Gas Network Capability Needs Report

December 2024

NESO
National Energy System Operator

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Foreword

Great Britain's (GB) energy system is undergoing a major transformation to achieve net zero, which requires a change to the way we operate the system today. The National Energy System Operator, NESO, is an independent, public corporation at the centre of the energy system taking a whole system view to create a world where everyone has access to reliable, clean and affordable energy.

Working in partnership with Government, Ofgem, industry and consumers, we take a long-term approach to planning that identifies whole energy system needs and ensures that the system can be designed and built accordingly. The Department for Energy Security and Net Zero (DESNZ) defines the policy, regulatory, and market frameworks for GB's energy sector. Recognising the importance of achieving net zero, DESNZ and Ofgem emphasise the need for coordinated expert advice and comprehensive planning across both gas and electricity sectors, including hydrogen, carbon capture and storage (CCS), and other technologies. Consequently, the National Grid Electricity System Operator (ESO) has transformed into NESO, an independent and impartial public body responsible for advising the government on the entire energy system. Our role involves strategic network planning across electricity, gas, and new vectors such as hydrogen, adopting a holistic approach to decarbonising the whole energy system. As the whole system energy operator, NESO now serves as GB's gas network planner, with specific obligations outlined in the gas planner licence. This inaugural Gas Network Capability Needs Report (GNCNR) is one of our first publications under these new obligations. It is a crucial component in our mission to plan for and achieve net zero while ensuring security of supply and delivering an efficient and affordable energy system.

In this report, we examine the gas network's capability to meet current and future requirements. Our analysis indicates that the National Transmission System (NTS) has sufficient capability to continue operating safely. We look forward to collaborating with industry, the Government, Ofgem, and our stakeholders and customers to build on our whole system analysis and insights, fulfilling our critical role for society and the economy.

Julian Leslie
Director of Strategic Energy Planning
& Chief Engineer

Executive summary

Context

Through the publication of the GNCNR, we, as NESO, are providing our first independent view of the NTS's capability to meet GB current and future network requirements.

The findings within the report will be used by National Gas Transmission (NGT) to propose network reinforcement options in the Strategic Planning Options Proposal (SPOP). Subsequently, NESO will evaluate any proposed reinforcement options and create a Gas Options Advice Document (GOAD) by the end of 2025. This two-yearly cycle will allow for gas network capability needs to be identified and network reinforcement options to be developed and assessed.

The GNCNR represents a stepping-stone towards building a whole system Centralised Strategic Network Plan (CSNP), which will set out a coordinated, multi-vector approach to long-term network planning across GB that will accelerate the development of the Government's net zero ambitions.

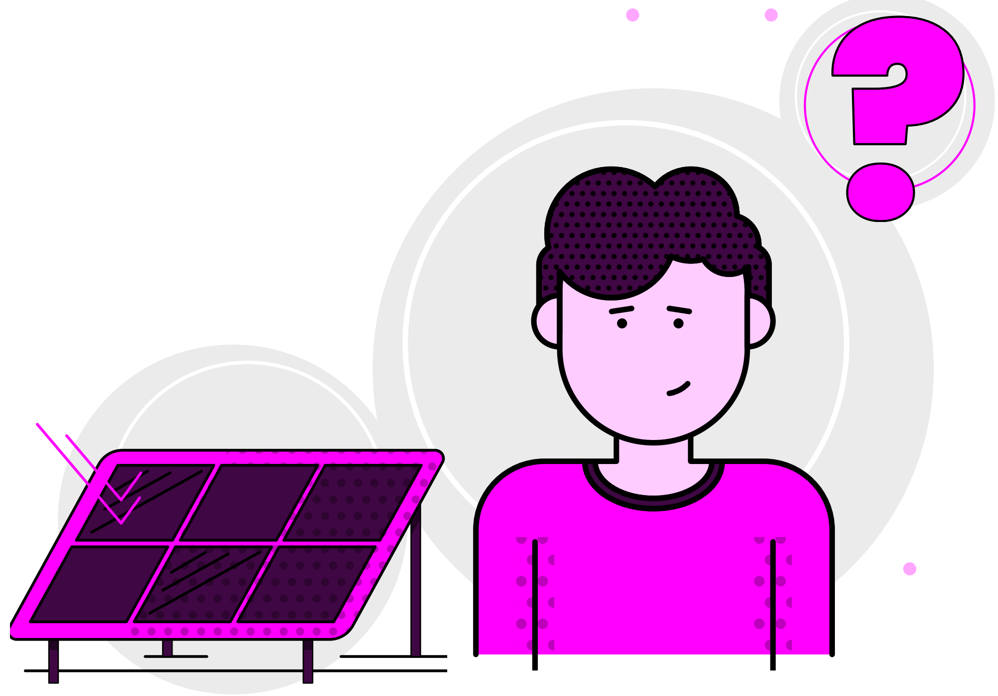
Following a commission from the Secretary of State for Energy Security and Net Zero, NESO has also prepared advice to explore how GB could achieve a Clean Power electricity system by 2030 ('Clean Power 2030', or CP2030). The CP2030 analysis has also assessed the ability for the gas system to provide the flexibility required to ensure adequate security of supply.

Methodology

The analysis of the physical capability of the NTS has been carried out using the Future Energy Scenarios (FES) 2024, with three net zero pathways and a Counterfactual.

In order to determine the NTS capability needs, a 'probabilistic range' of supply and demand was developed by taking into account uncertainties such as weather, day of the week, and historical data. We developed and consulted on our proposed methodology during summer 2024, and it reflects a similar methodology developed by NGT to prepare its June 2024 Annual Network Capability Assessment Report (ANCAR).

We have engaged during the development of this and our CP2030 analysis. Stakeholders highlighted the need for the gas network to remain reliable and highlighted the importance that the gas networks components – in particular its compressors – be available. The resilience of these gas network components has been considered in our analysis.



Key findings

The main findings of the report are:

01

For everywhere except for South Wales, the probability of network constraints remains very low over the next 10 years.

02

Our analysis suggests that there will be an increased probability of constraints at the Milford Haven terminal in South Wales, because of a potential increase in liquefied natural gas (LNG) imports at low (summer) demand levels. We do not anticipate that such constraints would impact NGT's ability to comply with its network safety or capacity obligations.

03

Beyond 2035, the energy system is faced with increasing uncertainty because of the evolving dynamics of technology, policy, market forces, and societal expectations. Due to the high degree of ambiguity and complexity, there is a further emphasis on the importance of strategic energy planning and adopting a holistic approach to ensure we address net zero and security of supply in the most efficient and economical way.

Conclusions

We conclude that the NTS has sufficient capability to allow for the safe operation of the network over the next decade. A forecast increase in LNG imports, in particular at Milford Haven in South Wales, drives an increase in the probability of constraints materialising on the network. We invite NGT to consider options for managing these constraints in their forthcoming SPOP.

We invite our stakeholders to provide comments and feedback, as we continue to analyse and provide strategic planning for the future of the gas transmission network. We encourage collaboration and coordination across the energy sector to ensure that the views of our valued stakeholders and customers are reflected within our assessment.

Introduction

NESO is required by its licence to produce the GNCNR, and it is intended to be an integral part of planning GB's NTS.

The NTS network planning process involves ongoing collaboration with NGT in assessing the capability of the NTS and will require NESO to consider any options presented by them to address any capability needs. Capability is defined as the amount of physical gas that can enter or exit the NTS into or out of a series of geographical zones, known as 'RIIO Zones'. Both the zonal concept and the specific construction of the zones were introduced by Ofgem and NGT as part of the business planning process and has been used in historical publications of NGT's ANCAR.

When the NTS has insufficient entry capability (known as an 'entry constraint'), gas cannot enter the pipelines to meet the flow nominations that are in line with the capacity already sold. NGT may choose to manage these situations commercially. The GNCNR has been designed to examine the probability of these constraints – both for network entry and network exit.

The capability assessment is carried out against different future supply and demand scenarios, derived from FES 2024 data. FES pathways are widely used by industries in their business planning. FES 2024 consists of three net zero pathways (Holistic Transition, Electric Engagement and Hydrogen Evolution), and the Counterfactual, which does not meet net zero. In our analysis, we have separated the Counterfactual from the three net zero pathways, aiming to provide a clearer picture to industry of the possible trajectories of future gas supply and demand, and the associated requirements for network capability.

Primary conclusions

Primary findings from this year's GNCNR are:

01

For everywhere except for South Wales, the probability of network constraints remains very low over the next 10 years.

02

Our analysis suggests that there will be an increased probability of constraints at the Milford Haven terminal in South Wales, because of a potential increase in liquefied natural gas (LNG) imports at low (summer) demand levels. We do not anticipate that such constraints would impact NGT's ability to comply with its network safety or capacity obligations.

03

Beyond 2035, the energy system is faced with increasing uncertainty because of the evolving dynamics of technology, policy, market forces, and societal expectations. Due to the high degree of ambiguity and complexity, there is a further emphasis on the importance of strategic energy planning and adopting a holistic approach to ensure we address net zero and security of supply in the most efficient and economical way.

We conclude that the NTS has sufficient capability to allow for the safe operation of the network over the next decade. A forecast increase in LNG imports, in particular at Milford Haven in South Wales, drives an increase in the probability of constraints materialising on the network. We invite NGT to consider options for managing these constraints in their forthcoming SPOP.

Clean Power 2030

Whilst not the primary focus of our capability analysis, in addition to these primary conclusions, from our CP2030 analysis we have shown that the NTS is physically capable of providing the flexibility that may be required by the gas-fired electricity generation fleet, subject to the availability and reliability of its compressor fleet.

Stakeholder engagement

Whilst the GNCNR is largely of specific technical interest within the gas industry, stakeholder engagement is a vital part of NESO's ways of working because it is essential that we reflect the views of wider society in our analysis.

We have identified a range of stakeholders that have varying levels of interest in this report. As we have carried out our analysis and developed the GNCNR, we have engaged with them in accordance with their respective interest. To facilitate effective engagement, we have grouped the stakeholders and interacted with them as follows:

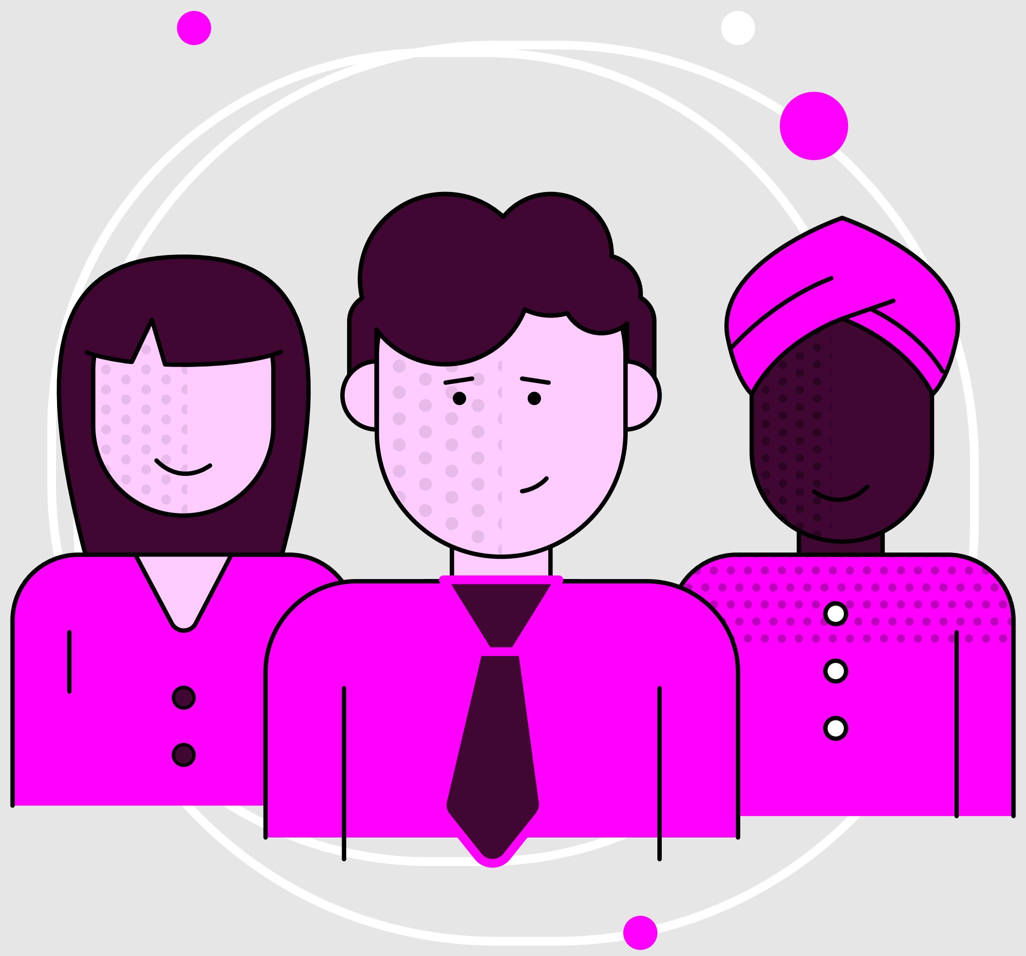
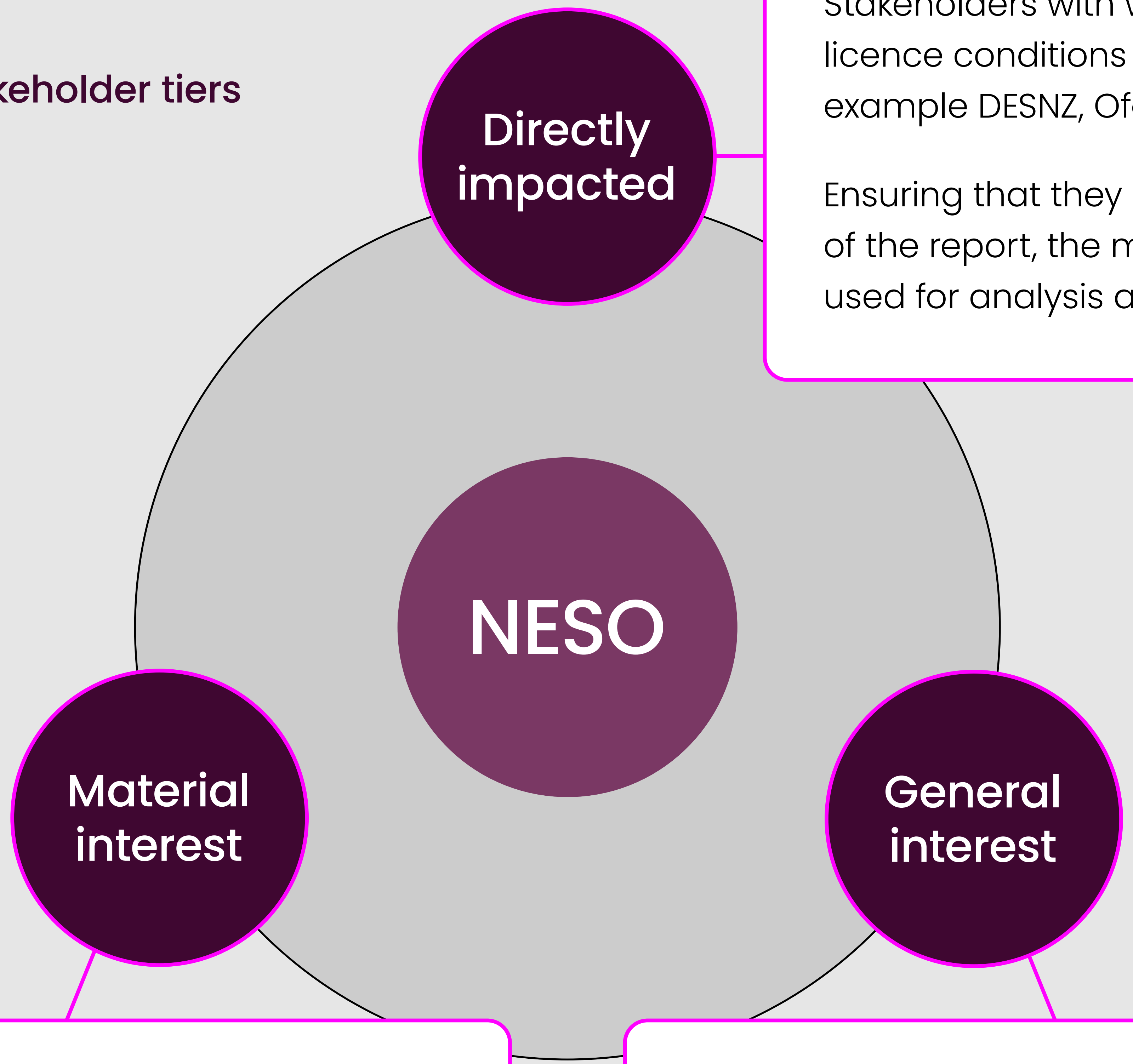


Figure 1: Stakeholder tiers



Stakeholders with whom we have specific licence conditions or policy implications, for example DESNZ, Ofgem.

Ensuring that they are aware of the direction of the report, the methodology that is being used for analysis and the various draft stages.

Industry participants that are likely to have material interest and involvement in the network planning process, for example NGT and Gas Distribution Networks (GDNs).

Enabling these key stakeholders to understand how the work is being conducted and the important elements that the final report might include.

All other stakeholders that have expressed an interest in being kept informed about our analysis, for example trade associations and academic bodies.

Keep them informed of the contents due to be made public to ensure awareness of the analysis outcomes.

Gas network planning

NESO has been established as part of the plan to decarbonise GB. As we transitioned from being the Electricity System Operator to the independent system operator and planner, our responsibilities around energy planning have evolved. We are taking a broader approach that considers energy needs at national and regional levels, and across different types of energy such as electricity, gas, and hydrogen.

One of our new responsibilities in accelerating the progress to net zero, is to take a strategic long-term approach in planning, identifying whole energy system needs and ensuring that the system can be designed and built accordingly.

This work will be underpinned by NESO's primary duties.

Our Primary Duties

NESO will promote the following three objectives:

Net Zero

Enabling the Government to deliver on its legally binding emissions targets.

Efficiency & Economy

Promoting efficient, co-ordinated and economical systems for electricity and gas.

Security of Supply

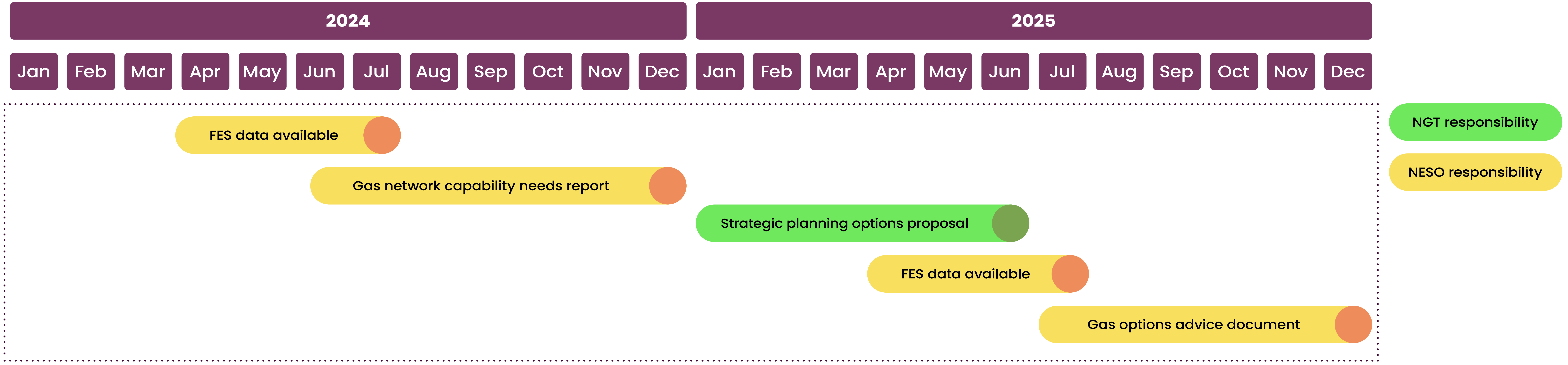
Ensuring security of supply for current and future customers of electricity and gases.

NESO is responsible for delivering the CSNP, which entails an independent and coordinated approach to long-term network planning across GB. This strategic network plan supports the Government's net zero ambitions by providing a collection of comprehensive whole energy network plans. These plans will focus on electricity transmission network planning, while also incorporating advancements in natural gas transmission and hydrogen infrastructure.

Ahead of the first CSNP being developed, we are responsible for producing a GNCNR. This responsibility is outlined in NESO's licence, specifically in Annex G, which contains the licence conditions for the gas system planner licence. Within Annex G, condition C8 relates to gas strategic network planning and specifies the conditions for us to prepare a GNCNR every two years. We are required to present our view of the physical capability of, and system needs for the NTS. This first GNCNR outlines the network capability of the NTS in relation to the natural gas supply and demand from the FES pathways. Our CSNP obligation is set out in condition C12 of our gas system planner licence.

Based on the GNCNR, NGT will develop a SPOP. NESO will then review and report on any options presented by NGT in a GOAD, which will be published in 2025. This process has been designed to be on a collaborative two-yearly cycle to identify network capability needs leading to the development and assessment of network reinforcement options. Figure 2 illustrates the timeframe set out for this process.

Figure 2: Network assessment two-year cycle



Methodology

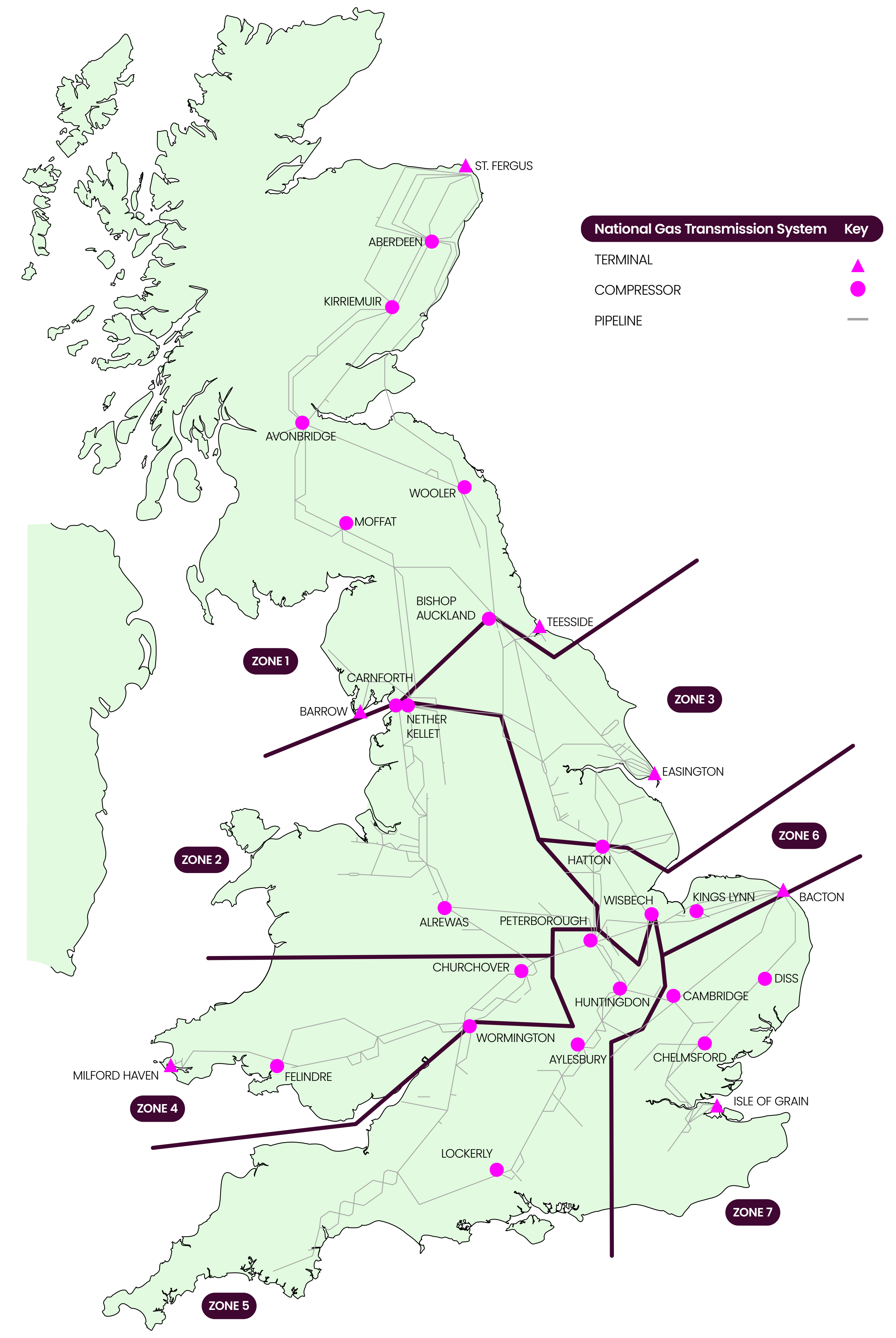
We have developed a methodology for undertaking the analysis that underpins the GNCNR. This methodology sets out how we analyse the flow characteristics of the NTS across a range of supply and demand forecasts and scenarios, while considering a variety of asset availabilities.

We utilise hydraulic modelling software to assess current and future network planning requirements of the NTS. To simplify communication of the capability of the NTS, it is divided into a series of seven 'RIIO Zones'.

Both the zonal concept and the construction of the zones were introduced by Ofgem and NGT as part of the 'Revenue = Incentives + Innovation + Outputs' (RIIO) business planning process and was used in historical publications of NGT's ANCAR. Each zone has distinctive gas flow requirements and characteristics. The seven RIIO Zones are referred to as:

- Zone 1 - **Scotland and the North**
- Zone 2 - **North West**
- Zone 3 - **North East**
- Zone 4 - **South Wales**
- Zone 5 - **South West**
- Zone 6 - **East Midlands**
- Zone 7 - **South East**

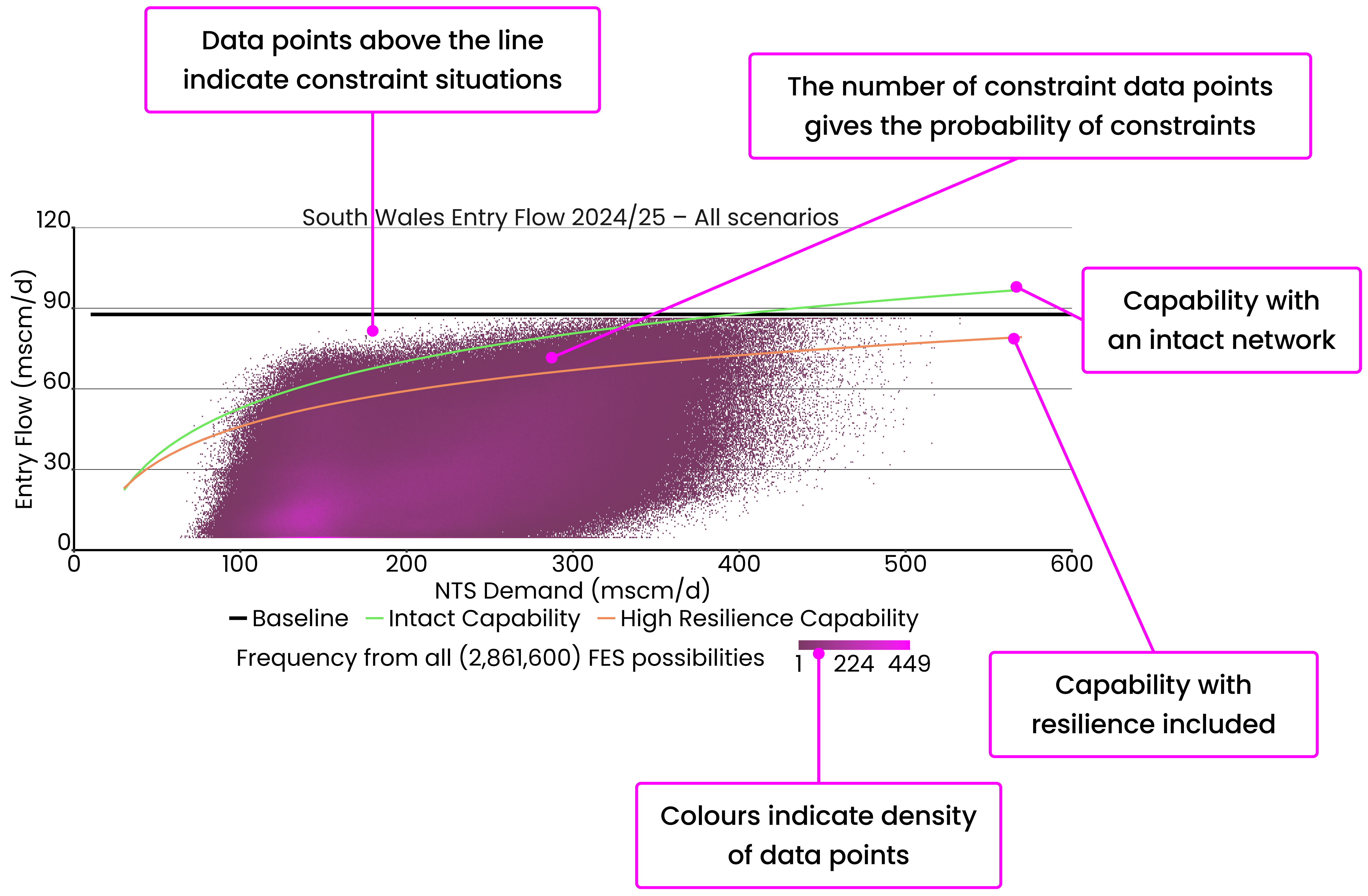
Figure 3: **RIIO Zone map**



Gas is delivered to the NTS via entry points which comprise terminals and storage sites. Exit points are above ground installations known as offtakes connected to the NTS where the gas leaves the network. These are mostly lower pressure gas distribution networks that supply mainly homes and businesses. However, there are some large industrial users directly connected to the NTS such as power stations, energy-intensive industry, gas storage sites and interconnectors.

Entry		Exit	
RIIO Zone	NTS Area	RIIO Zone	NTS Area
1	Scotland and the North	1	Scotland and the North
2	North West	4	South Wales
3	North East	5	South West
4	South Wales	6	East Midlands
7	South East	7	South East

Figure 4: Flame chart explanation



To visualise the capability of the NTS we include different sets of information on a figure referred to as a 'flame chart'. The information includes a large series of supply and demand forecasts (shown as individual points with different colours representing the density of points), two curves that describe the physical capability of the network, a line which represents 'baseline entry' or 'baseline exit' capacity[1], and a point representing a peak day demand forecast.

Looking at the flame chart in figure 4 there are several data points which are above the capability line. The number of data points above the line compared to the total number of data points in the chart shows the probability of the constraint. In this example, the number of points above the intact capability line can be compared to the 2.8 million points on the whole chart, implying there would be two constraint days (out of 365) for gas year[2] 2024/25.

NGT is also required to plan and develop the NTS such that it meets the 1-in-20 peak day. The 1-in-20 peak day demand is the demand, in a long series of winters, at connected loads held at the levels appropriate to the winter in question that would be exceeded in one out of 20 winters, each winter being counted only once. It is more specifically defined in NGT's licence and described in the Gas Demand Forecasting Methodology[3].

FES 2024 includes pathways that are used to provide three distinct views of supply and demand in GB up to 2050 which are consistent with achieving a net zero economy. FES 2024 also includes the 'Counterfactual' scenario which does not meet net zero by 2050. For each view, including the Counterfactual, a 'probabilistic range' of supply and demand is developed which takes into account uncertainties such as weather, day of the week, and historical data. This probabilistic range is used to assess the NTS capability needs.

The flame charts illustrate our analysis of the capability needs under two different sets of assumptions: an 'intact network' – which assumes all compressors are available, and a 'high resilience' condition, where some compressors are unavailable. This is described in more detail in the next section. A capability curve for each zone is derived from network analysis undertaken across a range of different national demand levels.

More detail on how we run the analysis can be found in the latest GNCNR methodology document available at: neso.energy/what-we-do/strategic-planning/gas-network-capability-needs-report

1 Capacity 'baselines' are specified in NGT's gas transmission licence.
2 In this document, years are specified as in 'gas years', which are years commencing 1 October.
3 National Grid, Gas Demand Forecasting Methodology, 2020, pp 38 - 39, available at: nationalgas.com

About resilience

As previously described, NESO assesses the physical capability of the NTS and how it compares with future network requirements. An intact capability is calculated based on an assumption that all compressor stations and other operational equipment are fully available for use.

It is not always possible to achieve intact capability because one or more compressor units may be unavailable at any given time. There are a variety of reasons for this, which could include planned and unplanned maintenance or other asset health-based interventions. To understand the impact of lowered availability, 'high resilience' capability analysis is carried out to reassess the network's capabilities.

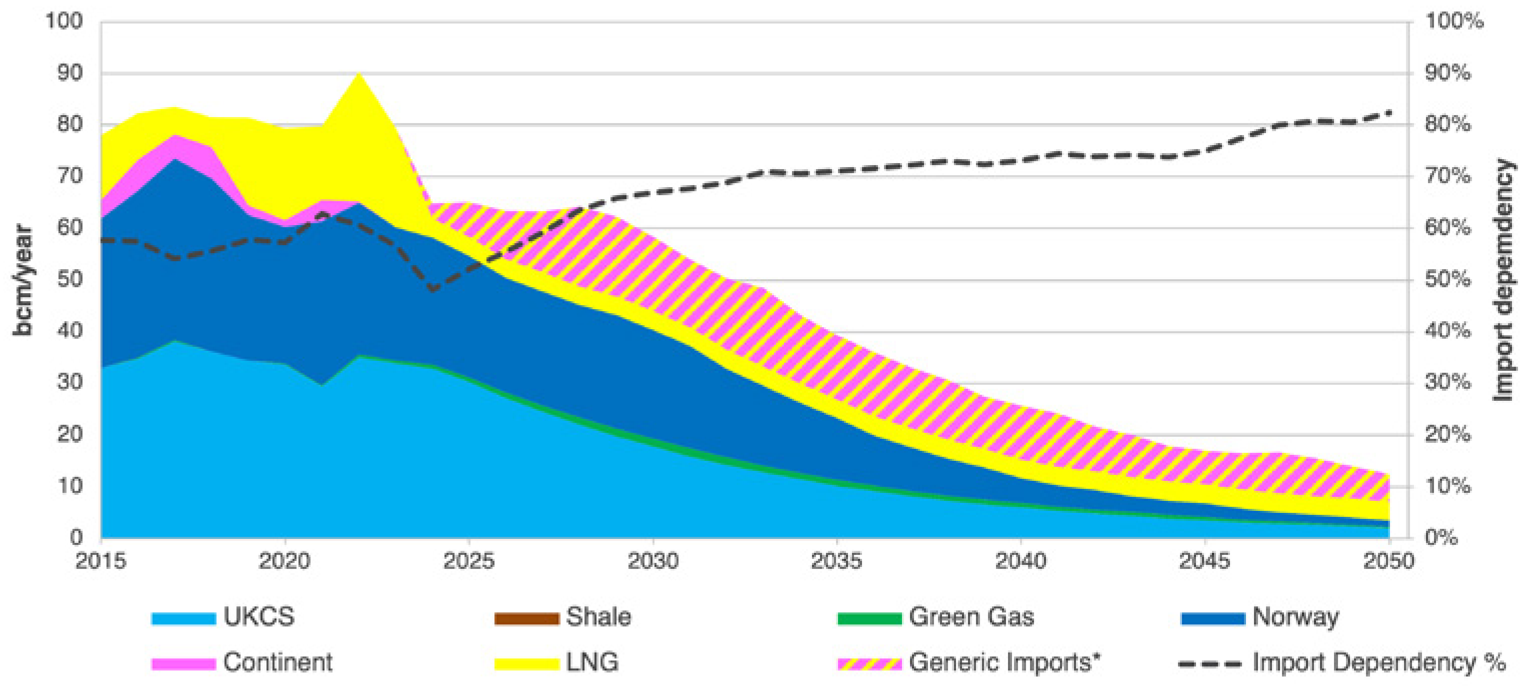
High resilience analysis is focused on the availability of the set of compressor stations that are particularly relevant for providing capability to a specific zone (it is not limited to compressors within the zone). The high resilience analysis only uses a mix of compressors within each set that is available at least 99% of the time, based on historical or projected availabilities.

Network capability up to 2035

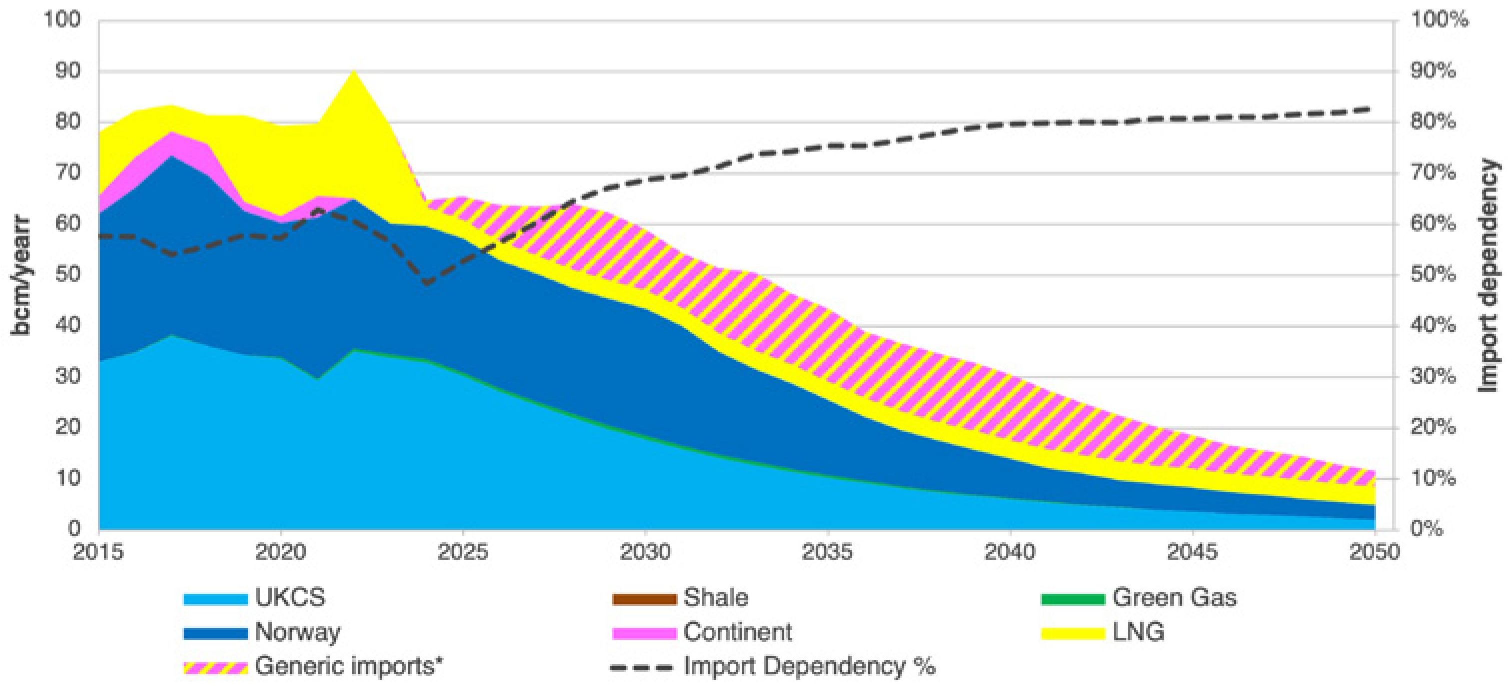
In this section we discuss analysis results for each RIIO Zone. The analysis covers entry and exit capability for both intact and high resilience conditions. The results will be shown in current gas year (2024/25), 5 years ahead (2029/30) and 10 years ahead (2034/35) as per the licence condition obligation. The analysis has been carried out against different future supply and demand scenarios, derived from FES 2024, together with consideration of GDN flexible capacity requirements, power generation flexibility (CCGT within-day profiling), and supply profiling[4]. For this analysis we have combined the three FES 2024 net zero pathways. The Counterfactual has been used in our assessment, as the results will mitigate the risk of a slower than expected transition to net zero. These results will be presented separately.

Figure 5: Annual gas supply and import dependency

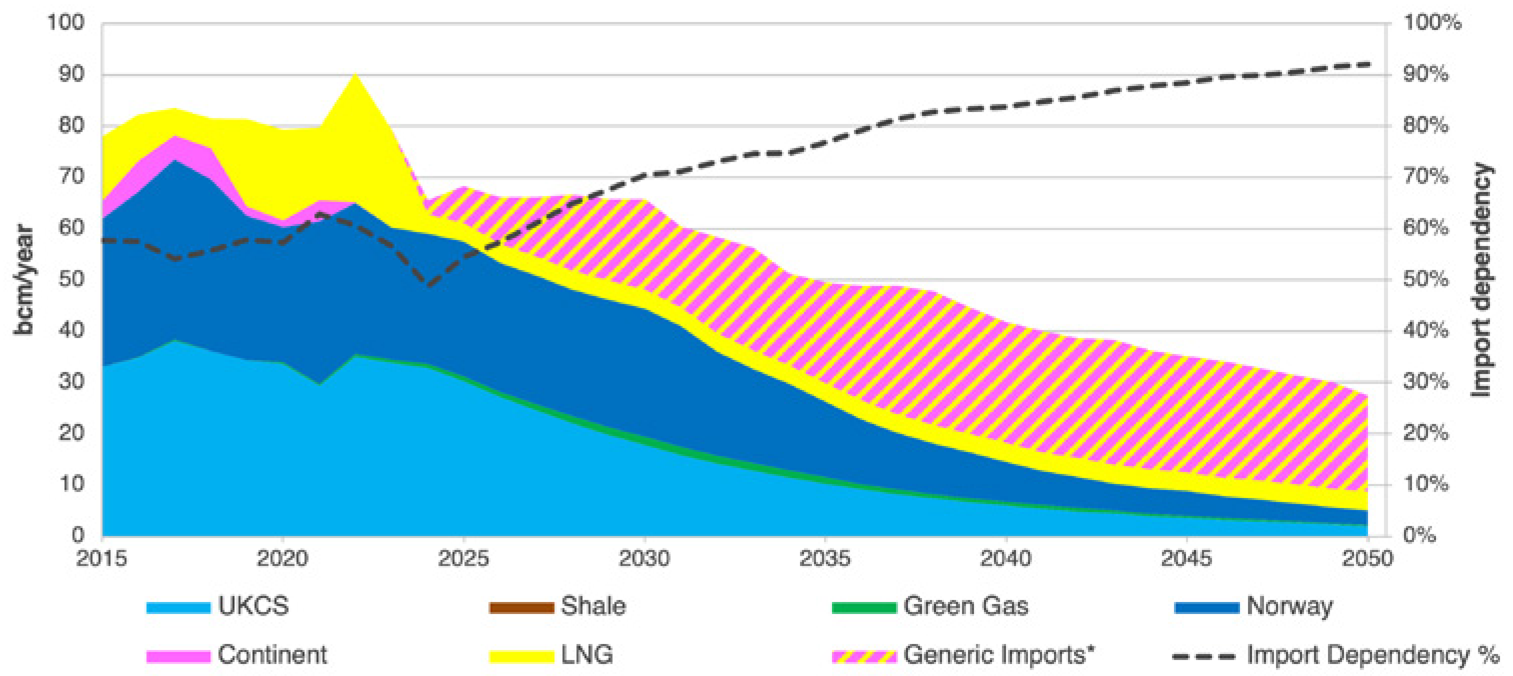
Holistic Transition



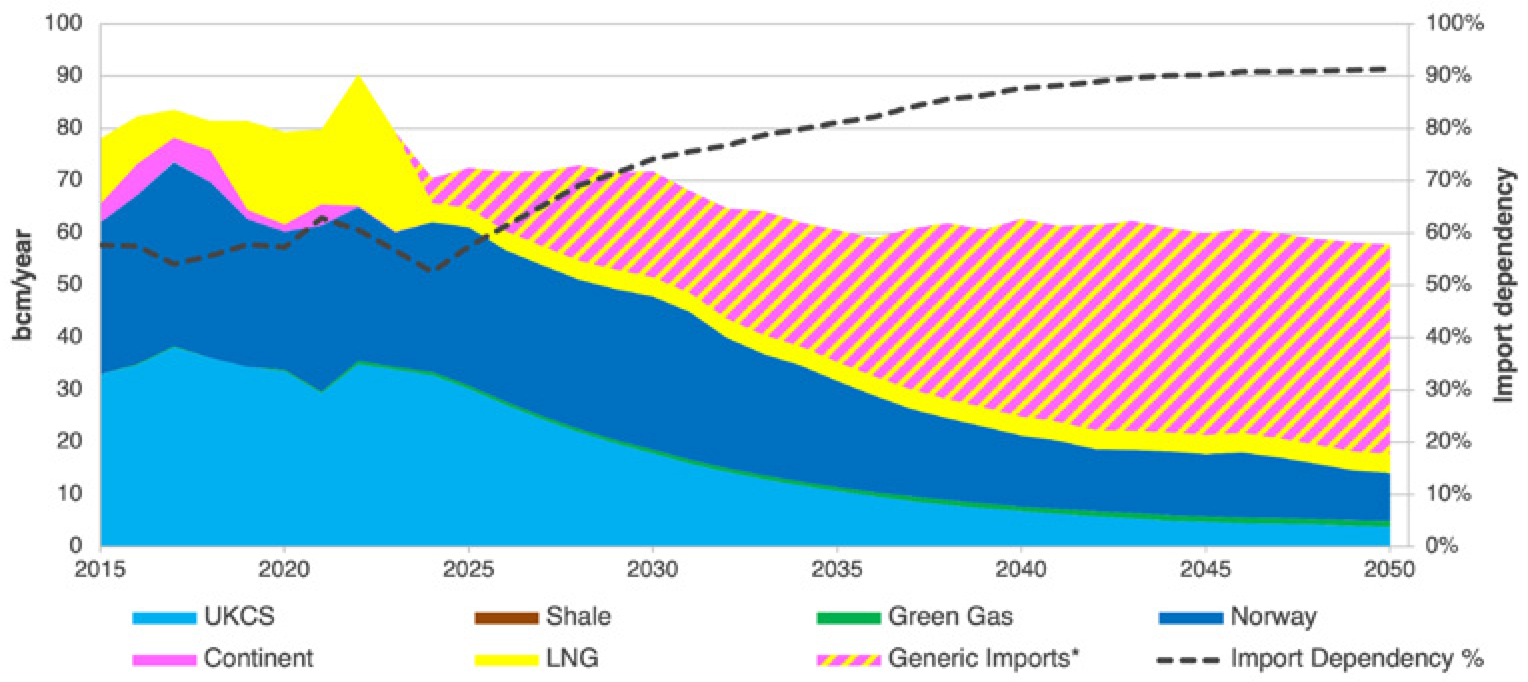
Electric Engagement



Hydrogen Evolution



Counterfactual

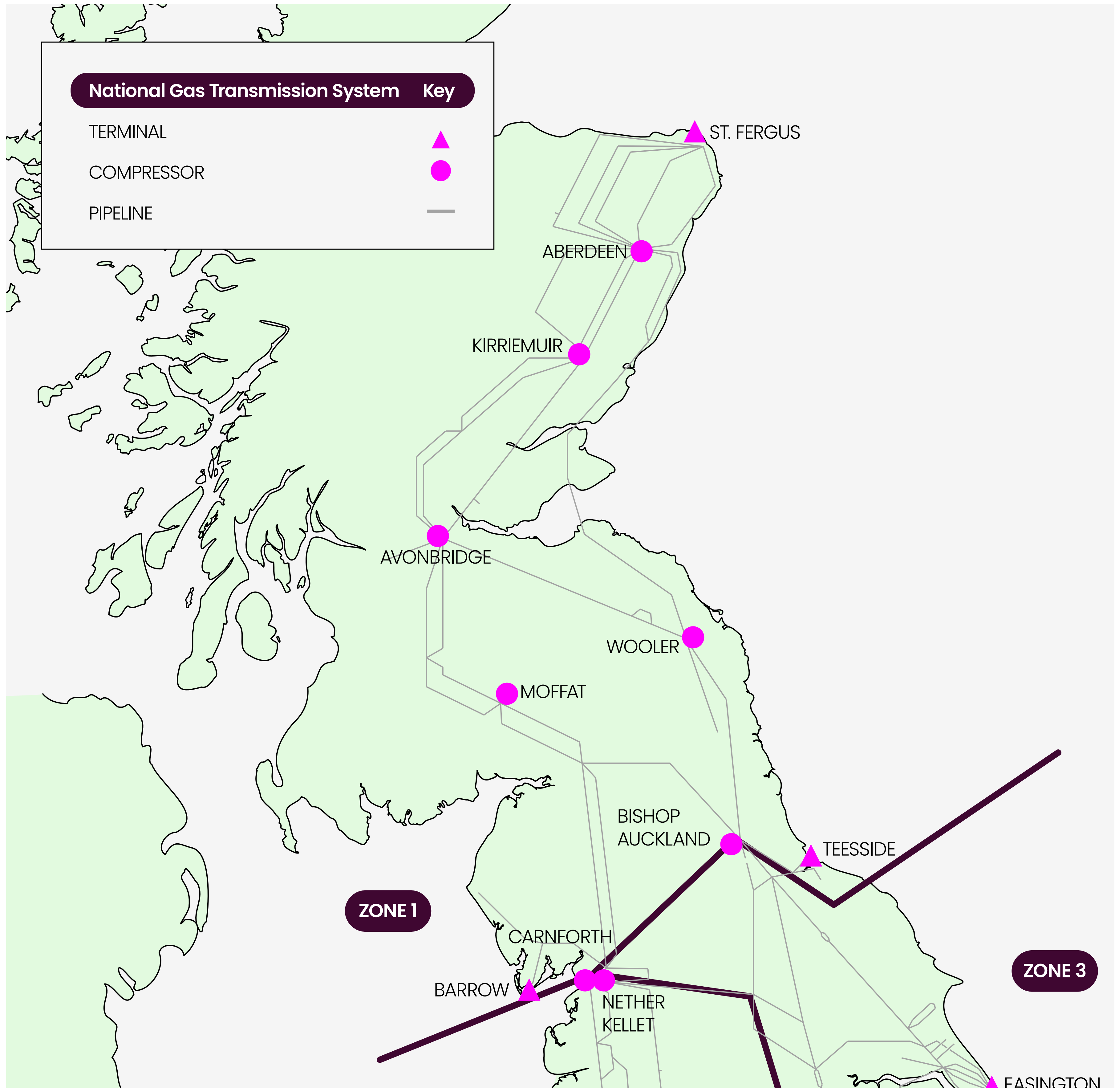


** Generic imports refers to LNG and/or imports from the continent*

4 National Gas Transmission, Transmission Planning Code, 2023, pp 63-65, available at: nationalgas.com

RIIO Zone 1 (Scotland and the North)

Figure 6: **Scotland and the North (Zone 1) map**



Introduction

RIIO Zone 1 covers all areas of Scotland and part of the North of England. The key assets that impact RIIO Zone 1's capability include compressors at Aberdeen, Kirriemuir, Avonbridge, Wooler, as well as the supply terminals at St Fergus, Teesside, and Barrow. Central Zone compressors such as Nether Kellet, Carnforth and Bishop Auckland also play an important role in supporting the entry capability. The zone also contains the Moffat interconnector, with export capability to Northern Ireland and the Republic of Ireland.

The zone primarily supports the bulk movement of gas from north to south, transporting gas from northern North Sea continental shelves of the UK and Norway to other regions of GB.

RIIO Zone 1 summary

- The network has sufficient capability to meet RIIO Zone 1 entry and exit requirements for the current year, as well as 5 years and 10 years ahead, under both the FES 2024 net zero pathways and the Counterfactual.
- With the central compressor resilience considered, there is sufficient capability to meet Zone 1 entry requirements for the current year, as well as 5 years and 10 years ahead under both the FES 2024 net zero pathways and the Counterfactual.
- In the St Fergus supply sensitivity for Zone 1, we assessed exit capability by using a range of flows from St Fergus terminal into the zone. In this sensitivity, the network has sufficient capability to meet the exit requirements for 5 years and 10 years ahead under the FES 2024 net zero pathways and Counterfactual.

RIIO Zone 1 (Scotland and the North)

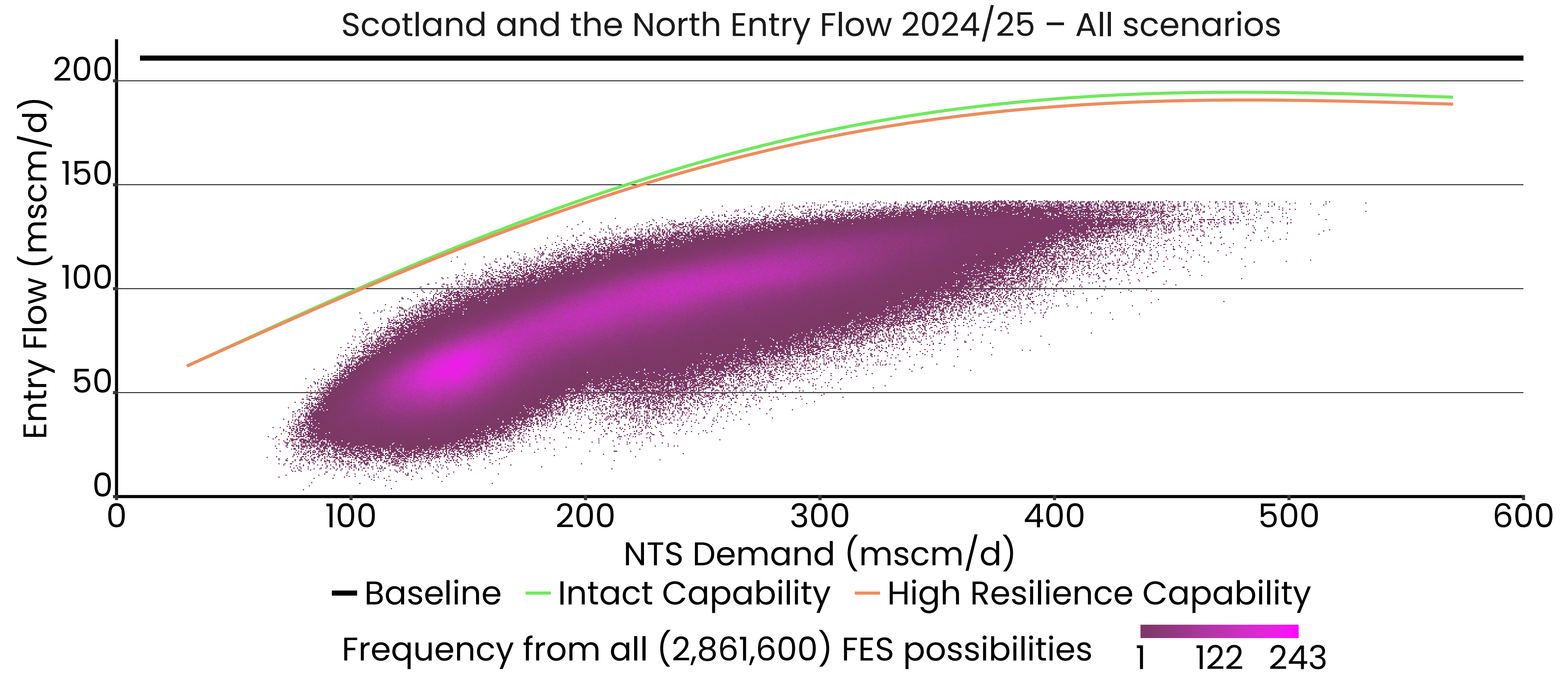
RIIO Zone 1 entry

As shown in Figure 7, both the intact network capability and high resilience capability curves for the zone are above the expected entry flows, indicating that there is sufficient capability to meet entry requirements within the zone for the current year, as well as 5 years and 10 years ahead.

Flame charts in Figure 7 also show a decrease in Zone 1 entry flows in the next 5 years and 10 years. This is consistent with the forecast decline in the production of gas from the UK Continental Shelf (UKCS). There are no constraint days expected in the zone under either intact or high resilience scenarios.

Constraint days – RIIO Zone 1 entry						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 7: Scotland and the North (Zone 1) entry flame charts



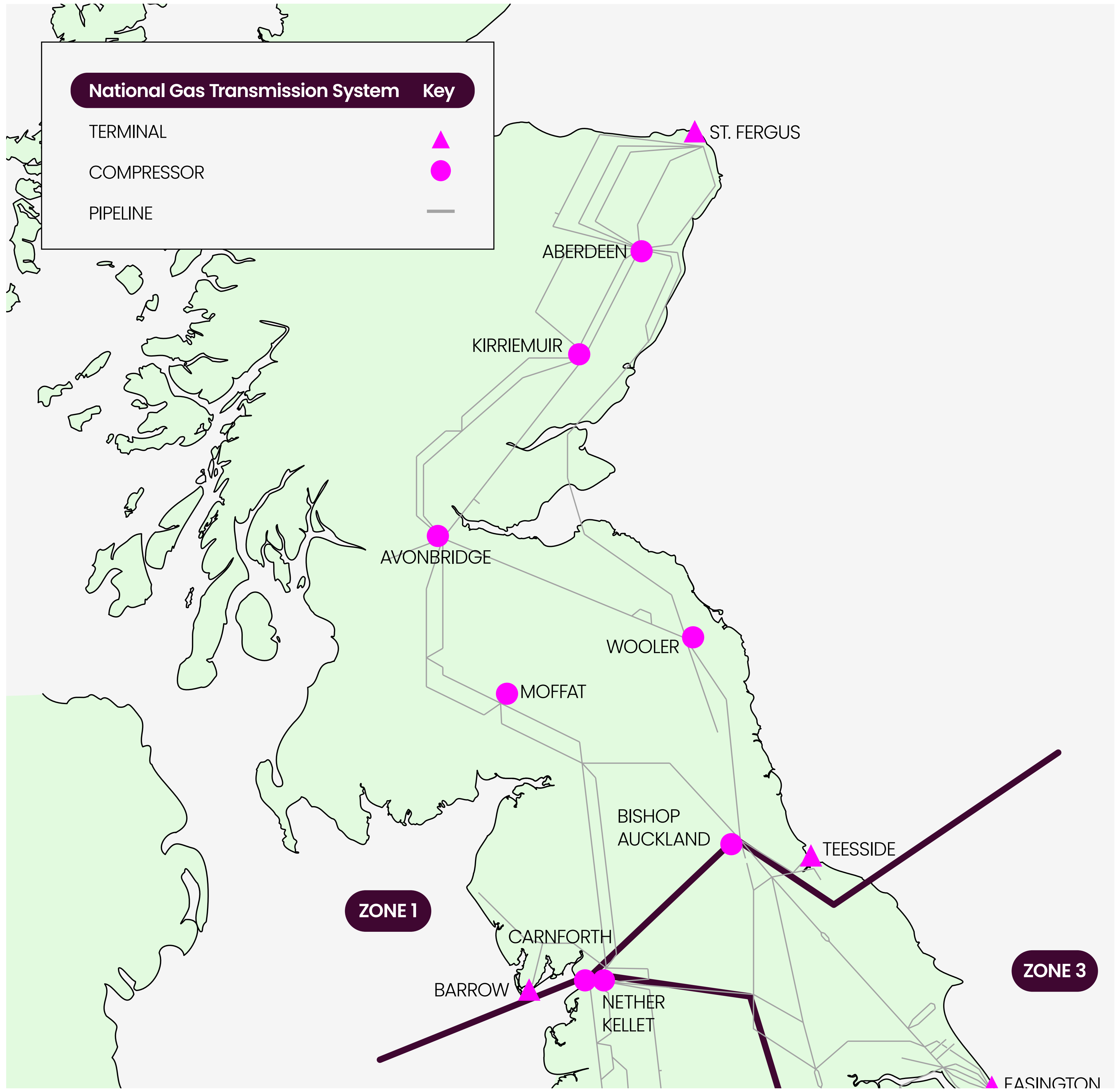
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 1 (Scotland and the North)

Figure 8: **Central resilience interactions**



RIIO Zone 1 entry with central compressor resilience

RIIO Zones 2 and 3 can be defined as the 'Central Zone' of the NTS. Compressor resilience within this Central Zone is important to overall network operability; in particular, it impacts the entry capability for RIIO Zone 1.

We have therefore specifically considered the impact of Central Zone compressor resilience on RIIO Zone 1 entry capability (referred to as the 'central compressor resilience' capability). The assumptions made are consistent with the resilience methodology (see About resilience).

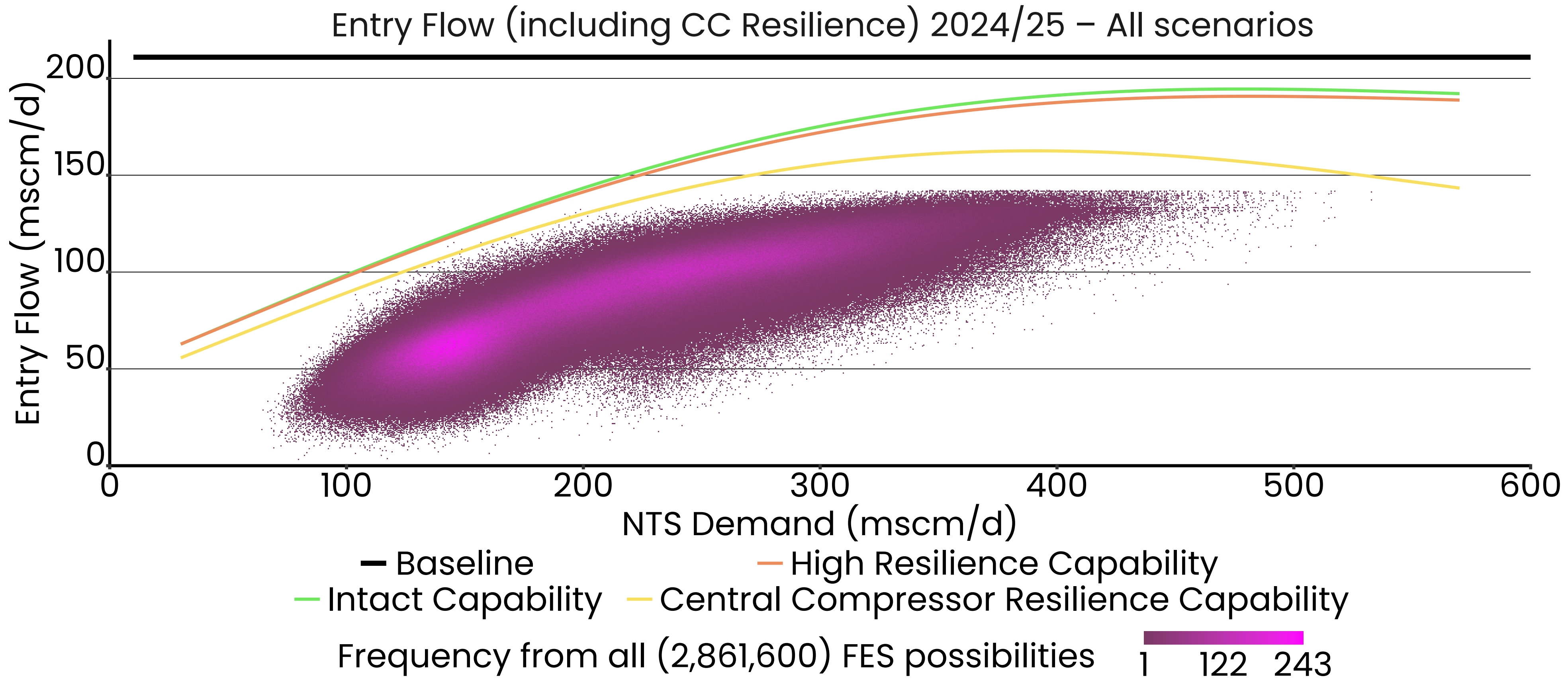
RIIO Zone 1 (Scotland and the North)

Figure 9 compares capability lines under three conditions: intact, high resilience and central compressor resilience. The intact condition assumed all compressors were available, the high resilience analysis applies the resilience methodology to compressors within the zone only, and the central compressor resilience analysis applies the high resilience scenario to both the zone and the central compressors. The central compressor resilience line is lower than the high resilience line and this is more pronounced at higher national demands, demonstrating the importance of Central Zone compressors in supporting the gas flows from north to south and maintaining entry capability in Zone 1.

The flame chart shows that there is sufficient entry capability for RIIO Zone 1 under all studied conditions, with no constraint days anticipated. This is true for the current year and for the 5 year and 10 year lookahead in both the FES 2024 net zero pathways and the Counterfactual.

Constraint days – RIIO Zone 1 entry with CC resilience						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 9: Flame charts for RIIO Zone 1 entry with CC resilience



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 1 (Scotland and the North)

RIIO Zone 1 exit

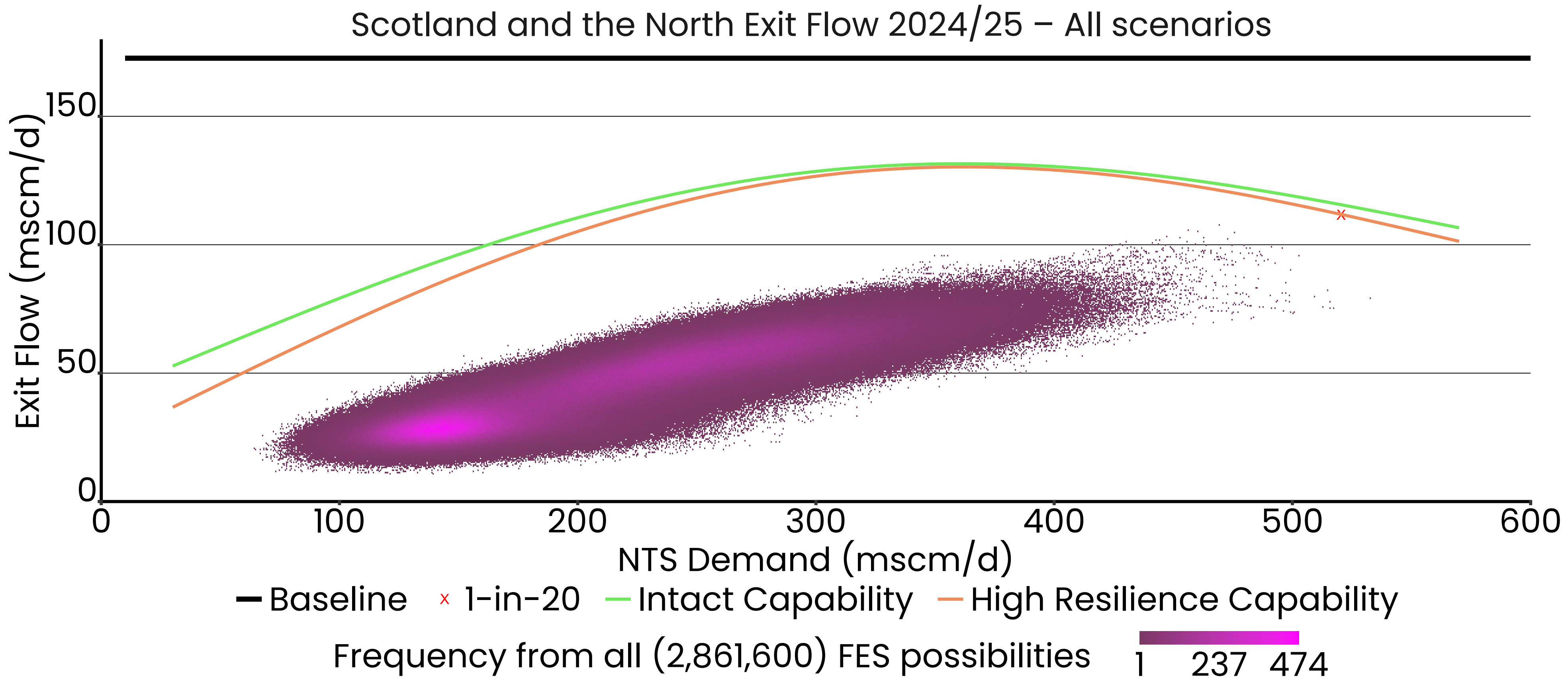
The flame charts in Figure 10 illustrate that there is sufficient exit capability in RIIO Zone 1 for the current year. The intact capability peaks at around 130 million cubic metres per day (mcm/d) in exit flows, then declines as demand exceeds 400 mcm/d, reflecting system limitations at higher pressures. The high resilience capability shows only a marginal drop due to compressor station unit limitations.

Under both the FES 2024 net zero pathways and Counterfactual, the capability is also sufficient to meet projected requirements for the 5 year and 10 year lookahead.

The intact and high resilience lines have been modelled comparing RIIO Zone 1 demand with national demand, but with supply into the St Fergus terminal reduced to the lowest projected supply for a five year period, as this reflects the most challenging conditions for the network. The other two terminal supply points (Barrow and Teesside) are also reduced to their lowest projected supply.

Constraint days – RIIO Zone 1 exit						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 10: Scotland and the North (Zone 1) exit flame charts



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 1 (Scotland and the North)

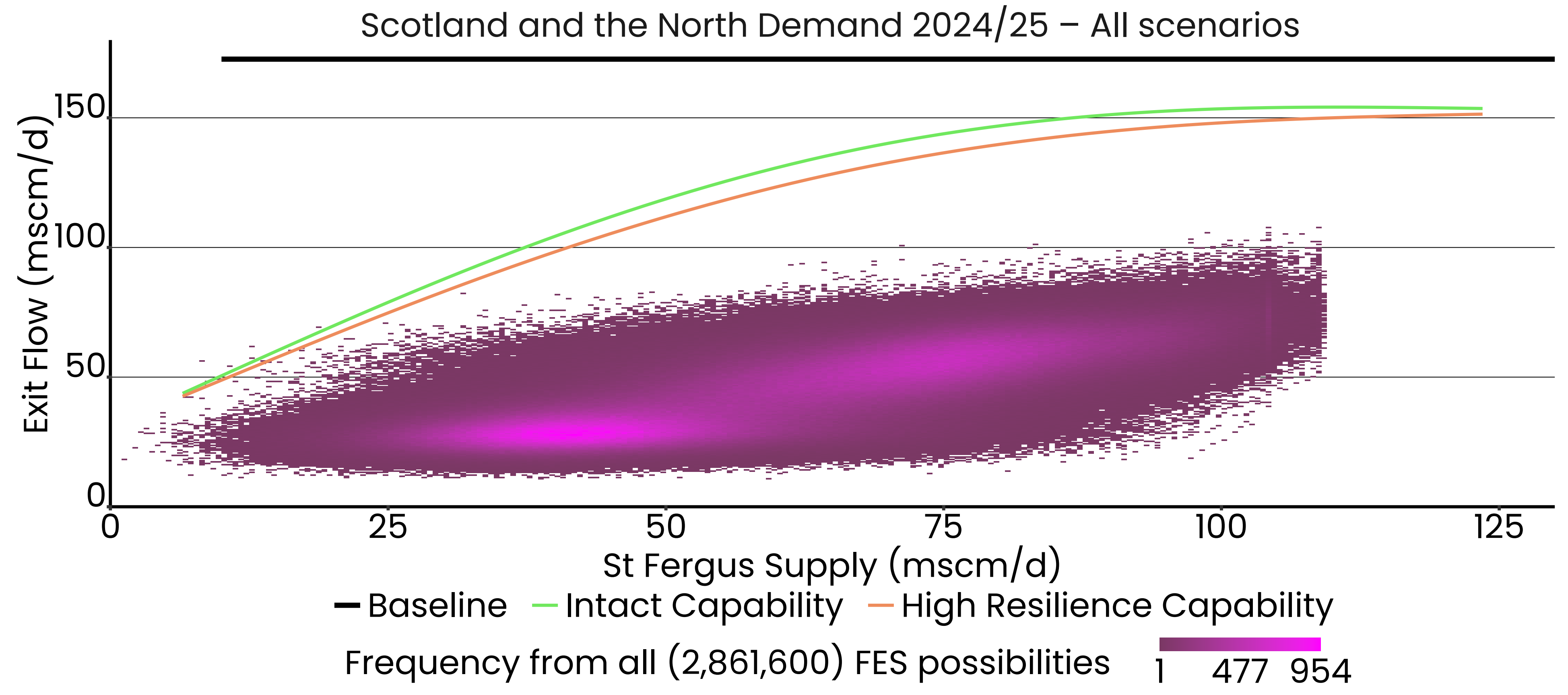
RIIO Zone 1 exit – St Fergus supply sensitivity

NTS compression does not currently support the transport of gas to the high-demand parts of Scotland from the southern zones or from the zone's more southerly terminals at Teesside and Barrow. Therefore, the entry flows from St Fergus terminal are important in meeting exit requirements within the zone. For this reason, RIIO 1 exit capability was also assessed by modelling the sensitivity of RIIO Zone 1's exit capability with a range of flows at the St Fergus terminal. Supplies from the Barrow and Teesside terminals were reduced to a minimum.

The flame charts (Figure 11) show that in the current year, there are sufficient forecast flows from St Fergus terminal to meet exit flow requirements in Zone 1. The result remains consistent for the 5 year and 10 year lookahead under the Counterfactual. The FES 2024 net zero pathways show that there are no constraint days 5 years and 10 years ahead.

Constraint days – RIIO Zone 1 exit – supply sensitivity						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 11: St Fergus supply sensitivity exit flame charts



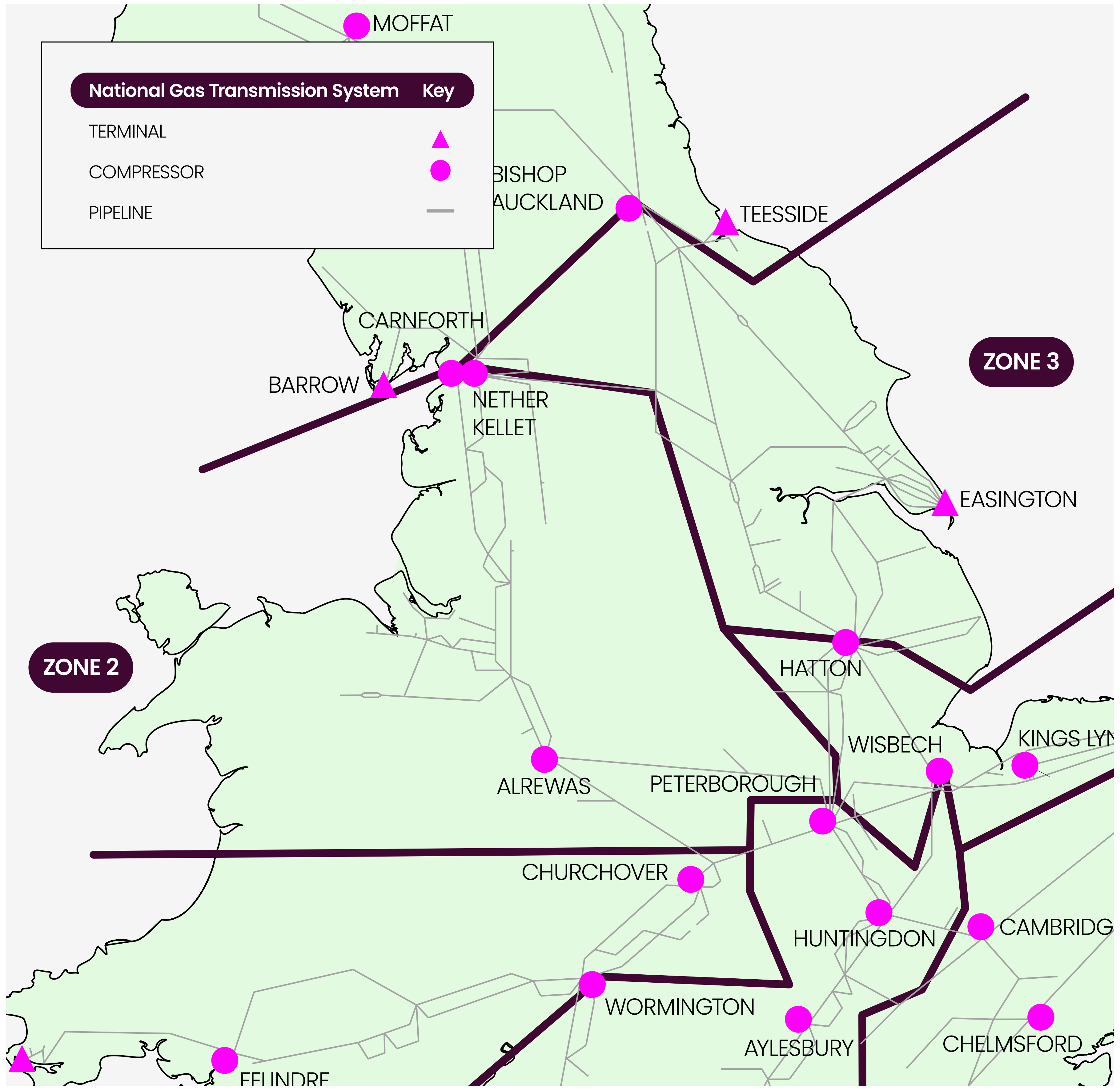
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 2-3 (Central Zone – North West and North East)

Figure 12: **North West and North East (Zones 2 and 3) map**



Introduction

The Central Zone consists of the North West (Zone 2) and North East (Zone 3) combined. It forms a critical transit route for gas flow between the north and south of the NTS.

The key assets that impact Central Zone capability include compressors at Nether Kellet and Carnforth, Alrewas, Hatton, and Bishop Auckland. The Central Zone also contains the majority of GB's gas storage sites.

RIIO Zone 2-3 (Central Zone) summary

- The Central Zone serves as a crucial transit zone for the movement of gas across the NTS, enabling network flexibility and resilience. Therefore, it is assumed that supply will always be available to meet demand within the zone and for this reason, we have not undertaken exit capability analysis for the Central Zone.
- There is sufficient entry capability in the Central Zone to meet the demand for the current year, as well as for the 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.

RIIO Zone 2-3 (Central Zone – North West and North East)

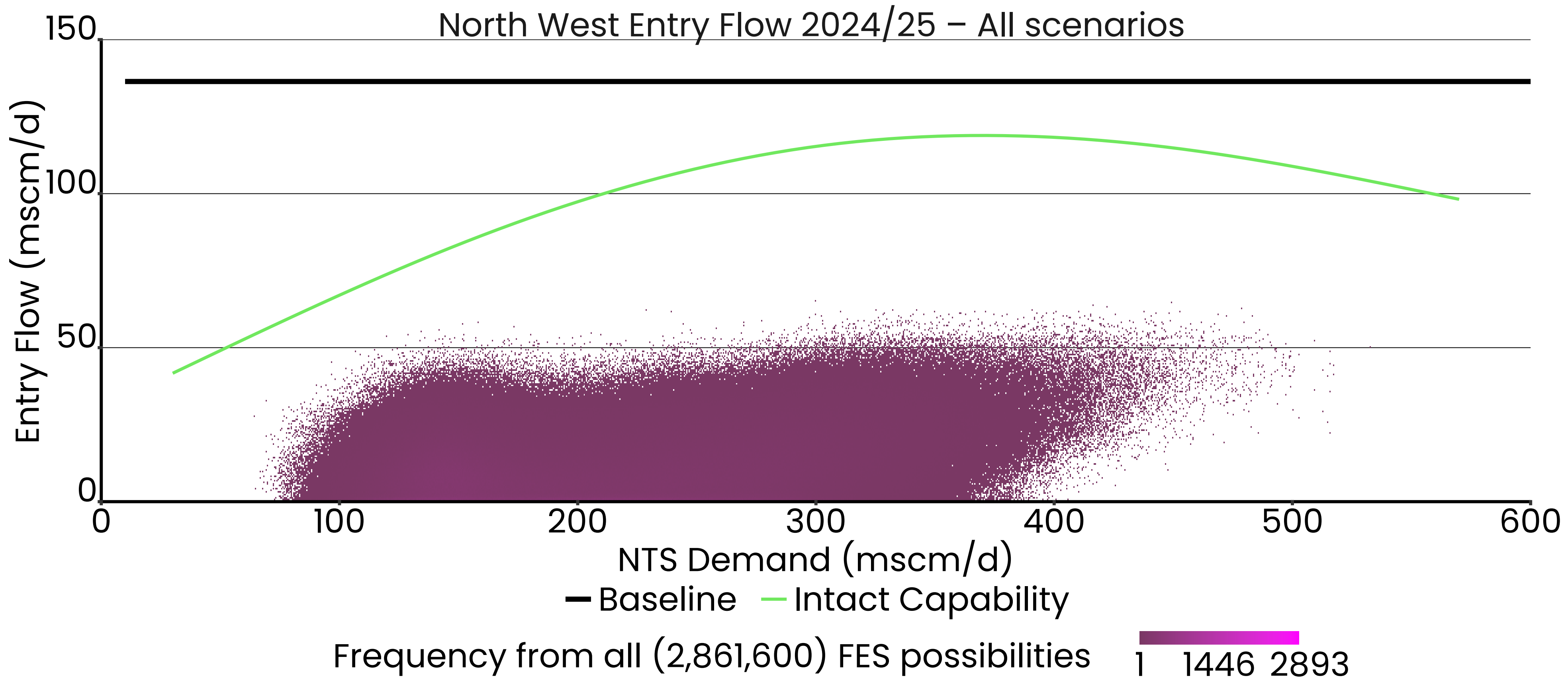
RIIO Zone 2 entry

As shown in Figure 13, RIIO Zone 2 (North West) entry capability is sufficient to meet the current requirements.

In both the FES 2024 net zero pathways and the Counterfactual, the flame charts indicate there will be sufficient entry capability for the 5 year and 10 year lookahead, as the zone's entry flows reduce in both cases.

Constraint days – RIIO Zone 2 entry			
	Intact		
	All scenarios	Net zero pathways	Counterfactual
2024/25	0		
2029/30		0	0
2034/35		0	0

Figure 13: North West (Zone 2) entry flame charts



2024/25
All scenarios

2029/30 Net zero pathways
& Counterfactual

2034/35 Net zero pathways
& Counterfactual

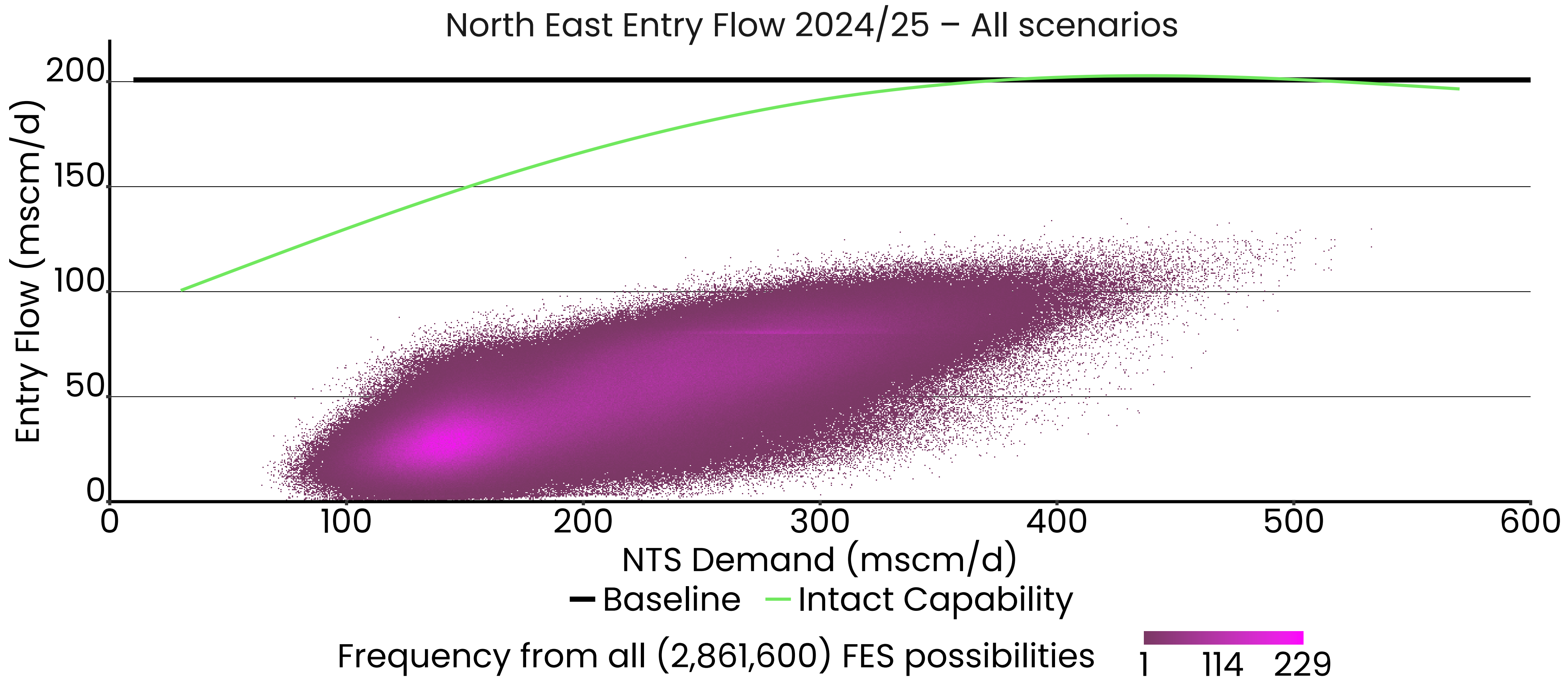
RIIO Zone 2-3 (Central Zone – North West and North East)

RIIO Zone 3 entry

RIIO Zone 3 (North East) entry capability is sufficient to meet requirements for the current year and the 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual. Minimal changes are observed in the range of entry flows between the years assessed (Figure 14).

Constraint days – RIIO Zone 3 entry			
	Intact		
	All scenarios	Net zero pathways	Counterfactual
2024/25	0		
2029/30		0	0
2034/35		0	0

Figure 14: North East (Zone 3) entry flame charts



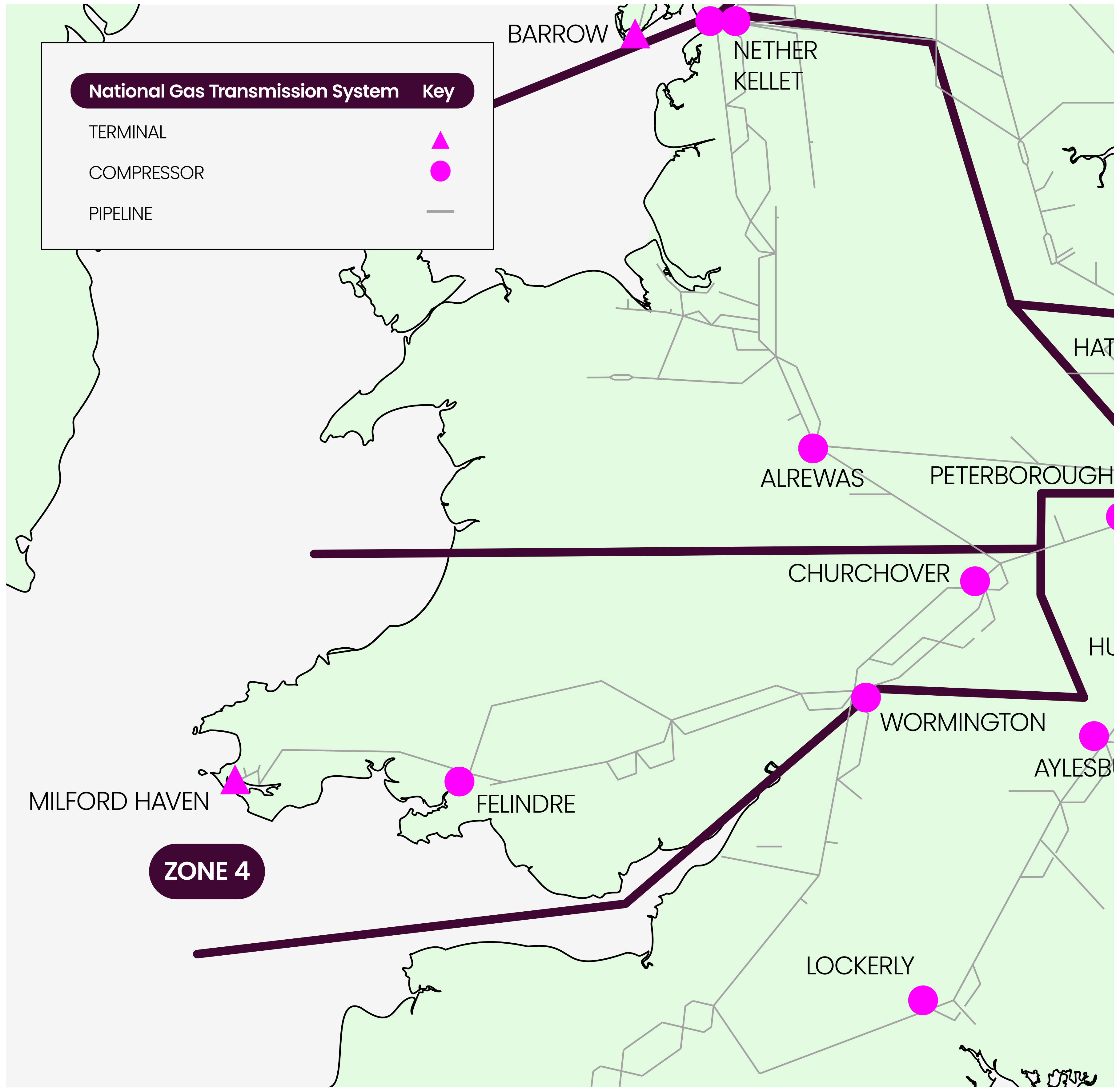
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 4 (South Wales)

Figure 15: **South Wales (Zone 4) map**



Introduction

RIIO Zone 4 covers South Wales. The key assets that impact RIIO Zone 4's capability include the LNG supply terminal at Milford Haven and compressors at Felindre, Wormington and Churchover.

The Milford Haven LNG import terminals can accommodate large volumes of natural gas from across the world. Gas supplied to Milford Haven is then transported across South Wales to customers within and beyond the region. These supplies also have a role to play in maintaining pressures at the southwest extremity of the NTS.

RIIO Zone 4 summary

- Based on an intact network, an average of two days of entry constraints are expected for RIIO Zone 4 in the current year. The high resilience scenario analysis shows an average of 14 constraint days.
- For the 5 year and 10 year lookahead, an increase in constraint days is expected for Zone 4 entry. Between these years, the Counterfactual shows an increase of constraint days from 13 to 28 days (intact scenario) and 40 to 62 days (high resilience scenario). The net zero pathways show a corresponding increase from 12 to 24 days (intact scenario) and 34 to 45 days (resilience scenario).
- Under both the FES 2024 net zero pathways and the Counterfactual, an increase in LNG import from the zone's Milford Haven terminal is likely to lead to more constraint days over the next 10 years.
- There is sufficient exit capability in RIIO Zone 4 to meet demands for the current year, 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.

RIIO Zone 4 (South Wales)

RIIO Zone 4 entry

As shown in Figure 16, for the current year entry flows in Zone 4 are expected to exceed capability in both intact and high resilience scenarios. For the intact network, two constraint days can be expected. For a high resilience network, the capability is substantially reduced and 14 constraint days can be expected annually, spread across the range of national demands.

Over the next 10 years, a reduction in national gas demand and UKCS gas production will create an increased reliance on LNG supply into the South Wales region under both the FES 2024 net zero pathways and the Counterfactual. The higher proportion of supply from LNG in South Wales compared to national demand will lead to a greater potential for constraint days.

The FES 2024 net zero pathways show a particularly large increase in entry flows on days when the national demand is low (Figure 16). This could lead to an increased number of constraint days on the NTS over the next 5 years, based on both the intact (12 days) and the high resilience (34 days) network scenario.

In the 10 year lookahead it is anticipated that at very low demands there is potential that Milford Haven could account for an increasing portion of national supply, leading to a further increase in the number of constraint days under these conditions (24 days for intact and 45 for a high resilience network).

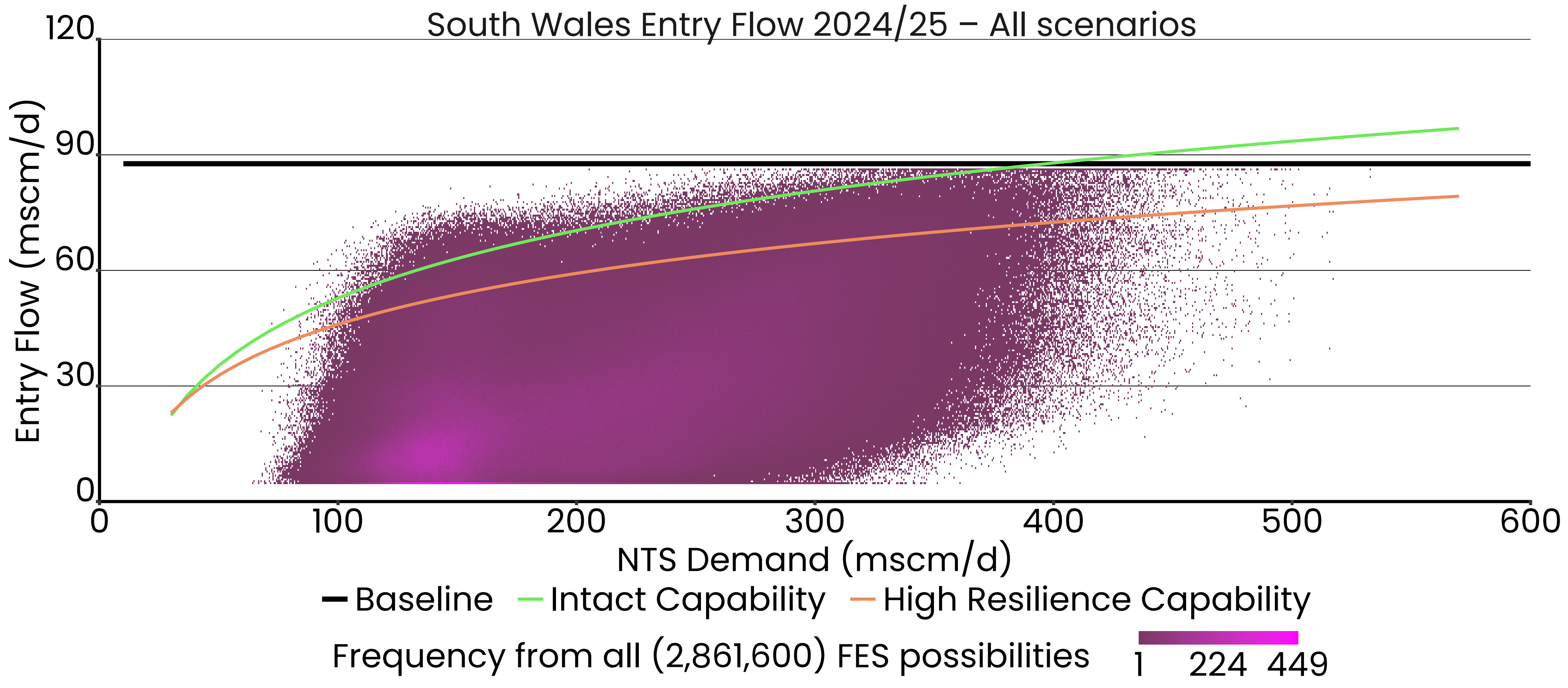
In slight contrast, for the Counterfactual, constraint days are expected to be more evenly distributed across the demand range for the next 5 and 10 years. Constraint days increase from 13 to 28 (intact scenario) during this period, or from 40 to 62 (resilience scenario).

It should be noted that in some cases the zone's entry flow exceeds the existing baseline. These flows reflect a recent uprating of the terminal flow capability – specifically the installation of additional vaporisation at one subterminal. Prior to the summer of 2024, there was also an application in place for additional ('incremental') capacity of ~15 mcm/d at the Milford Haven entry point. The application has now been withdrawn and so the capacity baseline is not expected to increase. The flame charts reflect that the terminal operators are expected to have a commercial driver to flow gas onto the NTS up to the limit of their physical capability.

RIIO Zone 4 (South Wales)

Constraint days – RIIO Zone 4 entry						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	2			14		
2029/30		12	13		34	40
2034/35		24	28		45	62

Figure 16: South Wales (Zone 4) entry flame charts



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 4 (South Wales)

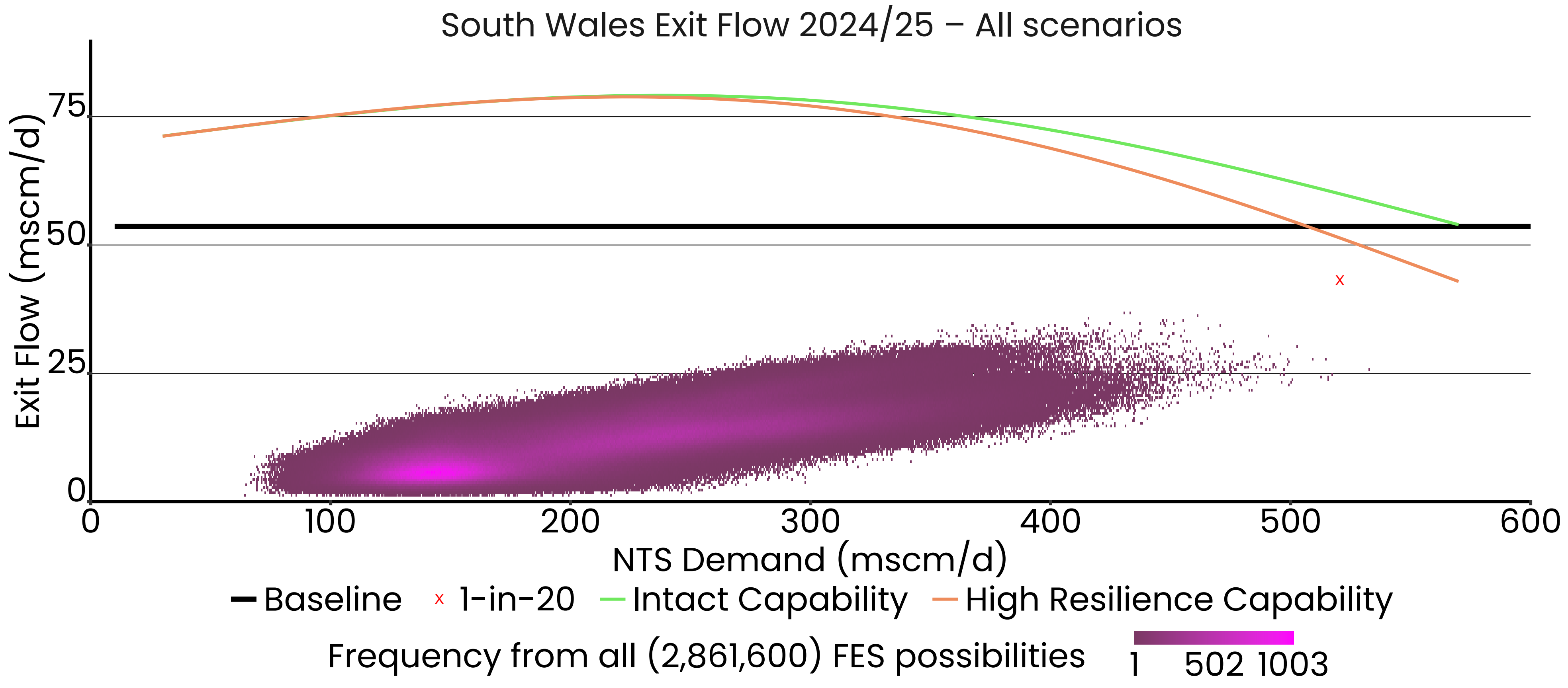
RIIO Zone 4 exit

Figure 17 shows RIIO Zone 4 has sufficient exit capability to meet demands for the current year and 5 year and 10 year lookahead. The result is consistent for the intact and the high resilience scenario, under both the FES 2024 net zero pathways and the Counterfactual. The zone's exit capability was modelled with supplies at Milford Haven at a five year statistical minimum, creating a low supply condition in terms of meeting exit requirements.

The high resilience capability shows a downward trend when moving towards higher national demand, due to the impact of the increased pressures in the area. However, the current exit capability is still sufficient to meet the requirements for the current year, 5 year and 10 year lookahead.

Constraint days – RIIO Zone 4 exit						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 17: South Wales (Zone 4) exit flame charts



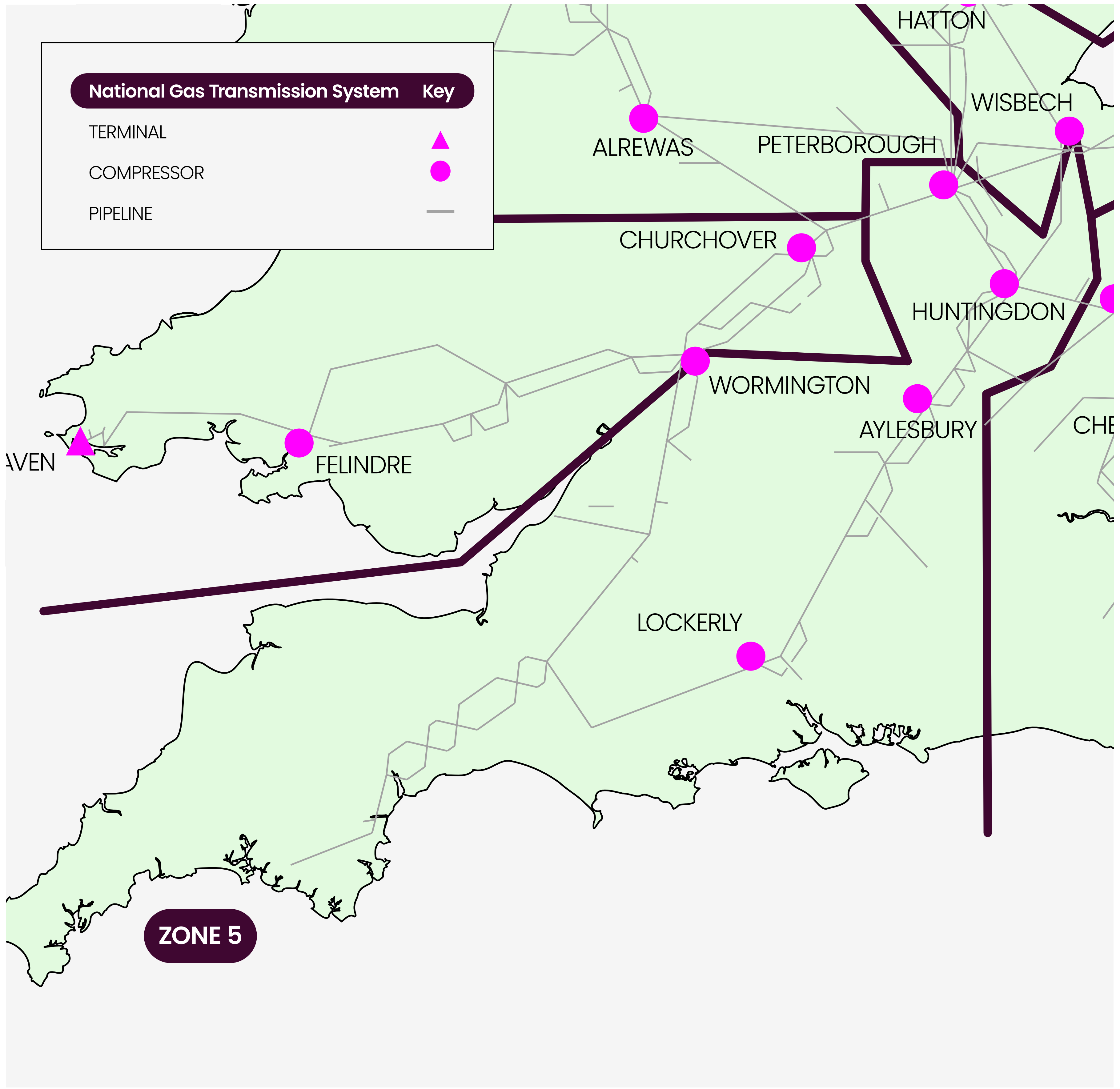
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 5 (South West)

Figure 18: South West (Zone 5) map



Introduction

RIIO Zone 5 covers the South West. The key assets that impact the capability include compressors at Wormington, Huntingdon, Aylesbury, Lockerley, and Peterborough.

Zone 5 receives a significant gas supply from the LNG terminal at Milford Haven (in RIIO Zone 4), which has a direct impact on the exit capability of the region.

RIIO Zone 5 summary

- There is sufficient exit capability in RIIO Zone 5 to meet the requirements for the current year, as well as the 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.
- No analysis was carried out for entry capability, as there are no entry sites in RIIO Zone 5 (excluding storage that accounts for less than 5% of local winter demand).

RIIO Zone 5 (South West)

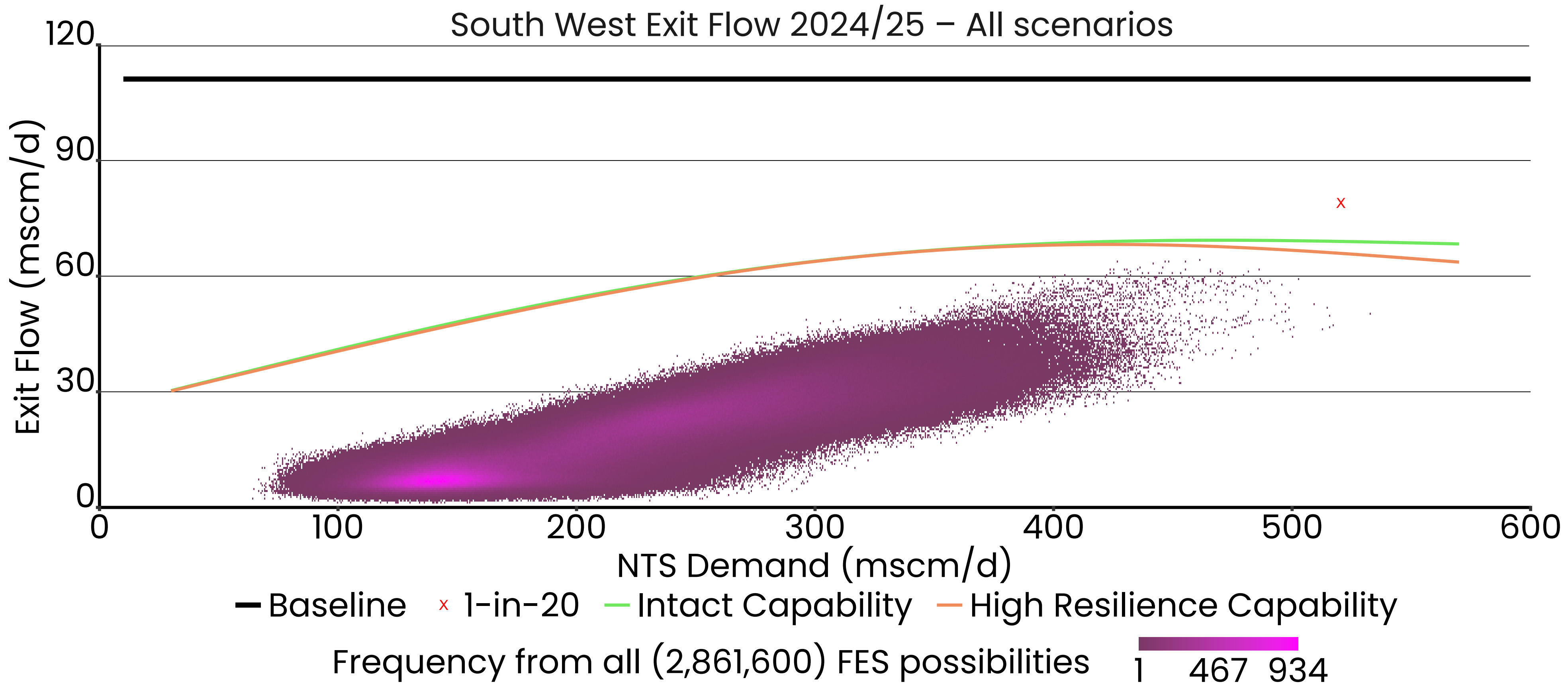
RIIO Zone 5 exit

Figure 19 indicates there is sufficient capability in RIIO Zone 5 to fulfil the exit requirements for the current year, as well as 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.

For the 5 year and 10 year lookahead the forecasted flame chart shows the intact and high resilience capability lines are above the flame under both the FES 2024 net zero pathways and the Counterfactual, indicating that there is sufficient capability for an intact and a high resilience network.

Constraint days – RIIO Zone 5 exit						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 19: South West (Zone 5) exit flame charts



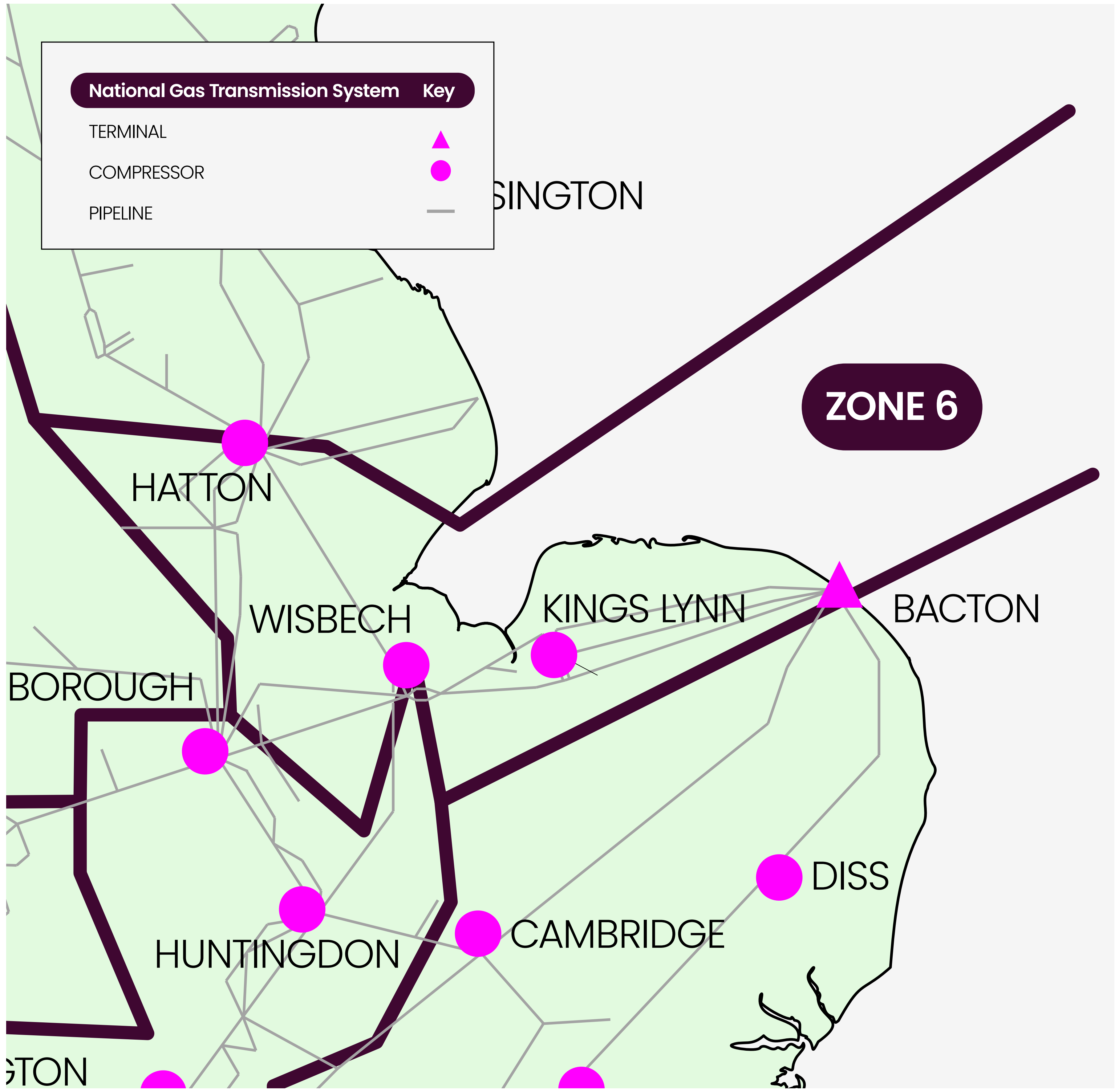
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 6 (East Midlands)

Figure 20: East Midlands (Zone 6) map



Introduction

RIIO Zone 6 covers the East Midlands. The key assets that impact RIIO Zone 6 capability include compressors at Kings Lynn, at Hatton and Alrewas, in Central Zone and at Peterborough (which supports both RIIO Zone 5 and 7), as well as the two interconnectors at Bacton.

RIIO Zone 6 receives gas via Bacton supply terminal (in RIIO Zone 7) from the UKCS and flows gas to and from Europe via its interconnectors (connecting to Belgium and the Netherlands). Movement of gas into the region is primarily enabled by compression at Hatton, with Alrewas and Peterborough supporting pressures in the region.

RIIO Zone 6 summary

- There are no entry sites in RIIO Zone 6, so entry capability analysis is not applicable.
- For RIIO Zone 6, two capabilities have been assessed: an overall zonal exit capability, and the specific exit capability at Bacton. These are referred to as 'RIIO Zone 6 exit (overall)' and 'Bacton exit' respectively.
- RIIO Zone 6 exit (overall) sensitivity was based on a low supply condition: assuming Bacton and Isle of Grain (IOG) supplies are reduced to projected minima in the FES 2024 net zero pathways and the Counterfactual.
- RIIO Zone 6 has sufficient exit capability to meet requirements for the current year, as well as the 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.

RIIO Zone 6 (East Midlands)

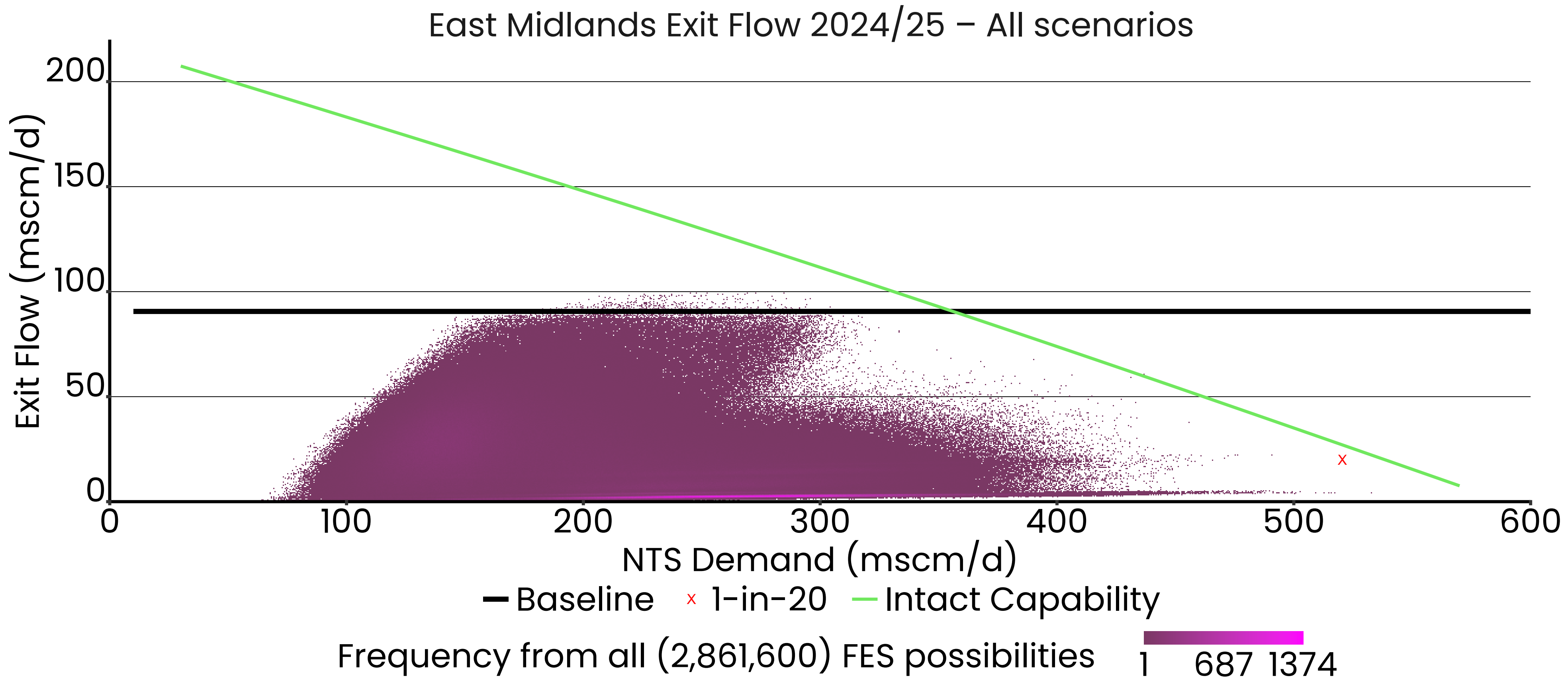
RIIO Zone 6 exit (overall)

Figure 21 indicates that under both the FES 2024 net zero pathways and the Counterfactual, RIIO Zone 6 has sufficient exit capability to meet all demand obligations in the current year, as well as 5 year and 10 year lookahead.

RIIO Zone 6 has sufficient exit capability to meet requirements for the current year, as well as the 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual. The result was based on a low supply condition: assuming Bacton and IOG supplies are reduced to five year statistical minima in the FES 2024 net zero pathways and the Counterfactual.

Constraint days – Sensitivity 1: RIIO Zone 6 exit (overall)						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 21: Sensitivity 1: RIIO Zone 6 exit (overall) flame charts



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 6 (East Midlands)

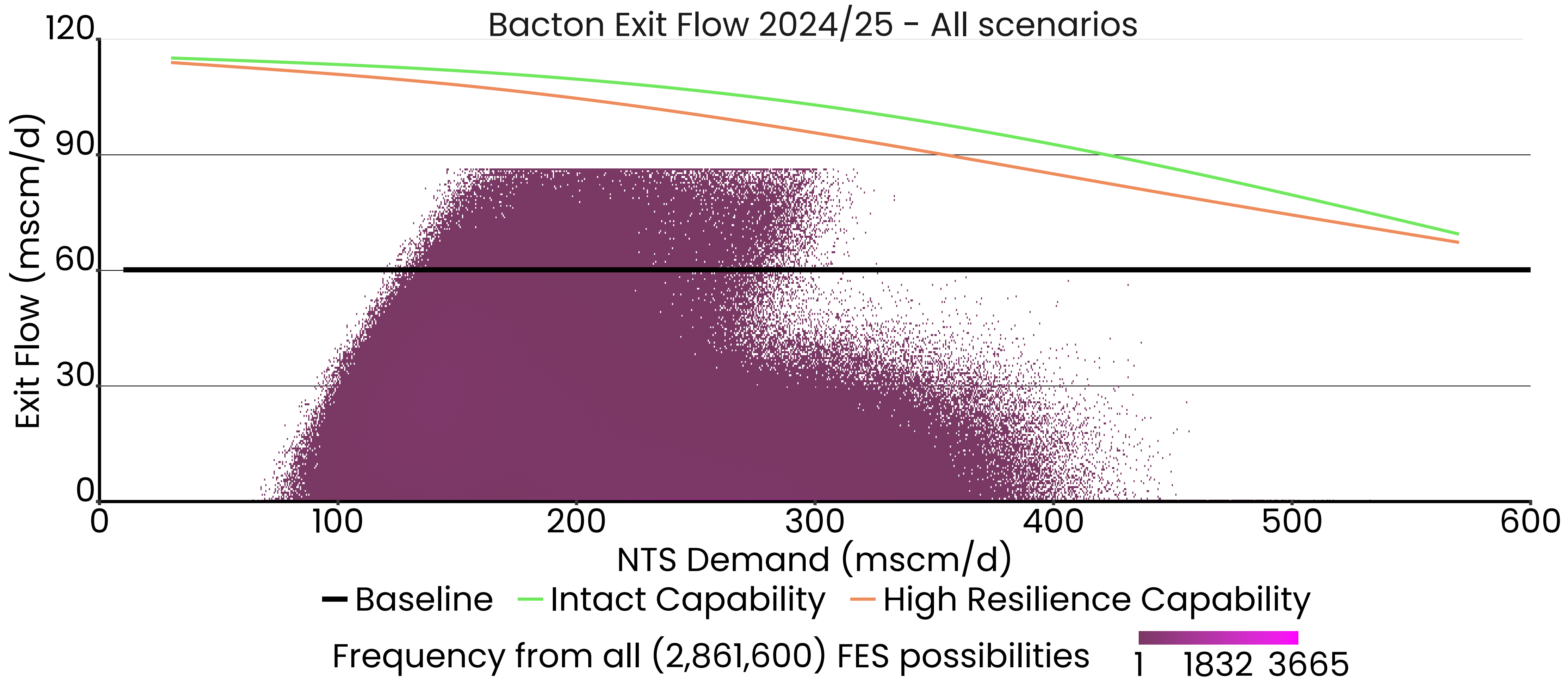
Bacton exit

Figure 22 shows the capability for interconnector export at Bacton terminal for the current year. No constraint days are expected in relation to Bacton exit flow. The flows are concentrated on low-demand days, reflecting the tendency for gas exports to be higher in the summer.

Across the FES 2024 net zero pathways and the Counterfactual, Bacton exports in the 5 year and 10 year lookahead are forecasted to be lower than the current year across all seasons. Gas export decline correlates with an increase, in Europe, of other imports. Figure 22 shows the zone's forecast exit flows exceeds baseline. For these flows to materialise NGT would need to release additional capacity on a non-obligated basis.

Constraint days – Sensitivity 2: Bacton exit						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 22: Sensitivity 2: Bacton exit flame charts



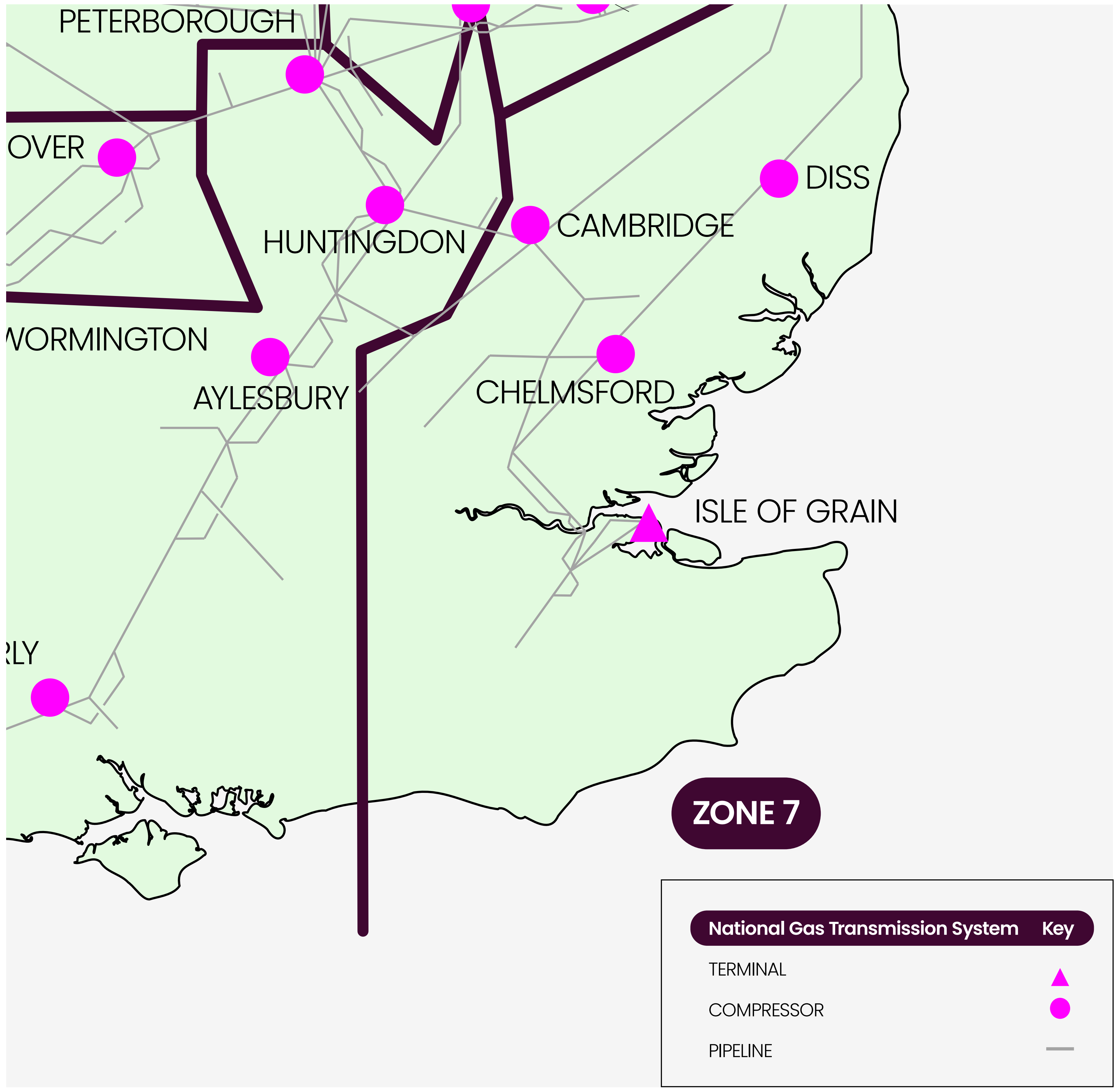
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 7 (South East)

Figure 23: **South East (Zone 7) map**



Introduction

RIIO Zone 7 covers the South East. The key assets that impact RIIO Zone 7's capability include Bacton terminal and IOG LNG supply terminal (receiving LNG globally), and Cambridge, Diss, Chelmsford, Huntingdon and Peterborough compressor stations.

RIIO Zone 7 summary

- RIIO Zone 7 contains gas terminals Bacton and IOG. The variability of gas flows at the two terminals has a large impact on the zone's entry capability. Three sensitivities were carried out: two with varying gas flows at Bacton and IOG, and an Optimised sensitivity with a balanced gas supply at Bacton and IOG.
- In the Bacton entry and the Optimised sensitivity, RIIO Zone 7 has sufficient entry capability to meet requirements for the current year, as well as 5 year and 10 year lookahead, under all FES 2024 net zero pathways and the Counterfactual.
- The IOG Entry sensitivity shows the possibility of an average one constraint day under high resilience conditions in the current year, as well as 5 year and 10 year lookahead for the FES 2024 net zero pathways and the Counterfactual.
- Under the FES 2024 net zero pathways, a small number of data points exceed the capability line when IOG flows at 40 mcm/d in the Bacton entry scenario. A similar trend is observed when Bacton flows at 40 mcm/d and 60 mcm/d in the IOG entry sensitivity. However, the frequency of points is small and so does not result in any constraint days being forecast.
- There is sufficient exit capability within RIIO Zone 7 for the current year, as well as 5 year and 10 year lookahead, under both the FES 2024 net zero pathways and the Counterfactual.

RIIO Zone 7 entry

Bacton and IOG are the two supply terminals in RIIO Zone 7. The entry capacity of the zone as a whole is heavily influenced by the distribution of entry flows into the zone from the two supply terminals. For this reason, RIIO Zone 7's entry capability was assessed under three sensitivities: exit capability of Bacton with a 0 mcm/d and 40 mcm/d flow at IOG, exit capability of IOG with a 40 mcm/d and 60 mcm/d flow at Bacton, and an Optimised sensitivity, where supplies at IOG and Bacton terminals are balanced to achieve the maximum entry capability.

RIIO Zone 7 (South East)

Sensitivity 1: Bacton entry

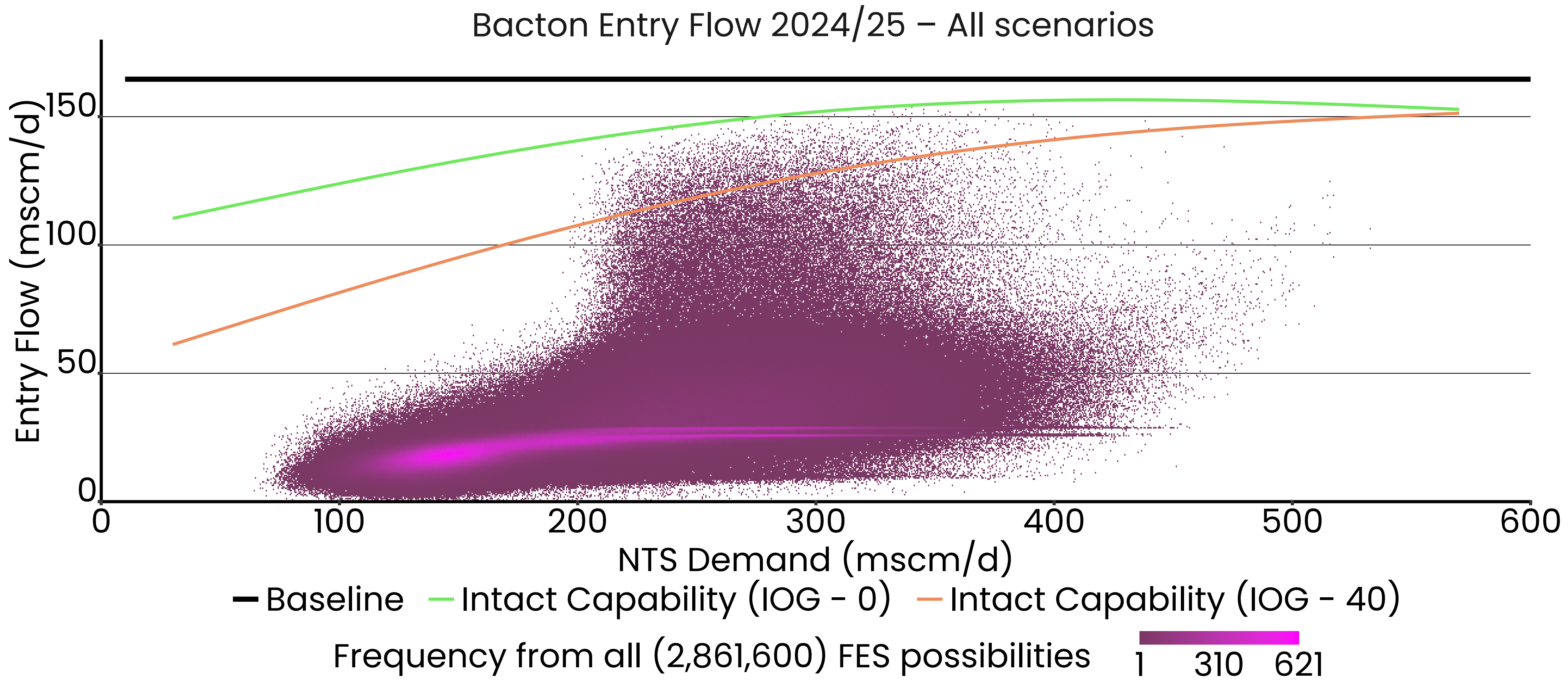
RIIO Zone 7 intact entry capability was assessed against IOG gas flows of 0 mcm/d and 40 mcm/d. Figure 24 shows that the network has sufficient entry capability to meet all NTS demand levels for the current year, as well as 5 year and 10 year lookahead, under the FES 2024 net zero pathways and the Counterfactual.

A small number of data points exceed the capability line when IOG flows at 40 mcm/d, suggesting the potential for one constraint day in the 10 year lookahead under the FES 2024 net zero pathways and the Counterfactual.

Constraint days – Sensitivity 1: Bacton entry

	Intact					
	IOG at 0 mcm/d			IOG at 40 mcm/d		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		1	1

Figure 24: South East (Zone 7) Bacton entry flame charts



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 7 (South East)

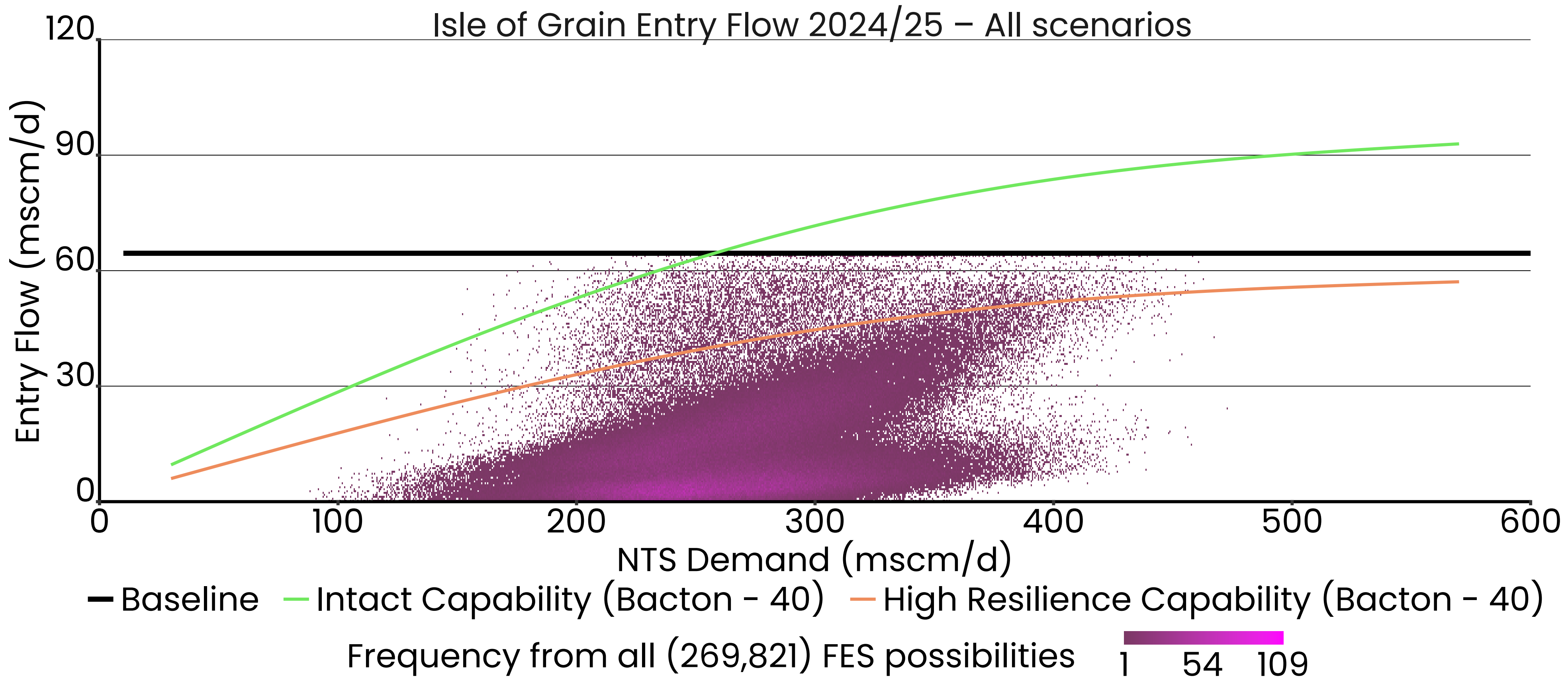
Sensitivity 2: Isle of Grain entry – Bacton at 40 mcm/d

Figure 25 and Figure 26 include both the intact and the high resilience IOG entry capability lines in RIIO Zone 7. Figure 25 shows Bacton flows at 40 mcm/d and Figure 26 shows Bacton flows at 60 mcm/d. To reflect the modelling assumption, the data points on the flame chart have been filtered to show only IOG flows where the corresponding Bacton flows are within +/- 5 mcm/d of 40 mcm/d and 60 mcm/d sensitivities respectively.

Figure 25 for Bacton at 40 mcm/d shows that, in the high resilience scenario, one constraint day is expected for the current year, as well as 5 year and 10 year lookahead, under the FES 2024 net zero pathways and the Counterfactual. There are no constraint days expected under intact conditions for the current year, as well as 5 year and 10 year lookahead, under the FES 2024 net zero pathways and the Counterfactual.

Constraint days – Sensitivity 2: Isle of Grain entry – Bacton at 40 mcm/d						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			1		
2029/30		0	0		1	1
2034/35		0	0		1	1

Figure 25: South East (Zone 7) Isle of Grain entry flame charts



+ 2024/25 All scenarios

+ 2029/30 Net zero pathways & Counterfactual

+ 2034/35 Net zero pathways & Counterfactual

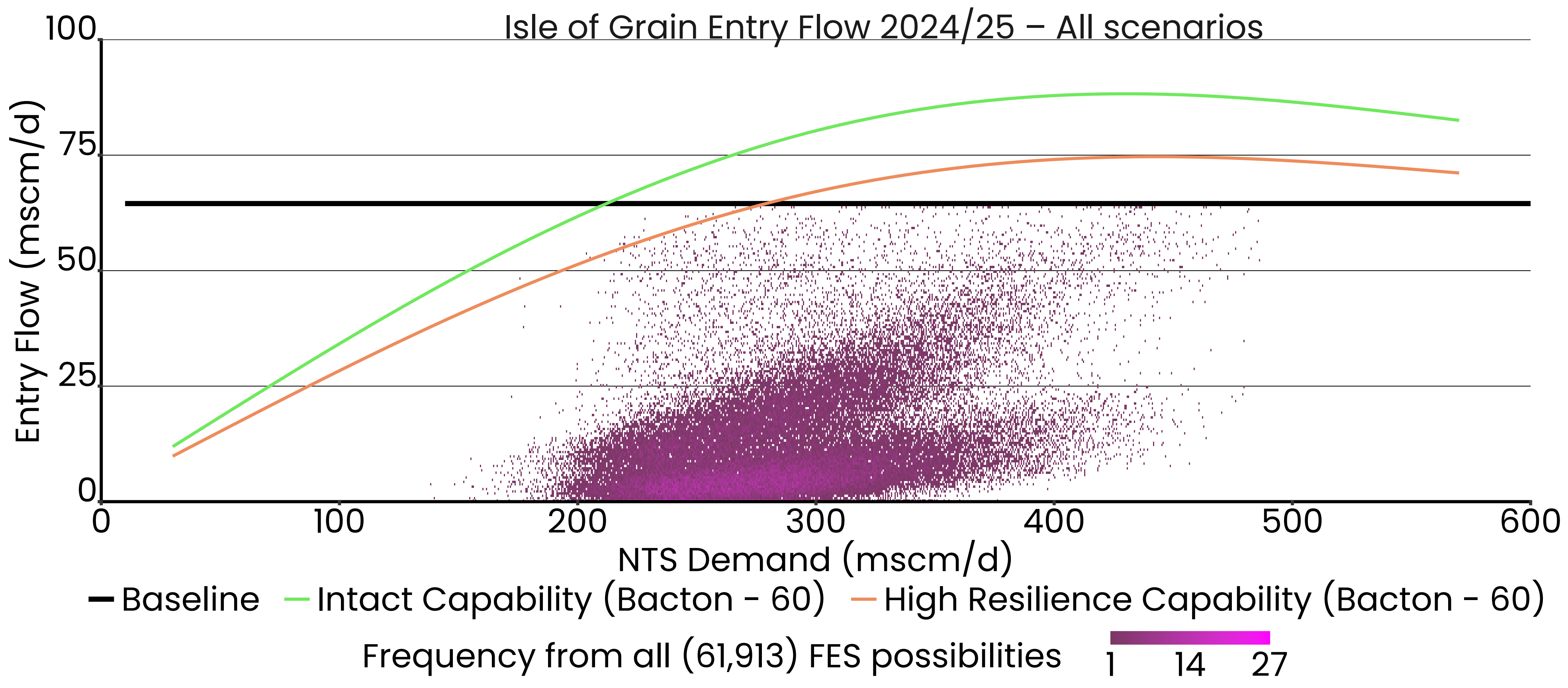
RIIO Zone 7 (South East)

Sensitivity 2: Isle of Grain entry – Bacton at 60 mcm/d

Figure 26 for Bacton at 60 mcm/d, there are no constraint days expected under intact and high resilience conditions for the current year, as well as 5 year and 10 year lookahead, under the FES 2024 net zero pathways and the Counterfactual. Although a few data points are above the capability lines, they do not result in constraint days.

Constraint days – Sensitivity 2: Isle of Grain entry – Bacton at 60 mcm/d						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 26: South East (Zone 7) Isle of Grain entry flame charts



2024/25
All scenarios

2029/30 Net zero pathways
& Counterfactual

2034/35 Net zero pathways
& Counterfactual

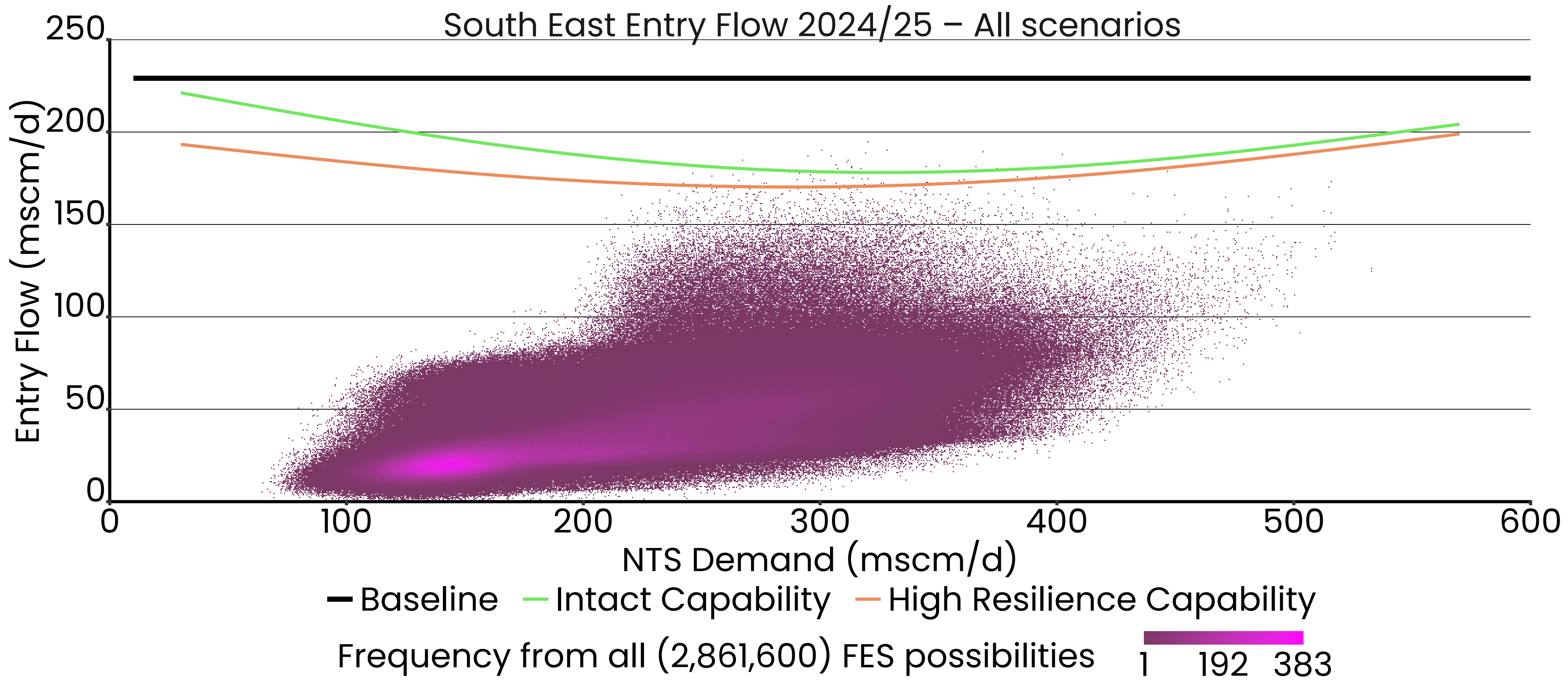
RIIO Zone 7 (South East)

Sensitivity 3: optimised

In this sensitivity analysis, RIIO Zone 7's entry capability achieved its maximum, with a balanced gas supply at Bacton and IOG. Figure 27 shows there is sufficient capability to accommodate entry flows at all national demand levels for the current year, as well as 5 year and 10 year lookahead. Although a few data points are above the capability lines, they do not result in constraint days. Capability during the low NTS demands is subjected to change based on the Bacton exports.

Constraint days – Sensitivity 3: Optimisation						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 27: South East (Zone 7) Optimisation entry flame charts



2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

RIIO Zone 7 (South East)

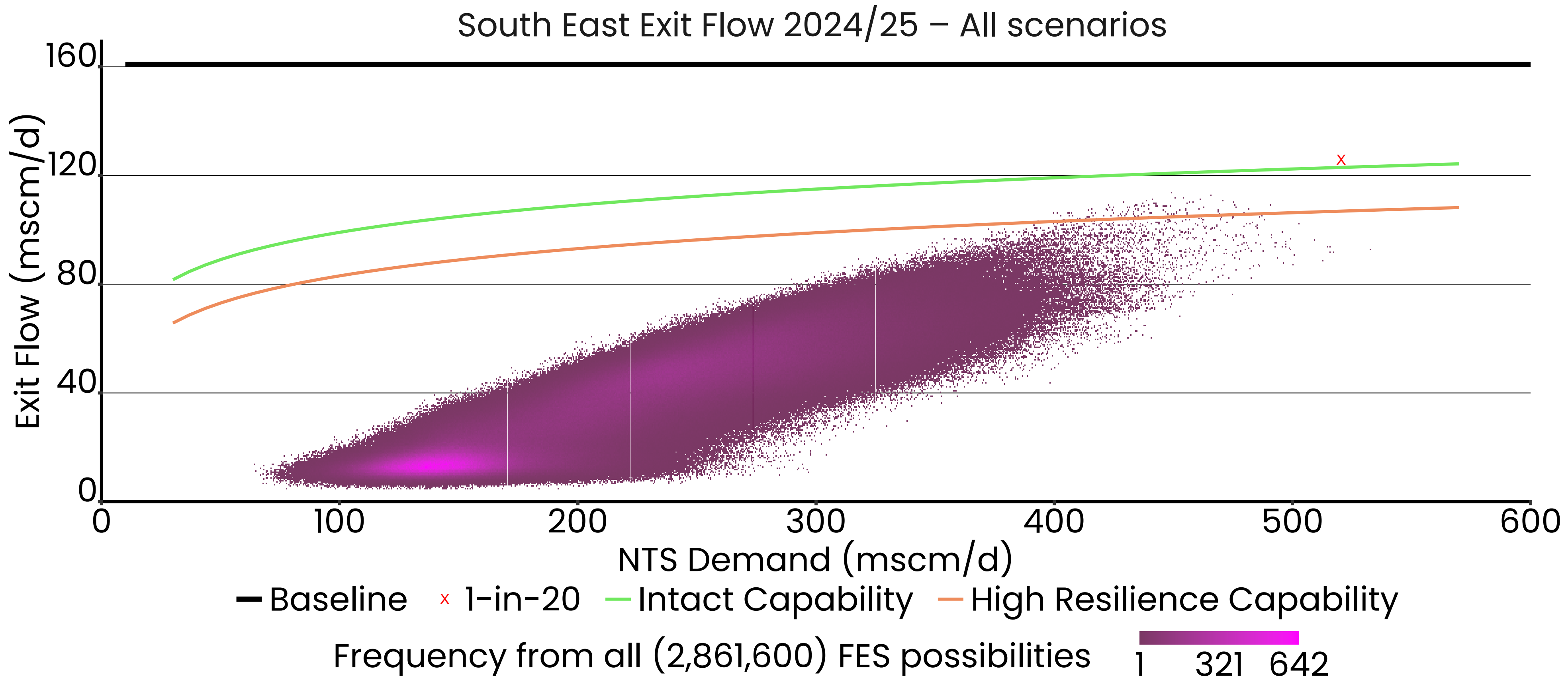
RIIO Zone 7 exit

Figure 28 shows that RIIO Zone 7 has sufficient network capability with no constraint days expected under both the intact and the high resilience condition.

Under both the FES 2024 net zero pathways and the Counterfactual, both intact and high resilience exit capability will be sufficient to meet requirements across the range of national demands for the current year, as well as 5 year and 10 year lookahead.

Constraint days – RIIO Zone 7 exit						
	Intact			High resilience		
	All scenarios	Net zero pathways	Counterfactual	All scenarios	Net zero pathways	Counterfactual
2024/25	0			0		
2029/30		0	0		0	0
2034/35		0	0		0	0

Figure 28: South East (Zone 7) exit flame charts



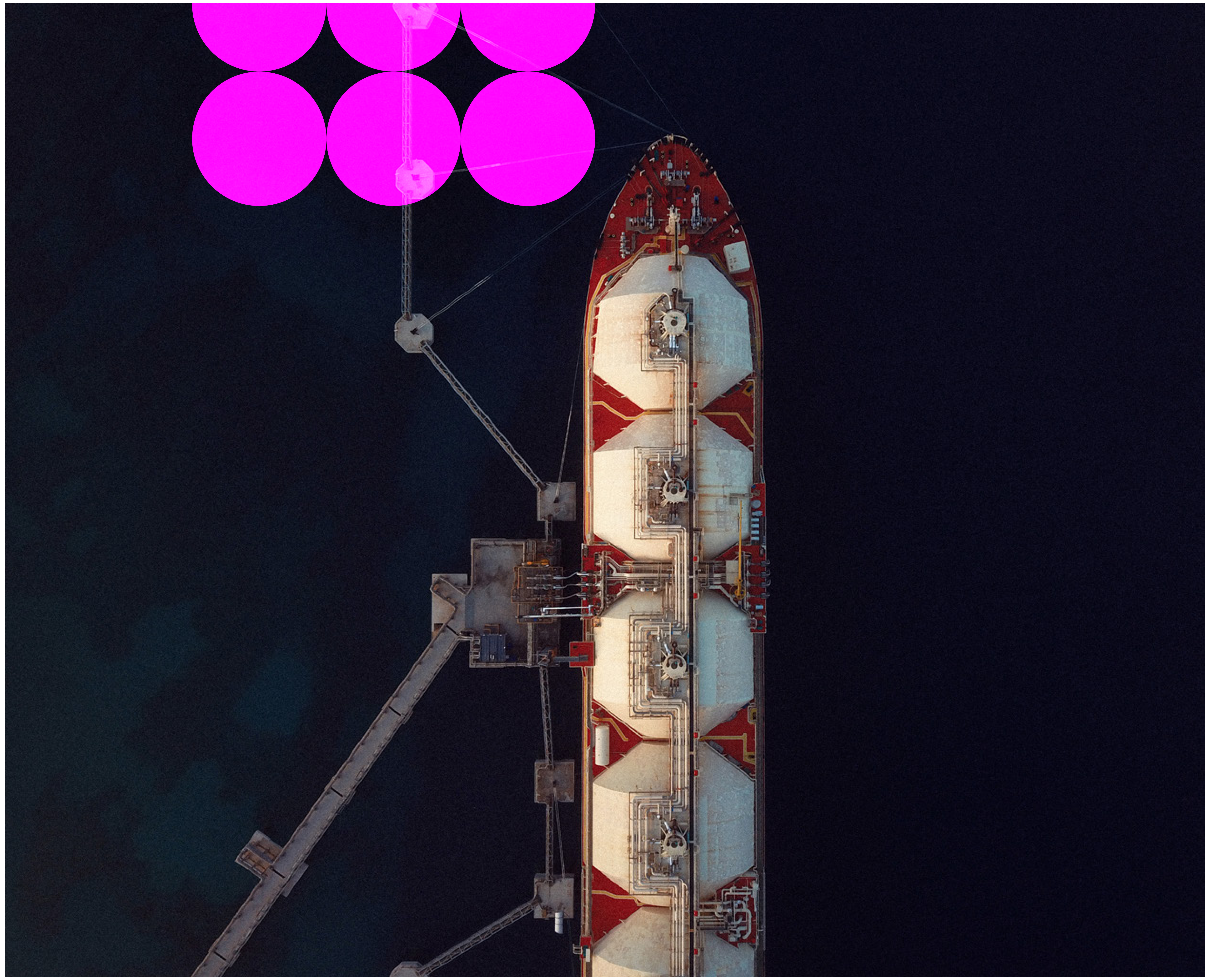
2024/25 All scenarios

2029/30 Net zero pathways & Counterfactual

2034/35 Net zero pathways & Counterfactual

Network capability beyond 2035

The evolving dynamics of technology, policy, market forces, and societal expectations introduce a high degree of uncertainty and complexity into the energy system. In this chapter, we highlight specific challenges ahead, examining the interplay of various factors and their potential impact on the gas network capability as we look beyond 2035.



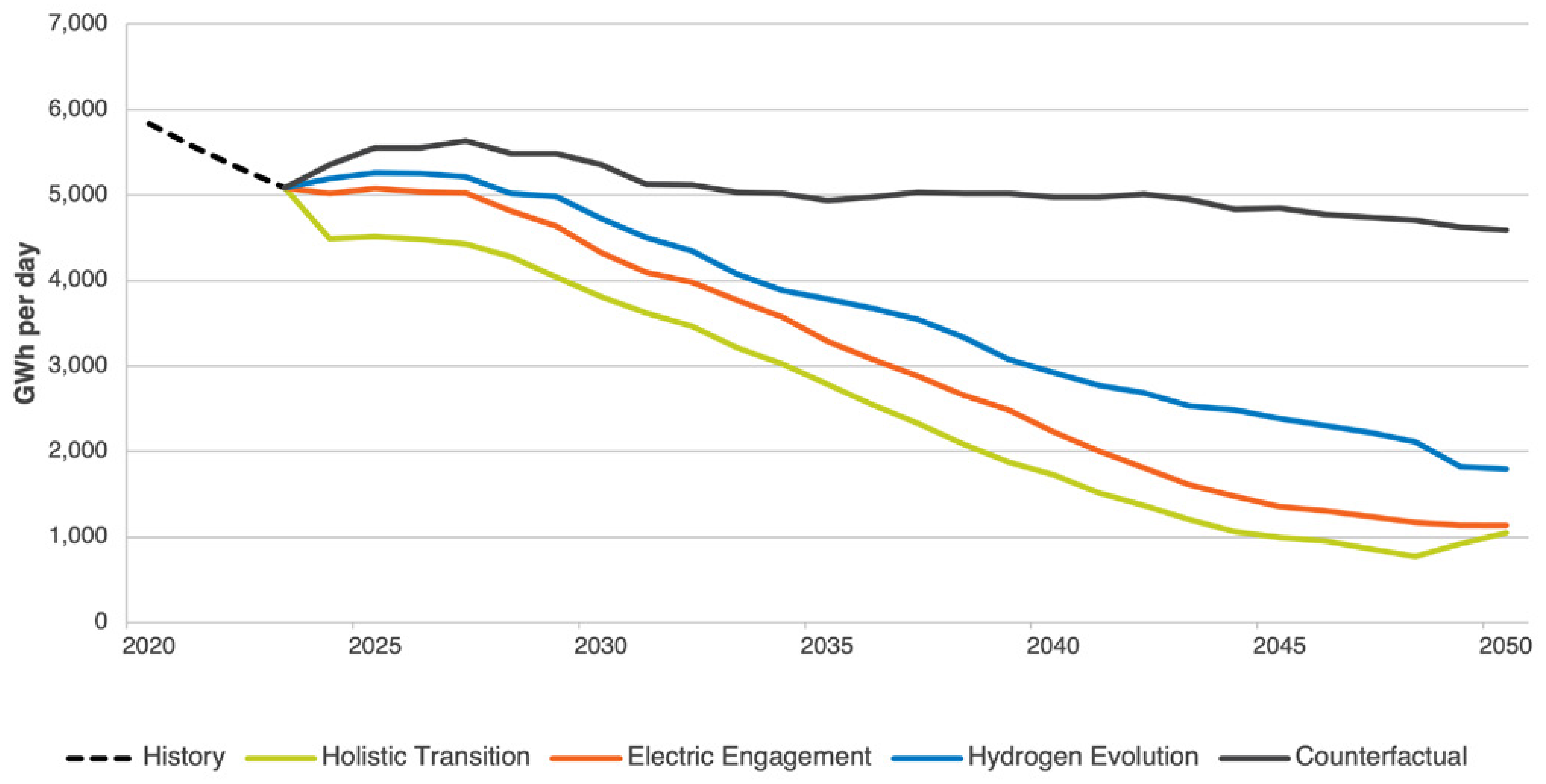
Uncertain demand

In order to achieve net zero goals, all of the FES 2024 net zero pathways require the transition from carbon-intensive fuels, such as natural gas or petrol, to low-carbon alternatives like electrification or hydrogen. This fuel switching is necessary across all sectors of the economy; the heat and the transport sector in particular are likely to see significant changes in their fuelling practices. This will occur in industrial, commercial, and domestic sectors. The potential changes in fuel for domestic heating will require coordination of whole system energy planning to ensure these demands can be met at all times, irrespective of the fuel or technology used. The Counterfactual assumes a continued reliance on fossil fuels, with a slow and limited level of fuel switching.

Electrification is a significant fuel switching option across all sectors, along with the production of hydrogen. However, it is important to acknowledge that fuel switching will present different challenges for each sector. These include considerations such as the technological readiness of alternative options, the installation rate of these options, and the broader system benefits and trade-offs associated with the transition.

Figure 29 shows a wide range for peak demand (1-in-20 day) requirements in GB between 2024 and 2050. Even though it does not meet the UK's net zero ambition or carbon reduction targets, we include the Counterfactual in network planning activities because it enables the identification of what might be required to protect consumers from the risk of a slower than planned transition from natural gas. Whilst the FES 2024 net zero pathways forecast a significant decline in natural gas, the Counterfactual shows only a 10% reduction in peak demand by 2050 with some increases in the nearer term. This uncertainty increases the difficulty of gas network planning, especially for the longer time horizon.

Figure 29: Natural gas peak demand (1-in-20 day)



Overlaid onto this national picture, different regions will progress at varying rates and use different technologies in their decarbonisation endeavors. Factors such as policy frameworks, the deployment of renewable energy, and advancements in technology contribute to the evolving demand for natural gas, making the modelling of gas demand forecasts increasingly complex and variable.

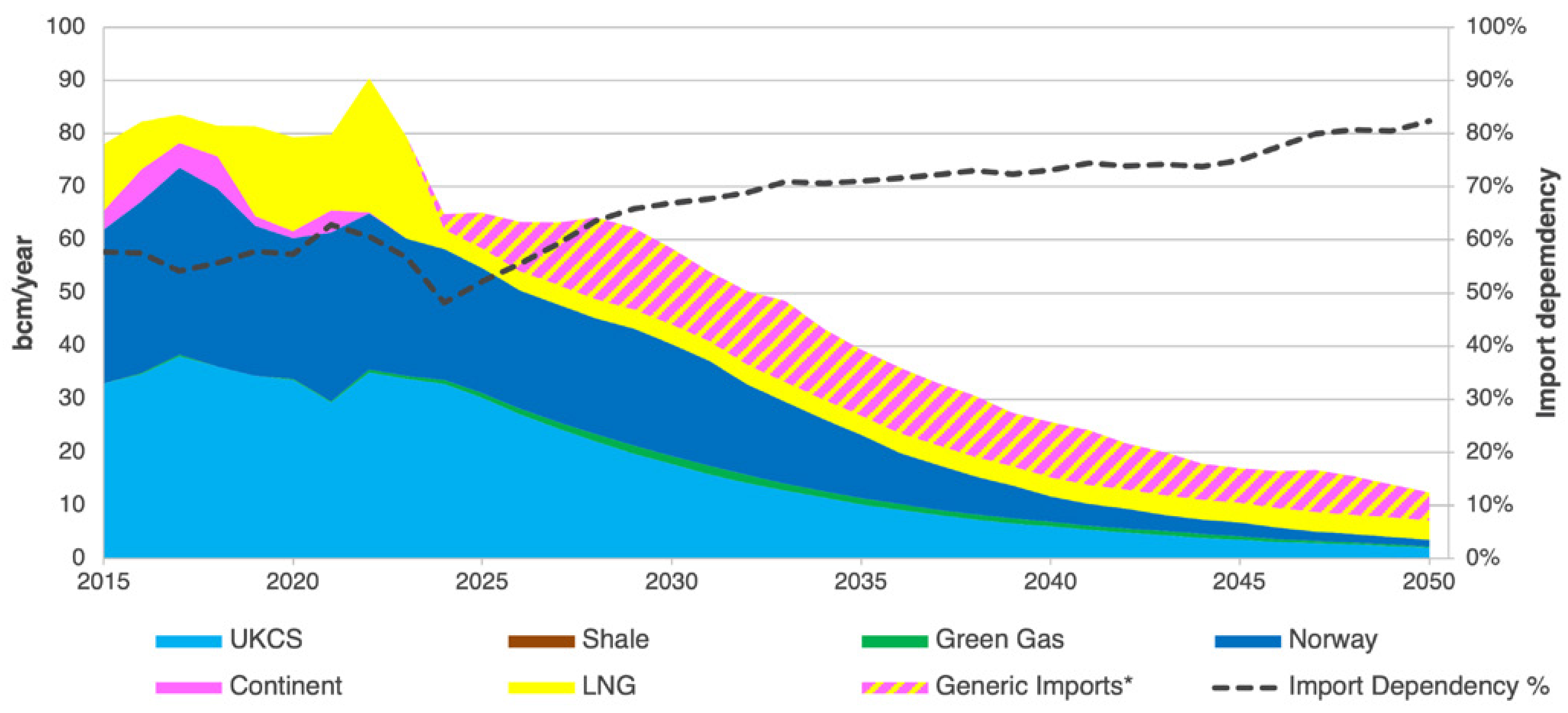
A Regional Energy Strategic Planner (RESP) role is being established within NESO to ensure the local networks can support the rapid decentralisation and decarbonisation of energy at a local level while being coordinated as part of national strategic energy plans.

Challenges of gas supply

Figure 30 illustrates the changing sources of natural gas out to 2050 based on the FES 2024 Holistic Transition pathway. This shows the declining supply and demand for gas and the increasing dependency on imports. The increasing dependency on imports leads to a greater uncertainty on the location of supplies and may also increase day-to-day volatility of individual supplies, increasing the challenges of long-term planning.

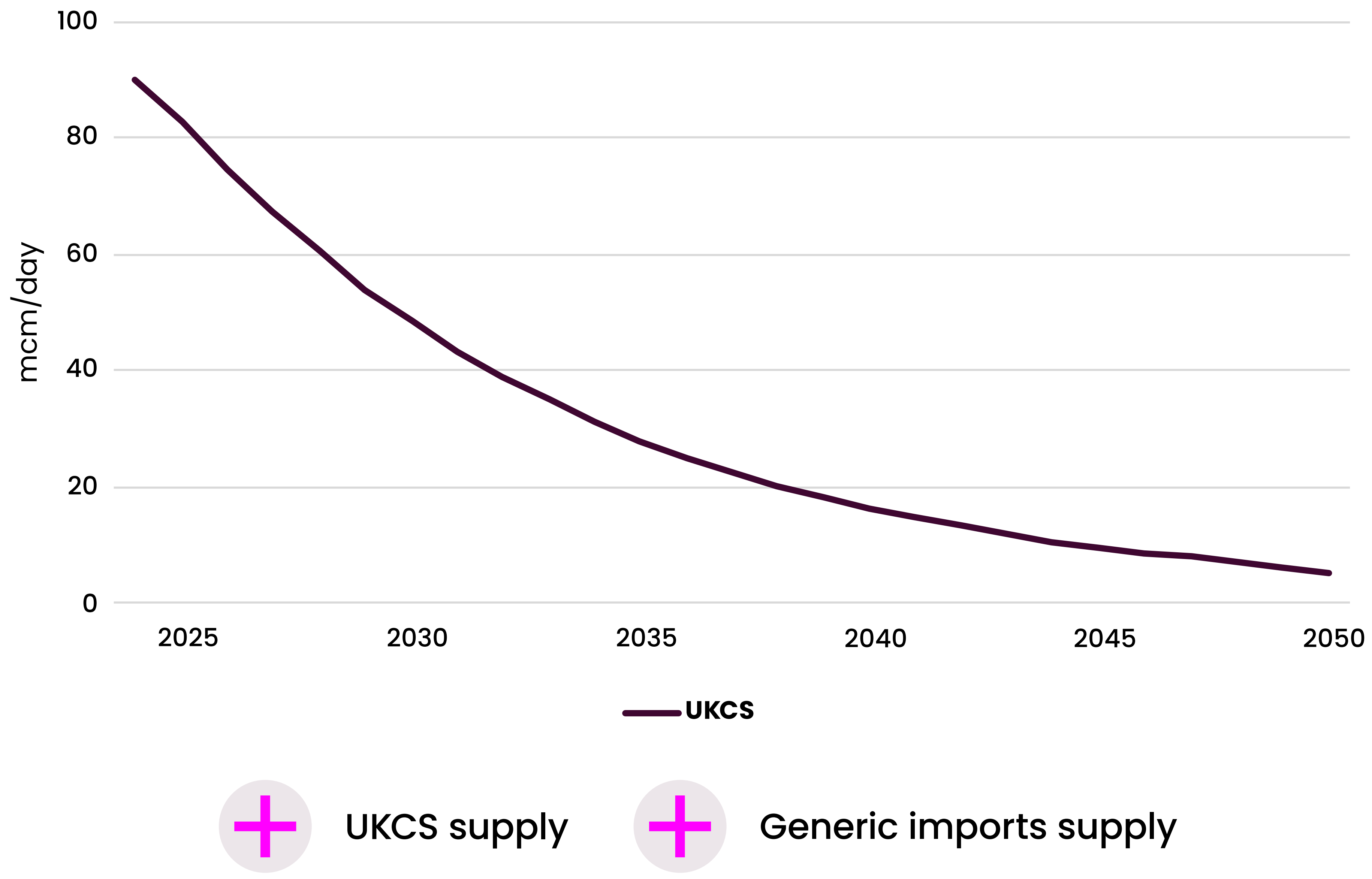
To highlight this point, Figure 31 shows the range of potential supplies from UKCS, LNG and continental imports. The supplies from UKCS are predicted to consistently decline. In comparison, the ranges of supplies from LNG and continental imports are much larger: from near 0 mcm/d up to 160 mcm/d and 118 mcm/d respectively.

Figure 30: Annual gas supply and import dependency in Holistic Transition



Source: FES 2024
** Generic imports refers to LNG and/or imports from the continent*

Figure 31: FES 2024 gas supply ranges



The gas supply landscape has changed in recent years. The significant reduction in Russian flows to Europe has driven an increased dependency on LNG flows into Europe, in particular via the GB market and the Dutch and Belgian interconnectors. However, Europe has now substantially increased its regasification capability, implying that less LNG will come via GB.

Impact on gas network planning

Figure 32 shows the difference between the consistent entry/exit capability lines of the network and the changing supply and demand forecasts of gas flows in current year, 2035, 2045 and 2050.

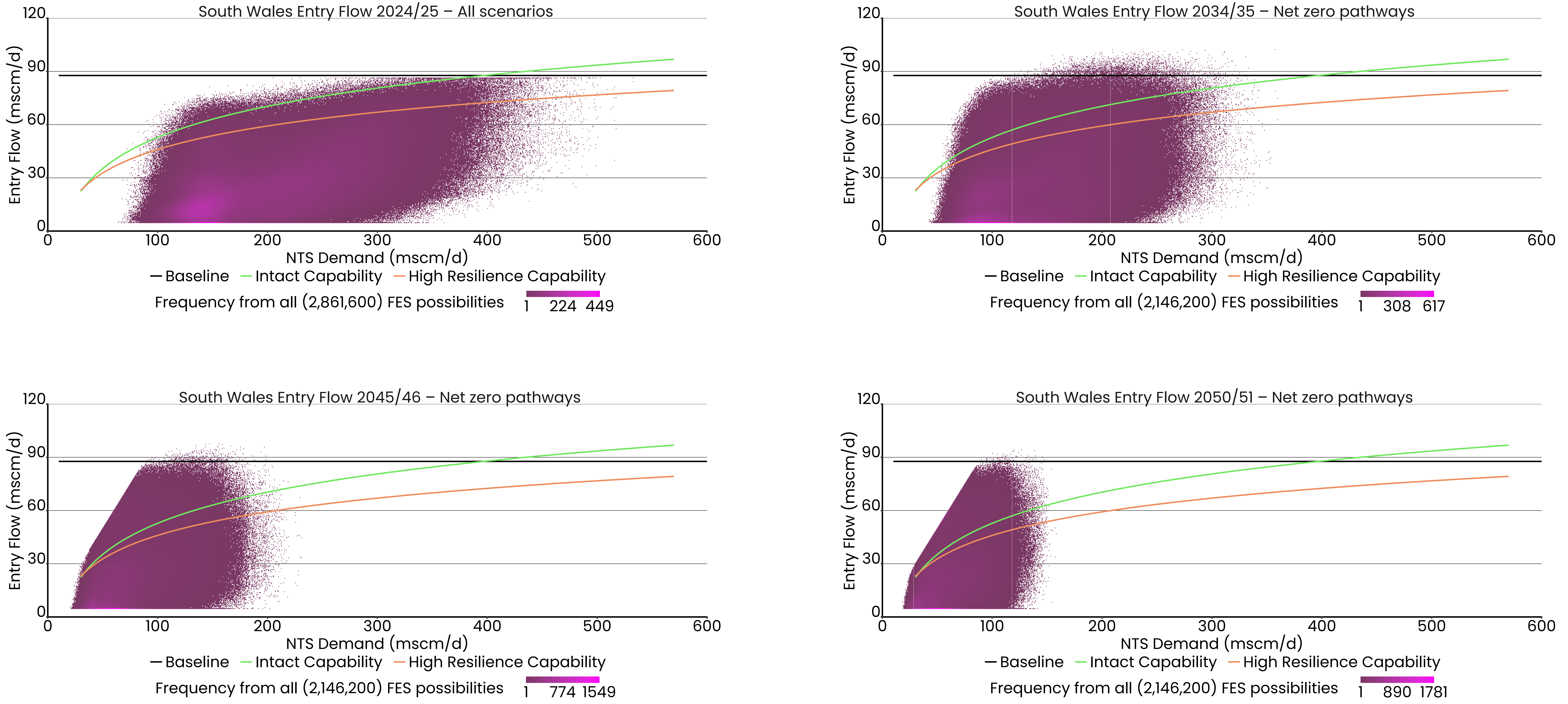
With such changes to the natural gas flows, we will see a changing requirement for the NTS. The changing rate, and sometimes direction, of flows will drive changes to the required duties of NGT's compressor fleet and other assets.

As shown in Figure 29 there is a reduction in gas demand over the years, but the range of supply from some locations does not reduce, and therefore a wide range of potential flows remains. This drives an increase in the variability of compressor operation, potentially reducing both the efficiency of the fleet and maintenance opportunities throughout the year.

NGT has suggested that it might be possible to repurpose some parts of the NTS for alternative duties, such as hydrogen or CCS. Project Union has been suggested by NGT as a 'backbone' for hydrogen transmission across GB, and some of it may make use of repurposed NTS pipelines. If NGT publish investment proposals for Project Union or any other proposals for repurposing NTS pipelines, we will need to consider the impact on the NTS's capability and the corresponding impact on consumers. Should any such proposals be approved, we would expect to incorporate the approved changes into the relevant GNCNR.

Changing flows will impact the importance of certain feeders and other NTS assets. As flows from the UKCS decline, the GB gas market will become increasingly dependent on imports. In particular, the supply of gas from LNG terminals becomes critical over the 2030-2040 period.

Figure 32: **Flame chart evolution 2025 to 2050**

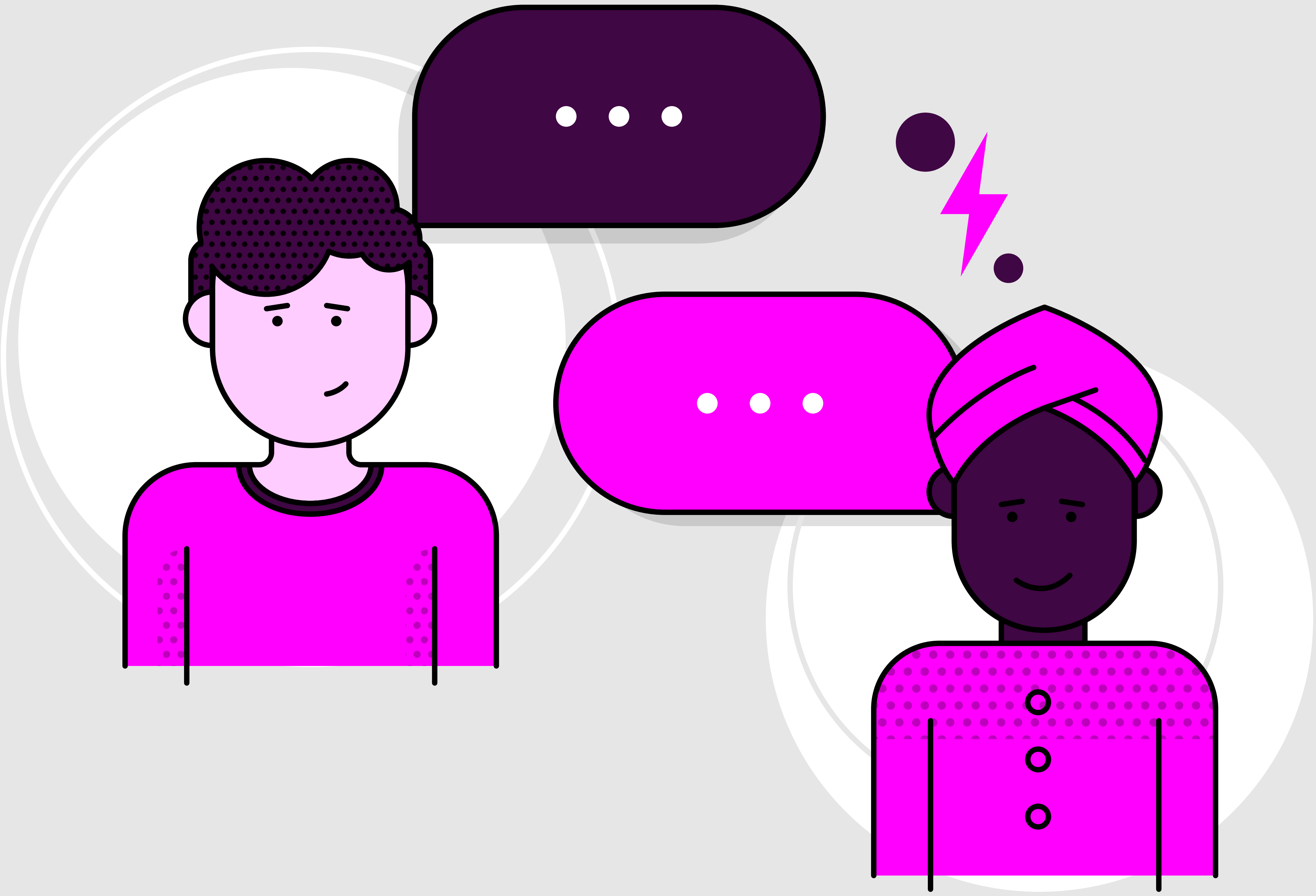


Transition to the whole energy network

The transition to a whole energy network requires addressing a multitude of challenges to effectively address net zero and security of supply in the most efficient and economical way. Strategic energy planning plays a vital role in guiding the transition by providing a roadmap that accounts for the interdependencies and interactions of different energy systems.

As the industrial decarbonisation plans are advancing, we note that gas demand remains significant. Industry currently relies on gas for most of its energy needs, however, a shift to electrification, adoption of low-carbon hydrogen, and abatement of gas through CCS, depending on the specific application, will see a transformation of gas demand. Certain industries, due to the carbon emissions associated with their processes, may require a combination of fuel switching and CCS implementation to achieve their decarbonisation goals. Additionally, the impact of dispersed industries cannot be overlooked, as their unique characteristics may require different approaches that are less transmission focused but still have a notable influence on the overall decarbonisation efforts.

Continuing the conversation



Thank you for reading, we hope you have found the Gas Network Capability Needs Report insightful and useful

In terms of next steps, we welcome stakeholder engagement for our GNCNR process, using your comments and questions about GNCNR 2024 to inform our future analysis and insights.

With the publication of the GNCNR, NGT will be able to use the capability data to develop network options. We will then review and report on these options in our GOAD publication, which will be published at the end of 2025. Through the development of this advice document, we will be seeking your views and feedback.

Ways to connect and stay in touch

We will be sending surveys, energy articles and engagement opportunities via our NESO newsletter. You can subscribe on the NESO website neso.energy/news-and-events

You can also contact us directly through our GNCNR email address at box.gas.networkplanning@nationalenergyso.com and one of our team members will be in touch.

Access our current and past documents, data, and media at: neso.energy/publications-library

For further information on NESO, please visit: neso.energy

Write to us at:

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FAQ

1. **How does the GNCNR fit within Strategic Energy Planning?** As part of NESO's new responsibilities, we are coordinating system design and planning efforts across the whole energy industry. Through our Strategic Energy Planner (SEP) role, NESO has responsibility for the CSNP (Centralised Strategic Network Plan) and other processes such as Strategic Spatial Energy Plan (SSEP) and RESP (Regional Energy Strategic Plan). Ahead of the first CSNP being developed, we are responsible for producing a GNCNR, fulfilling our gas planner licence obligations.

2. **Is the GNCNR part of CSNP?** The CSNP will consist of a collection of plans focusing on electricity transmission network planning, as well as developments in natural gas transmission and hydrogen. The GNCNR will form part of CSNP once established, in accordance with our licence condition. Through the GNCNR, NESO will provide an independent view of the gas network capability, thus providing a stepping stone towards a whole energy system analysis.

3. **What is the NTS?** The NTS is a high-pressure gas transportation system, moving natural gas from entry to exit points. The NTS is made up of approximately 7,660 km of pipeline, 24 compressor sites, 8 gas terminals, and over 350 above ground installations. The NTS is owned and operated by NGT; NESO has gas network planning responsibilities for the NTS, as per the Gas System Planner Licence.

4. **What are the entry points on the NTS?** Gas is delivered into the NTS via entry points where gas is added to the NTS from:

   - Supply terminals (sometimes comprising more than one sub-terminal),
   - LNG terminals (where liquefied natural gas is returned to its gaseous state),
   - Interconnectors,
   - Storage sites.

5. **What are exit points on the NTS?** Exit points are those sites where gas leaves the NTS to meet the needs of end consumers. These include:

   - Distribution network offtakes, for onward supply to domestic and business consumers,
   - Direct connections to large industrial users and power stations,
   - Sites where gas flows to locations outside of GB via interconnectors,
   - Sites where gas is put into storage.

6. **Why is Britain divided into seven zones for capability analysis?** The concept of zones has been introduced by NGT to breakdown the complex NTS into smaller and more manageable parts. Each of the seven zones ('RIIO Zones') has distinctive gas flow regimes and requirements for which we can assess entry and/or exit capability.

   The geographic descriptions, for instance South East, are provided as indicative explanations for each zone. For example, RIIO Zone 4, commonly known as South Wales, covers not only South Wales but also part of the Midlands.

7. **What is a network asset?** A network asset represents any physical part of the gas transmission network, such as compressors, pipelines, valves, and regulators.

8. **What is a compressor?** A compressor is a piece of equipment used in the gas transmission network to move gas from entry to exit points by increasing the pressure of the gas within a specific part of the pipeline system. There are currently 24 compressor stations at different sites across GB.

9. **What is mcm?** Million cubic metres (mcm), sometimes referred to as million standard cubic metres per day (mscm/d) is a unit of measurement for gas volume. During our analysis, we use mcm as a measure of the effective volume of gas which is independent of pressure, temperature, or compressibility of gas and is representative of the actual energy content. It is often used as part of the daily volume of gas (mcm/d).

10. **What is network capability?** Network capability is the maximum flow of gas that the network can physically transport to and from specific locations or regions without exceeding high pressure safety limits or compromising any equipment safe operational tolerances whilst still meeting minimum pressure obligations at offtakes. This can be influenced by various factors, such as supply and demand fluctuations, the availability of network assets and so on.

11. **What does intact capability mean?** For intact capability, all gas transmission compressors are assumed to be available and reliable.

12. **What is high resilience?** High resilience is defined in terms of the combination of compressor units (within a zone or zones) that can be estimated to be available 99% of the time.

13. **What is a gas constraint?** A constraint is where the pressure or flow required to meet customer needs cannot be met by the physical capability of the network.

14. **What is a constraint day?** A constraint day occurs when supply or demand exceeds the physical NTS capability.

15. **How do you model network capability?** We use network modelling software called SIMONE to simulate extensive scenarios across a range of supply and demand forecasts. SIMONE allows us to create a complex mathematical model of the NTS which we use to assess current and future network planning requirements.

16. **What is a flame chart?** Flame charts are visual representations of the capability needs within each NTS zone during a particular time. The probabilistic gas supply and demand points are represented in the flame chart and compared to the capabilities boundaries to understand whether the projected flows can be supported by the gas network capability.

17. **What are interconnectors?** An interconnector is a pipeline transporting gas between different countries. There are a total of three interconnectors linking GB with other countries:

- the Irish Interconnector, a unidirectional link, transporting gas from GB to both Northern Ireland and the Republic of Ireland,
- the Belgian Interconnector, a bidirectional gas pipeline between Bacton and Zeebrugge in Belgium,
- and lastly, the Dutch Interconnector is a bidirectional gas pipeline connecting Bacton and Balgzand in the Netherlands.

18. **What is LNG?** Liquefied natural gas or LNG is natural gas that has been converted to liquid form for ease of storage or transport. The liquefaction process reduces the volume of gas by approximately 600 times, making it more practical and cost-effective to store and transport.

19. **What is linepack?** Linepack is defined as the volume of gas physically contained within the NTS at any time.

20. **What is the '1-in-20' demand level?** The 1-in-20 peak day demand is the demand, in a long series of winters, at connected loads held at the levels appropriate to the winter in question that would be exceeded in one out of 20 winters, each winter being counted only once. It is more specifically defined in NGT's licence and described in the Gas Demand Forecasting Methodology.

Acronyms

Acronym	Description
ANCAR	Annual Network Capability Assessment Report
bcm/year	Billion cubic metres per year
CCS	Carbon Capture and Storage
CCGT	Combined Cycle Gas Turbine
CP2030	Clean Power 2030
CSNP	Centralised Strategic Network Plan
DESNZ	Department for Energy Security and Net Zero
ESO	Electricity System Operator
FES	Future Energy Scenarios
GB	Great Britain
GDN	Gas Distribution Network
GOAD	Gas Options Advice Document
GNCNR	Gas Network Capability Needs Report
IOG	Isle of Grain
LNG	Liquefied Natural Gas
mcm/d	Million cubic metres per day
mscm/d	Million standard cubic metres per day
NESO	National Energy System Operator
NGT	National Gas Transmission
NTS	National Transmission System
Ofgem	Office of Gas and Electricity Markets
RESP	Regional Energy Strategic Plan
RIIO	Revenue = Incentives + Innovation + Outputs
SEP	Strategic Energy Planning
SPOP	Strategic Planning Options Proposal
SSEP	Strategic Spatial Energy Plan
UKCS	UK Continental Shelf

Legal

Pursuant to its gas system planner licence, National Energy System Operator has a long-term planning and forecasting function in relation to the gas transmission network.

For the purpose of this outlook document, the terms "we", "our", "us" etc. are used to refer to the licensed entity, National Energy System Operator.

National Energy System Operator has prepared this outlook document pursuant to its gas system planner licence 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 from users of the gas and electricity transmission systems in Great Britain together with its own forecasts of the future development of those systems.

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