.

Next steps

Detailed design of the preferred option and we will continue to assess the requirements at this site.

3.5 Zone 5: South West

Project: Peterborough and Huntingdon compressor stations
Category: Legislative change

Background

Peterborough and Huntingdon compressor stations support network exit capability in the South East and South West. They have been considered together due to their operational interdependence. Each station consists of three gas-powered units. These units are within scope of the IED and MCPD and will need to be decommissioned or operate with restricted running hours by December 2030 in order to remain compliant.

In January 2023, through the Peterborough and Huntingdon Uncertainty Mechanism, we submitted proposals to achieve MCPD compliance. In June 2023, Ofgem subsequently published confirmation of the final preferred option, comprising the installation of a new gas turbine compressor unit (approximate size 15MW) commissioned before 1 January 2030. The new unit will be installed on an existing plinth. Subsequently the legacy Avon compressor unit at Peterborough Compressor Station will be decommissioned, subject to a reassessment following operational acceptance of the new unit. In the case of Huntingdon Compressor Station, the Final Preferred Option is the counterfactual 'do nothing' option. Under this option, the existing Avon compressor unit will be retained under the 500-hour Emergency Use Derogation allowed for in the Directive, with significant asset health investment to improve unit availability.

Status

We have completed the majority of work at Huntingdon and Peterborough compressor sites, delivering two new IED compliant gas turbines. We have contract awarded the design contract for Peterborough new unit and have begun survey works at Huntingdon for Asset health work to be carried out.

Next steps

We will continue to close out any remaining defects, progress handover to operations and close out the IED project. We will continue to work towards the re-opener submissions to Ofgem in March 2025 for Peterborough MCPD and June 2025 for Huntingdon MCPD.

3.6 Zone 6: East Midlands

Project: King's Lynn compressor station
Category: Legislative change

Background
King's Lynn compressor station supports network entry and exit capability in the South East and East Midlands. The station consists of four gas-powered units. Two of these units are within scope of the MCPD and therefore will need to be decommissioned or operate with restricted running hours by January 2030 in order to remain compliant.

Status
In our RIIO-T2 Business Plan we proposed that two compliant gas-powered units should be installed at King's Lynn in order to maintain existing capability and resilience at this station. We submitted an Uncertainty Mechanism requesting a new unit. Ofgem published their decision not supporting a new unit.

Next steps
We will continue to assess the level of need at this site.

3.7 Zone 7: South East

Project: Bacton terminal
Category: Asset management

Background

The Bacton terminal is a key strategic gas terminal into the UK and will continue to operate until at least 2050 under our current FES pathways. The site commenced operation in 1968 in a coastal environment which accelerates degradation, and has operated continuously since, with no site-wide outages. Examination of the risks and consideration of the needs case work at Bacton has identified issues that should be prioritised in the short, medium and long term and, as part of the work completed during the Final Option Selection Report (FOSR) process, NGT has now selected a preferred option of base case asset health to 2035-50.

Status

The Bacton FOSR was submitted in February 2024 in line with the timeframe agreed with Ofgem and presented our preferred option of baseline Asset Health up to 2050, along with additional options to validate that this is the least cost to consumers. Our investment areas consist of a valve Replacement programme, LV and Cathodic Protection system replacements. Ofgem consulted on the FOSR and provided a Minded to Position to accept our option in August 2024. We have continued to develop the FOSR cost re-opener which will present costs for the preferred option in October 2024, with a view that work is already underway to start executing the works in 2025 on short term 'no regrets' items.

Next steps

- Finalisation of costs submission (3 x EJPs, overarching document and detailed cost book) and then issue to Ofgem on 31 October 2024.
- Ofgem review process and SQs – October-December 2024.
- Tender launch – March 2025.
- Contract award – May/June 2025.
- Ofgem decision awaited between December 2024 and March 2025.

3.8 National

Project: Physical Security Upgrade programme
Category: Legislative change

Background

Our network is subject to a multitude of security threats, which are ever-changing and increasing in sophistication and persistence. These threats include criminality, espionage, sabotage, activism, terrorism and insider action, as well as a rapidly growing threat to industrial control systems due to cyber attacks from a range of hostile forces, including state-backed groups. The Physical Security Scope of Works (PSSW) is a DESNZ led national programme that commenced in RIIO-1 to enhance physical security at critical sites.

In RIIO-T2, our investments cover the latest phase of sites agreed with the Government.

Status

In RIIO-T2 our investments cover the latest phase of sites agreed with Ofgem.

Next steps

Delivery of the RIIO-T2 plan, and preparation of the RIIO-GT3 programme of works. Given the lifespan of the hardware and technical assets, we have continued with a rolling Asset Replacement programme to ensure that all PSSW sites have state of the art security solutions commensurate with known vulnerabilities and the prevailing threat.

3.9 Cyber protection

Project: Cyber protection
Category: Legislative change

Background

The UK Network and Information Systems (NIS) Regulation came into force in May 2018 to co-ordinate and raise overall levels of cyber resilience across the UK and keep pace with the European Union (EU) and global security standards. As part of our programme of cyber-security investments, we have continual close engagement with Ofgem, DESNZ and the National Cyber Security Centre (NCSC) to ensure that NIS Regulations are funded and implemented in an appropriate and timely manner.

Status

As an operator of Critical National Infrastructure (CNI), we are increasing our cyber resilience appropriately as part of our RIIO-T2 Business Plan and in accordance with the UK Cyber Assessment Framework (CAF).

Next steps

We continue to deliver the plan that has been agreed with Ofgem and DESNZ.

3.10 Methane emissions

Project: Methane emissions
Category: Legislative change

Background

At COP26, the UK Government along with 121 other governments committed to the Global Methane Pledge with the aim of reducing global methane emissions by 30% from a 2020 baseline.

Rapidly reducing methane emissions will significantly help global efforts to reduce carbon emissions and keep on track efforts to limit global warming to 1.5° C and prevent the worst consequences of climate change.

Status

Our three Uncertainty Mechanism submissions have been developed collaboratively with Ofgem and contain investment proposals for reducing methane emissions from the NTS.

Ofgem's decision document can be found here.

We are now in the delivery phase of these investments which involves progressing procurement and detailed design, where applicable, for the assets delivering methane emission reduction.

We are also planning and delivering our Expanded Fugitive Gas Escape Detection and Quantification programme.

Next steps

We will be reporting on progress with our methane emission reduction investments annually within the Regulatory Reporting Pack (RRP).

3.11 National

Project: Redundant assets
Category: Asset management

Background

As the requirements on the NTS change, there are assets on the network that are no longer required by National Gas or our customers to operate the network – these are defined as redundant assets.

Assets that remain on the network for longer than required represent an ongoing maintenance commitment and operational cost, as well as having the potential to cause detrimental impacts to the environment.

Status

A range of scopes to decommission redundant assets and sites were identified and funding awarded through the RIIO-T2 final determination. In the first three years of RIIO-T2 we have completed 16 outputs against the Redundant Asset Price Control Deliverable. An additional 17 outputs are in progress with delivery planned in 2024/25.

Next steps

Progress the delivery of the 17 outputs noted above.

3.12 CCUS SCO_2T Connect

Project: SCO_2T Connect
Category: Carbon Capture, Utilisation and Storage (CCUS)

Background

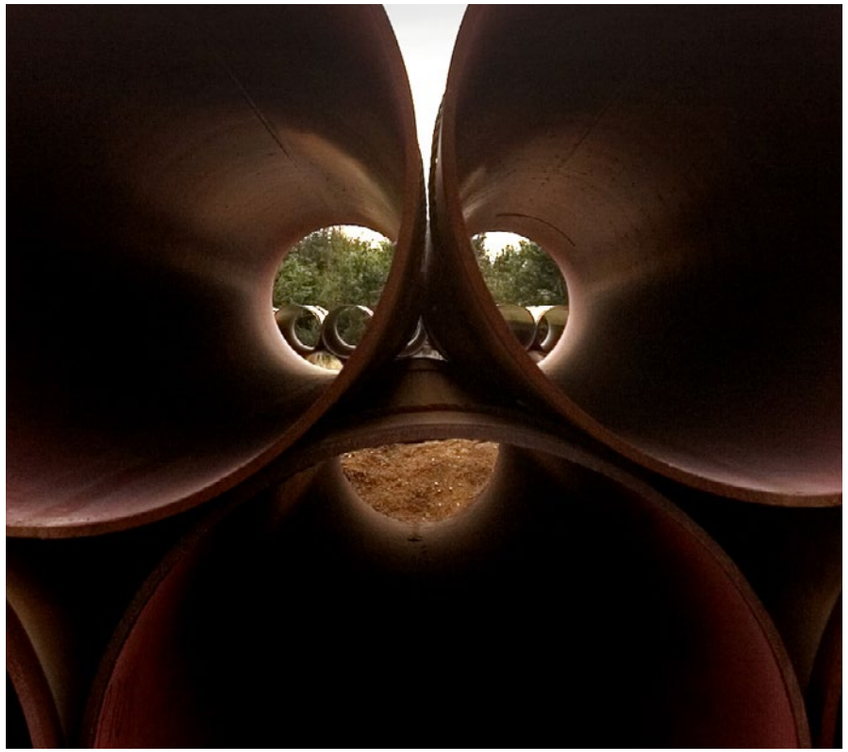
SCO_2T Connect aims to deliver ~340 km of repurposed and new build pipeline to connect hard-to-abate CO_2 emitters in Scotland's central belt with offshore storage at St Fergus. Connecting the CCUS value chain in Scotland enables the capture of up to approximately 3.5Mtpa, (8% of Scotland's emissions by 2035) and up to 16% of Scotland's emissions by 2045. The Scottish Cluster is one of the first four low-carbon industrial clusters in the UK Government's Cluster Sequencing Process, tasked with catalysing the CO_2 market in the UK.

Status

SCO_2T Connect has the capacity to proceed at pace to meet key milestones. Having completed Pre-FEED earlier in 2024, we are now preparing to execute FEED, and the broader set of activities to support it, in 2025. National Gas is working closely with Project Acorn and other members of the Scottish Cluster to advance the delivery of the Scottish Cluster.

Next steps

The next phase of work will focus on advancing the technical design alongside the associated land and consenting activities for a scheme of this size. In addition, we will work to ensure the necessary regulatory and commercial frameworks are in place to enable us to support the Government's vision for a well-functioning CO_2 and competitive market of the future.



3.13 Innovation at the heart of everything

In RIIO-T2, we are focused not only on regulatory innovation, but on reinforcing our innovation culture across the business, driving innovation and efficiency into every investment and activity. Whilst the transition of the energy system is an immediate focus, we must also ensure our transitioned network is optimised to deliver energy at the lowest cost with the highest levels of safety.

National Gas is in a unique position, as owner and operator of the National Transmission System (NTS), to take a leading role in whole system energy thinking. We are working closely with the UK electricity and gas networks, to enable future interactions that support our network connections to transition to net zero. As the only transmission network in the UK, it is important to share learning across global Transmission System Operators (TSOs), which we actively do through the GIE, GERG and H2GAR working groups.

3.13 Innovation at the heart of everything (continued)

3.12.1 HyNTS programme overview

National Gas developed and delivered the HyNTS programme to address the UK net zero targets and establish whether the NTS could transport blends of hydrogen and natural gas, as well as 100% hydrogen. The programme is made up of over 80 projects, gathering the evidence and data needed to identify suitable methods for repurposing our network to carry hydrogen.

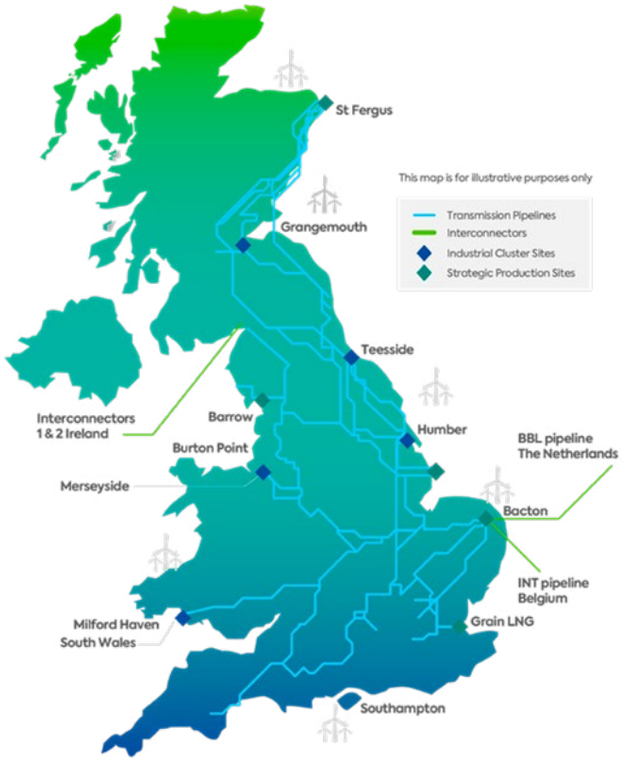
The projects and activities in this programme feed into other future infrastructure projects, such as ProjectUnion, to enable the decarbonisation of industry and power. They also feature in the Hydrogen Heating programme, which is supporting a UK Government policy decision on the future of heat, by supplying evidence of our network's capability to the Health and Safety Executive (HSE) and the DESNZ.

The NTS is the backbone of Britain's energy system today. It is vital that we prove that the network can maintain current levels of safety, resilience and security of supply, if it were converted to hydrogen.

Read more about our projects on the Smarter Networks Portal.

Figure 13
Nation transmission direct connections.

– **35** power generation
– **15** industrial
– **9** storage sites
– **4** distribution businesses
– **3** interconnectors
– **2** LNG terminals



c.5,000
miles of pipeline and >500 AGIs

3x
the energy transported by the electricity grid

3.13 Innovation at the heart of everything (continued)

3.12.2 HyNTS FutureGrid test facility

The completion of Phase 1 established FutureGrid as a trailblazer in the hydrogen sector. Creating a bespoke scale network sourced from decommissioned NTS assets, the facility validated the safe and efficient flow of pure hydrogen, setting a global precedent. The first phase focused on the safety case of hydrogen transportation and proved the viability of transporting hydrogen in blends and 100% hydrogen across the UK.

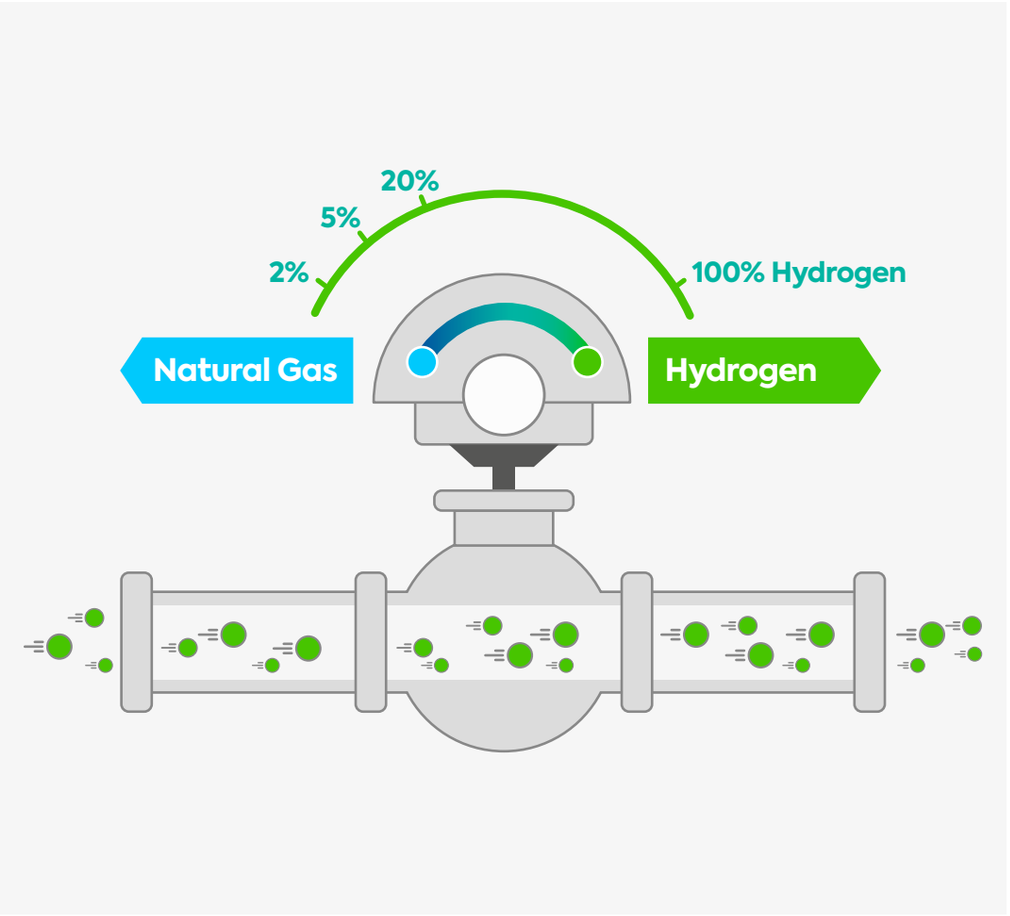
Testing was successfully completed on the FutureGrid Flow Loop in March 2024. All gas compositions were tested as per the test programme, as well as additional tests which had been identified as opportunities for additional data collection. Performance testing considered the operation of ball valves, flow control valves, regulators, and filters. The performance of different types of flow meter was also investigated, and a gas chromatograph for gas quality. Venting operations have also been carried out, and a vibration survey has been undertaken of the facility.

Testing undertaken on the FutureGrid test facility successfully demonstrated the capability of existing ex-service Natural Gas Transmission infrastructure to safely transport hydrogen. Most of the assets performed broadly as expected, and testing was successfully completed across all gas compositions.

This phase laid a robust foundation for advanced hydrogen technologies, reinforcing National Gas' commitment to leading the transition to a low-carbon future.

100%

hydrogen achieved – a world first!



3.13 Innovation at the heart of everything (continued)

3.12.3 HyNTS Compression

The compression project represents a critical step in understanding hydrogen transportation on a national scale. A 1 km loop, incorporating a decommissioned compressor from an existing site, is at the core of this initiative. This project aims to gather invaluable data on how hydrogen can be effectively compressed and transported across the country. Insights from this project will be instrumental for ProjectUnion, our visionary hydrogen backbone proposed for 2050, designed to ensure a reliable and extensive hydrogen distribution network throughout the UK.

Global testing hub

FutureGrid is now opening to the world, inviting researchers, companies, and governments to use the facility to test a range of hydrogen blends and various gas transportation equipment. This unique facility offers a platform to explore diverse hydrogen applications, fostering innovation and collaboration on a global scale. By providing access to its state-of-the-art infrastructure, FutureGrid aims to accelerate the development and adoption of hydrogen technologies worldwide.

Key objectives of the Compression project include:

Evaluating System Impact
Analysing the effects of hydrogen on existing gas infrastructure.

Transportation Efficiency
Identifying optimal methods for long-distance hydrogen transport.

Safety Protocols
Establishing safety standards for hydrogen compression and transit.

Key objectives of the Deblending project include:

Hydrogen Extraction
Developing efficient techniques for deblending hydrogen from gas blends.

Transport Integration
Demonstrating hydrogen's viability as a clean fuel for transportation.

Use Case Validation
Providing a tangible example of hydrogen's potential in daily operations.

3.12.4 HyNTS Deblending

The deblending project focuses on the separation and use of hydrogen post-transportation. This project will demonstrate the feasibility of extracting hydrogen from mixed gas streams, ensuring its purity and readiness for various applications. Notably, FutureGrid will feature a refuelling point for site vehicles, showcasing the practical use of hydrogen in transport and promoting its adoption in the sector.

Looking ahead

As FutureGrid advances into Phase 2, its role in shaping the future of energy becomes increasingly significant. The insights gained from the compression and deblending projects will not only inform the development of ProjectUnion but also drive the global agenda for sustainable hydrogen use. FutureGrid's ongoing commitment to innovation, safety, and collaboration ensures it remains at the forefront of the hydrogen revolution.

In conclusion, the FutureGrid hydrogen test facility stands as a beacon of progress in the energy sector. By transforming decommissioned NTS assets into a cutting-edge research hub, it has set a new standard for hydrogen technology. With Phase 2 underway, FutureGrid is poised to unlock new possibilities in hydrogen transportation and its use, paving the way for a cleaner, greener future.

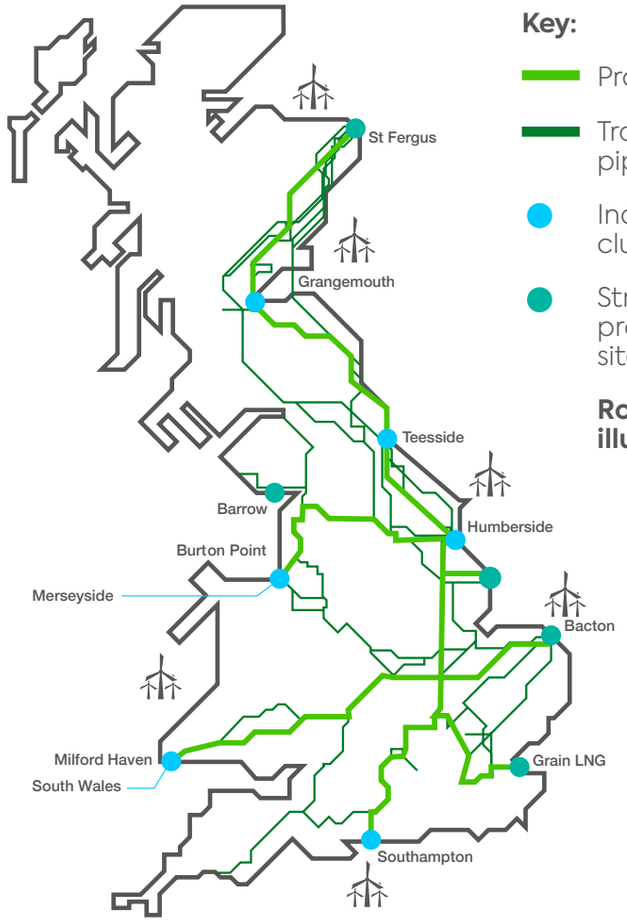
3.14 ProjectUnion

ProjectUnion is a pioneering project, led by National Gas Transmission (NGT), which will create a hydrogen transmission backbone for the UK, facilitating the transport of 100% hydrogen. By the mid-2030s, the backbone will connect strategic hydrogen production sites, industrial clusters, and hydrogen storage facilities, while serving major industrial customers and power generation sites directly, as well as through Gas Distribution Network (GDN) connections. Through a combination of repurposed existing assets, and new infrastructure a hydrogen backbone of up to 2,500 km will be created. A hydrogen backbone will be at the heart of a net zero future, acting as a key enabler for developing a hydrogen economy and realising key UK Government targets.

ProjectUnion will support a whole UK energy system approach to decarbonisation by providing critical resilience and flexibility to the electricity system during periods of low renewable electricity generation. In 2023, ProjectUnion was awarded funding to carry out the Feasibility Phase of the project.

The Feasibility Phase had three key outcomes:

- Phasing Strategy, including prioritisation and timing for delivery of each section of the hydrogen backbone while ensuring security of supply on the remaining methane network. It will also deliver a staged approach to project delivery and funding.
- Preliminary Front-End Engineering Design (Pre-FEED) activities for a full hydrogen backbone, delivering an appraised set of routing options, a constructability assessment and a Planning and Consenting Strategy based on enhanced cost estimates and asset data. A full engineering policy review will also be undertaken.
- Hydrogen market enabling activities, including a supply chain assessment and ongoing customer and stakeholder engagement.



3.14 ProjectUnion (continued)

The ProjectUnion Feasibility Phase closed in September 2024. As the project progresses to the next phase, the overall ProjectUnion programme will adopt a phased approach to delivery. This approach has been taken to ensure that the delivery of a hydrogen backbone accounts for network resilience, while taking into consideration key requirements such as future policy decisions and alignment with user need signals. A phased approach further provides optionality in the size and scale of a hydrogen transmission network that can be delivered over time, ensuring minimised risk for consumers and efficient delivery.

Building on the outcomes of the Feasibility Phase, we have developed a proposed scope and funding requirement to deliver the FEED.

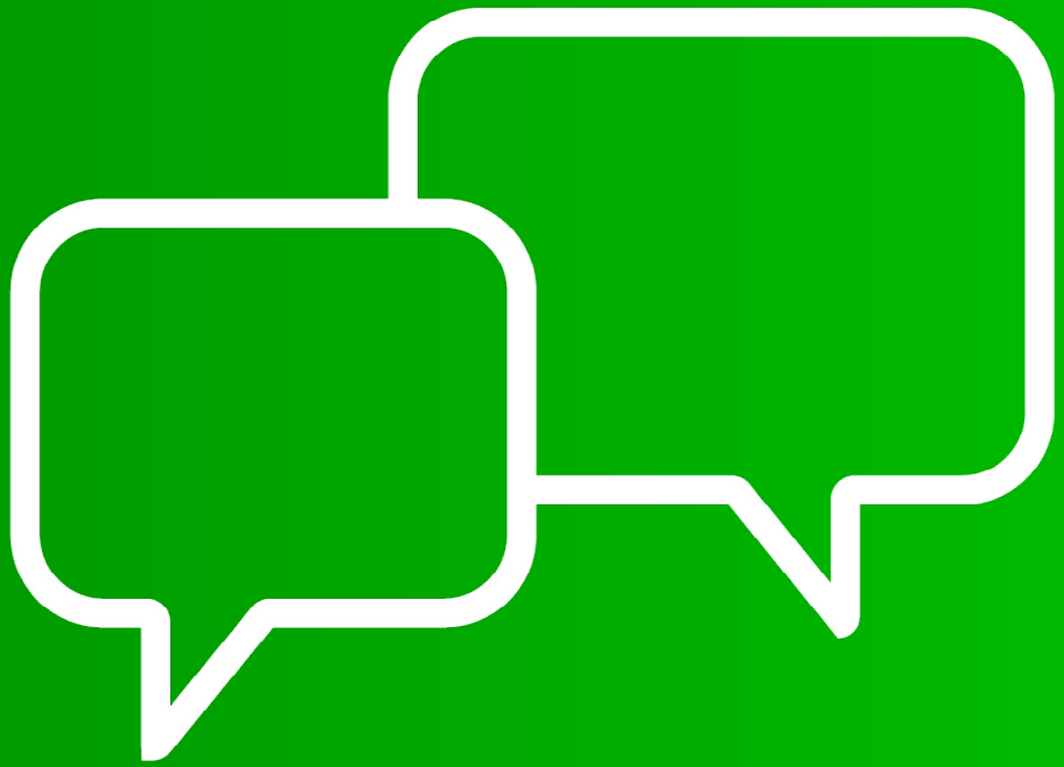
FEED – Will identify a preferred routing option from the options identified during pre-FEED, where a revised options list will undergo conceptual design, lands and consents activities will be continued, and procurement activities will be commenced.

We also look to commence **ProjectUnion: Essential Enabling Activities** – a programme of work critical to ensuring a fully operational and accessible hydrogen transmission network. These packages of work will support the delivery of FEED and ensure a fully operational network through demonstrating the potential to repurpose, defining operating procedures, adapting existing systems and assets for hydrogen, and developing and delivering a transition plan and governance structure to deliver FEED and further phases of ProjectUnion.

Note: FEED and ProjectUnion: Essential Enabling Activities are subject to funding approval from Ofgem via the NZASP reopener.

4 Contact us

Continuing the conversation



Continuing the conversation

Your feedback is really important to us.

Letting us know what you think of the information we share with you, and how we're sharing it, helps us shape our future communications to ensure we're communicating what matters most, in a way that suits you.

Email us with your views and feedback on our publications at:
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Appendices/ supporting information

Appendix 1 Useful links

Capacity explained & methodologies
https://www.nationalgas.com/our-businesses/system-operation/capacity

Capacity reports
https://data.nationalgas.com/reports/capacity

Connections process
https://www.nationalgas.com/our-businesses/connections

Constraint management
https://www.nationalgas.com/our-businesses/system-operation/capacity/constraint-management

Entry capacity
https://www.nationalgas.com/our-businesses/entry-capacity

Exit capacity
https://www.nationalgas.com/our-businesses/exit-capacity

Gas customer hub
https://customerhub.nationalgas.com/s/

Gas data portal
https://data.nationalgas.com

Gas quality
https://www.nationalgas.com/our-businesses/gas-quality

Network maps
https://www.nationalgas.com/our-businesses/network-route-maps

Appendix 2 Gas quality developments

GS(M)R review

The review of the Gas Safety (Management) Regulations 1996 (GS(M)R) was completed in March 2023. CD291 – Revision of the Gas Safety (Management) Regulations 1996 – Health and Safety Executive – Citizen Space (hse.gov.uk).

As a result of this review, the UK gas quality specification within the GS(M)R was amended as follows:

- Removal of the Incomplete Combustion Factor (ICF) and Soot Index parameters.
- Introduction of a 0.7 relative density limit.
- Increase to the permitted oxygen content on below 38 bar systems from 0.2 mol% to 1.0 mol%.
- Reduction to the lower limit for Wobbe Index from 47.2 MJ/m³ to 46.50 MJ/m³.

These changes were implemented with immediate effect in respect of NTS entry points; and the reduction to the Wobbe Index limit which enters into force on 6 April 2025. This lead-time was designed to allow additional time for impacted consumers to make any technical modifications to equipment that may be necessary to accommodate a wider Wobbe index range.

Following engagement with terminal operators, in March 2024, we raised UNC Modification 0870 to enable the new lower Wobbe Index limit to be implemented at five NTS entry points where the terminal operators had indicated a desire to do so. Approval of this modification is a pre-requisite to NGT agreeing the relevant contractual change within each of these operators' Network Entry Agreements. Based on discussions with these operators, we do not expect gas with a low Wobbe Index to flow consistently into the network at these locations, rather that the extension to the range will be used temporarily when steady state conditions are disrupted.

We are mindful of concerns held by some of our stakeholders who offtake gas from the NTS – particularly those parties that operate CCGT plant – that a wider Wobbe Index range increases their level of operational and commercial risk. Improving gas quality transparency has therefore been central to the Modification 0870 discussions. We are seeking agreement from the relevant terminal operators to share more data and we are aiming to implement publication of the gas quality measured at GDN offtakes from the NTS in spring 2025 as a first step.

One associated challenge is that the Bacton interconnectors are currently unable to accept gas with a Wobbe Index below the current lower limit of 47.2 MJ/m³ when exporting to the continent due to the specifications that apply on the networks of continental Transmission System Operators (TSOs). We are therefore working in parallel with BBL, Interconnector and the relevant EU TSOs to implement a solution that will facilitate reductions in Wobbe Index specification at the relevant interconnection points.

Appendix 2 Gas quality developments (continued)

Oxygen specification

The current GS(M)R specification for oxygen at 0.2 mol% is a barrier for biomethane injection into the NTS. We have therefore been working on an evidence case for GS(M)R exemption to be submitted to the HSE that would allow us to offer an elevated oxygen specification. Such gas could be detrimental to the operations of some stakeholders that offtake gas from the NTS, notably underground storage, therefore the process by which we may agree to a higher limit and associated stakeholder engagement is central to this work. Aligned to this, we are currently discussing with the industry via UNC Modification 0882 how to increase transparency where a new NTS entry point wishes to have a gas quality limit that, whilst GS(M)R compliant, would be outside the standard NTS specification.

Potential review of upper Wobbe Index limit

In February 2024, Ofgem announced that it was seeking industry views about a potential re-examination of the evidence base to raise the upper limit for Wobbe Index in the GS(M)R that had been rejected in the earlier review by HSE. A workshop was held in June 2024, which Ofgem is currently considering the output from to inform its view about if and how such a review should proceed.

Other developments

Two terminal operators sought to increase their contractual upper limit for Wobbe Index from 51.2 MJ/m³ to the GS(M)R upper limit of 51.41 MJ/m³. Shell raised Modification 0858 to enable the increase at its St Fergus terminal which was implemented in December 2023. In May 2024, Centrica raised Modification 0880 in respect of the York NTS entry point at Easington.

In June 2024, SAGE North Sea Limited raised UNC Modification 0885 to enable an increase to its permitted oxygen specification to 0.04 mol% (400ppm) and in September 2024 Shell UK Limited raised Modification 0898S to increase its carbon dioxide limit at its St Fergus terminal from 2.0 mol% to 4 mol%.

Appendix 3 Import infrastructure

Table A3.1
Existing import infrastructure

Facility	Operator/Developer	Type	Location	Capacity (bcm/year)	Source
Interconnector	Interconnector	Pipeline	Bacton	25.5	https://www.fluxys.com/en/about-us/interconnector-uk
BBL Pipeline	BBL Company	Pipeline	Bacton	8.0	https://www.bblcompany.com/about-bbl
Isle of Grain 1-3	National Grid	LNG	Kent	26.5	https://www.nationalgrid.com/national-grid-ventures/grain-lng/operational-information
South Hook 1-2	Qatar Energy, ExxonMobil and TotalEnergies	LNG	Milford Haven	21.0	https://www.southhooklng.com/about/commercial/
Dragon 1	Shell/Petronas	LNG	Milford Haven	8.4	https://www.dragonlng.co.uk/dragon-lng-flow-capacity
Langeled	Gassco	Pipeline	Easington	26.3	https://gassco.eu/en/about-us/where-we-are/pipelines-and-platforms/
Vesterled	Gassco	Pipeline	St Fergus	13.5	https://gassco.eu/en/about-us/where-we-are/pipelines-and-platforms/
Tampen**	Gassco	Pipeline	FLAGS/St Fergus	9.1	https://gassco.eu/en/about-us/where-we-are/pipelines-and-platforms/
Gjoa**	Gassco	Pipeline	FLAGS/St Fergus	6.4	https://gassco.eu/en/about-us/where-we-are/pipelines-and-platforms/
Total**				**141.2**	

**Both Tampen and Gjoa connect to FLAGS pipeline offshore, this limits total capacity of these pipelines and any UKCS gas to around 12.0 bcm/y.

https://www.shell.co.uk/business/oil-and-gas/segal-system

Appendix 4 Storage infrastructure

Table A3.2
Existing storage infrastructure

Site	Operator / Developer	Location	Space (mcm)	Approximate max delivery (mcm/d)	Website
Aldbrough	SSE/Statoil	East Yorkshire	295	29.9	https://www.ssethermal.com/energy-storage/aldbrough/
Hatfield Moor	Scottish Power	South Yorkshire	115	1.8	https://www.scottishpower.com/userfiles/file/Hatfield-Site-Information-2014.pdf
Hill Top Farm	EDF Energy	Cheshire	55	13.3	https://kistosplc.com/operations/hill-top-and-hole-house-uk/
Holehouse Farm*	EDF Trading	Cheshire	22	0.0	https://kistosplc.com/operations/hill-top-and-hole-house-uk/
Holford	Uniper	Cheshire	240	21.9	https://www.uniper.energy/united-kingdom/power-plants-in-the-united-kingdom/holford
Hornsea	SSE	East Yorkshire	310	6.4	https://www.ssethermal.com/energy-storage/atwick/
Humbly Grove	Humbly Grove Energy	Hampshire	282	7.2	https://www.humblyenergy.co.uk/
Rough	Centrica Storage	Southern North Sea	1505	10.9	https://www.centrica.com/our-businesses/upstream/centrica-energy-storage-limited-cesplus/
Stublach	Storengy	Cheshire	401	25.5	https://www.storengy.co.uk/storengy-uk-stublach-site
Total			**3225**	**116.9**	

Data Source: https://data.nationalgas.com/find-gas-data/view

Based on max values reported between 01/09/2024 and 19/11/2024.

*Not Operational.

Glossary

List of glossary terms

Glossary

1-in-20 obligation
This is the highest level of gas demand that we should expect to experience only once in every 20 years. We are obliged to plan and develop the network to meet the 1-in-20 level.

Asset
Any physical part of the network and includes such things as compressors, pipelines, flow valves and regulators.

Asset Management Plan (AMP)
An AMP provides a view of how we will manage, maintain and invest in our assets in line with legislation and our regulatory requirements.

Bacton
Bacton manages a large volume of the nation's gas, and is a critical component of the gas transmission network now and going into the future. Bacton is a key dynamic swing node for a large subset of our customer base at an interdependent part of the network. In addition, Bacton bridges GB with EU via two interconnectors (BBL and IUK), and controls flows into the South East to ensure security of supply for London and the west–east transit route for LNG into Europe.

BBL (interconnector)
A bi-directional gas pipeline connecting Bacton in the UK and Balgzand in the Netherlands .

bcm
Billions of cubic metres.

Capacity substitution
Whilst production of biomethane is growing rapidly worldwide, significant investment and innovation is still needed for it to become a major source of gas supply in the UK. The Chancellor's 2019 Spring Statement included new proposals to advance the decarbonisation of gas supplies by increasing the proportion of green gas in the grid, helping to reduce dependence on burning natural gas in homes and businesses. The consultation is expected to consider continued support for biomethane after funding for the Renewable Heat Incentive comes to an end in 2021.

Compressor
Compressors are used to move gas around the transmission network through high pressure pipelines. There are currently 71 compressors at 24 sites across the country. These compressors move the gas from entry points to exit points on the gas network. They are predominantly gas driven turbines that are in the process of being replaced with electric units.

Computerised Maintenance Management System (CMMS)
This is a digital support tool that helps inform decisions around the management and maintenance of our assets.

Constraint
A constraint is where the pressure or flow required to meet customer needs cannot be met by the physical capability of the network. On entry flame charts the potential of this is represented by a dot above the capability line.

Critical National Infrastructure (CNI)
The UK's Critical Infrastructure is defined by the UK Government as: "Those critical elements of Infrastructure (facilities, systems, sites, property, information, people, networks and processes), the loss or compromise of which would result in major detrimental impact on the availability, delivery or integrity of essential services, leading to severe economic or social consequences or to loss of life."

Cyber Assessment Framework (CAF)
The Cyber Assessment Framework (CAF) provides guidance for organisations responsible for vitally important services and activities. The CAF provides a systematic and comprehensive approach to assessing the extent to which cyber risks to essential functions are being managed by the organisation responsible. It is intended to be used either by the responsible organisation itself (self-assessment) or by an independent external entity, possibly a regulator or a suitably qualified organisation acting on behalf of a regulator.

Electricity (power) generation
Electricity generated by the burning of gas.

Electrolysis
Electrolysis is the process of using electricity to split water into hydrogen and oxygen. This reaction takes place in a unit called an electrolyzer.

Glossary

Emission legislation
Emissions legislation relates to The Industrial Emissions Directive (IED), which is the mandatory minimum emission standard that all European countries must comply with by 2023. The IED aims to prevent and reduce harmful industrial emissions, while promoting the use of techniques that reduce pollutant emissions and that are energy and resource efficient. The EU Withdrawal Act 2018 maintains established environmental principles and ensures that existing EU environmental law will continue to have effect in UK law, including the IED.

Entry terminals
These terminals allow gas supply to enter the NTS.

Exit points
Exit points are where gas exits the NTS e.g. to industrial users or to local infrastructure to provide gas to domestic homes.

Export
Gas demand on the NTS from interconnectors to Continental Europe or the island of Ireland.

Flame chart
These charts are a visualisation of the range of potential flows into and out of the zones across the network and the physical capability we assess to be available.

Green gas
Green gases are renewable and low carbon gases that can be used in place of fossil fuels, reducing carbon emissions in the heat, power, and transport sectors. They include biomethane, bio-propane, and hydrogen.

GWh
Gigawatt hours.

Heatmaps
As per flame charts with the addition of a 3rd dimension which is concentration of flows.

High resilience
Reflects levels of compressor capability which can be met 99% of the time.

Hybrid heating systems
The term refers to a system that uses a heat pump alongside another heat source. Typically, it describes fitting a heat pump alongside a fossil fuel (gas, oil or LPG) boiler.

Hydrogen
Hydrogen is a clean alternative to methane, also known as natural gas. It's the most abundant chemical element, estimated to contribute 75% of the mass of the universe. Here on earth, while it's present in nearly all molecules in living things, it's very scarce as a gas – less than one part per million by volume. Hydrogen can be produced from a variety of resources, such as natural gas, nuclear power, biogas and renewable power like solar and wind.

HyNTS Compression
HyNTS Compression investigates and demonstrates the opportunity of repurposing compressor systems for the compression of hydrogen and hydrogen blends in the National Transmission System (NTS).

HyNTS Deblending for Transport Applications
HyNTS Deblending for Transport Applications focuses on the delivery of high purity hydrogen from blended gas networks to enable delivery to transport applications, enabling hydrogen infrastructure to be provided more quickly and with greater resilience.

HyNTS Pipeline Dataset
HyNTS Pipeline Dataset looks to develop tools and processes to accelerate the pipeline assessment required for hydrogen readiness of NTS and Local Transmission System (LTS) pipelines.

HyNTS Protection
HyNTS Protection looks at protecting network assets from hydrogen permeation and maintaining asset lifetime using hydrogen barrier coatings, therefore reducing the cost of maintenance and replacement of network assets through the transition.

Industrial Emissions Directive (IED)
The main EU instrument regulating pollutant emissions from industrial installations. The IED was adopted on 24 November 2010. The IED aims to achieve a high level of protection of human health and the environment taken as a whole by reducing harmful industrial emissions across the EU, in particular through better application of Best Available Techniques (BAT).

Glossary

Interconnector
Two pipelines connecting GB and the EU. The Interconnector (UK) Limited is a bi-directional gas pipeline connecting Bacton in the UK and Zeebrugge in Belgium. BBL is a bi-directional gas pipeline connecting Bacton in the UK and Balgzand in the Netherlands.

Interconnector Limited
The Interconnector (UK) Limited is a bi-directional gas pipeline connecting Bacton in the UK and Zeebrugge in Belgium.

ISO 14224 standard
ISO 14224 provides a comprehensive basis for the collection of reliability and maintenance (RM) data in a standard format for equipment in all facilities and operations within the petroleum, natural gas and petrochemical industries during the operational life cycle of equipment.

ISO 55001 Framework
ISO 55001 is an asset management system standard, the main objective of which is to help organisations manage the lifecycle of assets more effectively. By implementing ISO 55001 organisations will have better control over daily activities, achieve higher return with their assets, and reduce the total cost of risk.

LNG
Liquid natural gas that has been converted to liquid form for ease of storage or transport. It is formed by chilling gas to -161°C so that it occupies 600 times less space than in its gaseous form.

Margin
The difference between gas supply and demand. A positive margin indicates supply is greater than demand. A negative margin when demand is greater than supply.

Mcm
Million cubic metres.

Medium Combustion Plant Directive (MCPD)
The requirements for the MCPD are detailed in Pollution Prevention and Control (Scotland) (Amendment) Regulations 2017 that came into force 19 December 2017 and for England and Wales in the Environmental Permitting (England and Wales) (Amendment) Regulations 2018 that came into force 29 January 2018.

Methane
Methane (CH_4) is a hydrocarbon that is a primary component of natural gas. Methane is also a greenhouse gas (GHG), so its presence in the atmosphere affects the earth's temperature and climate system. Methane is a short-lived climate pollutant with an atmospheric lifetime of around 12 years. While its lifetime in the atmosphere is much shorter than carbon dioxide (CO_2), it is much more efficient at trapping radiation. Per unit of mass, the impact of methane on climate change over 20 years is 86 times greater than CO_2; over a 100-year period, it is 28 times greater.

Moffat interconnector
The interconnector pipeline that connects the British system at Moffat, in Scotland to the Republic of Ireland, Northern Ireland and the Isle of Man. Physical gas flows are currently only possible in the direction of exit from GB.

Storage
Gas storage facilities designed to switch rapidly between injection and withdrawal to maximise the value from changes in gas price.

N-1 test/conditions
The N-1 assessment means that we, as the Gas System Operator, have to ensure that:

- the NTS is designed and built to meet a 1-in-20 peak day demand as required under the Gas Transporters Licence. This is defined as the amount of infrastructure (pipes and compressors etc.) needed to transport the gas that would be required by our customers in the coldest day of winter, in the coldest winter we could expect in a 20 year period
- the high pressure gas network has sufficient redundancy to meet a 1-in-20 peak day demand, even with the failure of the single biggest piece of infrastructure.

National Cyber Security Centre (NCSC)
The National Cyber Security Centre (NCSC) is a government department that provides cyber security guidance and support helping to make the UK the safest place to live and work online.

National Transmission System (NTS)
A high pressure gas transportation system consisting of compressor stations, pipelines, multijunction sites and offtakes. Pipelines transport gas from terminals to offtakes. The system is designed to operate at pressures up to 94 barg.

Glossary

Network Asset Risk Metrics (NARMs)
Used by Ofgem, the Network Asset Risk Metric (NARM) has been developed to quantify the benefit to consumers of a company's asset management activities. In RIIO-T2, this will be used as the output to hold the companies accountable for their investment decisions.

Network capability
This refers to the physical capability of the NTS, i.e. how much gas can be transported throughout the system on a given day.

Network capability zone
The National Transmission System (NTS) is a complex system of physical assets such as pipes, compressors, valves, supply points and offtakes. In order to simplify this, the analysis of the NTS has been partitioned into zones that correspond to the way in which gas flows through it.

NTS shrinkage
NTS shrinkage is made up of 3 components. Unaccounted for gas (UAG) is unallocated gas or gas that is lost or stolen from the system. Own use gas (OUG), gas that is used in the running of the system e.g. compressor fuel. And calorific value shrinkage (CVS) where gas of a particularly low or high CV enters the distribution network which differs with the flow weighted average CV of gas entering that network.

Ofgem
Office of Gas and Electricity Markets – Great Britain's energy regulator.

Peak day capability
This refers to the maximum level of supply capability of the NTS.

Peak demand
This is a 1-in-20 demand which means that statistically, in a long series of winters, it would be exceeded in one out of 20 winters. The 1-in-20 peak day is calculated from a statistical distribution of simulated historical peaks days. It is not the highest demand in the last 20 years, nor is it the demand that would be expected in the cold weather experienced in the last 20 years.

Peak supply
This refers to the maximum supply that can be achieved on any given day.

Peaking plants
Peaking power plants, also known as peaker plants, and occasionally just "peakers", are power plants that generally run only when there is a high demand, known as peak demand, for electricity.

Physical capability
The maximum amount of gas that the network can physically flow at specific locations without going outside any of its pressure obligations, or equipment's safe operational tolerances.

Planning and Advanced Reservation of Capacity Agreement (PARCA)
Developer and/or NTS Users (Shippers or Distribution Network Operators 'DNOs') can reserve firm NTS capacity through the Planning and Advanced Reservation of Capacity Agreement (PARCA) process. A PARCA is a bilateral contract that allows entry and/or exit capacity to be reserved for the customer while they develop their own projects.

Reliability, Availability, and Maintainability (RAM)
The RAM model is the output from a study undertaken to assess asset reliability, availability and maintainability.

Renewable
Forms of energy generation from renewable resources, which are naturally replenished, such as sunlight and wind.

Resilience
Resilience is the ability of the network to recover from unforeseen conditions such as asset failure. If, at a compressor site, there is a back-up unit, the site resilience is much higher.

RIIO-1
RIIO-1 relates to our Business Plan covering 2013-2021. Ofgem's performance-based RIIO model seeks to ensure consumers get the necessary investment in Britain's energy networks at a fair price. RIIO stands for Revenue=Incentives+Innovation+Outputs. Companies have to meet performance targets, set in consultation with consumers and network users: failure to do so brings automatic penalties.

Glossary

RIIO-T2
The RIIO-T2 period is 2021 to 2026. Ofgem's performance-based RIIO model seeks to ensure consumers get the necessary investment in Britain's energy networks at a fair price. RIIO stands for Revenue=Incentives+Innovation+ Outputs. Companies have to meet performance targets, set in consultation with consumers and network users: failure to do so brings automatic penalties.

Shale
Shale is a fine-grained, sedimentary rock formed as a result of the compaction of clay, silt, mud and organic matter over time and is usually considered equivalent to mudstone. Shale gas is natural gas found in shale deposits. This natural gas is a mixture of naturally occurring hydrocarbon gases produced from the decomposition of organic matter (plant and animal remains). Typically, shale gas consists of 70 to 90% methane (CH_4). This gas can be used for generating electricity and for domestic heating and cooking.

Single Value Framework (Copperleaf)
A tool to allow objective comparisons to be made around different types of investments, helping to highlight and quantify all the benefits of each investment in order to understand which offers best value, even if the investments are very different.

Steam Methane Reform (SMR)
Steam methane reforming (SMR) is a process in which methane from natural gas is heated, with steam, usually with a catalyst, to produce a mixture of carbon monoxide and hydrogen used in organic synthesis and as a fuel. In energy, SMR is the most widely used process for the generation of hydrogen.

The Network and Information Systems (NIS
The Network & Information Systems (NIS) Regulations, aimed at raising levels of cyber security and resilience of key systems across the EU, came into force in the UK in May 2018. The Department for Digital, Culture, Media & Sport (DCMS) is the UK government department responsible for NIS.

Thermal insulation
Thermal insulation is designed to improve temperature regulation through installation in walls, floors, ceilings, roofs and other spaces. Insulation can prevent too much heat loss in winter and too much heat gain in summer, therefore reducing the requirement for heating and/or air conditioning, therefore reducing energy demand.

UK Continental Shelf (UKCS)
UKCS is made up of the areas of the sea bed and subsoil beyond the territorial sea over which the UK exercises sovereign rights of exploration and exploitation of natural resources.

Uncertainty Mechanism (UM)
Uncertainty mechanisms (UMs) exist to allow price control arrangements to respond to change. They protect both end consumers and licencees from unforecastable risk or changes in circumstances.

Unit availability
The unit availability for the current year is based on actual historic performance, and the end of RIIO-T2 values are based on the Reliability, Availability, and Maintainability (RAM) study findings and the planned investments during RIIO-T2.

Weather corrected
The demand expected with the impact of weather removed. Actual demand is converted to demand at seasonally normal weather conditions, by multiplying the difference between actual CWV and expected CWV by a value that represents demand sensitivity to weather.

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