Data Classification: Public

Gas Supply Security Assessment

Methodology statement to assess medium range gas supply security

November 2025

NESO
National Energy System Operator

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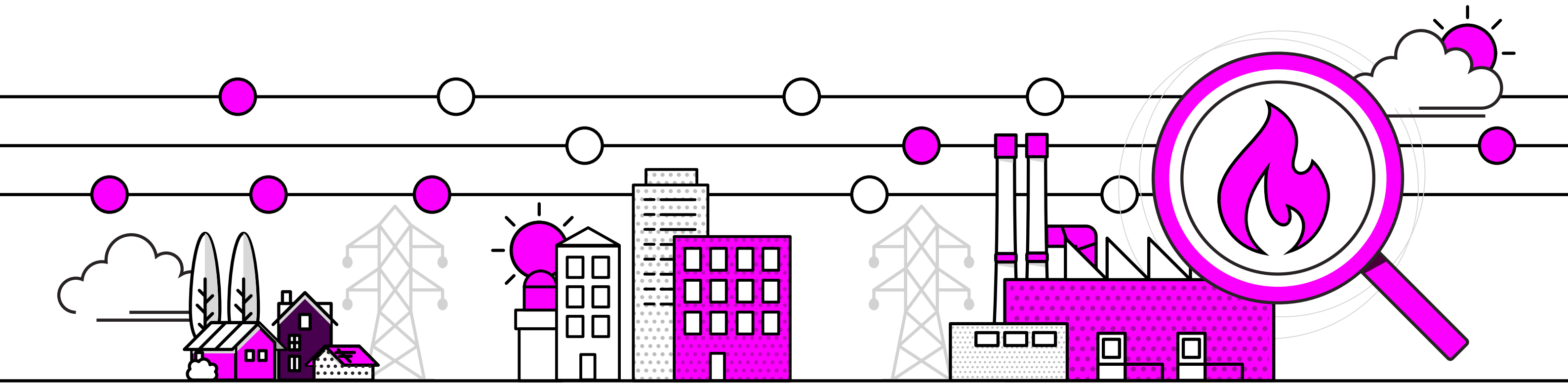

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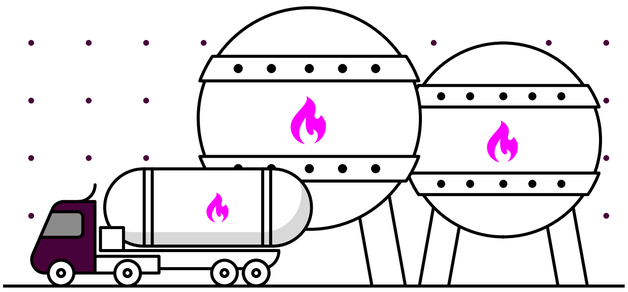


Introduction

The National Energy System Operator (NESO) is an independent public corporation at the centre of the energy system, taking a holistic view to create a world where everyone has access to reliable, clean and affordable energy.

NESO is built on the strong foundations of the Electricity System Operator (ESO), taking on additional responsibilities to serve as an independent and impartial public body responsible for advising the government on the whole energy system[1]. Our role involves strategic network planning across electricity, gas and new vectors such as hydrogen, and adopting a holistic approach to decarbonising the whole energy system. NESO now serves as Great Britain's (GB) strategic gas network planner, with specific obligations outlined in its gas system planner licence[2].

This includes licence condition C4[3], where NESO has the responsibility of delivering a new, independent medium-term *Gas Supply Security Assessment* (the Assessment). NESO will undertake and publish this Assessment annually, looking five and ten years into the future (medium term) to test if each of GB's supply sources could deliver the required volumes of natural gas onto the National Transmission System (NTS) for a range of peak and seasonal demand scenarios. This methodology statement builds on a proposed methodology published by government in December 2023[4], which considers the availability, deliverability and reliability of gas molecules to GB. Testing the NTS's ability to ensure secure supplies throughout GB is delivered by NESO's *Gas Network Capability Needs Report* (GNCNR)[5].

As GB continues to decarbonise towards its Clean Power 2030 and Net Zero 2050 goals, the Assessment will provide a clearer picture to government and industry of any security of supply challenges facing GB in the coming decade, and any steps that could be taken to mitigate risk. To help plan a secure network that accounts for the changing dynamics of the gas system while delivering for consumers, the Assessment sits alongside existing publications produced by NESO such as *Future Energy Scenarios* (FES)[6] and the GNCNR, and National Gas Transmission's (NGT) *Gas Ten Year Statement*[7] and season-ahead outlooks.[8]

NESO has taken the opportunity to test and refine the government's proposed methodology for assessing gas supply security. We have used this document to explain both the outcome and the reasoning behind those changes. Many of these changes are the result of working closely with NGT, Ofgem, government (including the Department of Energy Security and Net Zero (DESNZ)), other non-departmental government bodies and academics, while engaging with the wider gas supply industry, including terminal and infrastructure operators. When published each year, the Assessment will provide industry, government and wider stakeholders with independent analysis of natural gas supply and demand margins for the GB market five and ten years ahead.

1 What we do, National Energy System Operator.

2 *Annex G: Gas System Planner Licence Conditions.pdf*, Ofgem.

3 *GSP Licence Terms and Conditions*, Ofgem.

4 *Gas Supply Security Assessment: Proposed methodology for assessing medium range gas supply security*, DESNZ.

5 *Gas Network Capability Needs Report (GNCNR)*, National Energy System Operator.

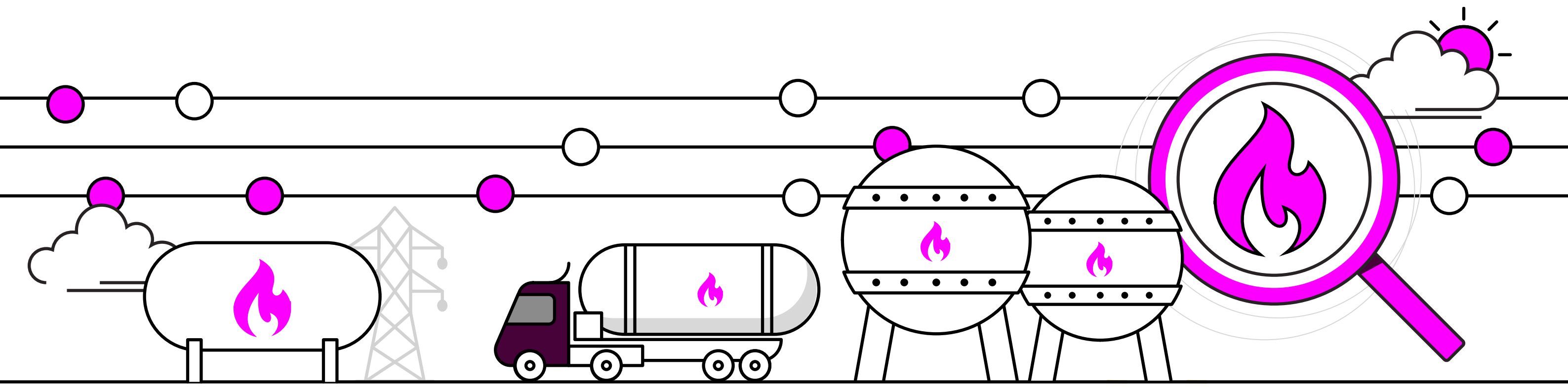
6 *Future Energy Scenarios (FES)*, National Energy System Operator.

7 *Gas Ten Year Statement 2024*, National Gas.

8 *Gas Winter Outlook 2024*, National Gas.

The calculated margins may indicate a risk that insufficient supplies could be delivered onto the NTS under either an intact network – where all gas supply infrastructure is fully operational – or when industry standard supply tests are applied, that is, when the single largest piece of supply infrastructure experiences full outage (N-1). In this event, NESO will also provide advice on potential mitigations which could be taken forward in the coming years to prevent or protect against these risks, while also accounting for GB's commitment to meeting Clean Power 2030 and Net Zero 2050 goals.

This methodology statement is published alongside the first *Gas Supply Security Assessment*. We are committed to working collaboratively with stakeholders following this initial publication to inform and refine the ongoing development of this new piece of work. We warmly welcome feedback on how we can further improve our modelling over the coming months. Please contact us at box.gassupplysecurity@neso.energy.



1. How the gas supply market has delivered gas security

Gas is currently used to heat our homes, generate electricity and power our industry. Natural gas accounts for around 39% of Great Britain's (GB) total energy supply today[9], with GB's gas interconnectors also supporting gas security in Northern Ireland, the Republic of Ireland and mainland Europe. Although natural gas demand is expected to decline as GB progresses towards net zero, gas will still be critical for heating, power and industry in the medium term.

To deliver gas where and when it is needed, it is transported locally via one of 13 local distribution zones (LDZs), operated by four gas distribution network operators. The NTS, operated by National Gas Transmission (NGT, also known as National Gas), provides most of the gas to these LDZs. Gas is also delivered to Ireland, Northern Ireland and the Isle of Man via the unidirectional Moffat interconnector system, and to mainland Europe via two bi-directional interconnectors. Gas is moved around the NTS to meet demand through pressure differences between offtakes and network entry points, as well as a fleet of compressor stations, which can change the pressure and flow of molecules. Gas on the NTS typically travels around 25 mph, meaning unforeseen increases in intraday demand cannot immediately be met by an increase in supplies. For this reason, the gas system is commercially balanced daily at 5am, with the volume of gas within the NTS – known as Linepack – used to provide a within-day buffer. In winter 2024/25, Linepack provided up to 35 mcm[10] and 9 mcm[11] of within-day and day-on-day flexibility, respectively.

Gas is delivered onto the NTS by five aggregated supply sources, delivering through 14 entry sub-terminals, three LNG terminals and seven gas storage facilities[12] (Figure 1). GB sources are the UK Continental Shelf (UKCS), Norwegian Continental Shelf (NCS), Liquefied Natural Gas (LNG), gas interconnection with Europe (interconnectors) and gas storage sites. In addition to NTS deliveries, a small proportion of biomethane gas is also supplied directly to the LDZs. Biomethane is extracted from biogas, which is produced via anaerobic digestion of waste organic matter.

Each source has individual characteristics, defining how much gas it could deliver onto the NTS, how likely it is to do so, and how flexible it could be to deliver additional volumes when GB's gas demand rises. Flexibility could be required for events such as a period of cold weather or a global supply shock, such as following Russia's full illegal invasion of Ukraine. The relative contribution of each source will differ over time as UKCS production declines and reliance on imported sources increases. For example, UKCS's contribution to gas and energy security has changed significantly in recent years. UKCS is the term for a series of gas fields around the UK, predominantly in the North Sea and other waters surrounding the UK. As recently as 2004, GB was a net exporter of gas, meaning the UKCS provided more gas over the course of a year than was consumed domestically. However, the UKCS has matured significantly in the last 20 years, with naturally declining production volumes, and GB is now a net importer, with volumes increasingly being sourced internationally to meet demand. Imports come from three main routes: from pipelines connected to the NCS, via the

9 *Future Energy Scenarios 2025: Pathways to Net Zero*, National Energy System Operator.

10 *Gas Winter Review 2024/25*, National Gas.

11 Find gas transmission data portal, National Gas.

12 These are: St Fergus 1, St Fergus 2, St Fergus 3, Teesside 1, Teesside 2, Easington 1 (Langeled), Easington 2 (Dimlington), Easington 3 (Rough UKCS), Barrow, Bacton 1 (Shell), Bacton 2 (Seal), Bacton 3, Bacton BBL and Bacton Interconnector. Sub-terminals can be named differently depending on the source data. Where this has happened, the number can be used instead.

two interconnectors between mainland Europe and GB, and delivered to LNG terminals by cargoes from around the world. GB also benefits from a gas storage industry, which – apart from one seasonal storage site – is characterised by being able to refill and deliver onto the NTS rapidly.

In 2024, the GB gas import dependency – the proportion of gas consumed in GB which originated outside GB – stood at 49%. On peak days during the winter, domestic supply – that is, from UKCS and biomethane – met just 20% of demand[13]. Import dependency will increase, creating a challenge to understand whether gas is available to replace declining UKCS production.

There is a separate question of whether the NTS can continue to meet GB gas demand as different terminals are used in different ways compared to their historic patterns. This is analysed in NESO's *Gas Network Capability Needs Report* (GNCNR)[14], published in December 2024, and will be further investigated by National Gas's *Strategic Planning Options Proposal* (SPOP) and NESO's *Gas Options Advisory* (GOA) document, which is due to be published by the end of 2025[15].

While the NTS is owned and operated by NGT, each import entry point and storage site is privately owned, with operational independence. On any given day, numerous factors, such as the capacity that has been made available, whether that capacity has been booked, shippers' trading strategies, international pricing differentials, pricing between different hubs, and total demand, mean there is uncertainty over the exact supply mix each terminal will deliver onto the NTS. This methodology includes a merit order of how this uncertainty can be reflected.

13 NESO's internal analysis.

14 *Gas Network Capability Needs Report (GNCNR)*, National Energy System Operator.

15 Gas Options Advice (GOA), National Energy System Operator.

2024/25

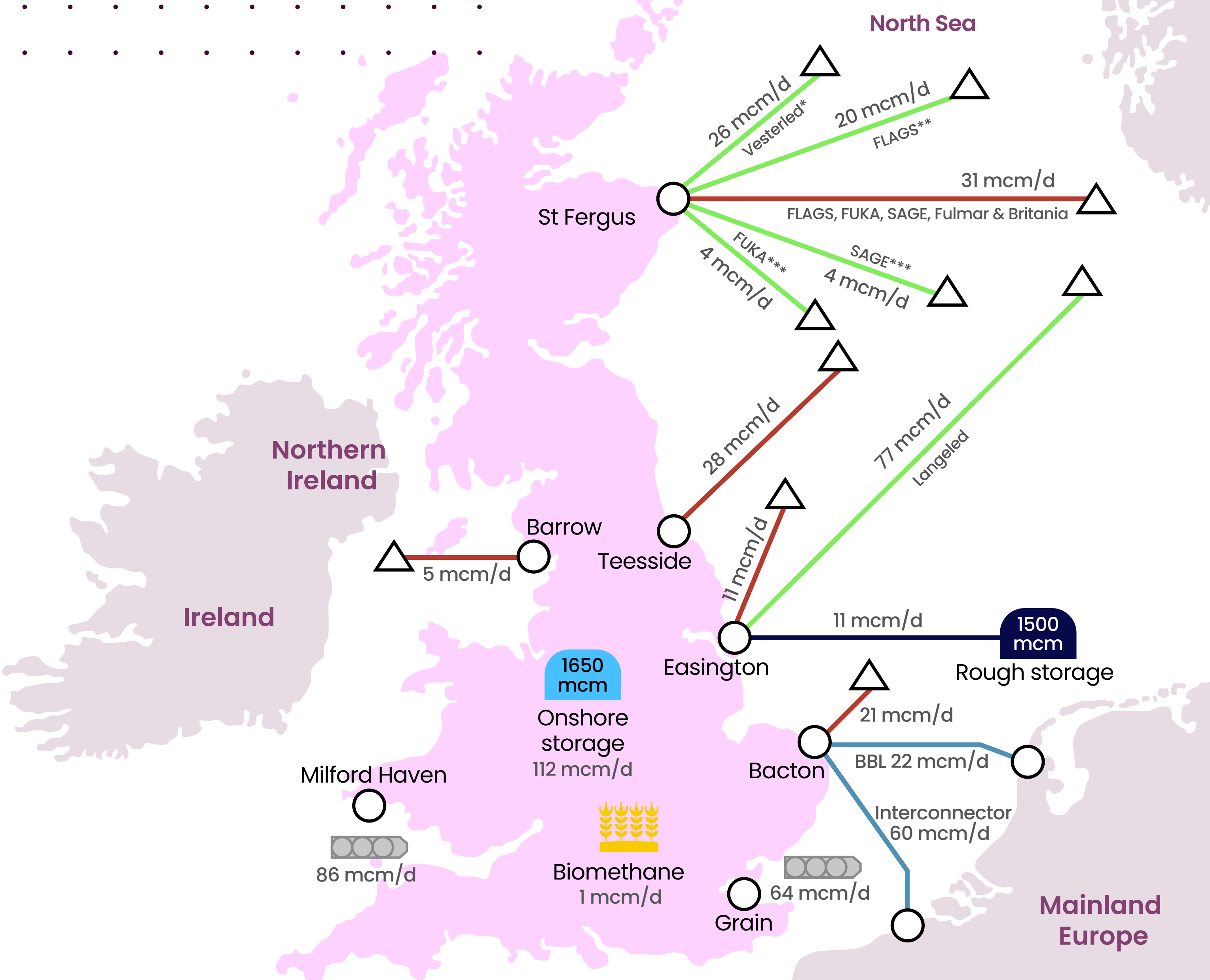


Figure 1: GB's 2024/25 gas supply map showing observed maximum deliverable capabilities.

- Gas site
- Offshore gas fields
- LNG jetty
- UKCS (UK Continental Shelf) (peak capability mcm/d)
- NCS (Norwegian Continental Shelf) (peak capability mcm/d)
- Interconnectors (peak capability mcm/d)
- Depleted gas field storage (volume capacity mcm)
- Onshore storage (volume capacity mcm)
- Biomethane

* Gassco report as 'St Fergus'
** Gassco report as 'Fields into SEGAL'
*** Non-Gassco reported

2. Our approach to testing medium-term gas supply security

Given GB's increasing reliance on imported gas in the future, the uncertainty over how gas supply will be delivered onto the NTS and how that gas will be used in future scenarios, this Assessment provides a picture of the supply and demand balances during peak periods and expected winter conditions.

Technical calculations will be used to estimate a realistic maximum delivery of each supply source in a process known as de-rating. The concept of de-rating is widely used for electricity security of supply assessments and can also be applied to gas supply security to better estimate the actual availability, reliability and deliverability of supply sources over the specified time horizon. Compared to testing technical capability of NTS entry points and the network itself, a de-rating approach aims to develop a more realistic assessment of where gas volumes could originate, how they could be delivered to a terminal and then transported onto the NTS. This means our de-rated supplies may be lower than those found in other assessments that consider the technical maximum capability of gas supply infrastructure.

To test whether de-rated supply can meet demand, we evaluate periods of elevated winter demand, known as cold snaps, and periods of expected seasonal normal weather conditions[16]. Assessing de-rated supplies against demand profiles derive either a positive or negative supply margin. A more detailed perspective is gained by assessing supply and demand balances across a period of consecutive days, as flexible sources – including gas and LNG storage – can deliver decreasing volumes over time. As a result, margins may be positive on day one but negative on day two or later. Note, we expect cargoes will deliver to LNG terminals, so a constant rate of delivery is assumed throughout the cold snap.

Demand profiles are developed from gas demand modelling underpinning NESO's *Future Energy Scenarios*[17] (FES). We have used FES for this Assessment because (a) its modelling considers the whole energy system, so is holistic and coherent across different energy vectors, and (b) it has a well-established stakeholder engagement programme. This allows the wider energy industry to understand the impact of a range of known demand profiles on gas security of supply.

As instructed within our licence condition C4[18], this fundamental approach has been shaped by testing the following principles of gas supply, which were previously defined in the government's proposed methodology:

- **Availability:** Are the physical quantities of natural gas that GB will need available from supply sources, as predicted through the demand profiling?
- **Reliability:** Will these quantities be purchased by and delivered to GB market participants?
- **Deliverability:** Will there be sufficient infrastructure capability to receive and transfer the quantities of natural gas required into the gas system?

The de-rated supply volumes have not explicitly considered cross-border price differentials, and the calculation process has assumed that sufficient incentive exists, such that de-rated supplies originating outside GB are delivered when required, if available.

16 *Gas Demand Forecasting Methodology*, National Grid.

17 *Future Energy Scenarios (FES)*, National Energy System Operator.

18 *Annex G – Gas System Planner Licence Conditions*, Ofgem.

3. How does this new Assessment fit with existing security measures?

Gas supply security is already assessed through NGT's *Winter*[19] and *Summer*[20] *Outlooks*, the *Gas Ten Year Statement*[21], the UK government's *National Risk Assessment*[22] and the annual *Statutory Security of Supply Report*[23]. NESO also publishes the FES[24] and GNCNR[25].

These assessments rely on infrastructure tests and assume, where possible, that the market will deliver the necessary gas molecules. They include an N-1 standard calculation, which tests whether the maximum supply capability of NTS entry points is sufficient to meet 1-in-20-year peak day demand[26], should the single biggest piece of supply infrastructure be unavailable[27]. They do not test whether physical volumes of gas molecules are available, reliable and deliverable onto the NTS when required. NESO's new assessment will address this gap and is intended to complement existing analyses, evaluating security of supply for both an intact (fully operational) network and against an N-1 reduced system.

NGT will continue to hold the responsibility to develop, maintain and operate economic and efficient networks, and facilitate competition in the supply of gas in GB. NESO has been working closely with NGT to identify how N-1 may impact this Assessment, and any whole energy mitigations which may be necessary as a result.

The following section of the document sets out the technical calculations used to assess margins based on aggregated de-rated supply. This is followed by details of how the demand profiles were developed, and individual de-rated supply calculations by source. The final section presents the approach taken to categorise the various supply sources according to their relative risk of non-delivery due to international competition.

19 *Gas Winter Outlook 2024*, National Gas.

20 *Gas Summer Outlook 2025*, National Gas.

21 *Gas Ten Year Statement*, National Gas.

22 *National Risk Register 2025*, HM Government.

23 *Statutory Security of Supply Report: 2024*, GOV.UK.

24 *Future Energy Scenarios (FES)*, National Energy System Operator.

25 *Gas Network Capability Needs Report (GNCNR)*, National Energy System Operator.

26 1-in-20-year peak day gas demand reflects a level of gas demand that should statistically be observed once in every twenty years. 1-in-20-year peak day gas demand can vary from year to year and is sensitive to the assumed structure of gas demand, for example, how many homes use gas-fired boilers for heating.

27 Mandated in EU Regulation 2017/1938. This was incorporated into UK law by the Gas (Security of Supply and Networks Codes) (Amendment) (EU Exit) Regulations 2019 – see *Transmission Planning Code*.

4. How NESO is assessing the expected margins

In line with NGT's daily reporting and seasonal outlooks, NESO is assessing supply and demand margins in million cubic metres per day (mcm/d). Each supply source component is the outcome of individual calculations which acknowledge the independent characteristics of each, observed throughout each winter. The individual supply sources are then aggregated in a merit order that accounts for the operational flexibility, price sensitivity and market optionality of each source.

The following calculation and definitions are used to develop a multi-day gas supply margin, which compares de-rated supply against a chosen gas demand profile. In the case of this Assessment, margins are assessed over an 11-day period.

$$\text{Margin}_{d,w,p} = (UKCS_w + NCS_w + LNG_{w,p} + Int_w + Stor_{d,w} + Bio_{w,p}) - Dem_{d,w,p}$$

Where:

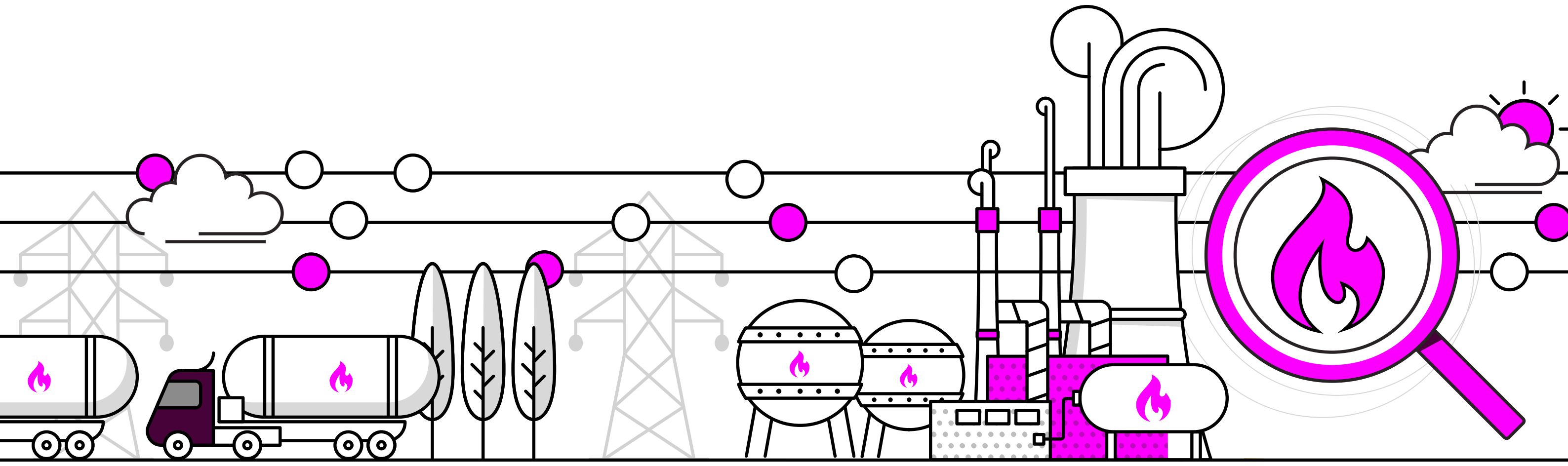
- *d* is the gas day of the assessment period
- *w* is the assessment winter tested, where winter runs from 1 October to 31 March
- *p* is the peak or seasonal normal demand profile corresponding to the relevant FES scenario
- *UKCS* is the de-rated UKCS supply component for assessment winter *w*, in units mcm/d
- *NCS* is the de-rated NCS supply component for assessment winter *w*, in units mcm/d
- *LNG* is the de-rated LNG supply component for assessment winter *w*, for demand profile *p*, in units mcm/d
- *Int* is the de-rated interconnector supply component for assessment winter *w*, in units mcm/d
- *Stor* is the de-rated storage supply component for assessment winter *w*, for each gas day *d* under assessment, in units mcm/d
- *Bio* is the de-rated biomethane component in assessment winter *w*, for demand profile *p*, in units mcm/d
- *Dem* is the gas demand for each gas day *d* of the cold snap, in assessment winter *w*, for demand profile *p*, in units mcm/d

Each component of the formula is defined in its individual section, with explanations of how it can be calculated, where to source data, and any changes from the government's proposed methodology.

These chapters explain how to:

- develop demand profiles by identifying the demand scenario, the appropriate duration of a cold snap, and associated within-period demand profile shape.
- evaluate each supply component through technical calculations based on their individual characteristics, including how availability of volumes can decrease as a result of delivered volumes the day before – for example, gas storage sites, where deliverability decays day-on-day until there are new injections.

- subtract the gas demand value from total de-rated gas supply figure from the demand figure to provide a margin on each day of the assessed period. A negative margin indicates a potential shortfall of gas.
- apply a merit order to reflect how each supply source contributes to meeting demand. Supplies at the top of the merit order are calculated to flow most reliably when demand requirements are high, while those lower down are subject to greater optionality regarding whether volumes could be delivered. This helps to understand not just whether supply security can be met, but how it could be, enabling a starting point for planning of mitigation measures.



5. How demand is calculated

Gas demand corresponds to the volume of gas used by residential consumers, industrial and commercial (I&C) facilities and gas-fired power generators, in addition to the volume of gas transported to Ireland, Northern Ireland and the Isle of Man via the Moffat interconnector system. Also included is shrinkage: gas lost through leaks, theft or used in the transmission process.

Daily demand during the periods under assessment is not expected to drop sufficiently to enable storage reinjection, so reinjection is not included in demand figures. GB-to-EU gas exports are also assumed to be zero during the winter months and are therefore not considered in our demand figures.

The first step in this medium-term gas supply security analysis is to establish demand profiles against which de-rated supply sources can be assessed. Future gas demand is highly uncertain; consequently, a range of scenarios should be considered. This will indicate under which circumstances the most prominent security of supply risk may materialise and how a more rapid decline in gas demand can improve security of supply.

5.1 Characterising demand with the Future Energy Scenarios

The FES 2025 pathways allow demand profiles to be produced which reflect varying rates of key sector decarbonisation, most notably domestic heating and power generation, deriving a range of higher and lower gas demand outcomes. The five pathways capturing the potential evolution of energy demand and supply in GB are:

- **Ten Year Forecast (10YF):** NESO's base case, reflecting our current best view of future demand for gas and power over the next ten years. It considers existing project development and policy action.
- **Holistic Transition (HT):** Net zero is met through a mix of electrification and hydrogen, with hydrogen mainly used around industrial clusters. A high-renewable capacity pathway, with lower unabated gas-fired generation.
- **Electric Engagement (EE):** Net zero is met mainly through electrified demand. Consumers are highly engaged in the transition through smart technologies that reduce energy demand, such as electric heat pumps and electric vehicles.
- **Hydrogen Evolution (HE):** Net zero is met through rapid progress for hydrogen in industry and heat. Widespread access to a national hydrogen network is assumed. Some consumers will have hydrogen boilers, although most heat is electrified.
- **Falling Behind (FB):** Net zero emission reductions by 2050 are not met. Falling Behind represents the slowest credible rate of decarbonisation in the heating, power generation and I&C sectors, and therefore the highest credible gas security of supply risks can be assessed. Compared with our base case of the Ten Year Forecast, Falling Behind has lower engagement in clean heat technology from consumers, lower electricity demand flexibility and slower power system decarbonisation.

The new Ten Year Forecast reflects the most likely outcome and is therefore used as our base case, with the other four pathways used as upper and lower boundaries of expectation.

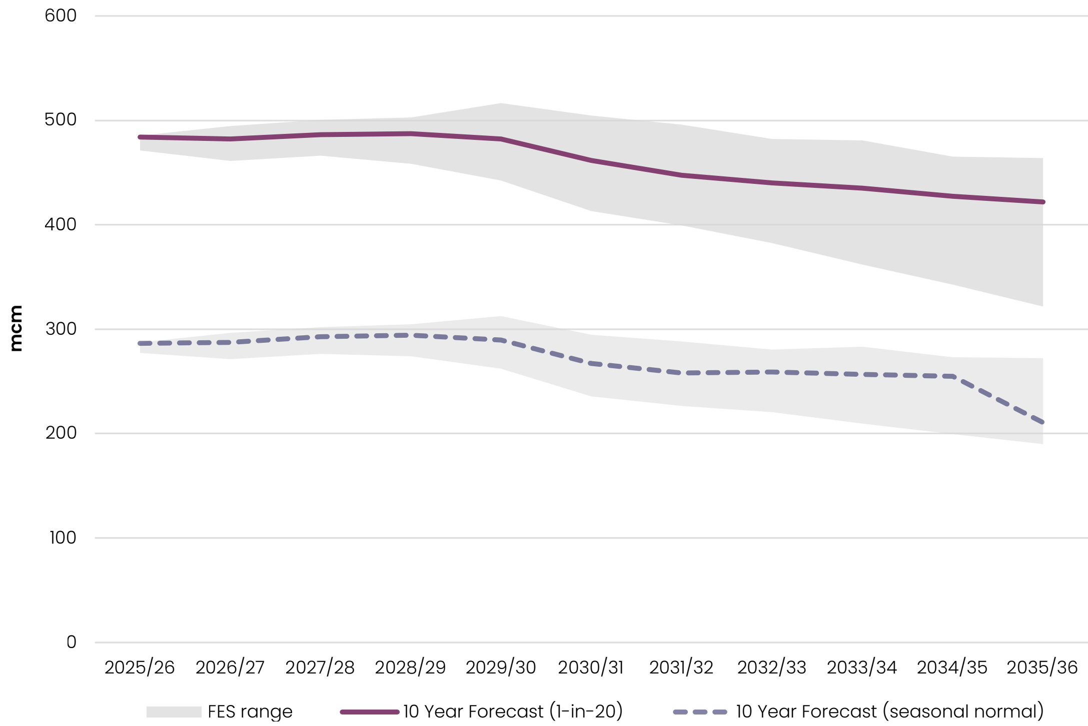


Figure 2: Ten Year Forecast single day 1 in 20 peak demand and representative single day seasonal normal demand, including FES pathway ranges.

For each pathway and year, daily seasonal normal demand volumes and single day 1-in-20-year peak demand are calculated. Seasonal normal demand is used in FES and NGT's *Winter Outlook*, referring to the demand level that would be expected under weather conditions considered normal for a particular time of year. Also used in these publications is the 1-in-20-year peak day demand, which is characterised by elevated demand for heating and power generation. Due to their widespread use in gas supply security analyses, there is value in assessing security of supply against both the 1-in-20-year peak gas demand day and seasonal normal demand for each pathway and year (Figure 2) in this Assessment. These outputs of FES demand modelling therefore provide the basis for developing our demand profiles.

As recommended by government in the proposed methodology, this Assessment will complement existing security of supply analyses by assessing supply sources against multi-day demand profiles. For each FES pathway, multi-day demand profiles will be developed to assess how the gas supply system responds to the most statistically likely weather conditions (seasonal normal) and more extreme weather events (peak), while capturing the extent to which de-rated supply can decrease amid periods of elevated demand.

Our licence condition states that peak demand should derive from 1-in-20-year analysis. Therefore, the multi-day peak demand profiles will include the single day 1-in-20 peak demand for each pathway and year. The duration of the demand profiles will be consistent with a cold snap statistically likely to occur once in every 20 years, the derivation of which is outlined in the following section.

Constructing peak demand profiles in this way requires an assumption that the 1-in-20-year peak day gas demand occurs during a cold snap whose duration is equally extreme. Climatological modelling indicates this is a possibility, but the precise likelihood of the two events coinciding is not evaluated. Crucially, this approach allows us to assess the security of supply implications of the 1-in-20-year peak day gas demand occurring during a multi-day cold snap.

5.2 What is a cold snap and how long are they expected to last?

A cold snap event is a period during which weather conditions place more stress on the gas supply system than is expected during normal, seasonal weather. This is principally due to the additional gas demand for heating precipitated by very low temperatures. NESO has collaborated with the Met Office to test and refine government's proposed methodology, which considers an appropriate duration of a cold snap used to assess security of supply. As per the proposed methodology, NESO will continue using Composite Weather Variable (CWV) to define a cold snap but has updated how this data will be used.

CWV was developed to explain LDZ demand variations and measures daily weather by combining temperature and other variables including wind chill[28]. CWV calculations have historically been expressed in a range of -4 to 16°C, with daily observations since 1960. During higher actual temperatures, the marginal effect of temperatures on heating demand is zero, so CWV is capped at 16°C and generally remains at this level during the summer months.

The government originally defined a cold snap as a period of one or more days of negative CWV and recommended the use of CWV data from 1990 onwards to reflect changing trends due to climate change[29]. The proposal suggested seven days to be an appropriate test duration for a cold snap as this encapsulated 90% of cold weather periods which correspond to the definition. Through testing this approach with the Met Office, it was determined that the government's use of historic CWV observations – which are relatively few in number – failed to capture the full extent of variability in GB climatology and thus may be under or overstating the true duration of a cold snap expected to occur once in every 20 years.

NESO and the Met Office have adjusted the approach by applying Unprecedented Simulation of Extremes with Ensembles (UNSEEN) methodology to the Assessment[30]. The UNSEEN methodology has been applied using the Met Office decadal prediction system (DePreSys) initialised every year as a 40-member ensemble. Each ensemble represents a version of history that could have feasibly occurred based on GB's underlying climatological conditions. For the date range considered, 1990–2015, this provides a much larger range of plausible CWV values and more effectively captures the variability in GB's climatology over the period.

Additionally, the definition of a cold snap was amended from "one or more" to "two or more consecutive days of negative CWV", such that standalone days of cold weather did not constitute a cold snap. Applying this definition, the UNSEEN methodology allows NESO to identify over 1,100 cold snaps which feasibly could have occurred between 1990 and 2015, compared with just 25 using observed CWV data. This distribution of cold snaps is used to determine the duration of a 1-in-20-year event. This is identified as 11 days, equating to the 95th percentile on the probability distribution. For consistency, an 11-day duration is similarly applied to the seasonal normal demand profiles for each scenario and assessment year.

Assuming the 11-day cold snap evolves in such a way that the 1-in-20-year peak day demand, as reported in the FES publication, is in the middle of this cold snap (that is, day 6), the peak demand profile can be derived by the following equation:

$$Dem_{d,w,p} = (SND_{d,w,p} + \frac{PP}{5}(PD_{w,p} - SND_{d,w,p}))^{*}WF_d$$

28 *Gas Demand Forecasting Methodology*, National Grid.

29 *Proposed methodology for assessing medium range gas supply security*, DESNZ.

30 UNSEEN Methodology, Met Office.

Where:

- *SND* is the seasonal normal demand expected on each of the gas days assessed for the relevant FES pathway, expressed in mcm/d. This data is taken from FES gas demand modelling.
- *PD* is the 1-in-20-year peak demand for the relevant FES pathway and year, expressed in mcm/d. This data is taken from FES gas demand modelling.
- *PP* reflects the number of days between Day 1 and Day 6 or Day 6 and Day 11. *PP* derives the shape of the demand profile, where ($1 \leq PP \leq 5$). *PP* denotes peak proportion, given the shape of the demand profile is proportionate to the difference between peak demand and seasonal normal demand on each day.
- *WF* is the weekday, weather-corrected demand adjustment factor. The peak proportion used in *PP* and the weekday adjustment factor used in *WF* have been determined by NESO as per Table 3. This is necessary as non-weather-sensitive gas demand fluctuates throughout the week. The adjustment factors were derived through analysis of historic cold snaps of the past 10 years, that is, since 2015.

Table 1: Weekday adjustment factors for 11-day cold snap demand profile

Day of Cold Snap	Weekday	Peak Proportion (*PP*)	Weekday Adjustment Factor (*WF*)
Day 1	Friday	0	0.9985
Day 2	Saturday	1	0.9724
Day 3	Sunday	2	0.9593
Day 4	Monday	3	1.0135
Day 5	Tuesday	4	1.0213
Day 6	Wednesday (1-in-20 peak)	5	1.0000
Day 7	Thursday	4	1.0242
Day 8	Friday	3	0.9985
Day 9	Saturday	2	0.9724
Day 10	Sunday	1	0.9593
Day 11	Monday	0	1.0135

The assumptions that dictate the shape of the peak gas demand profiles were derived from an assessment of historic 11-day peak gas demand profiles. Thus, the demand profiles reflect a period of elevated demand that could be expected for the time of year under extreme weather conditions. It is assumed that the 1-in-20-year peak day gas demand falls on a Wednesday, as this derives the highest total weekday demand across the 11-day period.

This same approach applies to calculate GB exports to Ireland, Northern Ireland and the Isle of Man, reflecting that the extreme weather would be likely to affect the entirety of the British Isles. Similarly, power station gas demand is also subject to the same calculations. While this is arguably a simplification, it is sufficient to reflect that temperatures and wind speeds fall simultaneously in the first six days of the cold snap, precipitating higher gas-fired generation requirements, before increasing from the seventh day onwards.

5.3 When is the expected period of least resilience?

Each year and within seasons, the gas system goes through natural cycles to meet the overall needs of the market. This can include planned infrastructure maintenance, historical patterns of refilling and emptying of storage sites, changing competition for uncontracted LNG between different markets, or price signals between winter and summer spreads shaping the delivery of molecules. This means that there is value in identifying when the gas system is expected to be least able to meet elevated demand over extended periods. The point at which de-rated supplies are least likely to meet a peak gas demand profile is regarded as the expected period of least resilience.

The government's proposed methodology suggested the period of least resilience should correspond to when gas storage stocks are at their lowest. This has historically been at the end of the winter season, that is, March. Through testing the temporal distribution of peak NTS demand, international competition for volumes, and expected storage refill ahead of cold snaps, NESO is revising this period to late in February.

This period still accounts for lower average gas storage than in the first half of winter and January (when storage has an opportunity to refill during lower demand periods in late December). It also accounts for cold snap analysis, which identified a seven-fold higher prevalence of cold snaps falling in February relative to March, explained in Table 4. Lastly, this accounts for greater competition for interconnector flows or LNG cargoes with the wider European market, which could also experience a simultaneous cold snap, compared to March when southern Europe begins entering meteorological spring.

Table 2: Cold snap prevalence, storage stocks and demand by month (1990–2015)

Month	No. of Ensemble Cold Snaps (1990-2015)	Avg Onshore Storage Stock (mcm) Last 5 winters	Max NTS Demand (mcm/d) Last 5 winters	Max NW* Europe Demand (mcm/d) Last 5 Winters
December	296	1285	421	1326
January	425	1108	415	1280
February	318	814	421	1102
March	46	604	356	800

*Netherlands, Belgium, France and Germany

6. How supply will be calculated

Once the gas demand profiles are developed, each of the six supply sources needs to be de-rated.

6.1 UK Continental Shelf

The UKCS has historically provided continuous and reliable flows, especially during winter outside of traditional maintenance seasons. Future annual availability is independently projected twice a year by the North Sea Transition Authority (NSTA), a non-departmental public body sponsored by DESNZ[31]. Working with the NSTA on how these projections could be used, de-rated UKCS supply in mcm/d can be calculated using the following formula:

$$UKCS_w = \frac{SPy * 1000 * SF}{WD_w}$$

Where:

- *SP* is NSTA's net gas supply projection in units billion cubic meters (bcm)[28]. NESO will use NSTA's spring projection.
- *y* is the calendar year being assessed and defined by the period of least resilience. It can be the latter of two calendar years where this falls within the second half of the gas year (October to March).
- *WD* is the number of days in the assessment winter.
- *SF* is the Seasonality Factor calculated from the total supply of the last three calendar years:

$$SF = \left(\frac{HWS}{HSS + HWS}\right)$$

Where:

- *HWS* is the total quantity of gas delivered to the NTS over winter from UKCS sources. This is assessed over the three gas winters prior to the publication of the Assessment, excluding the most recent winter.
- *HSS* is the historic summer supply quantity, or the total quantity of gas delivered to the NTS from UKCS sources, in units mcm. This is assessed over the three gas summers prior to the publication of the Assessment, excluding the most recent summer.

For example, the Assessment published in November 2025 uses winters 2021/22, 2022/23, and 2023/24 and summers 2022, 2023, and 2024. This way, full gas years are considered to test NSTA's projections.

The historic flow data used for *HWS* and *HSS* can be taken from NGT's Data Item Explorer website[32], which has five years of historic data. The Gassco and non-Gassco delivered Norwegian flows must be subtracted from the St Fergus flow to determine the UKCS portion. How this is completed is outlined in the Norwegian Continental Shelf section. To test the methodology, NESO was provided with NGT's Measurement (MST) file, which includes over 30 years of data history. This methodology

31 Data and insights – Production and expenditure projections, North Sea Transition Authority.

32 National Gas Transmission Data Portal (Supplies>Daily Actuals (Physical)>Volume).

statement explains where data tested outside of the Data Item Explorer is used.

Owing to the limited flexibility of the UKCS system to respond to increasing demand, supplies are expected to be able to deliver equal volumes for each day of the period assessed.

Updates from proposed government methodology

The proposed methodology included a projection adjustment to account for any instances of UKCS supply being less than projected. We have removed this calculation after testing NSTA's projections on a five-year lag and found that this occurred only once since 2020. Working with NSTA, this was due to delayed maintenance from the Covid-19 pandemic extending summer maintenance. Even if this were repeated, summer maintenance would not impact peak winter demand periods.

6.2 Norwegian Continental Shelf

The Norwegian Continental Shelf (NCS) contains significant volumes of gas reserves. NCS production is delivered from gas reserves in fields within the North Sea, Norwegian Sea and Barents Sea surrounding Norway. Ownership of gas fields is held by a combination of state-owned, private and international companies, while the NCS transport system is operated by Gassco[33]. Over the last five years the NCS has produced a maximum daily volume of around 360 mcm. However, due to several factors including market and infrastructure conditions, it has more recently produced around 330–350 mcm per day. Like the UKCS, the NCS is expected to deliver less in 2030 and 2035 than it has in recent winters. In January 2025, the Norwegian Offshore Directorate published projections showing that annual delivery is expected to drop by between one third and one half by 2035[34].

Even during periods of peak gas demand, GB cannot guarantee that the technical maximum of the supply infrastructure will be used because most supply from Norwegian fields can deliver to several EU hubs, including Germany, Belgium, France and Denmark, with onward delivery to additional gas markets including the Netherlands and Poland. Collectively these hubs can receive up to 260 mcm per day which, assuming this infrastructure capacity and flexibility remains the same, will be greater than Norway's production capacity by the mid-2030s. This gives Norwegian gas producers optionality over the market, enabling them to take advantage of the most favourable price.

In winter 2024/25, maximum import capacity to GB's terminals was 134 mcm per day, but this was not observed continuously as imports are dictated by demand requirements, pre-contracted flows determining directionality and competition with Europe for remaining spot flows. The majority of import volumes are delivered from two pipelines connected to the shared Norwegian system, namely Langeled and Vesterled.

A smaller quantity, which cannot easily be redirected to Europe, is delivered through the Shell Esso Gas and Associated Liquids (SEGAL) system, which is directly connected to the St Fergus sub-terminal. Lastly, there are two pipelines that are not operated by Gassco and deliver both UKCS and NCS volumes. These pipelines are Frigg UK (FUKA) and Scottish Area Gas Evacuation (SAGE) and are referred to as 'non Gassco delivered'. These systems are owned by NSMP[35] and Ancala[36], respectively. Each pipeline has individual characteristics depending on where it is connected in the NCS system, which gas fields flow through it, and whether the network creates competition for the volumes.

33 Our roles and responsibilities, Gassco.

34 Exports of oil and gas, Norwegian Petroleum.

35 FUKA Pipeline, NSMP.

36 SAGE, Ancala.

Considering these variables, NESO is using the following calculation to de-rate Norwegian gas supply:

$$NCS_w = (HL * LF_w) + (HV * VF_w) + (HS * SF_w) + (HNG * NGF_w)$$

Where:

- *HL* is the Langeled historic supply quantity, calculated via Gassco's historic nominations, which is the maximum daily quantity of gas delivered to the NTS from Langeled, in units mcm/d[37]. All pipelines are assessed over the three gas winters (October to March) prior to the publication of the Assessment. Data is available via Gassco's website[35].
- *LF* is the Langeled deliverability decay factor for the assessed winter.
- *HV* is the Vesterled historic supply quantity, calculated via Gassco's historic nominations[35], which is the maximum daily quantity of gas delivered to the NTS from Vesterled, in units mcm/d.
- *VF* is the Vesterled deliverability decay factor for the assessed winter.
- *HS* is the SEGAL historic supply quantity, calculated via Gassco's historic nominations[35], which is the maximum daily quantity of gas delivered to the NTS from SEGAL, in units mcm/d.
- *SF* is the SEGAL deliverability decay factor for the assessed winter.
- *HNG* is the non-Gassco delivered historic supply quantity, deemed to be the maximum daily quantity of NCS gas delivered to the NTS via non-Gassco pipelines, in units mcm/d.
- *NGF* is the non-Gassco delivered decay factor for the assessed winter.

Calculating non-Gassco delivered flows

To calculate NCS flows through the shared infrastructure of FUKA and SAGE, it is possible to develop delivery curves using the Norwegian Offshore Directorate Fact Pages website[38]. This includes identifying production volumes each month of the winter and aggregating per day of any assessment period, as well as the total volume of producing fields and future production.

These fields are:

- Alvheim
- Bøyla
- Edvard Grieg
- Hanz
- Symra (production beginning in 2027)
- Ivar Aasen
- Martin Linge
- Skogul
- Solveig
- Volund

The decay factors have been determined by NESO using historic Gassco flows[35] and Norwegian Offshore Directorate[36] remaining reserve data to create decay curves. Where specific fields are linked to a pipeline, decay curves are developed as regression models. Where multiple fields are aggregated and have different processing options, the pipeline is considered to have a fixed decay profile. The 2025 Assessment uses the decay factors in Table 4. The factors will be reviewed and, if necessary, recalculated in future years. The decay factors assume that there will be no restrictions on NCS gas entering the GB system due to gas quality limits. Ofgem is working with DESNZ and HSE,

37 Gassco UMM

38 Field: Monthly – by field – Factpages, Norwegian Offshore Directorate.

the responsible party for the Gas Safety (Management) Regulations (GSMR), to consider a review of the upper range of acceptable Wobbe Index[39].

Table 3: Decay factors for Norwegian pipelines

Term	Pipeline System	Decay Factor (5 year)	Decay Factor (10 year)
LF	Langeled	1.000	1.000
VF	Vesterled	0.651	0.265
SF	SEGAL	0.194	0.069
NGF	Non-Gassco delivered	0.288	0.156

Updates from proposed government methodology

The proposed methodology produced a de-rated figure of Norwegian production, creating a distinction between flows available before and after European terminals delivered at their maximum capacities. NESO has determined, using long-term production forecasts, that NCS production is likely to lead to a drop in the total import capacity of NCS-connected European systems by 2035. Therefore, the de-rated figure would be zero using this methodology, except for SEGAL and non-Gassco delivered. NESO has replaced this approach with an assessment of each individual pipeline.

6.3 Liquefied Natural Gas

Liquefied Natural Gas (LNG) cargoes can be delivered to three import terminals in GB: the Isle of Grain in Kent, and the South Hook and Dragon terminals at Milford Haven in South Wales. LNG is traded on the international market, meaning GB competes with other countries for cargoes, particularly during periods of market tightness. Nonetheless, the GB market has historically attracted sufficient volumes to meet demand. This held true even in 2022, when reduced pipeline flows to Europe following Russia's full illegal invasion of Ukraine required increased financial incentives for cargoes to deliver LNG to GB terminals. Recently, almost 70% of GB LNG was delivered from the USA, with nine other countries providing the remainder: USA (68%), Qatar (8%), Trinidad (7%), Algeria (5%), Angola (3%), Peru (3%), Norway (2%), Nigeria (2%), Guinea (1%) and Egypt (1%)[40]. The terminals store liquid methane in cryogenic tanks before converting it back into a gaseous state and delivering it onto the NTS. Some of these volumes are continuously delivered as boil-off, a small quantity of gas which evaporates from LNG either into the NTS or LDZ. However, the majority of volumes can be held in storage and delivered onto the NTS when required.

LNG delivery to GB's three terminals is used to balance GB's supply and demand each winter. Throughout 2022 and into 2023, LNG was delivered to GB, regasified and exported to mainland Europe to help meet European demand. EU states have since increased their LNG import capability considerably. Upgrades to GB's terminals and recently constructed European Floating Storage Regasification Units (FSRUs) highlight the crucial role LNG will play in GB's and Europe's energy mix now and in the future.

There is no guarantee that, during the expected period of least resilience, cargoes are either delivering into LNG storage at the beginning of the cold snap or that LNG storage is at maximum

39 *UNC0870: Amendments to Wobbe Index and Calorific Value Lower Limits at NTS System Entry Points*, Ofgem.
40 *Digest of UK Energy Statistics (DUKES) 2025*, Chapter 4, GOV.UK.

fullness. Therefore, LNG cannot be assumed to deliver at its maximum capacity indefinitely. In de-rating LNG supply, the calculations below first establish the network capacity and possible utilisation rate, and then how long volumes could be delivered without a cargo arriving during a cold snap, by establishing expected LNG storage starting stocks. Lastly, the risk of LNG not being able to continue delivering once storage volumes have been run down is assessed. These factors are expressed in the following calculations:

Testing capacity and utilisation rates

$$LNG_{w,p} = \min\left(NTS_w, \frac{(LC_w * HR)}{EC}\right) + \left(HB * \frac{FLS_w}{HLS}\right)$$

Where:

- *NTS* is the total daily quantity of gas the NTS can accept across all LNG import terminals, in units mcm/d. Detailed modelling of the NTS's entry point capacities under different flow and demand profiles is included in NESO's *Gas Network Capability Needs Report*[41]. For Milford Haven capability, a simple lookup on national demand is used. For Isle of Grain capability, a lookup for Bacton flows from Interconnectors and UKCS, and national demand, is used.

  The total de-rated Bacton flow figure is used to constrain Isle of Grain deliverability. This avoids preferential treatment of any supply source.

- *LC* is the LNG terminals' future technical capability, deemed to be the daily maximum quantity of gas that could be processed by the regasification terminals, in units GWh. This value is converted into mcm/d using the energy conversion factor (EC) provided below. This is provided by LNG site operators through a data request or available on third-party energy analytics platforms.

- *EC* is determined by the calorific value (*CV*) of the gas and is calculated using the formula:

$$EC = CV * \frac{1000}{3600}$$

- The *CV* can vary slightly based on the gas composition. The *CV* used for LNG is 39.6 MJ/m^3.

- *HR* is the maximum historic LNG delivery rate. It is assessed over each day of the last five years prior to publication by dividing maximum aggregated delivery from LNG terminals by technical capacity, excluding NTS constraints. This is provided by LNG site operators or third-party energy analytics platforms.

- *HB* is the historic boil-off quantity, deemed to be the maximum daily quantity of gas delivered to the LDZ from LNG boil-off, in units mcm/d. This is assessed over the 15 gas winters (October to March) prior to the publication.

- *FLS* is the future LNG terminal storage capacity, deemed to be the maximum quantity of gas that could be stored within the LNG terminal in assessment winter *w*, in units mcm of gas equivalent.

- *HLS* is the historic LNG terminal storage capacity, deemed to be the maximum quantity of gas that could be stored within the LNG terminal in the year in which *HB* occurs, in units mcm of gas equivalent.

41 *Gas Network Capability Needs Report (GNCNR)*, National Energy System Operator.

Only boil-off that is delivered directly to the LDZ should be considered as part of the embedded supplies. LNG terminals that deliver boil-off to the NTS are accounted for in the LNG component. LNG terminals that reliquefy boil-off need not be considered at all in this context.

The historic boil-off flow data is taken from the MST file provided by NGT. Like UKCS data provision, the NGT Data Item Explorer website[42] is an alternative source. The future and historic LNG terminal storage capability is provided by LNG site operators through a data request by NESO, which is used for *FLS* and *HLS*. Future storage capacity is also available on third-party energy analytics platforms, and in some instance published by operators on public websites.

Delivery from LNG storage and new cargo arrivals

Supplies from LNG already within the terminal's storage are expected to be delivered with greater reliability and be less sensitive to spot market competition than an LNG cargo delivered during a cold snap. Understanding the starting LNG storage stock helps to determine how long LNG terminals can deliver before a new cargo is required. LNG from storage[43] can be determined by the following formula:

$$LFS_{d,w} = \mathrm{LS}_{d,w} - \mathrm{LH}_{w}$$

Where:

- *LS* is the LNG stock level. This is initially calculated to be the average total quantity of LNG contained within the LNG terminals recorded one day before each of the last five cold snaps, in units mcm of gas equivalent. *LS* then falls throughout the assessment periods as volumes are withdrawn to meet demand. This is identified through matching storage levels available on NGT's Data Item Explorer website[44].
- *LH* is the LNG heel, deemed to be the minimum quantity of LNG that can be stored in the storage tanks combined across all terminals, in units mcm of gas equivalent provided by LNG terminal operators. An approximation of these volumes can be derived by calculating a minimum from publicly available historic stock data on NGT's Data Item Explorer website[44].

If LNG from storage is calculated to be unable to deliver sufficient volumes for the supply system to meet demand for the entire duration of the defined cold snap, it is then necessary to identify the volume required from additional cargoes during the cold snap period. LNG from cargoes on each day of the cold snap is calculated using the following formula:

$$LFC_{d,w} = LNG_{w} - LFS_{d,w}$$

LNG cargo availability is subject to a range of factors including pre-contracted volume destinations, aggregated competition across separate demand basins in Europe, Asia, and South America, and the production and export capacity of existing and expected liquefaction terminals. GB has been able to attract sufficient LNG at a range of prices, outbidding other markets, so an LNG tightness model is used to approximate whether a cargo could be delivered on time and whether elevated prices might be needed to attract it. A loosening market (*GMT*>0) indicates increasing

42 National Gas Transmission Data Portal

43 LNG from storage in referring to that stored within the import terminals at the start of the cold snap rather than the now decommissioned inland LNG storage facilities.

expectation of future LNG deliverability, and the de-rated supply can be maintained. A tightening market (*GMT*<0) could result in reduced LNG send-out from any of the three terminals.

The global market tightness (*GMT*) for calendar year y is determined by the following formula:

$$GMT = \frac{HD}{HC} - \frac{FD_y}{FC_y}$$

Where:

- *HD* is the historic global LNG demand, deemed to be the average yearly quantity of LNG delivered to regasification terminals, in units bcm of gas equivalent. This is assessed over the three calendar years prior to the publication of the Assessment to account for the recent growth of LNG availability.
- *HC* is the historic global LNG export capability, deemed to the average yearly capability of LNG liquefaction export terminals, in units bcm of gas equivalent. This is assessed over the three calendar years prior to publication of the Assessment.
- *FD* is the future global LNG demand, deemed to be the total quantity of LNG forecast to be delivered to regasification terminals in calendar year *y*, in units bcm of gas equivalent.
- *FC* is the future global LNG export capability, deemed to be the capability of LNG liquefaction export terminals in calendar year *y*, in units bcm of gas equivalent.

The historic global LNG demand used for *HD* is available from market price and data providers. While not public, these services are available for subscription. The future global LNG demand and future and historic export capabilities used for *FD*, *HC* and *FC* are available from third-party energy analytics platforms.

Updates from proposed government methodology

The proposed methodology recommended determining the quantity of LNG available to purchase on the international market, but a specific methodology had not been identified. The international market tightness assessment documented above is designed to provide this insight.

The proposed methodology de-rated future LNG capability but did not restrict this volume by constraints on the NTS. Following analysis and engagement with both network and terminal operators, NESO has identified and included how constraints may impact future deliverability at both Milford Haven and the Isle of Grain.

6.4 Gas storage sites

In winter 2024/25, GB's gas supply security was supported by eight operational gas storage sites. Seven sites were medium-range facilities, characterised by an ability to cycle rapidly (at times within day) between reinjection and withdrawal, and capable of completely refilling within a 30-day period. In contrast, Rough is the UK's only long-range gas storage site, whose operation reflects the model adopted throughout Europe, where storage facilities refill during the summer months and provide stable, baseload gas supply during the winter. We have assumed that Rough is unavailable over the assessment period on the basis that it has not refilled during summer 2025 ahead of winter 2025/26. Storage facilities in winter 2024/25 were Aldbrough, Hill Top, Holford, Hornsea, Hatfield Moor, Humbly Grove, Stublach and Rough.

GB's gas storage supply can be determined by the following formula:

$$Stor_d = \sum_s (MW_s * DC_{l\,s,d})$$

Where:

- *MW* is the maximum daily quantity of gas that could be delivered to the NTS by storage site *s*, in units mcm/d. The maximum withdrawal, maximum stock and deliverability coefficients are provided by the storage site operators through a data request by NESO. Alternatively, the data portal is sufficient[44].
- *DC* is the deliverability coefficient, deemed to be the proportion of the maximum withdrawal that could be delivered for each site, compared with its expected fullness level on the cold snap day being assessed. This is a function of $l_{s,d}$, defined below. The source data is the same as *MW*[46]. Site withdrawal, injection and working volume are also published annually by Ofgem on their website[45,46].
- *l* is the proportion of gas stored in each site compared with the maximum stock. This is derived using the following formula:

$$l_{s,d} = \frac{SL_{s,d}}{MS_s}$$

This portion identifies the reliability of volumes being delivered from storage when necessary. The following definitions are used:

- *MS* is the maximum working volume of gas that can be stored within storage site *s*, excluding cushion gas, in units mcm.
- *SL* is the opening stock level, deemed to be the total quantity of gas contained within the storage site, excluding cushion gas, in units mcm. For each site, the average stock level on the day preceding each of the last five cold snaps is used[47], where the cold snaps were identified by applying the same definition as outlined in the Demand section to observed, historic CWV data.

Finally, to understand how storage sites will deliver over several days we use the following formula:

$$SL_{s,d} = SL_{s,d-1} - RW_{s,d-1}$$

Where:

- *RW* is the quantity of gas delivered by the storage site necessary to satisfy demand.

Stock levels determine the storage deliverability, so each day of the assessed period will have a different storage deliverability based on the amount consumed on previous days. For the first day

44 National Gas Transmission Data Portal

45 GB gas storage facilities 2025, Ofgem.

46 Decay curves are currently the same for both assessment winters. However, sites may be excluded from a given assessment winter if market intelligence suggests they will not be operating.

47 *Gas Demand Forecasting Methodology*, National Grid.

of the cold snap when d = 0, the stock level is the average level on the day prior to the last five cold snap periods (the same as the LNG storage assumption).

On days or scenarios with lower demand, withdrawals may not be required, and total remaining supply could include sufficient excess for volumes to inject into storage sites. This would allow following assessed days to have a greater starting stock than if withdrawals had been continuous.

Updates from proposed government methodology

The proposed methodology starting stock level used an average of the stock level in February and March for the last five winters. NESO has identified that this has the potential to underestimate starting stock levels because averages include periods where there has already been elevated demand and does not account for operators injecting volumes in preparation for a cold snap. Instead, the average starting stock prior to cold snaps in the last five years is more representative.

6.5 Interconnectors

There are two bidirectional interconnectors between GB and Europe, known as Interconnector Ltd (INT) and Balgzand Bacton Line (BBL), which connect GB with the Belgian and Dutch hubs. Interconnectors provide additional flexibility to both the National Balancing Point (NBP) gas market in GB and the Title Transfer Facility (TTF) market in the Netherlands. They have been used by GB to export volumes during summer, supporting European storage refill, and to import volumes during winter to meet periods of elevated demand. Although imports to GB have declined since 2022 due to reduced Russian flows limiting European flexibility, interconnectors still make an important contribution to achieving flexibility each winter.

To calculate a de-rated figure for each interconnector, the following formula is used:

$$Int_w = \min\left(HI, \frac{IC_w}{EC * 1{,}000{,}000}\right)$$

Where:

- *HI* is the maximum daily quantity of gas delivered to the NTS from interconnectors over the last 15 gas winters, in units mcm/d. The historic interconnector flow data used for *HI* is taken from the MST file.
- *IC* is the total import capacity across all interconnectors for each assessment winter, in kWh/d. The future interconnector capability is taken from the ENTSOG Transparency website[48]. Current capacity is also available on each of the operators' websites; however, this is not necessarily an indication of future capability, as these figures can be revised due to compressor availability and gas or power network constraints[49,50]. Unit conversion is required before aggregating these values[51].
- *EC* is the energy conversion factor from energy to volume. For interconnectors, a calorific value (*CV*) of 40 MJ/m^3 is used. Note: 1 GWh = 1,000,000 kWh.

48 ENTSOG Transparency Platform

49 About BBL, BBL Company.

50 Interconnector, Fluxys.

51 Interconnector operators publish data in GWh/d and provide the conversion into mcm/d. This differs slightly from the LNG operator calculation but does not materially change the outcome.

Updates from proposed government methodology

The proposed methodology for de-rated interconnector supply suggests a five-year duration for maximum historic flow. Interconnector import volumes have been limited in recent years due to market conditions, so a longer timeframe is used instead. Since Russia's illegal invasion of Ukraine, interconnector imports to GB have declined by 90%, primarily as a result of limited surplus gas available for export from mainland Europe. The EU has also announced an ambition to phase out all Russian LNG imports by 2027. However, NESO analysis shows that interconnector imports could exceed those seen over this period during peak demand by using available transmission capacity in the Netherlands and Belgium to transport surplus European LNG and storage volumes.

NESO has also identified instances where the de-rated interconnector capability exceeds current and expected future capacity, so a constraint is applied.

6.6 Biomethane

The final de-rating calculation for the Assessment is for biomethane, which is predominantly delivered directly into local distribution networks. This is a new part of the methodology to account for measurable volumes of biomethane now being delivered. Biomethane is extracted from biogas, which is produced via anaerobic digestion of waste organic matter, typically from agricultural or water treatment.

The following formula uses the annual biomethane production base case estimate from the *Future Energy Scenarios* (FES) publication and converts it into an average daily production figure. Since biomethane is considered to have limited potential for flexibility, availability is assumed to be constant throughout the year. Thus, the average available daily production volume can be approximated as:

$$Bio_{w,p} = \left(\frac{BP_{y,p} * 1000}{365}\right)$$

Where:

- *BP* is the NESO FES biomethane projection for gas year *y*, for demand profile *p*, in units bcm.

Data provision

Biomethane projections can be found in the latest FES workbook[52].

Updates from proposed government methodology

The proposed methodology did not include provisions for assessing supplies embedded into the LDZ. However, it did state that, if alternative sources of gas would meaningfully contribute to meeting GB's demand, an additional de-rating factor should be developed. This has now been implemented.

52 *Future Energy Scenarios (FES)*, National Energy System Operator.

7. Ranking de-rated supply sources in a merit order

Once each supply source has been de-rated, they can be ranked in a merit order before testing against demand profiles. This process provides an understanding of how the gas supply market may respond to different future demand scenarios and helps to identify where actions may be necessary to support gas supply security. It also demonstrates how our reliance on certain supply sources may increase as UKCS and NCS deliverability declines.

This step is modelled on NGT's existing merit order list used in the *Winter Outlooks*, the *Gas Ten Year Statement* and the government's proposed methodology[53]. However, it has been updated to account for increased uncertainty in how each supply source could operate in the future. Previously, aggregated supply sources were ranked 1–5 (excluding biomethane), with each source assumed to deliver its technical capability before a new source came online. The Assessment employs an updated approach based on historic market delivery and analysis of the availability, reliability and deliverability of each terminal and entry pipeline. This led to the formation of four groups comprising multiple supply sources:

Table 4: Merit order supply groups and sources

Group	Sources
Group 1	UKCS, NCS SEGAL, NCS non-Gassco delivered, biomethane
Group 2	NCS Langeled
Group 3a	LNG, underground storage
Group 3b	Interconnectors, NCS Vesterled

The new merit order recognises that at any point throughout the gas year, total demand is unlikely to be met by a single source. Instead, demand is first met by sources in Group 1.

Group 1: These sources are considered the most reliable and least flexible. They are directly connected to the GB market and have limited optionality to deliver elsewhere or to ramp up production.

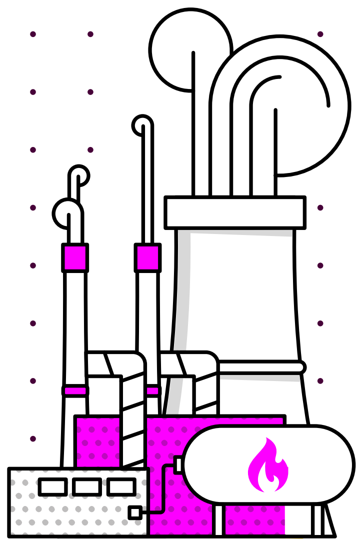
Group 2: This considers Langeled supply in isolation, since it exhibits high levels of reliable flows each winter. The pipeline directly connects the Nyhamna Norwegian and Easington terminals, with a larger number of fields feeding into its delivery and onshore processing. Despite previous reliability, decreasing NCS production poses an emerging risk to maintaining current flow volumes through Langeled.

Group 3a and 3b: If there is further demand to be met, a blend of these supply sources would then be expected to be operational. This recognises that each supply source may not deliver or be capable of delivering its maximum technical capacity before a separate flexible source enters the mix.

The share of each supply source to be dispatched from Group 3 is determined as a proportion of their maximum deliverability for that day. For example, if for a given day the total Group 3

53 *Gas Supply Security Assessment*, Department for Energy Security & Net Zero.

deliverability is 100 mcm and the demand not met by Groups 1 and 2 is 60 mcm, 60% of the deliverability of each site in Group 3 will be delivered that day. In reality, individual sites will be dispatched based on their asset characteristics, market conditions, shipper trading strategies and within-season variability of stock levels. This is especially relevant for group 3a, where underground storage and LNG storage decay at individual rates across each supply source site or sub-terminal. LNG storage has up to seven days of deliverability when full, so for this source to operate at its de-rated figure, LNG cargoes would be required to replenish stocks towards the end of the cold snap, assuming they are full at the start.



8. Testing the methodology

As this is a new Assessment, NESO has tested the methodology using the most recent full winter of 2024/25. The five years ahead gas supply security was assessed using data available from 2019, including the 1-in-20-year peak demand figure from the Steady Progression scenario[54]. This provides an indication of how appropriate the methodology can be at the five-year horizon, while also identifying any unforeseen changes in the intervening years that may create a divergence between expected and actual supply security.

The analysis shows a surplus of 35 mcm on the peak day (day six) had GB experienced a 1-in-20-year winter muti-day cold snap. The actual peak day margin, reported in NGT's *Winter Outlook*, is 127 mcm[55]. This difference can be attributed to previously decommissioned supply assets such as the Rough storage facility being available in 2024 but not 2019, and increased utilisation of LNG terminals. This demonstrates the ongoing need for supply security to be assessed in the near term.

The table shows what the total de-rated figure could have been, and how each supply source could have contributed to that total figure had the merit order been applied in the same way as it will for the 2025 publication, where individual supply sources have been grouped together according to an assessment of their availability, reliability and deliverability.

Table 5: De-rated supply contributions and calculated margins over an 11-day cold snap

(mcm/d)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 12
Biomethane	1	1	1	1	1	1	1	1	1	1	1
UKCS	78	78	78	78	78	78	78	78	78	78	78
Norway	125	127	131	141	147	150	146	140	133	126	125
LNG	30	34	44	65	77	85	77	63	46	31	29
Storage	29	35	45	66	79	91	82	61	43	27	25
Interconnector	31	36	48	74	89	98	88	72	51	32	30
Merit order meeting supply	294	311	347	425	471	503	472	415	351	295	288
Demand	294	311	347	425	471	503	472	415	351	295	288
Total available de-rated supply	538	541	541	534	534	539	538	530	530	531	530
Margin	**244**	**230**	**195**	**110**	**64**	**35**	**67**	**115**	**179**	**236**	**242**

54 *Future Energy Scenarios*, National Grid ESO.

55 *Gas Winter Outlook 2024*, National Gas.

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