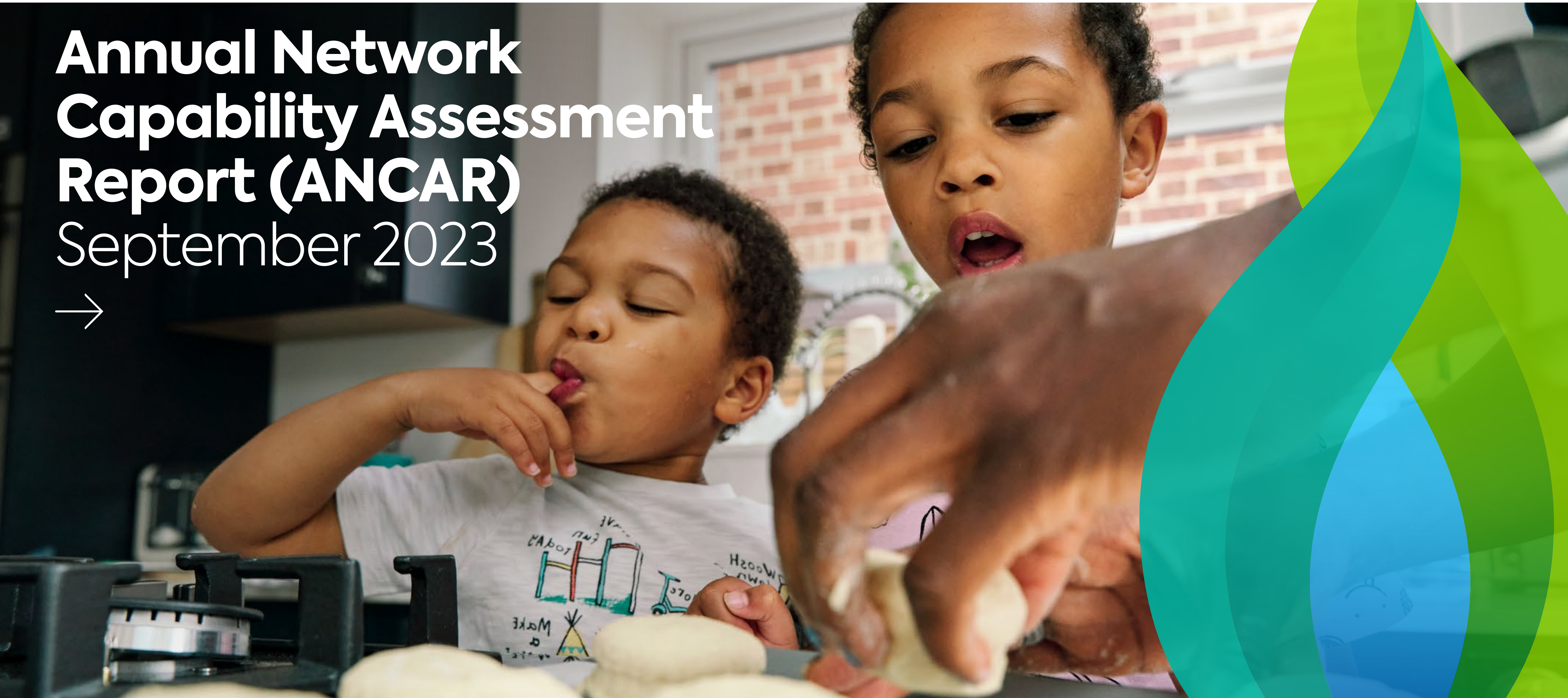
national gas transmission

Annual Network Capability Assessment Report (ANCAR)

September 2023



Welcome

1. Network resilience

2. Network capability and resilience

3. Development of the Network Capability process and analysis

Glossary

Welcome
How to use this document

We have published the ANCAR Report 2023 as an interactive document.

Home
This will take you to the contents page.

Enlarge/reduce
Hover over the magnifying icons 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 the latest issue of the Annual Network Capability Assessment Report (ANCAR).

Your feedback is so important to us ⊕

[1] The SP scenario in FES 2021 was re-named to Falling Short (FS) in FES 2022. As we are using the FES 2021 scenario we use SP as opposed to FS.

We've made some changes

Previous issues of ANCAR have included a wealth of background information due to it being a relatively new publication, but this information doesn't change year to year and adds considerable length to the report. To help you find the latest developments and most up-to-date information, we've refined the format of this document by:

- removing any background information that has previously been repeated e.g. the Network Capability Methodology section (you can still find this information in previous ANCAR publications, which are available on our website).
- setting out the report to focus on updates, or changes, that we feel are more relevant to you e.g. this year's ANCAR will focus on network resilience.

We hope you find this change a positive one and we welcome your feedback.

About this publication

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 scenarios using a range of inputs and data including the Future Energy Scenarios (FES) outputs produced by the Electricity System Operator (ESO). 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.

As outlined in the Gas Ten Year Statement in November 2022, this ANCAR is using a hybrid approach to FES. We have based our analysis on the FES 2021 Steady Progression[1] (SP) and System Transformation (ST) scenarios and these will be used alongside the FES 2022 scenarios of Consumer Transformation (CT) and Leading the Way (LW).

There are no incentives or policies in place for consumers to change their behaviour, eg. converting to heat pumps or investing in thermal insulation, therefore we do not expect the reductions in demand shown in the SP[1] and ST FES 2022 to materialise. As a prudent system operator, we need to base our analysis and investment decisions on robust assumptions to ensure that the system capability is fit for the future to enable us to meet the requirements of our customers.

It's also worth noting that neither of these data sets account for the current global situation following Russia's invasion of Ukraine and the consequential changes we are seeing in the level of LNG imports and export flows to Europe. We are working to develop our models to better reflect these changes for inclusion in the future.

Out to 2031, the flame charts in this report support the proposals we made in our latest Business Plan. That is, the range of physical capability available to us via existing and planned assets is consistent with the requirements flagged by the supply and demand scenarios we have used from FES as informed by our customers and stakeholders.

The main findings of this year's ANCAR are:

- The range of physical capability currently available on the network is consistent with the requirements demonstrated by the supply and demand scenarios we have utilised from FES.
- 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 across GB for the foreseeable future.
- As is consistent with previous ANCAR publications, it is clear that additional capability investment is needed for the South Wales zone to ensure the network can cope with increasing supplies of imported gas. The Western Gas Network upgrade and the new compressor unit at Wormington both contribute towards increasing capability in this zone.

It is important to note that we are observing significant changes to flow patterns as a result of the war in Ukraine, with the network needing to operate in ways it hasn't previously and was not designed to do – as an example, exports to Europe and associated LNG flows are significantly higher than any of the FES scenarios. We are currently in the process of assessing these risks (e.g. high imports at Isle of Grain, whilst exports to Europe are also high), and any need for additional investment will be considered as part of the development of our RIIO-3 Business Plan submission.

You asked, we listened

In response to your feedback we are, and have been, focusing on projects that include a significant amount of work on resilience and compressor availability.

The flame charts historically shown in this report have reflected an asset base that is 100% reliable and available. However, we all know that breakdowns and outages do occur, planned and unplanned – and we understand the need to better illustrate these real-world conditions. With that in mind, we've updated our flame charts in this report to include two additional lines. The first to visualise 'intact capability', which assumes all compressors are available and reliable. The second line shows 'high resilience' which reflects a more realistic level of capability which can be met 99% of the time. We further explain these updated flame charts in each section of the report below.

Collaboration with you, our stakeholders, will remain a key focus to help us evolve and improve the information we provide in ANCAR. Ultimately, this is a document for you – so please let us know how we can improve it further in the future. If you'd like to get in touch, please contact Andrew Marsh.

Ian

Ian Radley
Director, System Operations

Network resilience

1.1 Intact and high resilience capability

1.2 Calculating zone availability

1.3 Calculating zone resilience

1.1 Intact and high resilience capability

Intact Capability is the highest capability a zone can deliver, this is also referred to as Network Capability. It is based on the assumption that all compressor stations and other assets in the zone have their full capability available. As this may require more than one compressor unit at each station, it may not be possible to achieve intact capability if one or more compressor units are not available for any reason.

'High resilience' or 'high confidence' capability is the compressor reliability we calculate a zone should always be able to deliver, given current and predicted levels of availability. It is calculated so that the likelihood of unavailable compressors preventing high resilience capability is below 1%. In order to achieve an availability of 99%, the capability has to be assessed with only a subset of compressors available, e.g. 99% of the time at least 2 out of 4 compressors will be available. As these scenarios have less compression available, the high resilience capability is unlikely to deliver the same flows as intact capability.

High resilience capability can often be achieved through running multiple combinations of compressor stations, which reduces the impact of varying unit-level availability.

FES flow scenarios shown in the flame charts which lie above the high resilience capability line have the potential to not be met should the necessary assets not be sufficiently available. This would result in constraint days in an entry zone or potential for failure to supply customers with gas in an exit zone. The number of constraint days predicted can therefore be used as a metric to assess network resilience. FES flow scenarios which are above the intact line can not be met with the current assets, regardless of their availability. The number of FES flow scenarios between the two lines which may not be met is dependent on compressor unit availability.

1.2 Calculating zone availability

Station-level availabilities were used to calculate high resilience capability, and the likelihood of achieving intact capability in each zone. The availability of the station is based on the availability of the units required to achieve the full capability of the station. The unit availability for the current year is based on actual historic performance, and the end of RIIO-2 values are based on the reliability, availability, and maintainability (RAM) study findings and the planned investments during RIIO-2.

The combinations of stations required to deliver intact capability or high resilience capability are used to calculate zone-level availabilities. The calculations are shown in figures 1 and 2.

Figure 1
Calculation of zone intact availability

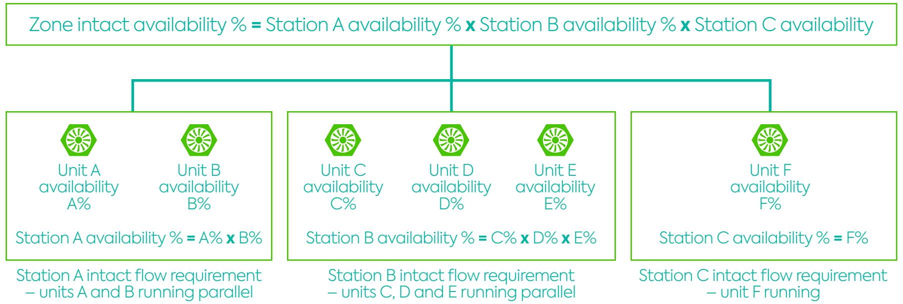
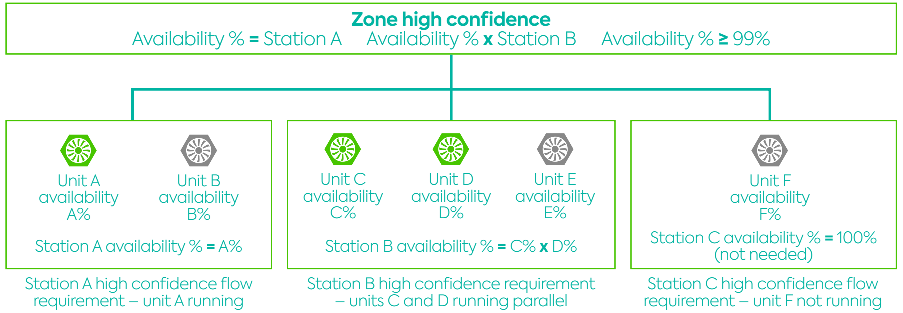


Figure 2
Calculation of high resilience capability



1.3 Calculating zone resilience

To measure the impact of availability on network resilience, we modelled the FES flow scenarios in each zone and analysed the likelihood that the network would be able to meet those scenarios. Constraint days in an entry zone are the number of days in a year that we expect the network will not be able to meet flow scenarios without commercial actions. The more resilient the network, the lower the number of constraint days. In the case of an exit zone, a constraint day represents a failure to meet exit pressures without commercial actions.

We calculated the highest entry and exit flows that the intact capability network and high resilience capability network can meet across increasing levels of demand for each zone and included them on flame charts:

- Intact capability is represented by the orange line – it is higher because it represents the most capable network operating scenario, i.e. our maximum capability.
- High resilience capability is represented by the pink line – it is lower because it reflects the actual availability of compressor units in the zone.

An example for entry flows in South Wales is shown in figure 3.

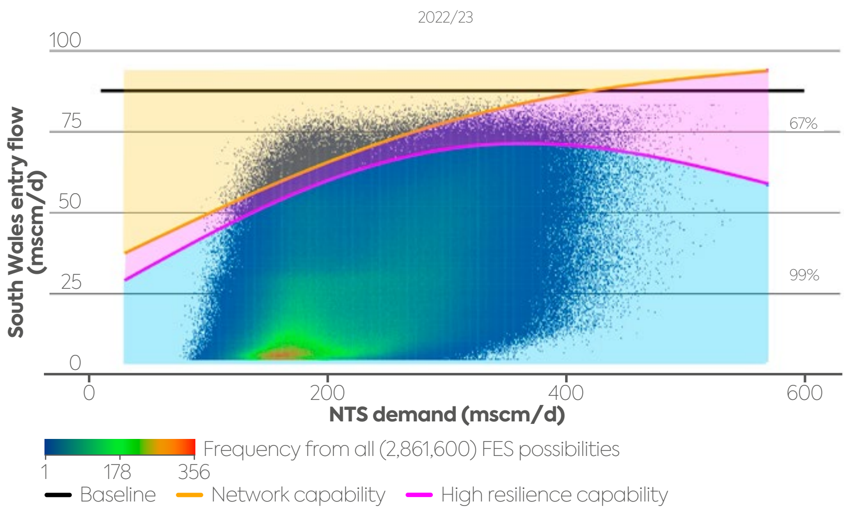
What this means – understanding our intact and high resilience lines

The network cannot deliver any of the flow scenarios above intact capability (the orange line). The network has a 99% likelihood of delivering all scenarios under the high resilience line (the pink line). The actual capability on any given day will be between the two lines depending on asset availability.

The likelihood of achieving intact capability is used to estimate the average number of flow scenarios that will not be met. This number is then converted into days.

- The total number of FES flow scenarios under the high resilience capability line (points in the blue area on the chart) represent scenarios that have a greater than 99% likelihood of being met given current availability/reliability of compressor units and other assets.
- The total number of FES scenarios under the intact capability line, but above the high capability line (the pink area), has a 67% likelihood of being met in the above example, since this is the compounded zonal availability based on unit-level values.
- Flows above the intact capability line (the orange area) cannot be met.

Figure 3
Current operating strategy example for South Wales entry



1.3 Calculating zone resilience

The number of constraint days is estimated using the number of scenarios that might be met (pink area) multiplied by the likelihood that the intact capability will not be available. This is added to the total number of scenarios that cannot be met (orange area) to produce an expected number of scenarios not met (see figure 4).

The number of FES flow scenarios between the two lines which may not be met is dependent on compressor unit availability, which is therefore a key metric in assuring network resilience. Using this analysis, availability targets can be set for compressor units based on the planned reductions to our compressor fleet over the next ten years. We conduct a similar exercise for the years 2025/26 and 2030/31 to enable us to calculate a short, medium, and long-term perspective.

Figure 4
Constraint days calculation

Flow scenarios not met = Scenarios that cannot be met (orange area) + Scenarios that might be met (pink area) x (1 – Intact network availability (%))

Network capability and resilience

2.1 Overview
2.2 Scotland and the North (zone 1)
2.3 Central zones (zone 2 and 3)
2.4 South Wales (zone 4)
2.5 South West (zone 5)
2.6 East Midlands (zone 6)
2.7 South East (zone 7)
2.8 Beyond 2031

2.1 Overview

The capability lines are based on the current network, including any confirmed changes, as laid out in our RIIO-2 Business Plan.

In some zones, there is an opportunity to stop operating compressors that are non-compliant with emissions directives or are redundant for the operation of the network. In some cases, where the required level of capability is not compromised, they can be decommissioned and not replaced. The units that have provided, and are still required to provide resilience to the main operating units at compressor sites will be retained; a decision on whether these are maintained, derogated or replaced will need to be made as part of the T3 business planning process. The network capability based on intact levels is not affected, but the system resilience (how often that capability can be achieved) will be reduced in the event units are derogated or decommissioned instead of being replaced.

Over the next ten years it is proposed that our compressor fleet's operational units will reduce, mainly due to the Medium Combustion Plant Directive (MCPD) emissions legislation. This reduction will not impact the capability of the network, but it does remove some of the system's resilience which could increase the likelihood of a constraint.

The high resilience lines that we have added to this year's flame charts assume that National Gas receives funding to maintain the level of resilience we expect to have at the end of the RIIO-2 period (2026). This will be a key part of the T3 business planning proposals in terms of the level of resilience required across the network and how this interacts with HMG's view of an onshore infrastructure standard as highlighted in the Energy Security Plan published in March this year.

Out to 2030, the updated flame charts continue to support the proposals we made in our RIIO-2 Business Plan, i.e. the range of physical capability is consistent with the requirements demonstrated by the supply and demand scenarios from FES with the assets we have available in the network analysis. After 2040, some of the scenarios undergo fundamental changes – discussed further in section 2.8.

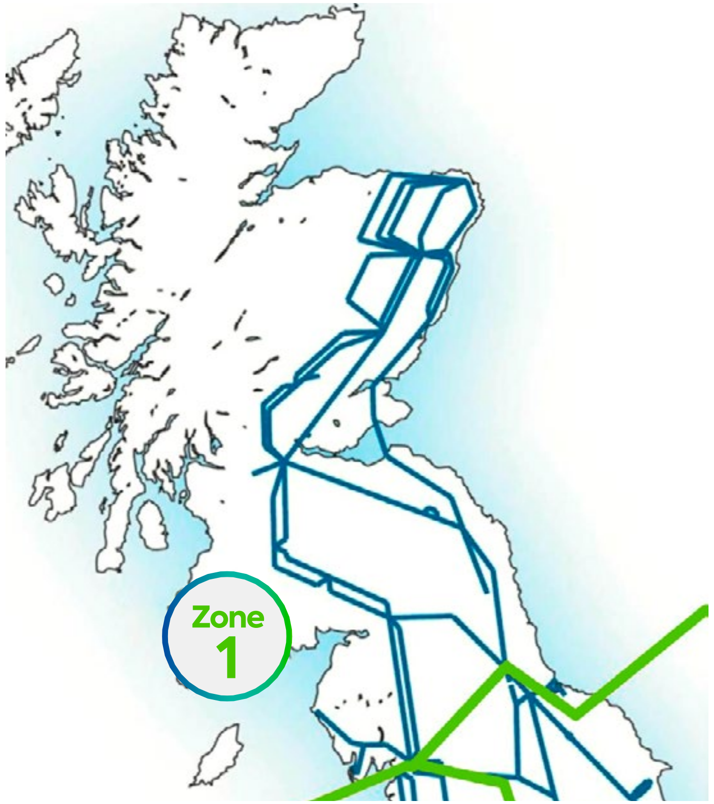
Declining supplies from the UK Continental Shelf (UKCS) mean that the Scotland and the North zone will have less reliance on some compressors and we will be decommissioning those that support St. Fergus entry flows over the next ten years. It's important to note that other compressors in this area are still critical to maintain exit pressures and there may be a requirement to reverse compression to increase flow capability from south to north.

As well as delivering entry and exit physical capability, compressors are also essential for moving gas within a zone and between zones, as we discuss in section 3, in order to relieve pressure increases at entry points to satisfy demand and raise pressure at exit points across the network. We continuously review our investment and maintenance plans to ensure the compressor fleet is resilient and delivers value to consumers. We seek to optimise operation of the system to minimise possible constraints where it is economic to do so.

Gas remains an integral part of the GB energy system, underpinning GB energy security. Our network ensures millions of people can access the energy they need to heat their homes; power British industry; and facilitate flexible electricity generation. As such, maintaining security of supply, such as the 1-in-20 obligation, is of upmost importance to us.

2.2 Scotland and the North (zone 1)

Zone 1

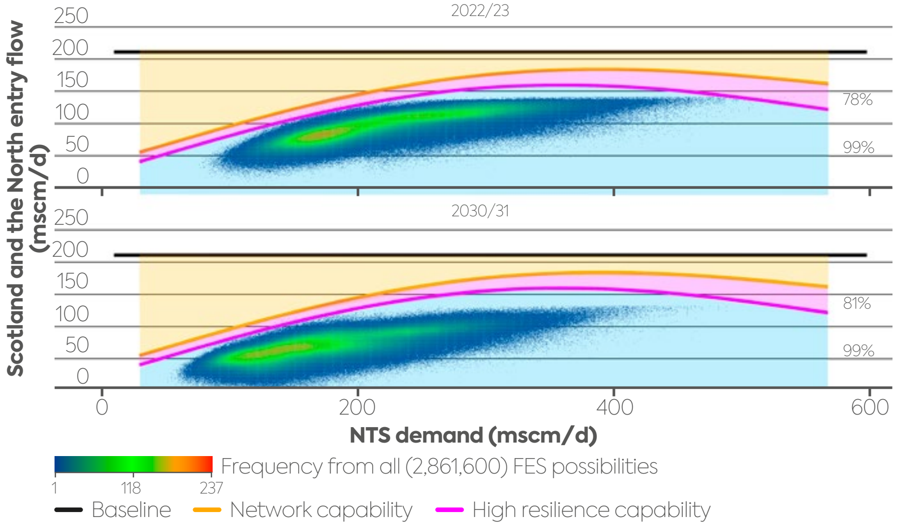


2.2.1 Entry

Figure 5 shows that both the intact and high resilience lines are above future expected flows. This indicates that Scotland and the North's entry capability is sufficient to meet current and future requirements. There is a reduction in zone entry flows as UKCS supplies are forecast to decline. This is reflected in the 2030/31 chart by the lowering of the flame's position, and a greater concentration of flow frequency towards the lower demand levels as national demand decreases.

Figure 5 shows our high resilience capability is above the flame in both graphs; with investment in the zone, the ability to meet maximum intact capability improves from 78% to 81% by the end of RIIO-2. This increase is due to planned asset health work on our compressor stations within the zone. We will continue to review our future compression strategy in Scotland and the North as we develop our RIIO-3 plans and potentially reassess the high resilience and intact capability lines as our plans develop.

Figure 5
Scotland and the North entry capability



2.2 Scotland and the North (zone 1)

2.2.2 Exit

Figure 6 shows our Scottish exit capability against NTS demand. We do not currently have intact and high resilience lines for this chart, although we aim to in the future. It shows however that the flame is below our 1-in-20 point, and so we expect to be able to meet exit demand in the zone.

2.2.3 Scotland's 1-in-20

With the network having limited capability to transport gas from south to north, the projected decline in entry flows at St. Fergus will make it difficult to meet our exit commitments in Scotland. To assess the required capability, we annually review the supplies from the St. Fergus terminal against the demand in Scotland. This is because we currently have no compression capability to move the supplies from Teesside, the North East and the North West towards the areas of high demand in Scotland. Flows from Barrow are expected to steadily decline to zero between now and 2031.

Figure 7 shows that in 2030/31 we still expect the maximum flow through the St. Fergus terminal to be similar to today's flows, but there are now several scenarios with very low or zero flows. A number of them are beyond our current levels of capability and would lead to scenarios where the demand cannot be met on the system without intervention. We continue to monitor supply and demand flow rate changes and, when appropriate, we will put forward recommendations to mitigate any constraints or failure to supply risk.

Figure 6
Scotland and the North exit capability against NTS demand for 2022/23 and 2030/31

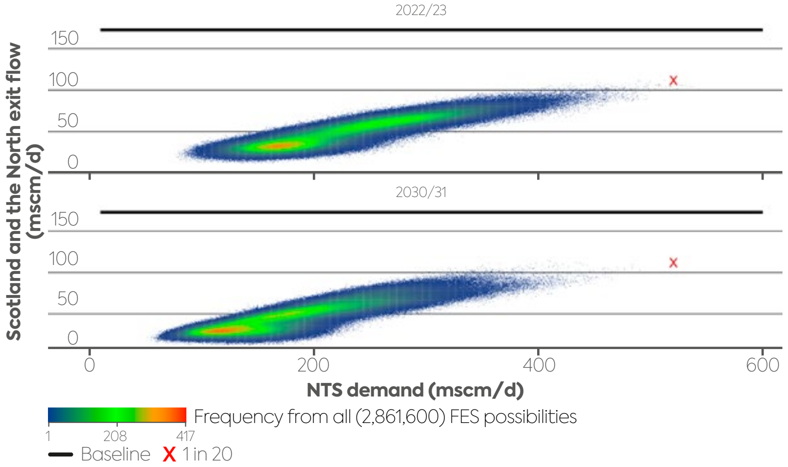
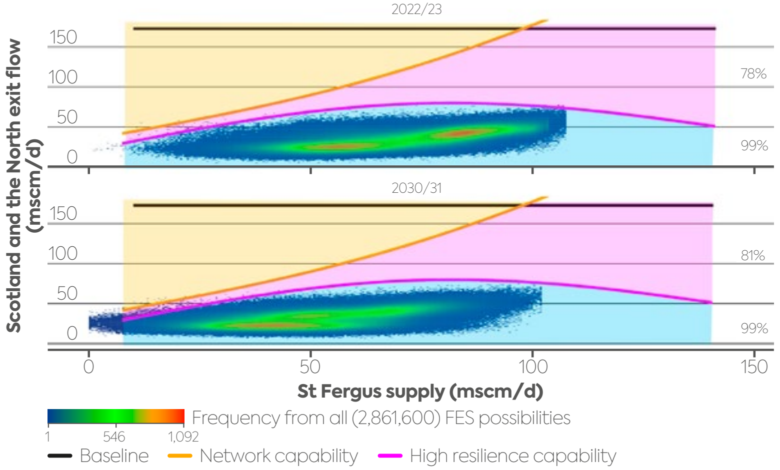


Figure 7
Scotland and the North's supply and demand



2.2 Scotland and the North (zone 1)

2.2.4 Proposed developments

Within this zone, we propose to decommission three compressor units during RIIO-2 and a further three units in RIIO-3[1]. Due to a significant reliance on compression to deliver this zone's capability, there are planned investments during RIIO-2 to improve the reliability of other key units in the zone that continue to provide the network capability required over the next ten years.

The final decision on the units to be decommissioned in the RIIO-3 period (2026 to 2031) will be reviewed during the RIIO-2 period (2021 to 2026) as further network capability information and stakeholder requirements become available.

Historically, entry flows into this region have far exceeded local demand therefore there has been a requirement to move the excess gas to the high demand areas further south. Currently supply approximately matches peak demand, but in all four FES scenarios peak demand will exceed supply at some point in the future. Currently, all the compression in the zone is designed to move gas south, to the rest of Britain. We will continue to review our forecasts to identify the optimum time to deliver changes to reconfigure some compressor sites to support flows from south to north when the depleting local supplies cannot support peak local demand. For more detail see our Gas Ten Year Statement 2022 (GTYS).

[1] The RIIO periods are price control periods that are as follows: RIIO-1 (2013 to 2021), RIIO-2 (2021 to 2026) and RIIO-3 (2026 to 2031).

2.2 Scotland and the North (zone 1)

2.2.5 Compressor station availability and constraint days

Figure 8 shows the zonal and station availability for zone 1, both now and at the end of RIIO-2. It shows the current availability of all stations in the zone to be 78%, with that number increasing to 81% by the end of RIIO-2. This increase is due to planned asset health work across compressor stations, with the greatest increase being at Aberdeen compressor station.

Figure 9 shows that there are no expected entry constraint days for Scotland now and to the end of RIIO-2.

Figure 8
Scotland and the North station availabilities current and end of RIIO-2

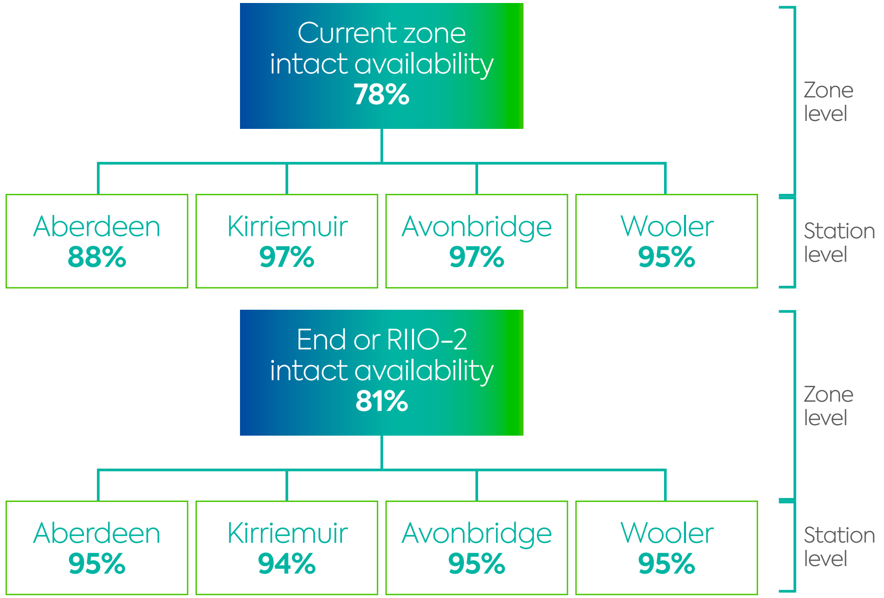
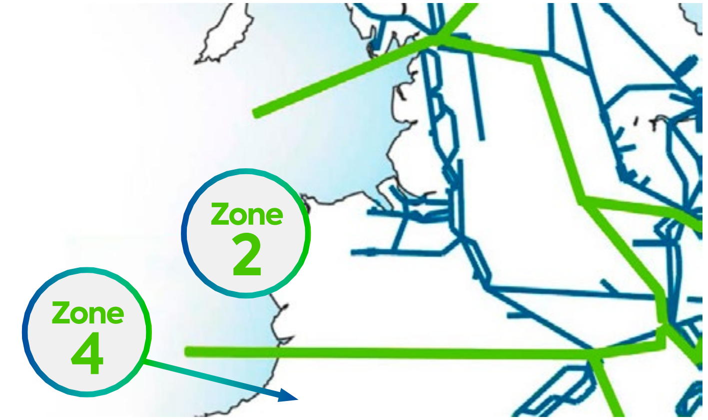


Figure 9
Current and end of RIIO-2 expected constraint days for zone 1

	Constraint days	10th percentile	Expected days	90th percentile
Current resilience	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0

2.3 Central zones (zone 2 and 3)

Zone 2



2.3.1 North West (zone 2)

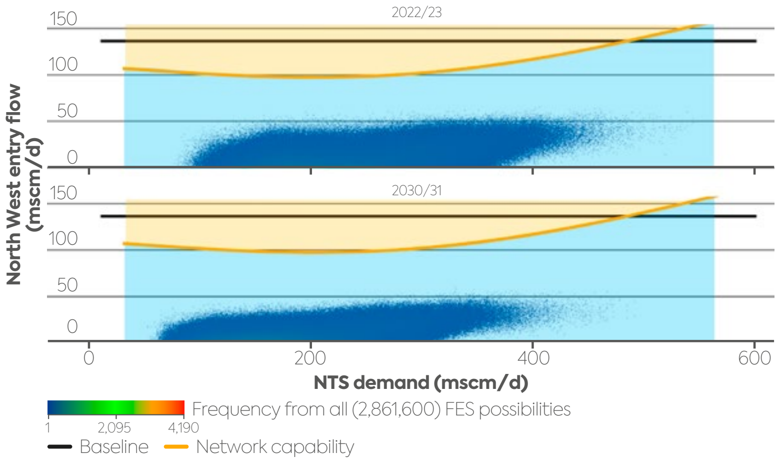
2.3.1.1 Entry

Figure 10 indicates that the North West's entry capability is sufficient to meet the entry requirements required both now and in the next ten years. As illustrated, there is minimal change in the range of entry flows between the decades. There is no high resilience line on the North West chart because the intact network capability is always available due to lack of reliance on compressors for North West entry, so no constraints are expected in this zone.

From the diagram it can be seen that the zone's capability line is significantly above any of the expected supply and demand flows.

Part of this capability is required due to the North West being a transit zone for moving gas between zones with the use of compressors in the more southern zones. This interzonal flow is not reflected in the entry capability charts which currently display only entry point flows and not pipeline flows from other zones. Consequently, the charts only illustrate part of the functional requirements of the assets. We are continuing to develop methods of demonstrating this requirement, as outlined in section 3.

Figure 10
North West entry capability for 2022/23 and 2030/31



2.3 Central zones (zone 2 and 3)

2.3.1 North West (zone 2)

2.3.1.2 Exit

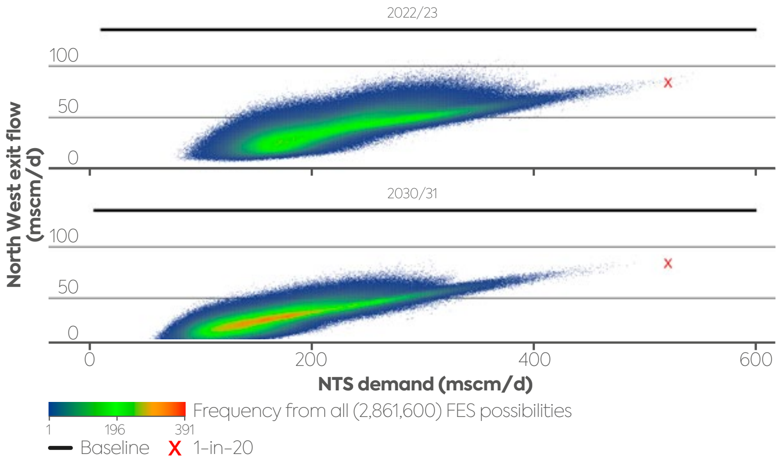
The North West network has sufficient capability to meet the exit requirements required both now and in the next ten years. We would expect to always deliver the exit flow requirement due to the lack of reliance on compression in this zone, therefore zonal resilience is not necessary.

The range of the 2030 flow pattern is similar to the 2022 flow pattern, although the range of potential flows, at any given NTS demand level, has reduced slightly. There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end, whilst zonal demands are only slightly reduced. The small demand reductions are believed to be due to the earliest signs of the net zero strategies taking effect as less natural gas is being used.

2.3.1.3 Proposed developments

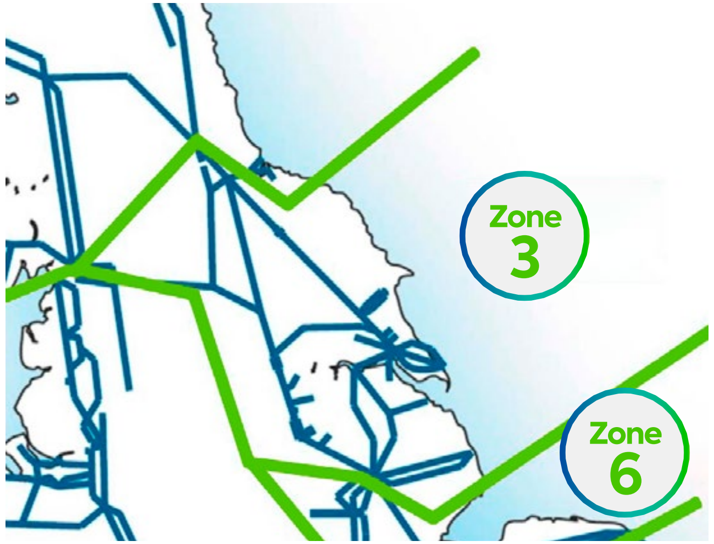
During RIIO-2 it is proposed to decommission two compressors in this zone. This would impact our entry capability in the north, however the St. Fergus baseline was reduced at the start of RIIO-2 and we don't expect to see entry levels exceeding our capability in the future. The final decision on whether these units can be decommissioned will be made in the T3 business planning process and will be under review during the RIIO-2 period. These proposals will reflect the forecast reduced need to transport gas from the north to the south due to declining UKCS supplies but also the need to achieve appropriate levels of network resilience to ensure energy security.

Figure 11
North West exit capability for 2022/23 and 2030/31



2.3 Central zones (zone 2 and 3)

Zone 3



2.3.2 North East (zone 3)

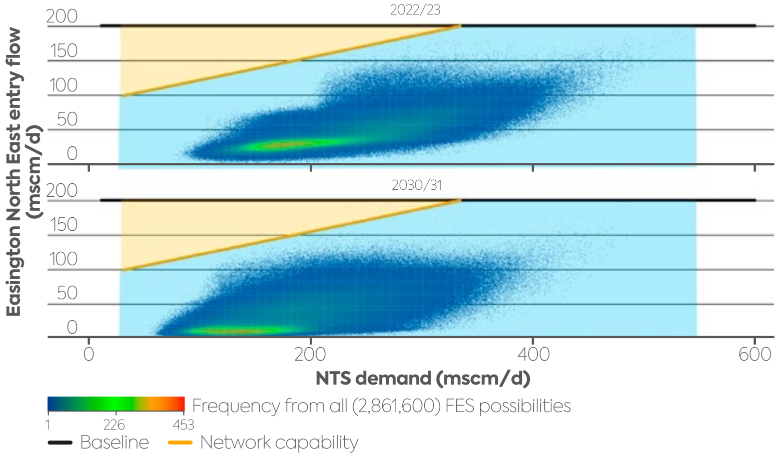
2.3.2.1 Entry

Figure 12 indicates that the North East's entry capability is sufficient to meet the entry requirements both now and in the next ten years.

The 2030 flow pattern shows more instances of higher Easington flows at NTS demand levels below 200 mcm/d when compared to 2022. There is also a more pronounced concentration of flow frequencies towards the lower NTS demand levels in 2030 and fewer flows at the extreme top end of NTS demand levels. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect.

The entry capability line for this region is above the expected flows in all the scenarios. There is no high resilience capability line on this chart because there is no reliance on compression in this zone. Therefore no potential constraints are expected in this zone. Part of this excess capability is due to the North East being a transit zone to move gas between zones with the use of compressors. This interzonal flow requirement is not reflected in the entry capability charts which currently display only entry point flows and not pipeline flows from adjacent zones. Consequently, the charts only illustrate part of the functional requirements of the assets, that is entry and exit flows and not interzonal flows. We are continuing to develop methods of demonstrating this requirement, as outlined in section 3.

Figure 12
North East entry capability for 2022/23 and 2030/31



2.3 Central zones (zone 2 and 3)

2.3.2 North East (zone 3)

2.3.2.2 Exit

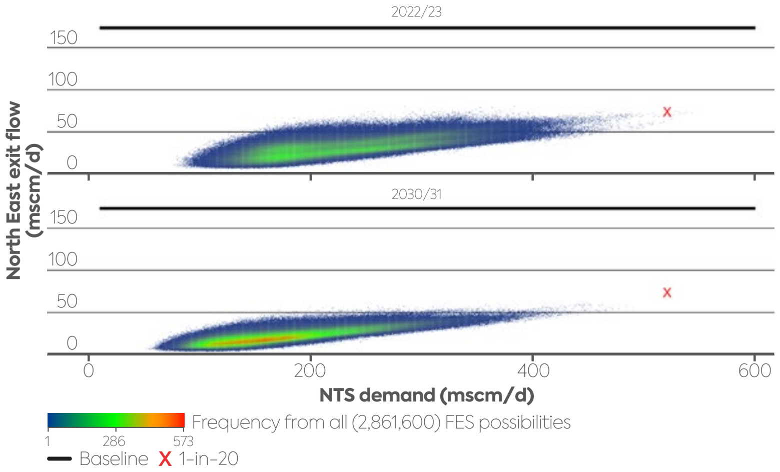
The North East zone has sufficient capability to meet the exit requirements required both now and in the next ten years. We would expect to always deliver the exit flow requirement due to there being no reliance on compression in this zone, therefore zonal resilience is not considered.

The range of the 2030 flow pattern is broadly similar to 2022 flow pattern, although the range of potential flows at any given demand level have reduced slightly. There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end of NTS demand levels, whilst zonal demands remain only slightly reduced. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect.

2.3.2.3 Proposed developments

During RIIO-2 we will be decommissioning two compressor units in this zone following the commissioning of one new unit to ensure the current capability is retained. This decommissioning will reduce the resilience level in the zone and so needs to be considered within the T3 business plan process. This will reflect the importance of retaining interzonal capability in this zone, especially given the potential impact on resilience in the North West region outlined above.

Figure 13
North East exit capability for 2022/23 and 2030/31



2.3 Central zones (zone 2 and 3)

2.3.3 Central (zone 2 and 3) compressor availability and constraint days

Figure 14 shows the availabilities of compressors used to support the central zones. We combine the two zones when examining availabilities as they are strongly linked to each other (as they both support strong interzonal flows from north to south), with compressor conditions affecting both zones.

There is little change in compressor availability for the central zones from now until the end of RIIO-2. However, there is the potential for significant improvements at individual stations, most notably to Bishop Auckland and, in particular, Nether Kellet – which recently returned to service from asset health works. There is a reduction in the availability of Carnforth compressor station, which is due to a unit at the site being decommissioned.

Figure 15 shows that there are no expected constraint days in the central zones currently as well as at the end of RIIO-2, indicating that current planned resilience work will be sufficient to maintain operations here.

Figure 14
Central zones, compressor availabilities current and end of RIIO-2

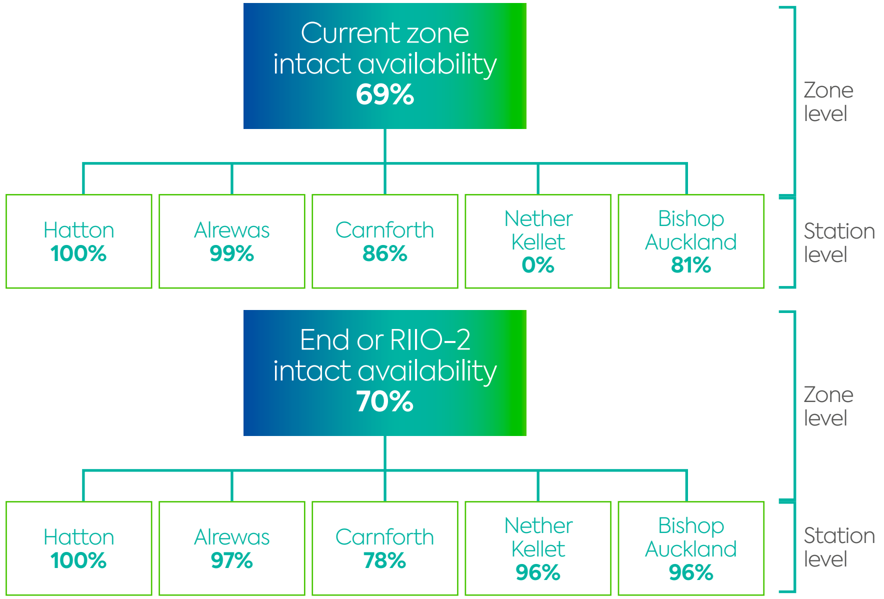


Figure 15
Current and end of RIIO-2 expected constraint days for zone 2 and 3

	Constraint days	10th percentile	Expected days	90th percentile
Current resilience	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0

2.4 South Wales (zone 4)

Zone 4

2.4.1 Entry

The entry capabilities for South Wales shown in figures 16 and 17 indicate an increase where supply is above intact and high resilience capability in the next 10 years. This is consistent with our previous ANCAR publications and shows the strongest indication of all the zones for an increased capability requirement. Within this zone the use of short-term physical and commercial actions (constraint management contracts and locational sells on the open market) have been used historically to manage flows above physical capability.

In 2031, based on the supply scenarios, there are more instances where supply is above capability due to a greater reliance on imports of LNG to offset the declining UKCS supplies, increasing flows through this zone.

Availability of compressors is improved by control system upgrades at Felindre, commissioning of Unit A at Felindre, as well as asset health works. This is based on the current planned RIIO-2 investments, including the Western Gas Network Project.

The Energy Security Plan published by the Department of Energy Security and Net Zero (DESNZ) in March 2023 sets out a number of proposals to enhance energy security whilst GB transitions to net zero. We continue to work closely with DESNZ on the proposals set out in the Energy Security Plan, one of which is the development of a gas supply security assessment.

As shown in figure 17, the WGN project reduces the likelihood of scenarios which would not be met by the intact and high resilience network capability after planned RIIO-2 investments, reducing the likelihood of constraint days quite significantly. We will continue to monitor the flows and review the need for further investment in this zone during RIIO-2.

Figure 16
South Wales entry capability for 2022/23

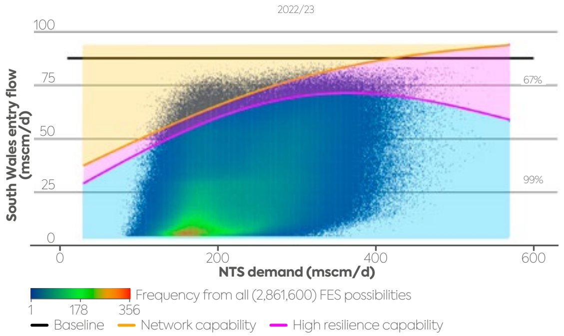
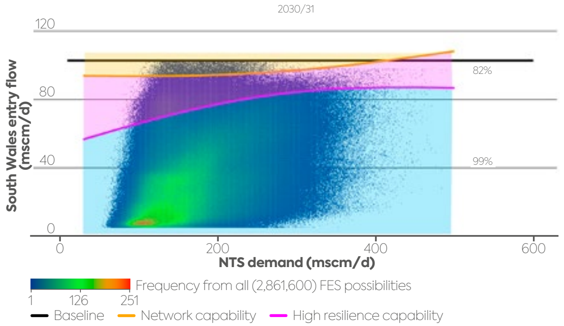


Figure 17
South Wales entry capability for 2030/31 after WGN upgrades



2.4 South Wales (zone 4)

2.4.2 Exit

The South Wales network has sufficient capability to meet the exit requirements now and in the next ten years. We would expect to always be able to deliver the exit flow requirement for this zone due to the increased level of LNG flows into Milford Haven and, as such, zonal resilience is not considered. The range of the 2030 flow pattern is broadly similar to the 2022 flow pattern, although the range of potential flows, at any given NTS demand level, has concentrated slightly.

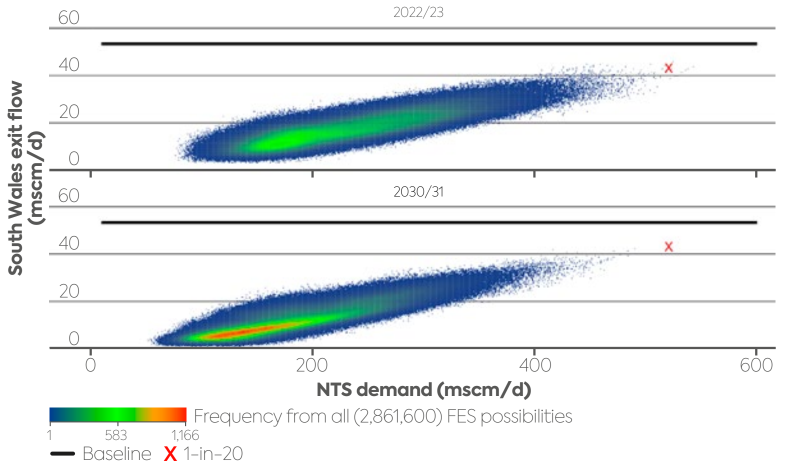
There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end of NTS demand levels, whilst zonal demands remain only slightly reduced. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect.

2.4.3 Proposed developments

2.4.3.1 Medium Combustion Plant Directive and Wormington

To provide the current level of entry capability both today and following completion of the Planning and Advanced Reservation of Capacity Agreement (PARCA), two units operating in parallel at Wormington are required. Two of the three units on site are impacted by the MCPD and if we choose to 'do nothing' they will be placed on a limited run hour derogation. Those derogations will impact how often we can provide the full network capability, and this drives the level of investment needed to support future entry flows from the terminal. We are currently seeking funding to ensure MCPD compliance through an Uncertainty Mechanism (UM) requesting that the two non-compliant units be replaced with two new units – this was submitted in August 2022, with a funding decision due in November 2024.

Figure 18
South Wales exit heatmap for 2022/23 and 2030/31



2.4 South Wales (zone 4)

2.4.4 Compressor availability and constraint days

Figure 19 shows the availability data for zone 4. Current availability sits at 67%, but this is expected to increase to 82% by the end of RIIO-2 due to an increase in station availability at Wormington. This does not account for the single point of failure represented by the single pipeline (Feeder 28) connecting Milford Haven to the network.

Figure 20 shows the expected constraint days both now and at the end of RIIO-2. We can see that the expected number of constraint days reduces by the end of RIIO-2 compared to now, which is due to the expected increase in availability of compressors in the zone and the completion of the WGN asset projects.

Figure 19
South Wales (zone 4) compressor availability

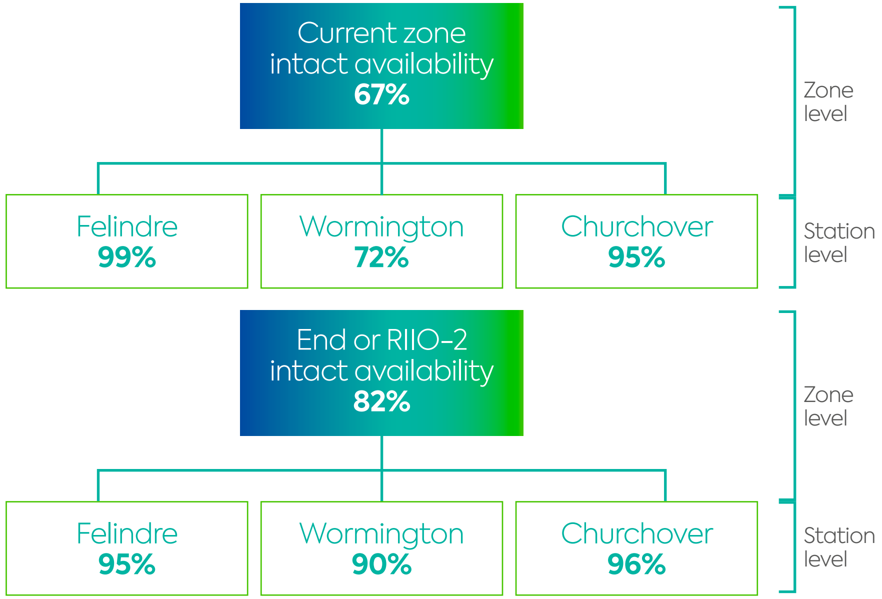
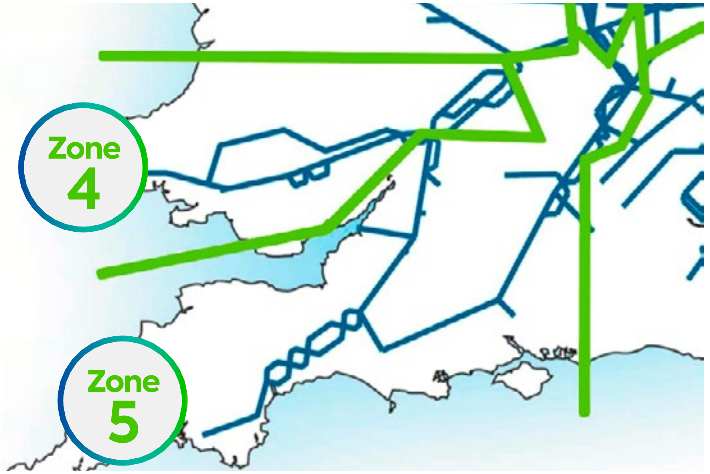


Figure 20
Current and end of RIIO-2 expected constraint days for zone 4

	Constraint days	10th percentile	Expected days	90th percentile
Current	Constraint days with intact capability	0	2	4
	Constraint days with high resilience capability	4	7	10
	Expected constraint days	1	3.6	6
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	2	5	8
	Expected constraint days	0	0.9	1

2.5 South West (zone 5)

Zone 5



2.5.1 Entry

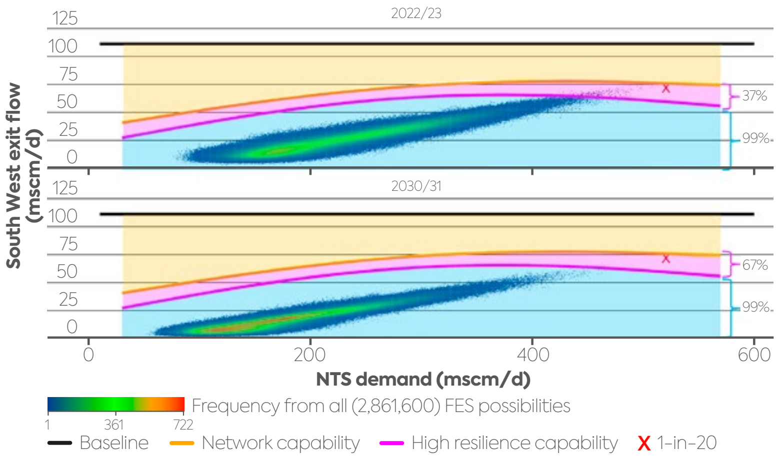
There are no entry sites in this zone. There is one storage site, but it is small, contributing less than 5% of the zonal supply in winter conditions. Therefore, there is no entry capability heatmap for this zone.

2.5.2 Exit

The 2030 flow pattern is broadly similar to the 2022 flow pattern, although the range of potential flows at any given NTS demand level has reduced slightly. There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end of NTS demand levels, whilst zonal demands remain only slightly reduced. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect. Due to the intermittency of wind, it's important that we retain the full intact capability.

The high resilience line in 2022 represents a risk to us being able to meet the 1-in-20 demand, investment during RIIO-2 goes some way to mitigating this risk, and we are assessing what other work is needed during the RIIO-3 business planning process.

Figure 21
South West exit capability for 2022/23 and 2030/31



2.5 South West (zone 5)

2.5.3 Compressor availability and constraint days

Figure 22 shows the compressor availability for zone 5. The intact availability for the zone is currently quite low, but this number increases by the end of RIIO-2 due to significant improvements to the availability of the Wormington and Aylesbury compressor stations as part of planned asset health work. All compressor stations in the zone achieve a greater availability due to this work. In addition to these resilience calculations it should be noted that the Lockerley station is totally reliant on electric drive compressors with no methane backup.

Figure 23 shows the expected constraint days for zone 5 now and at the end of RIIO-2. We currently expect no constraint days now and to the end of RIIO-2. This is due to the increase in compressor availability in the region. These constraint days and associated assumptions do not take into account the risk represented by the single feed pipelines on the network which are present in the South West, which are critical to meeting our customers' requirements.

Figure 22
South West compressor availability current and at the end of RIIO-2

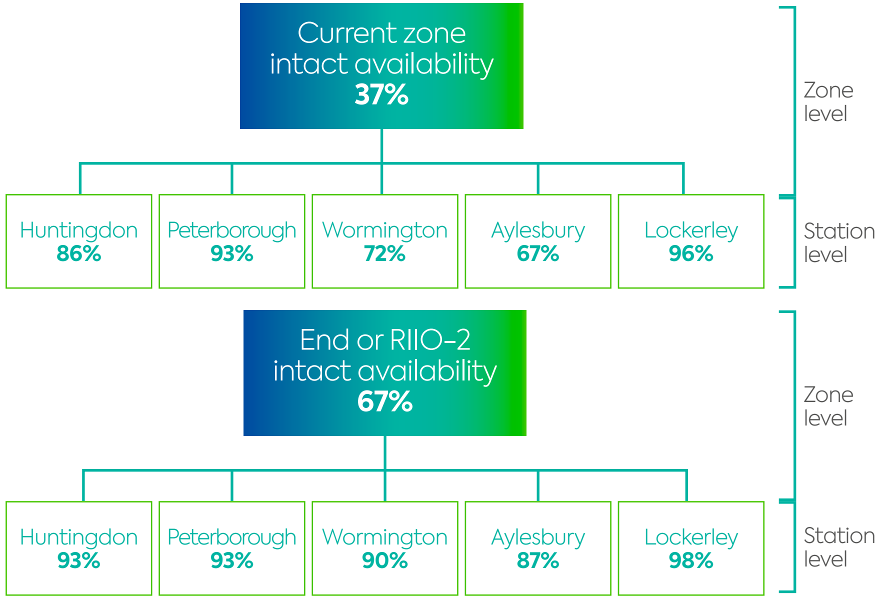


Figure 23
Current and end of RIIO-2 expected constraint days for zone 5

	Constraint days	10th percentile	Expected days	90th percentile
Current resilience	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	0	0	0
	Expected constraint days	0	0	0

2.6 East Midlands (zone 6)

Zone 6

Bacton is considered as an exit point for the East Midlands, as the gas it exports via the interconnectors is largely supplied by moving gas from the East Midlands, using the King's Lynn compressor station. In recent winters, King's Lynn has been used more frequently to facilitate winter exports, including enhanced pressure requests from Interconnector. Bacton is, however, also considered as an entry point for the South East as most of the gas coming through the terminal goes to meet demand in the South East.

2.6.1 Entry

There are no entry sites in the East Midlands zone, so no entry capability flame charts or heatmaps have been produced.

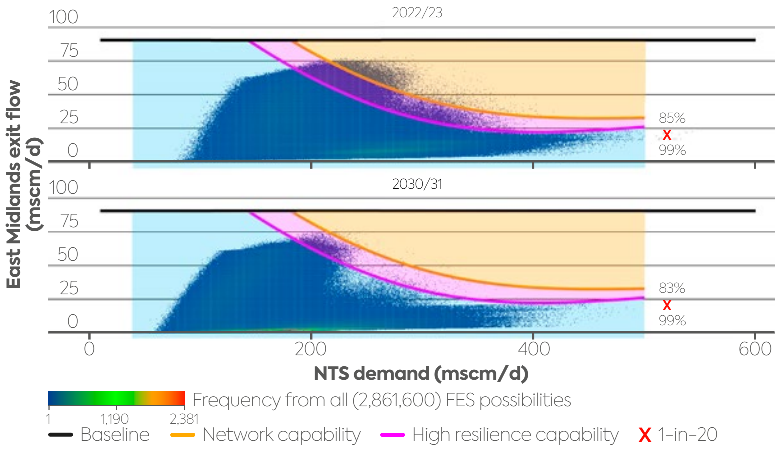
2.6.2 Exit

Figure 24 shows expected demand scenarios for minimum Isle of Grain and Bacton entry flows, as this is a 'worst case' demand scenario. Both the intact and high resilience capability lines show that the East Midlands network largely has sufficient capability to meet the 1-in-20 exit requirements required both now and in the next ten years. There are a number of flow points above the intact capability line in 2022/23, which indicates potential constraints. We would not expect these flow scenarios to occur at the same time as minimal Isle of Grain and Bacton inputs.

The 2030 flow pattern is broadly similar to the 2022 flow pattern, although the range of potential flows above an NTS demand level of 225mcm/d has reduced. There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end of NTS demand levels, whilst zonal demand extremes remain only slightly reduced. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect. The plateau shape present in the charts, as national demand increases, is caused by the transition of interconnection flows to the EU from exit to entry via Bacton.

The highest level of exit capability in the East Midlands is when Bacton is exporting to Europe. The chart shows that there will still be the need for Bacton to be able to support baseline levels of exit capability in 2030/31. Further optimisation of flows of LNG imports (Milford Haven and Isle of Grain terminals) could potentially increase the exit capability at East Midlands, via Bacton.

Figure 24
East Midlands exit capability for 2022/23 and 2030/31



2.6 East Midlands (zone 6)

2.6.3 Proposed developments
We are currently seeking funding to ensure MCPD compliance through an Uncertainty Mechanism (UM) requesting that we replace the one remaining non-compliant unit with one new unit – this was submitted in January 2023, with a funding decision due in November 2024.

2.6.4 Compressor availability and expected constraint days
Figure 25 shows the compressor availability for zone 6. For this zone only King's Lynn is considered as this is the only compressor required to meet exit demand at Bacton. The rest of the zone does not need compression in order to meet exit requirements. There is a slight decrease in availability at King's Lynn from now until the end of RIIO-2.

In figure 26, we can see the expected constraint days for the East Midlands zone decrease by the end of RIIO-2. This is based on the forecast reduction of export flows from Bacton over the next few years. This is based on the current FES forecasts which do not account for the recent flows on the network and predict a reduction in export flows from Bacton. This is being addressed in our current planning for RIIO-3 which will look to factor in the recent trends and how they could impact Bacton flows in the future.

Figure 25
East Midlands compressor availability

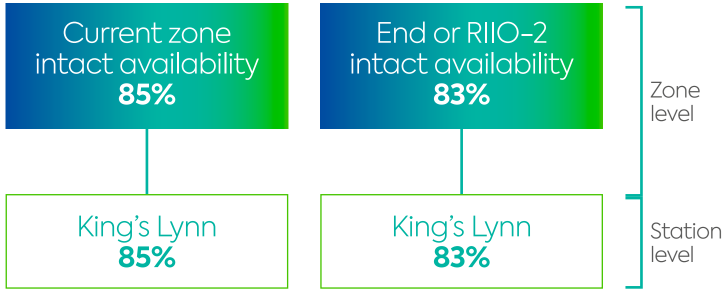
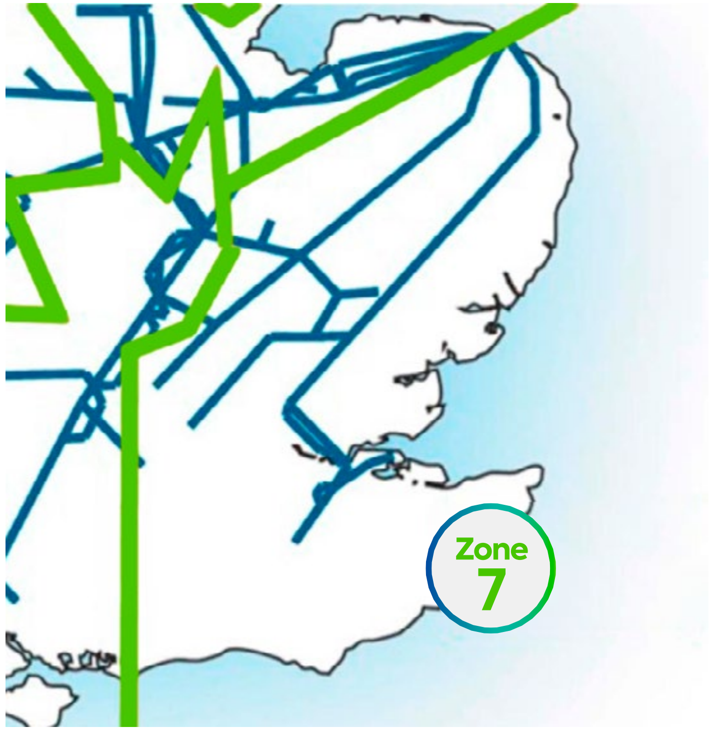


Figure 26
Current and end of RIIO-2 expected constraint days for zone 6

	Constraint days	10th percentile	Expected days	90th percentile
Current resilience	Constraint days with intact capability	0	1	2
	Constraint days with high resilience capability	7	11	15
	Expected constraint days	1	3.1	5
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	2	5	8
	Expected constraint days	0	0.6	1

2.7 South East (zone 7)

Zone 7



2.7.1 Entry

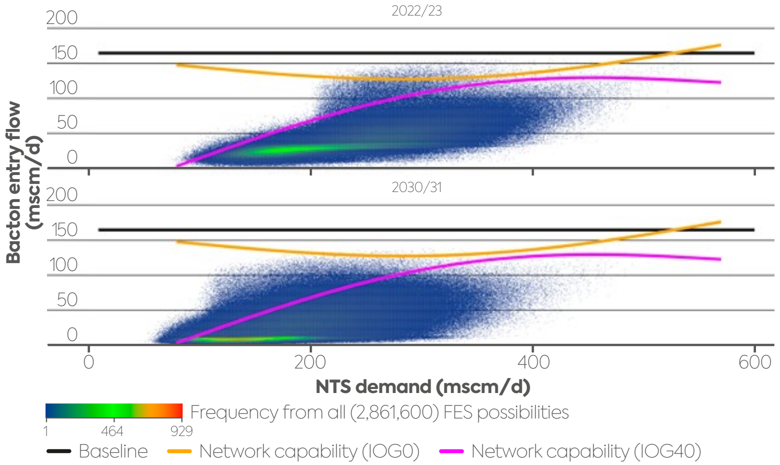
Bacton and Isle of Grain are considered entry points for the South East, as the gas from these facilities is largely used to support the high demand centres in the zone.

Figure 27 shows the intact capability lines for South East entry with Isle of Grain (IOG) flows at different levels. It can be seen there is an increase in expected Bacton capability when IOG flows are lower, especially when NTS demands are low. We expect Bacton flows to remain high and close to the current capability levels, although it can be seen that in 2030 there is an increase in flows at lower NTS demand levels which compromises our Bacton capability when IOG flows are higher.

There is sufficient intact entry capability when entry flows are only seen from the Bacton terminal. However, if flows from the Isle of Grain terminal are also high (40mcm/d) it would not be possible to maintain high entry flows at Bacton. As UKCS supplies decline and we become increasingly reliant on imported gas such as LNG, the risk of high flows from both terminals increases. As part of the T3 Business Plan process we will assess what investment may be needed to achieve acceptable resilience levels.

Unfortunately, we do not have high resilience lines for this entry zone currently, although we hope to be able to include these in the future.

Figure 27
South East entry capability for 2022/23 and 2030/31



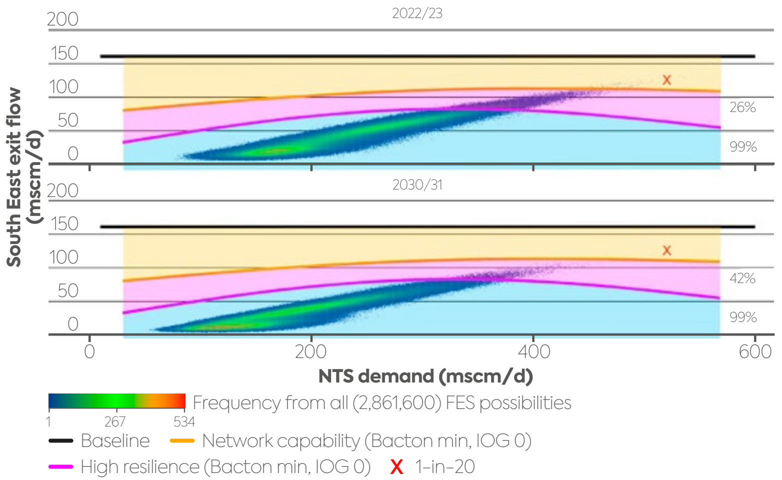
2.7 South East (zone 7)

2.7.2 Exit

Figure 28 indicates that the South East network does not have sufficient intact capability, where there are no IOG flows to meet the exit requirements both now and in the next ten years, as can be seen from the 1-in-20 demand level and the supply/demand scenarios being above the intact line. However, **during a 1-in-20 demand situation we would expect IOG flows onto the network**. As part of the T3 Business Plan process we will assess what investment may be needed to achieve acceptable resilience levels.

The 2030 flow pattern is similar to the 2022 flow pattern, although the range of potential flows has reduced slightly. There is a more pronounced concentration of flow frequencies towards the lower NTS demand levels and fewer flows at the extreme top end of NTS demand levels, whilst zonal demands remain only slightly reduced. The demand changes are believed to be due to the earliest signs of the net zero strategies taking effect.

Figure 28
South East exit heatmap for 2022/23 and 2030/31



2.7 South East (zone 7)

2.7.3 Compressor availability and constraint days

Figure 29 shows that our current intact availability for the South East is very low, primarily due to the low availability of Cambridge and Chelmsford compressor stations. By the end of RIIO-2 the availability improves slightly, although it is still comparatively low when compared to other zones. The South East is therefore an area of priority where investment is required if we wish to consistently reach appropriate levels of capability. Cambridge, Diss and Chelmsford are the stations which require the most improvement, as well as considering areas where high risk assets are in place including single feed pipelines that could represent significant risks to consumers.

Figure 30 shows the expected constraint days in the South East now and at the end of RIIO-2. We can see that there is a slight decrease in expected constraint days from now until the end of RIIO-2, due to the increased availability as a result of asset health work.

Figure 29
South East compressor availability current and end of RIIO-2

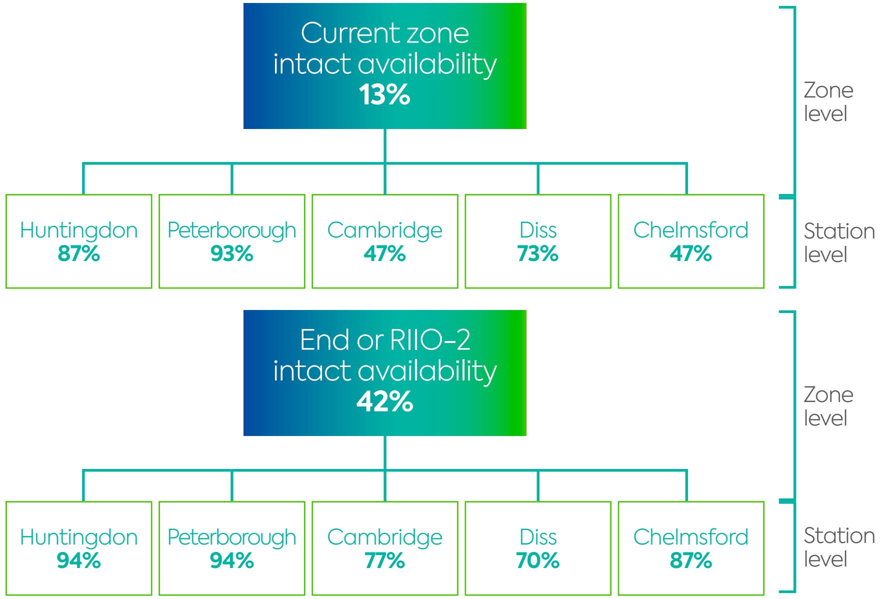


Figure 30
Current and end of RIIO-2 expected constraint days for zone 7

	Constraint days	10th percentile	Expected days	90th percentile
Current resilience	Constraint days with intact capability	0	0	0
	Constraint days with high resilience capability	5	9	13
	Expected constraint days	3.7	6.7	9.6
Resilience expectation end of RIIO-2 period	Constraint days with intact capability	0	1	0
	Constraint days with high resilience capability	6	10	14
	Expected constraint days	3.5	5.8	8.2

2.8 Beyond 2031

2.8.1 Entry 2031 to 2040

Post 2030, only SP[1] preserves similar patterns of exit and entry flows that the 2020s display, figure 31 shows a representative example.

In all scenarios, there is a continual shift away from supply flows from Scotland and the North (see figure 32) towards a greater dependency on supply flows from the south (see figures 33 and 34). This change of flow patterns will likely need to be managed by compressor alterations in order to maintain capability at key sites, as well as considering areas where high risk assets are in place including single feed pipelines. This shift needs to be set against a backdrop of lower forecast national demand volumes in the three net zero scenarios.

Figure 31
North East, SP[1] entry 2022 to 2040

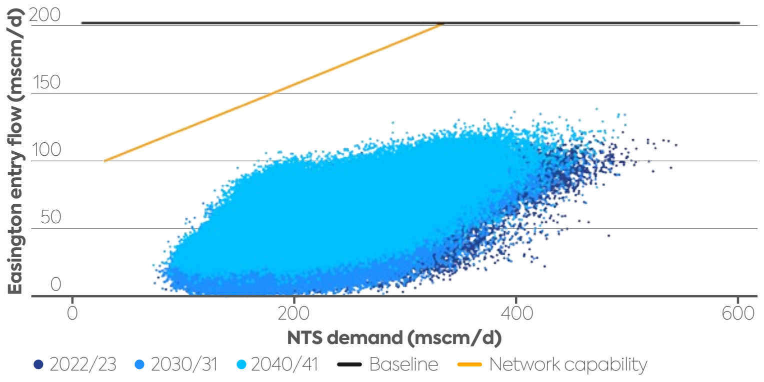
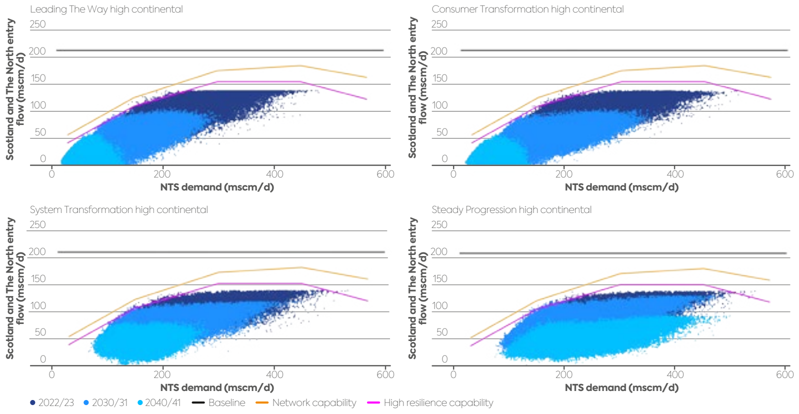


Figure 32
Scotland and the North entry 2022 to 2040



[1] The SP scenario in FES 2021 was re-named to Falling Short (FS) in FES 2022. As we are using the FES 2021 scenario we use SP as opposed to FS.

2.8 Beyond 2031

The development of shale gas, reflected post-2030 in SP[1], may require a future reconfiguration of the network. FES currently has the North West as the main source of this supply. Should shale gas evolve, we will monitor its development so that we better understand the implications for the NTS, enabling us to consider any consequences for network capability and investment.

Figure 33

South East 2022 to 2040

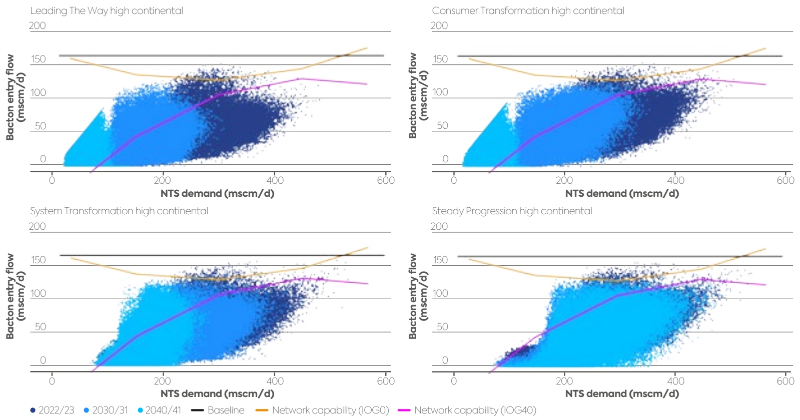
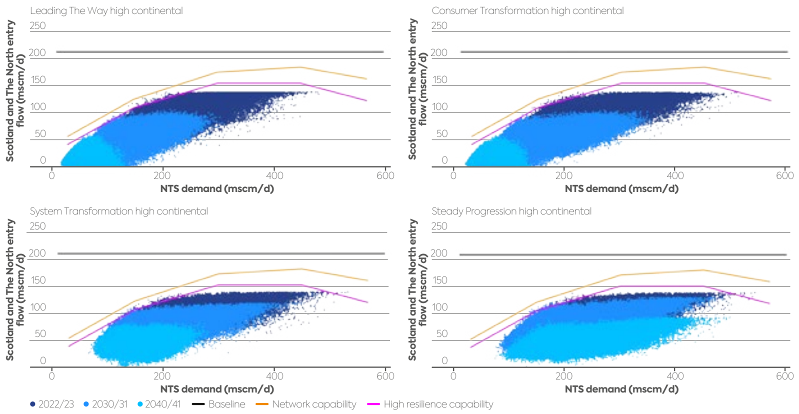


Figure 34

South Wales 2022 to 2040



[1] The SP scenario in FES 2021 was re-named to Falling Short (FS) in FES 2022. As we are using the FES 2021 scenario we use SP as opposed to FS.

2.8 Beyond 2031

2.8.2 Exit 2031 to 2040

The change in exit flows for each of the net zero scenarios (LW, CT and ST) is a reduction in demand, which is a continuation of what is seen in 2022 to 2031. The only non-net zero scenario (SP[1]) shows little variation from today's flows – a result of increased domestic appliance efficiency being offset by population growth. Figure 35 illustrates typical exit flows for 2022 to 2041.

Beyond 2031, there is a marked divergence in the different flows in the four scenarios as each one continues to follow its own specific pathway. This is exacerbated by the uncertain nature of hydrogen deployment, which only starts to ramp up after 2035.

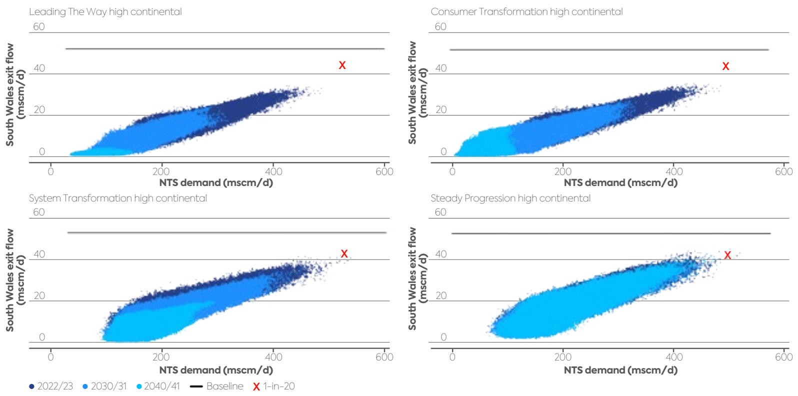
2.8.3 2041 to 2050

By 2050 the flows are expected to be substantially different to those of today. Consequently, the capability lines based on the current asset base will be of little relevance by 2050, with the exception of SP[1] in which demand for gas stays the same but the UKCS continues to decline.

Both LW and CT will have no, or negligible, gas flows. In ST, as the scenario name suggests, the system will be transformed to a network that will primarily support hydrogen dependency using methane reformation, from natural gas and electrolysis. This will need to begin from 2030 to achieve net zero by 2050. The NTS will have to transition to support both hydrogen and natural gas while maintaining system resilience. Much of the natural gas required in this scenario is forecast to be imported through existing terminals.

When, where and how these hydrogen generation processes take place is uncertain. There are a number of projects (in which we are participating) exploring the future of hydrogen that will better inform future analyses (see section 3.2).

Figure 35
Typical example of exit flows for 2022 to 2041



[1] The SP scenario in FES 2021 was re-named to Falling Short (FS) in FES 2022. As we are using the FES 2021 scenario we use SP as opposed to FS.

Development of the Network Capability process and analysis

3.1 Central strategy
3.2 Hydrogen

3.1 Central strategy

For the development of our central compressor strategy, we are examining the impact of the capability of zones 2 and 3 on the entry and exit capabilities of other zones on the NTS.

As seen in the above sections, we anticipate that North East and North West capabilities are sufficient for exit and entry requirements within those zones. However, the results do not reflect the true requirements of the zones within the NTS. Zones 2 and 3 support interzonal flows within the NTS and so can have a significant impact on capabilities in other zones. This is due to the placement of zones 2 and 3 within the NTS, situated between zone 1 (Scotland) where entry flows are typically high, and the more southern zones (zones 4–7) where both supply and exit demands can be high. As a result of their position, the availability levels in these zones are essential to the smooth operation of the NTS and the support of entry and exit capabilities across the NTS.

By changing the way we think about central zones and examining the impact of them on the capabilities of other zones, we hope to be able to gain a more accurate understanding of the resilience of the NTS and examine the effect of potential investment in the area more accurately.

Below, we go over a case study to examine the results of this kind of analysis in the future. We hope to incorporate the result of this development in our resilience analysis and include them on our capability flame charts next year.

3.1.1 Capabilities affected by central compressor methodology

Zonal capabilities influenced by the central units are as follows:

Entry	Exit
Scotland (zone 1)	Wales (zone 4)
North West (zone 2)	East Midlands (zone 5)
North East (zone 3)	South West (zone 6)
	South East (zone 7)

It is assumed that the zones in this table are the only ones affected by central unit availability. We assume this since central compressors will mainly impact how gas moves out of the northern zones, through the country, and down into southern zones. Whilst it is true that each zone has its own influence across the NTS, we believe the central zones have a significant enough impact on the above zones to warrant investigation.

We aim to show the high resilience and intact central capabilities for each of the zones in the above table in the near future. To illustrate this methodology, we have developed a Proof of Concept study for Scotland entry.

3.1 Central strategy

3.1.2 Proof of Concept

We have used previous network analysis which assessed the network entry capability of zone 1 (Scotland) as the basis for the central strategy. Supply was maximised in the northern zones and reduced in the southern zones to understand the maximum supply capability into St. Fergus, Barrow and Teesside. This process was repeated for several different central compressor combinations to understand how unit availability impacts capability to move gas through the country.

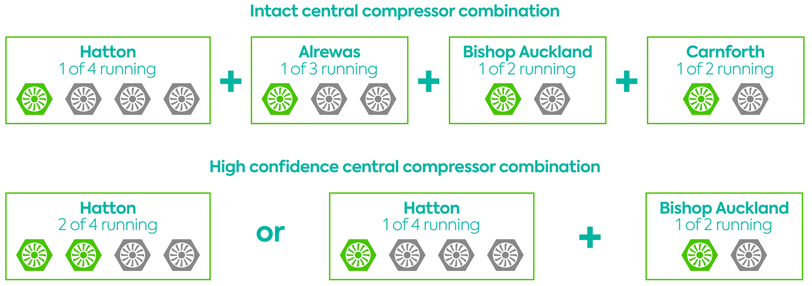
We have applied the following central strategy methodology to this Scotland entry capability analysis to illustrate how the central strategy findings will be applied to estimate constraints associated with central compressor resilience.

We first identified the original intact and high resilience capabilities associated with this zone, based on the resilience analysis in section 1. These are the capability lines which will be impacted by different compressor combinations.

We then performed probabilistic analysis to identify which compressor combination in the central zone offers 99% combined zonal availability (our high resilience capability). This analysis is summarised in figure 36.

The current intact combination has an availability of 61%, and the high resilience availability is 99%.

Figure 36
An example of intact and high resilience compressor combinations



3.1 Central strategy

3.1.3 The impact of the central zone compressors on Scotland and the North entry resilience

Figure 37 shows the current intact and high resilience lines for Scotland and the North. This chart assumes all compression outside of the zone is available. This chart suggests we have sufficient resilience in Scotland with a very low chance of entry constraints to supply in the region.

Figure 38 shows the same chart but this time the high resilience line is based on the impact of the resilience of compression in the central zone (North East and West network capability zones), with all compression in Scotland and the North assumed to be available. Similar to the previous chart it suggests very little chance of entry constraints in the Scotland and the North zone based on the resilience of compression in the central zone alone.

Figure 37
Scotland and the North (zone 1), entry heatmap for 2022/23 combinations

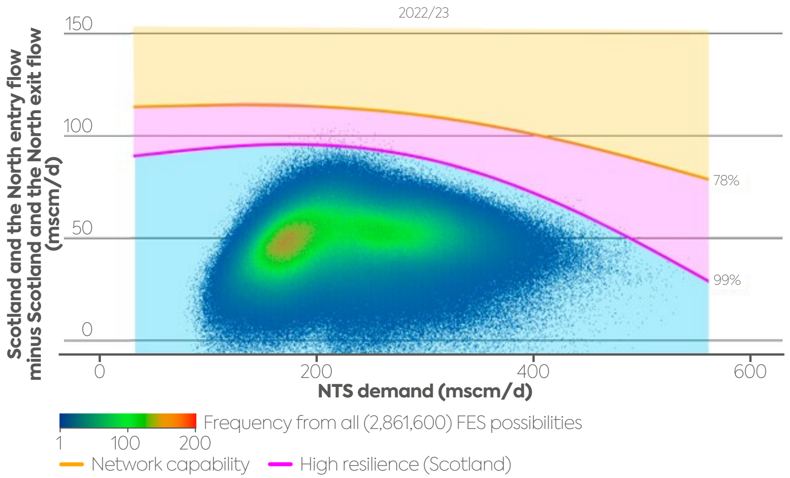
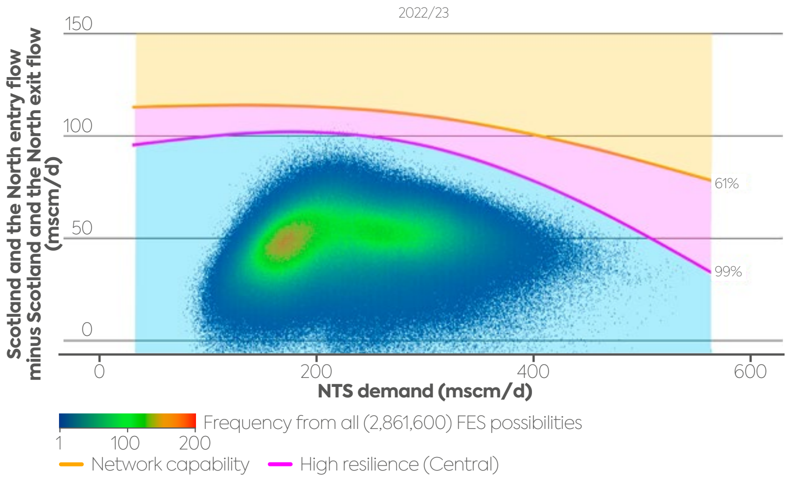


Figure 38
Scotland and the North (zone 1), entry heatmap for 2022/23

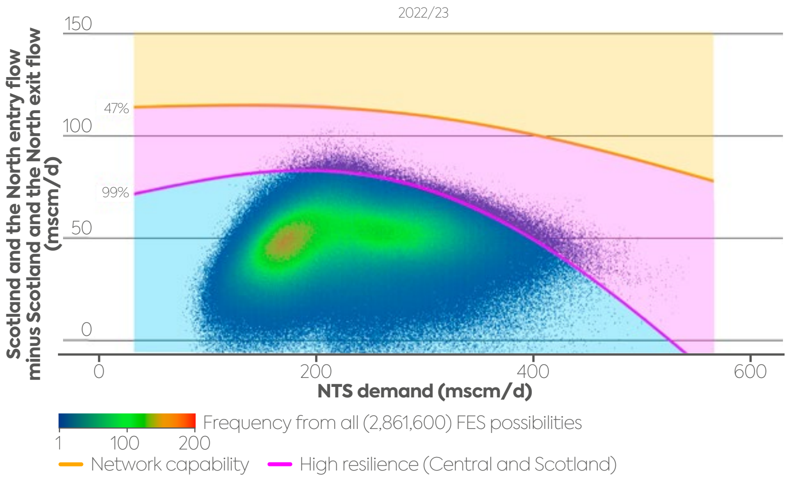


3.1 Central strategy

Once these resilience lines are combined in figure 39 we see that there are a number of scenarios above the high resilience line. These equate to 3 days a year on average so with a 47% chance of achieving the intact capability, based on the availability of compression in Scotland and the central zone, we are at risk of one constraint day per year.

We anticipate a similar impact on other zones on the NTS. By including this in our publications, we are able to better convey that the North East and North West zones, while having considerably less entry and exit constraints than the other zones, still require continuous investment so they can continue to effectively serve their role supporting the resilience and capability of the NTS as a whole.

Figure 39
Scotland and the North (zone 1), entry heatmap for 2022/23



3.2 Hydrogen

Achieving the UK's net zero targets will require decarbonisation across the whole energy system. The importance of the NTS to the UK's current energy supply means that we need to consider how to deliver low carbon energy, reliably and safely to all consumers. Existing research suggests that hydrogen could be an alternative to natural gas, but there are several knowledge gaps that need addressing.

We have been awarded funding through the Network Innovation Competition for our FutureGrid project. This project will look at the possibility of converting parts of the NTS to transport hydrogen and assessing if our current assets are compatible with transporting hydrogen.

Additionally, National Gas Transmission, in collaboration with industry decision makers and stakeholders, is working on the Hydrogen Gas Markets Plan (GMaP). We want to ensure the gas system and markets continue to deliver consumer value throughout the UK's potential transition to a full (100%) hydrogen future.

We believe hydrogen will play an integral role in achieving net zero by 2050, and to support this we're involved in a number of projects that are exploring the transition to hydrogen.

The overarching project, Project Union, is looking into the initial feasibility of this transition to support the Government's hydrogen targets of 10GW by 2030 and ensure Scotland's 2045 and the UK's 2050 net zero targets are met. Projects currently being supported are:

– **Project Union (HyNTS)** – UK hydrogen transmission backbone
– **East Coast Hydrogen** – connection of Teesside to Humber hydrogen hubs initially and further repurposing of the region (including Merseyside hydrogen hub).

A range of modelling scenarios are required to investigate the options available for the introduction of hydrogen into the NTS, whilst understanding the resulting impact:

- Identifying Project Union HyNTS options across a range of supply and demand levels:
  - What is the optimal route?
  - Repurposing of current assets
- Where repurpose isn't possible, what is the preferred asset solution?
  - Working with Gas Distribution Networks (GDNs) to understand their intent to convert from methane to hydrogen.
- ANCAR assessment:
  - What is the impact on our current network capability assessment?
  - Does the level of risk change and, if so, how?
- Security of supply impact:
  - Ensuring security of supply of the methane network as a key principle
  - Maintaining current levels of risk on the NTS.
- Operability impact on NTS:
  - When can the transition to hydrogen begin?

3.2 Hydrogen

3.2.1 Project Union

The network modelling principles used to deliver Project Union will be the same as current network modelling obligations, rules and tools. Figure 40 gives a summary of Project Union's ultimate aim for hydrogen high pressure feeders, some of which will be repurposed NTS lines and others new build. To achieve the required objectives, whilst highlighting any additional risks and opportunities, our network modelling will go through a range of scenarios and iterations working with GDNs and other stakeholders including governing bodies to ensure a 'one system approach' solution.

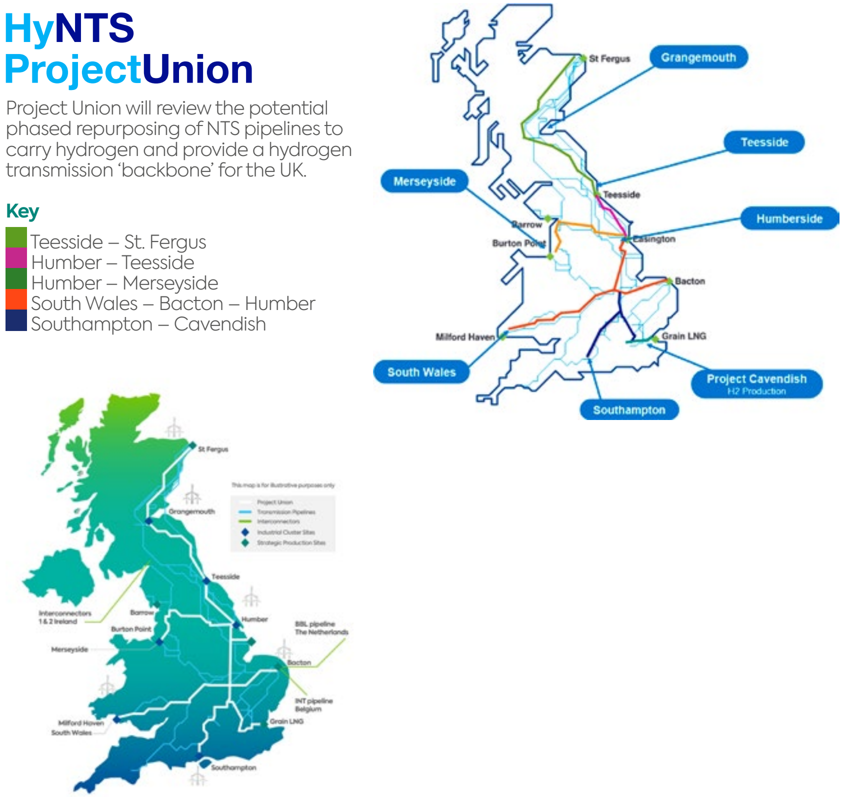
Additionally, we are developing our current suite of modelling tools to increase their functionality to better inform stakeholders and to input into forthcoming business decisions. This will enable us to find the optimal solution for the introduction of hydrogen alongside methane.

In December 2022, National Gas Transmission submitted a net zero pre-construction work and small project (NZASP) reopener submission for Project Union's Feasibility Phase. The Feasibility Phase has three key deliverables:

1. Pre-front end engineering and 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.
2. A 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.
3. Hydrogen market enabling activities (HMEAs) including development of options for the design of regulatory and commercial frameworks for hydrogen infrastructure and ongoing customer and stakeholder engagement.

Following Ofgem's consultation period, they have awarded funding of a total amount of £5.626m under the NZASP re-opener to carry out Project Union's Feasibility Phase.

Figure 40
Project Union map (a combination of repurposed and new build pipeline)



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, includes such things as compressors, pipelines, flow valves and regulators.

Commercial actions
Actions taken to balance the NTS, such as buying and selling gas either nationally or locally.

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.

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.

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.

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.

Intact capability
All compressors are available and reliable.

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.

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.

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

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.

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

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-2 Business Plan/Business Plan
RIIO (Revenue = Incentives + Innovation + Outputs) is a price control mechanism that is set by Ofgem. The RIIO-2 period is 2021 to 2026.

T3 plan
The planning process for RIIO-3 (Revenue = Incentives + Innovation + Outputs) which covers the period 2026 to 2031.

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

Unit-level values/availability
The unit availability for the current year is based on actual historic performance, and the end of RIIO-2 values are based on the RAM study findings and the planned investments during RIIO-2.

Legal notice

National Gas has prepared this outlook document in good faith, and has endeavoured to prepare this outlook document in a manner which is, as far as reasonably possible, objective, using information collected and compiled by National Gas from users of the gas transportation, together with its own forecasts of the future development of those systems.

While National Gas has not sought to mislead any person as to the contents of this outlook document and whilst such content represents our best views as at the time of publication, readers of this document should not place any reliance on the contents of this outlook document.

The contents of this outlook document must be considered as illustrative only and no warranty can be or is made as to the accuracy and completeness of such contents, nor shall anything within this outlook document constitute an offer capable of acceptance or form the basis of any contract.

Other than in the event of fraudulent misstatement or fraudulent misrepresentation, National Gas does not accept any responsibility for any use which is made of the information contained within this outlook document.

Copyright

National Gas Transmission plc
National Grid House,
Gallows Hill, Warwick.
CV34 6DA United Kingdom
Registered in England
and Wales No. 2006000

www.nationalgas.com