



Gas Winter Outlook

September 2023



Winter Outlook 2023



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Welcome



Executive summary



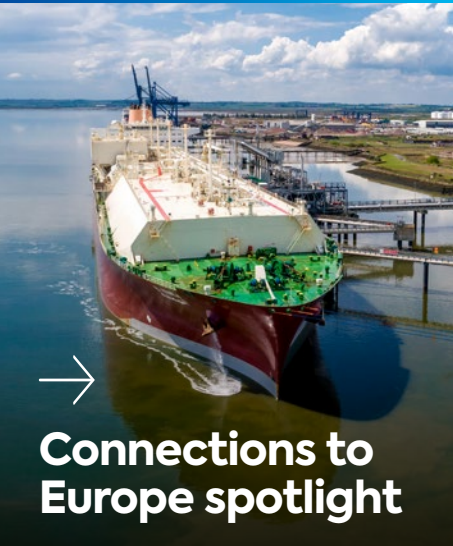
Winter preparations



Demand this winter



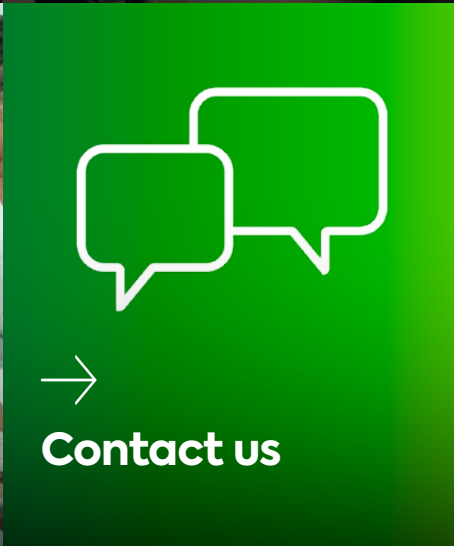
Supply and supply margins



Connections to Europe spotlight



Supply and demand



Contact us



Glossary



Welcome

How to use this document

We have published the Gas Winter Outlook 2023 as an interactive document.



Home

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Enlarge/reduce

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'Linked' content

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

Welcome to this year's Gas Winter Outlook



Last year, we saw unprecedented uncertainty and volatility across global energy markets as a result of the curtailment of Russian gas flows into continental Europe. I'm proud to say that Great Britain (GB) played an important role in responding to the potential supply shortfall that Europe faced – 7.6 billion cubic metres (bcm) of gas was exported to Europe through our network – the highest level ever and almost double that of the previous Winter. Whilst we are, collectively, in a better place than we were last year, it's important to remain aware of the risks that are present. To this end we are taking precautions, preparing assets and engaging heavily with government and stakeholders.

GB uniquely benefits from a range of diverse and flexible sources of gas. Last winter, 64% of GB gas supplies came from the UK continental shelf and Norway alone. Flexible and reliable infrastructure, combined with robust market arrangements support these sources of supply which have historically delivered energy security for GB. Even during times of market tightness, the most recent example being the prolonged period of cold weather last winter, GB was able to secure sufficient supplies to meet demand.

It is due to this that we believe it would take a combination of events (e.g. a very cold winter in the UK coinciding with a major interruption to one of our gas supply sources) for there to be a material risk to our energy security that could impact the gas and/or electricity systems. It is important to note here that we believe this to be an unlikely scenario, but the exploration and assessment of rare events such as this are an important exercise in winter preparedness. We are mitigating this risk by carrying out asset maintenance and exploring our response to such a scenario through our emergency exercises, alongside National Grid's Electricity System Operator (ESO) who have also assessed the risks to the electricity system in their [Winter Outlook](#), which is designed to help the electricity industry prepare for the winter period.

We are again using scenarios to complement our assessment of peak supply and demand capability and illustrate the extent to which GB energy security is dependent on flexible sources of imported gas supplies (such as LNG) throughout winter. It is important to note that these scenarios are not forecasts, nor are they intended to illustrate a best or worst case. The actual mix of supplies on any given day will be determined by the market.

We continue to closely monitor the market and it is possible that the information and analysis underpinning this document may change as we progress through winter. This could again be a challenging winter for energy supply throughout Europe. Factors beyond our control such as the weather, global market developments and the wholesale cost of gas will all influence the prevailing gas supply and demand situation in GB.

To that end, we very much see this publication as the start of a conversation and part of our continued commitment to engage in open dialogue with our stakeholders as we move through the winter. We hope that this year's publication helps you feel more informed and prepared as we enter the winter period, and we look forward to continuing the conversation with you over the coming months.



Ian Radley
Director, System Operations

About US

Other publications in this suite:

- [Gas Summer Outlook](#), published annually in April.
- [Gas Winter Review and Consultation](#), published annually in June.
- [Annual Network Capability Assessment Report \(ANCAR\)](#) published annually in June.
- [Gas Ten Year Statement](#) including the ANCAR Annex, published annually in November.



We are preparing our network to ensure we can react to changing market conditions and subsequent supply patterns.

Our licence is established under the Gas Act 1986. It requires us to develop, maintain, and operate economic and efficient networks and to facilitate competition in the supply of gas in GB. We have a responsibility to keep the NTS within safe operating limits.

In our role as the National Transmission System (NTS) Owner and Operator, we have three key responsibilities:

Infrastructure provider

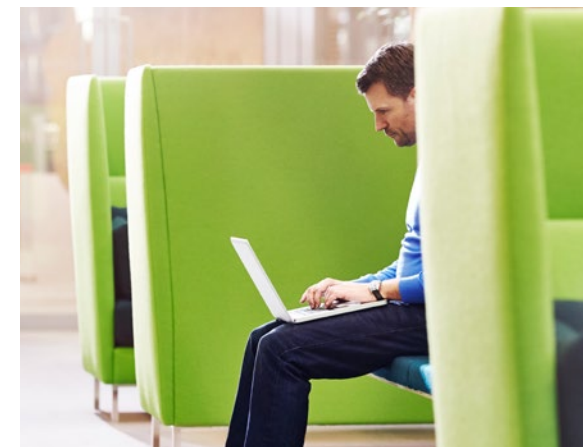
The operational configuration of the NTS infrastructure requires additional flexibility during the winter period, to ensure it can transport enough gas to meet the increased demand associated with the colder months. Gas supplies are driven by market dynamics and global prices, which have been particularly volatile in recent years –



we are preparing our network, particularly our compressors, to ensure we can react to changing market conditions and subsequent supply patterns.

Market facilitator

The underlying market arrangements in GB are established on the basis that the market will provide the gas itself, and that the market will balance supply and demand. Throughout the winter period, we conduct daily assessments of gas margins and communicate this to the industry via our market information portal. We also produce publications throughout the year, such as this one, to share information relating to the NTS (both short and longer term) with our stakeholders to support their own planning and operational activities.



Residual balancer

When there is an imbalance between supply and demand, we act as residual balancer by taking energy balancing actions via the On The Day Commodity Market (OCM). These title trades can set the system marginal price and encourage shippers who are out of balance to take actions themselves and, if required, we can also look to locationally trade at specific entry points to change the physical flow rate of gas.

In the unlikely event there is insufficient supply to meet demand, and the market is unable to resolve the imbalance, we have the tools we need to ensure the safety and integrity of the gas system in the event of a Network Gas Supply Emergency (NGSE). These emergency tools include requesting additional gas supplies be delivered to the NTS or requiring gas consumers (starting with the largest industrial consumers) to reduce or stop using gas. These tools will be used, if required, subject to authorisation by the Network Emergency Coordinator.

To read more about the tools available to us, please [visit our balancing website](#).



Executive summary

Key messages



Key messages

1. We have sufficient capability to meet peak (1-in-20) demand, with a positive supply margin under both intact and N-1 network conditions.

2. We forecast that GB demand (excluding exports to Europe) for winter to be comparable to last year, with the increase in residential demand being offset by reduced demand for power.

3. Total NTS demand (including exports to Europe) is forecast to reduce, as we expect reduced levels of exports to Europe when compared to the previous winter given that EU will enter winter with extremely high storage levels and now have increased LNG import infrastructure in place.

4. We have illustrated how the NTS could be balanced under a range of credible demand profiles. In all of our scenarios GB will be dependent on continued substantial imports of LNG and Norwegian gas this Winter. In cold winter scenarios, GB will likely also require imports from the EU.

5. Disruptions to other markets could impact the GB market, with a particular focus on the second half of winter dependent on the extent of EU storage usage. Overall, whilst we have more confidence that the market will perform as expected, we shouldn't discount the risk of events occurring, either in isolation or in combination, to put the EU and therefore by extension GB, under stress.

6. We have the necessary physical, commercial and market based tools to manage a supply and demand imbalance, including those related to a Network Gas Supply Emergency (NGSE), should it be necessary.





Winter preparations

Preparing for winter

Preparing for winter

As a prudent system operator we continually monitor supply and demand behaviour throughout the year, identifying potential risks and taking appropriate mitigating actions. We also look for opportunities to implement improvements in light of the changing geo-political context surrounding the energy landscape.

We continue to work closely with the Department for Energy Security and Net Zero (DESNZ) on the proposals set out in the [Energy Security Plan](#), published in March 2023, which detail focus areas for enhancing energy security whilst GB transitions to Net Zero. This plan covers items like ‘the role gas storage can play’ along with many others.

Some specific areas we are currently focussing on as we prepare for winter 2023/24 are discussed here. We will continue to provide updates on our winter preparations at the Gas Operational Forum – if you’d like to sign up to future forums you can do so [here](#).

1. Gas data provision

As part of our digitalisation programme of work we launched the new, re-branded [Gas Data Portal](#) in July 2023.

The Gas Data Portal replaces the Market Information Provision Initiative (MIPI) with the aim of making open data more accessible to all (both existing and new users), laying the foundation for future developments. Further work in this space will include:

- **Automated Programmable Interfaces (API) development** – create new modern versions of our existing APIs
- **Gas Data Portal improvements** – further enhancements based on user feedback
- **Change requests** – delivery of small changes to align with other system or legislative changes – in particular moving the Storage and LNG supplementary reporting into the Data Items.

Further information on the Gas Data Portal can be found [on our website](#).

2. Demand side response (DSR)

Prior to this winter period, we have been working with a range of industrial customers and other stakeholders to further improve our DSR options. These improvements include giving industrial customers the option to contract directly with National Gas Transmission (NGT) without needing to involve their shipper, and offering a product that will give five days notice ahead of any requirement to reduce demand.

Separately, NGT is working with DESNZ and Ofgem to get a better understanding of how a gas demand reduction initiative might operate for domestic and/or smaller I&C customers. We expect to run a small scale exercise in order to gather further information and data on this during the winter.

Preparing for winter

3. Exercise Everest

We continue to evolve our annual assurance exercise to ensure that the Network Emergency Coordinator (NEC) response strategy considers all aspects of the industry, with particular focus on the impact on power generation, through all stages of a Network Gas Supply Emergency (NGSE).

Exercise Everest will be held over three days in early October, encompassing all gas and electricity industry participants, and will focus on testing the various stages of a NGSE, including the 'pre-emergency' stage where the industry has been invited to participate in the utilisation of the available commercial tools to balance the system.

4. Operational maintenance and asset availability

We've used more historical operational data to allow greater access to the network throughout summer and enable us to carry out a larger amount of maintenance than normal, including:

- 23 Network Isolations and 3 pressure restrictions for various improvements to asset health
- 18 station outages have been carried out so far (at the time of writing), which will help improve our asset reliability. We expect to complete three more ahead of winter.
- commissioning new compression units at Peterborough and Huntingdon.

We have also mobilised a group of experts to lead on improving asset availability during the winter through reducing faults and being able to respond to faults more quickly.





Demand this winter

Demand forecast

Gas demand for power generation – spotlight





Demand forecast

Key messages

- Total GB demand for winter 2023/24 is forecast to be comparable to last year, with the increase in residential (NDM) demand being offset by reduced demand for power generation.
- Total NTS demand is forecast to reduce, largely as a result of lower interconnector exports to Europe both in terms of gas and electricity generated by gas (power generation).

Demand levels are inherently uncertain due to the significant influence changing factors such as the weather, cost of energy and geopolitical developments can have on energy requirements.

Below we highlight the key factors that have influenced our forecast for this winter, with further detail throughout the document:

- **Non-daily Metered (NDM)** – with energy prices still high and significant pressures remaining on household finances, we still expect demand to remain about 6% below the weather corrected actuals from 2021/22 and 1% lower than our 2022/23 forecast. However, with the falls in the energy price cap there is the potential for some changes in consumer behaviour. For this reason

we are preparing for an increase of just under 8% on last year’s weather corrected demands.

- **Daily Metered (DM)** – demand is comparable to last year. Our observations in winter 2022/23 showed DM demand was resilient to high energy prices. There are a number of reasons for this, with some customers protected from the impact of high prices due to longer term contracts and others either passing on or absorbing the extra costs.
- **NTS Industrial** – the primary driver of the forecast increase in this area is the assumption that some production may begin to increase as prices reduce.
- **Power** – this is forecast to be lower than last year’s actuals due to the expectation of reduced electricity exports to the EU. There is also some increase in renewable generation. More information on this is available in our demand for [power spotlight](#) on the next page.
- **Ireland** – the forecast increase this year is largely due to an increase in gas demand for power. Additionally, supplies from Corrib are projected to decrease as this field declines in production.
- **European exports** – a more significant reduction is forecast here as European storage stock levels are strong heading into winter, alongside additional LNG re-gasification capability coming online in Europe. Demand is expected to remain suppressed, largely due to voluntary demand reduction targets that are in place. Read more in our connections to [Europe spotlight](#).

Table 1

Forecast total gas demand for winter 2023/24, and weather corrected actual demand for 2022/23.

Winter demand (bcm)	2022/23 Actual Demand (Weather Corrected)	2023/24 Forecast demand	Change	% change	
Non-Daily Metered (NDM)	25.9	27.9	2	7.7	△
Daily Metered (DM)	3.8	3.5	-0.3	-7.9	▽
NTS Industrial	0.5	0.7	0.2	40	△
Power generation	9.3	7.8	-1.5	-16.1	▽
Total GB demand	39.5	39.9	0.4	1	△
Ireland exports	3	3.7	0.7	23.3	△
Interconnector exports (EU)	7.6	3.2	-4.4	-57.9	▽
Total NTS Demand	50.1	46.8	-3.3	-6.6	▽

Gas demand for power generation Spotlight

Key messages

- Total demand for power generation is decreasing year on year as increasing levels of renewables come online.
- Total demand for this winter is forecast to be 7.8 bcm/85.8 TWh, which is 1.5 bcm/16.5 TWh lower than the actual demand of winter 2022/23.
- On a day-to-day basis, demand for power has become increasingly variable due to the intermittent nature of renewables.

There are a number of factors that feed into the assumption that total demand for gas power generation over winter 2023/24 will reduce:

- Last winter there were a number of extended outages to French nuclear power, which meant that more electricity was exported to Europe, increasing the gas demand for power generation. The scale of these outages is expected to reduce this year, reducing demand for power exports, with GB expected to be a net importer this winter as more interconnection capacity comes online.
- Higher availability of GB Nuclear generation
- Increased renewable generation – additional capacity could increase renewable generation by about 2 TWh.

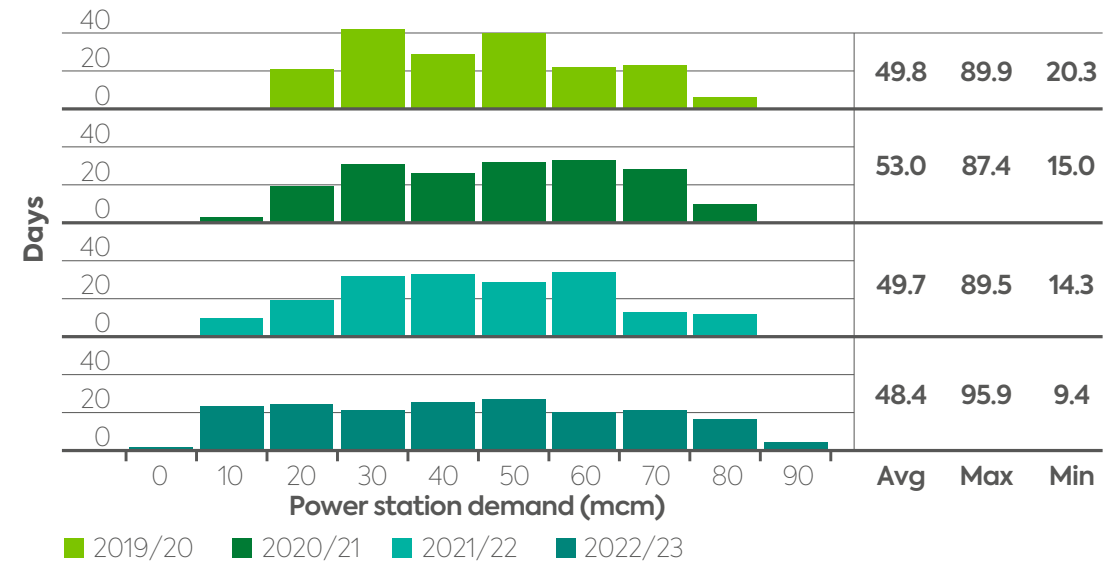
Gas provides significant flexibility to support power generation, and the level of gas demand for power is increasing in variability on a day to day basis. This is largely due to the intermittent nature of renewable power generation – electricity demand remains whether the wind is blowing or not, and gas is often required to produce electricity on days where it's not very windy or sunny and renewable output is limited. As our weather becomes increasingly variable, so will the requirement for gas to make up any shortfall from renewable energy sources.

During winter 2022/23 we witnessed the highest range of daily power demand seen to date, 9.4 mcm/d to 95.9 mcm/d (which occurred during the same week in December). See figure 1.

The highest demand for power last winter was 95.9 mcm/d (on 12 December 2022), equating to 1045 GWh. **On this day, 58% of electricity was generated from gas.**

The increased range and daily variability of gas demand for power is explored further in [our scenarios](#).

Figure 1
Winter power station daily demands. Number of days' demand for electricity at 10 mcm/d intervals.





Supply and supply margins this winter

- Supply range and capability
- Peak day supply margins
- UKCS and NCS
- A focus on Liquefied Natural Gas
- A focus on storage



Supply range and capability

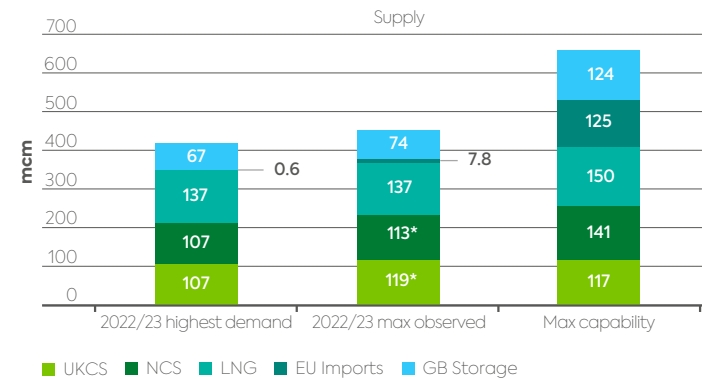
GB benefits from having diverse and flexible supplies, with steady reliable supplies from UKCS and Norway coupled with flexible supplies from LNG, GB Storage and the Interconnectors.

Our network has sufficient physical capability to accept gas from each of these sources in response to how the market chooses to balance demand and supply.

The observed range of supply for winter 2022/23 is shown in table 2, along with the max capability for each supply type. The max capability has been updated to reflect market intelligence, commercial capacities & observed flows.

- UKCS is based on our view of production from the fields connected to our system.
- Norway is based on the capacity of the pipelines connected to UK terminals. This takes into account any limitations from the shared infrastructure at St Fergus.
- LNG has been updated to reflect Obligated Capacity and observed flows.
- EU Imports are based on the capacity of the two interconnectors (INT and BBL) at Bacton.
- Storage capability reflects the increased capability of Rough along with updated market intelligence for other sites.

Figure 2
Supply breakdown



The maximum (physical) capability for each supply type is important when considering supply margins. You can read more on this on the [next page](#).

Figure 2 shows the supply breakdown on the highest demand day, the maximum observed flows for 2022/23 and our max physical capability.

Table 2
Observed daily max, min, average supplies in winter 2022/23 and max capability.

	Observed daily values in winter 2022/23 (mcm/d)			Max capability (mcm/d)
	Max	Min	Average	
UKCS*	119	80.1	103	117
NCS*	113	46.3	79.1	141
LNG	137	27.9	86.4	150
EU Imports	7.8	0.0	0.3	125
GB Storage	74	0.0	17.6	124

* Due to the offshore configuration at St Fergus we are unable to measure UKCS and Norwegian supplies separately as they enter our system at the same point. Therefore the individual contribution of these supplies is partially based on our estimates of the split at St Fergus.





Peak day supply margins

The peak day demand for winter 2023/24 is 462 mcm/d, which is slightly lower than forecast for the previous winter. This is primarily due to a decline in the expected power demand at peak. In addition there is a small reduction in the NDM demand forecast, due to an expectation of slightly more demand suppression compared to last year's forecast. In both cases these trends are in line with our winter demand forecasts.

Peak day supply is 621 mcm/d, this is higher than the previous winter as a result of a refresh of maximum physical capabilities to reflect market intelligence, commercial capacities & observed flows.

The supply margin between forecast peak supply and 1-in-20 peak demand for winter 2023/24 is 159 mcm/d. The supply margin is higher for winter 2023/24 due to the anticipated demand suppression and additional supply capability as mentioned above.

Under N-1 conditions (an event resulting in the loss of the single largest piece of NTS infrastructure) the supply margin at peak 1-in-20 demand is 87 mcm/d.

The 'Cold Day' is based on the coldest day for an average winter and is more representative of the likely level of demand on a cold winter's day than the peak 1-in-20 demand.

The cold day demand for 2023/24 is 404 mcm/d, which is lower than the previous winter (440 mcm/d), this is due to a combination of NDM demand suppression and reduced demand for power.

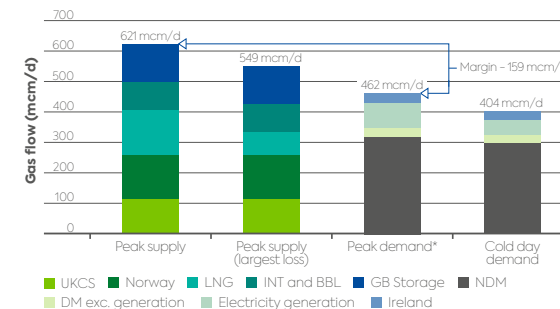
Table 3

Peak day supply margin for winters 2022/23 and 2023/24.

Forecast (mcm/d)	2022/23	2023/24	
1-in-20 peak demand	483	462	▽
1-in-20 non-storage supply	488	497	△
1-in-20 storage supply	117	124	△
Total 1-in-20 supply	605	621	△
1-in-20 margin	122	159	△

Figure 3

Peak day supply margin and cold day demand for winter 2023/24.



NB: as a consequence of how our network has evolved over the years, it is not possible to achieve maximum deliveries of European and LNG supply at the same time.

UKCS and NCS

UK Continental Shelf (UKCS)

UKCS continues to provide a steady baseload of supplies. During winter 2022/23, we saw an average supply of 103 mcm/d.

We expect to see supply levels similar to last winter, with new fields broadly offsetting any declines to existing ones.

Norwegian Continental Shelf (NCS)

Figure 4 shows the total NCS production for winter 2022/23.

We saw Norwegian supplies to Europe at technical capacity (blue dotted line, 250 mcm/d) for most of winter as shippers prioritised flows to Europe, as expected, due to favourable price signals.

The surplus supply (total production – flows to Europe), led to average daily supplies of circa 80 mcm/d to GB (dark green area).

We observed the market respond to high demand in GB, particularly during the cold snap in December, with flows to GB prioritised over Europe in response to pricing signals.

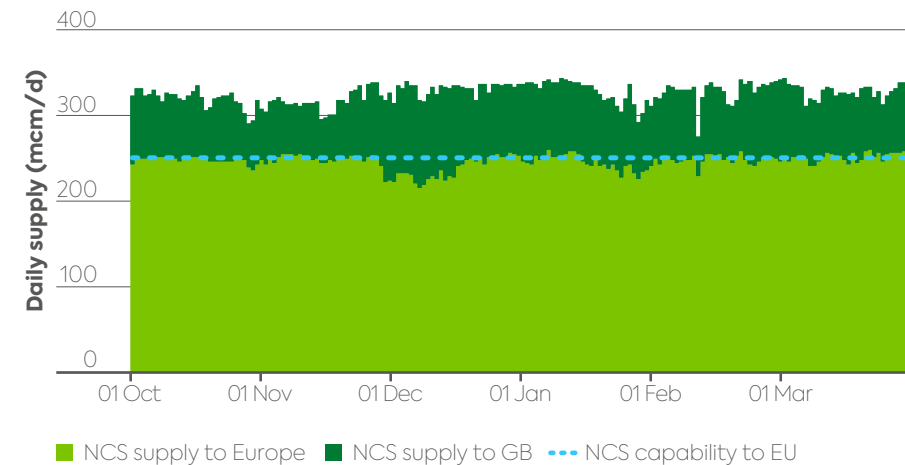
This winter we expect that NCS will continue to prioritise flows to Europe as they did last winter, with GB receiving circa 80 – 100 mcm/d most days. If the GB price is higher, then we'd expect GB to receive more supplies (up to the maximum physical capability of 141 mcm/d), especially during high demand periods.

As we shared in our [Summer Outlook](#), the NCS had a significant level of maintenance outages over the summer. There is a risk that these outages may extend into early winter, meaning there may be less supply available to GB during any ongoing maintenance.

It's worth noting that during the early part of winter, demand tends to be lower and there are other supply sources available to GB (such as LNG, which is highly flexible). If this risk were to materialise, we consider the possibility of any material impact to GB to be low as other supply sources would be able to respond appropriately.

You can find up to date information on supply outages on the Gassco website [here](#).

Figure 4
Daily Norwegian continental shelf daily flows.



A focus on Liquefied Natural Gas

GB has one of the largest re-gasification capabilities in Europe, and last winter we witnessed the highest LNG supplies to the NTS ever seen (15.7 bcm).

The peak daily LNG supply capability for this coming winter is 150 mcm/d, however actual flows will be determined by market conditions.

The consensus market view is that the global LNG market will remain in balance for winter 2023/24 as a drop in year on year LNG supply growth is offset by subdued LNG demand growth, driven by economic headwinds in China, higher European gas storage levels coming into winter, and lower European gas demand (driven by the power sector). As such, LNG imports into GB are also likely to be lower for the coming winter, as exports from GB to EU are likely to reduce (read more on this in our [Connections to](#)

Expert view:
Tom Marzec-Manser
 Head of Gas Analytics at ICIS

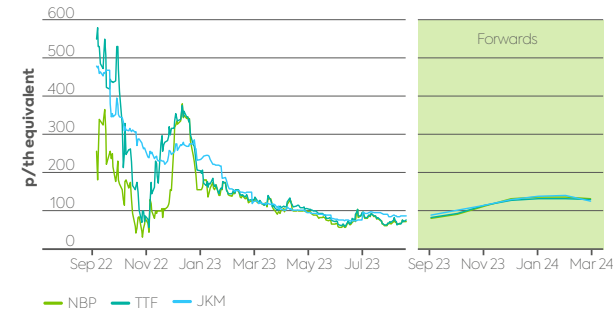
“The global LNG market remains finely balanced for the winter ahead. Any sudden changes to LNG supply or demand in Asia or the Americas could easily have a domino effect into Britain and Europe. While we don’t foresee any major disruptions, there remains a chance of an unforeseen incident. And it’s the risk of these happening which is making the market nervous even as storage across Britain and the EU are well stocked.”

[Europe spotlight](#)), meaning less LNG to transit through GB terminals for export to EU (figure 6).

Nevertheless, LNG as source of supply has the most potential to respond to address any supply/demand imbalances, and during winter 2023/24 we expect the market will deliver LNG supplies to GB when needed (as seen in previous years).

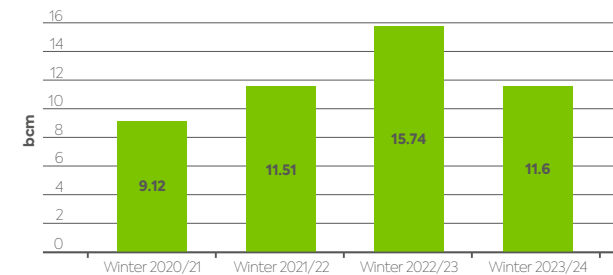
Global gas price differentials essentially determine where spot LNG (uncontracted supply) will deliver, and forward prices currently indicate that the market is evenly balanced between EU and Asia (figure 5). However, given the fine balance of the global LNG market and limited flexibility in the European gas market, European gas prices and global price differentials are likely to be more sensitive to market developments (e.g. Australian LNG strikes), which will impact flows to Europe.

Figure 5
Global gas prices (p/th equivalent).



Source: Argus (Historical)/ICE & CME (Forwards)

Figure 6
LNG imports to GB during winter months (bcm).



Source: Wood Mackenzie Short Term Outlook Q3



A focus on storage

Unlike European storage, which is used strategically on a seasonal basis, GB Storage behaviour is largely market driven, designed to be short-term and commercially focused.

Gas flows operate through pressure, and this is particularly evident with storage. Full storage can withdraw onto the NTS relatively quickly, but this deliverability reduces as storage depletes (less gas, less pressure, reduced flow). The deliverability curve for this winter is shown in figure 8, this shows how storage could deplete when all sites are run at max deliverability.

As we head into winter 2023/24, storage levels have been at similar levels to last year, but above the 5 year average. Due to the nature of GB Storage, stock levels can change quite quickly and the relative position can change from one week to the next.

Centrica brought the Rough storage facility back online last year and expanded it further ahead of this winter. The additional storage provided by Rough further strengthens the security of supply position for GB, which is of particular importance during winter.

Last winter, storage was used extensively – either injecting or withdrawing on most days (figure 9). This ensured stocks were sufficiently full to deliver significant volumes during the cold snap in December and later periods of colder weather.

In between these periods of cold weather significant volumes were reinjected as demands fell and additional supply was available. This helped to maintain high deliverability throughout the winter and ensured storage was available to respond when conditions required.

We would expect to see similar behaviour for the coming winter with storage remaining an important component of the supply mix and key in balancing supply and demand.

Figure 7
GB Storage stock levels including Rough.

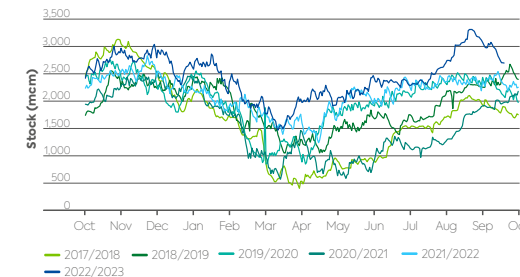


Figure 8
GB Storage deliverability.

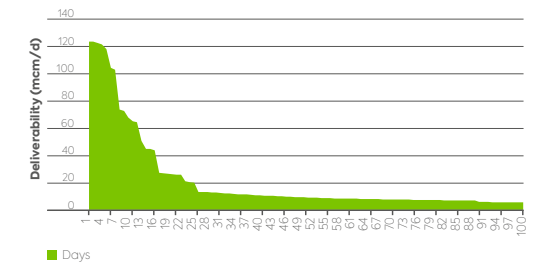
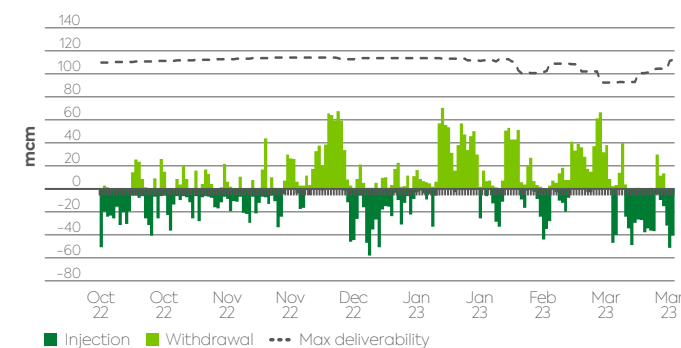


Figure 9
GB Storage injection and withdrawal levels over the last year.





Connections to Europe spotlight

The European context

Impact on interconnector flows

The European supply analysis



The European context

We expect to see a continuation of exports to the European continent this winter, albeit not as high as the levels observed last winter. This is largely due to the following:

European storage levels and mandated targets

The EU have exceeded their target of 90% storage fullness by 1 November 2023 ahead of time, placing the continent in a positive position in terms of security of supply and potentially reducing the urgency for imported gas from GB.

Additional regassification capability

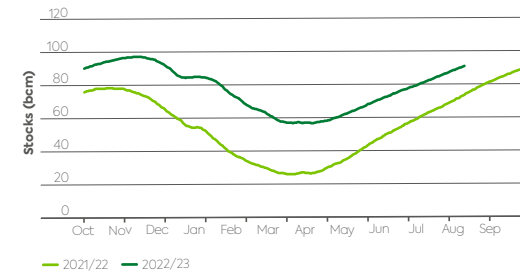
There should be approximately 22 bcm of additional regassification capability in Northwest Europe at the start of the winter period this year. Due to this, we may see LNG landing directly in Europe rather than passing through GB as we saw last winter.

European demand

The European council has set a voluntary 15% demand reduction target for member states between 1 April 2023 and 31 March 2024 to help ensure security of supply. In addition to this, whilst prices have fallen since last winter, they are still high in comparison to recent year. Winter heating demand in Europe (2022/23) was down 17% (~20 bcm) vs the 5-year average due to a mixture of milder weather and behaviour change due to high prices (Source: Wood Mackenzie¹). Due to all of these factors, particularly the demand reduction target, we would expect to see some level of EU demand suppression over the coming winter period.

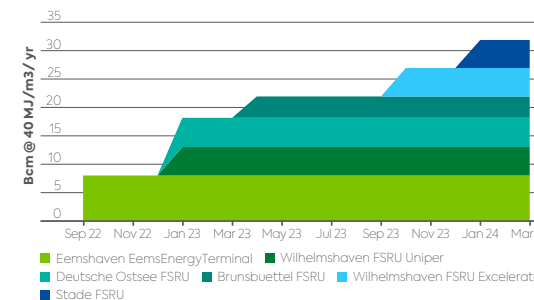
We also expect EU gas demand for power generation to be lower this year, largely due to the gradual recovery of French nuclear output (increasing from 278TWh in 2022 to 315TWh in 2023) following a series of maintenance outages (Source: Wood Mackenzie¹), reducing the need for GB to export electricity (generated from gas) to Europe.

Figure 10
European storage stocks (2021/22 and 2022/23).



Source: GIE AGSI platform (<https://agsi.gie.eu/>)

Figure 11
Northwest Europe regassification Floating Storage Regassification Unit (FSRU) and other capacity build (bcm/yr).



¹ Wood Mackenzie publication: Short-term outlook – Europe gas and power (Q2 2023)

The European context



There are a few additional, unpredictable factors that could influence the level of flows to and from Europe/GB over the winter period, namely:

Russian context

Although significantly reduced from historic levels, Europe does still receive some pipeline volumes from Russia through a variety of routes. These are shown in figure 12.

The imports via Belarus into Poland and Nord Stream into Germany have stopped, with virtually no pipeline imports into Northwest Europe.

Although reduced, some volumes are still received via Ukraine. The remainder of flows are mostly via Turkey, with limited flows directly to the Baltic States.

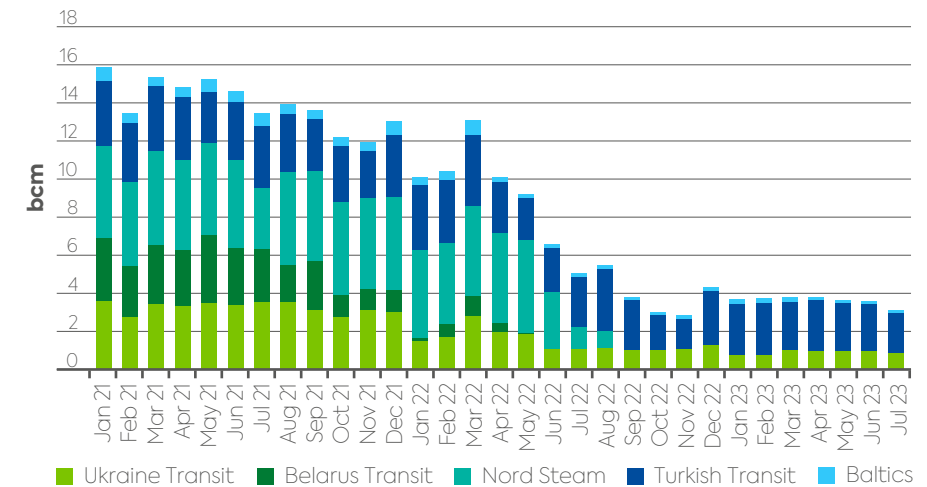
The likelihood of further disruption to these supplies cannot be discounted and we look to explore the impact of that in the following [section](#).

The weather

The weather can have a significant impact on gas demand in both GB and the EU for a number of reasons:

- A cold winter could increase gas demand for heating.
- Lack of wind, or a very dry winter could reduce the output from some renewables, placing greater importance on gas for power generation and/or the need for electricity imports from GB.

Figure 12
Russian pipeline volumes.



Source: Wood Mackenzie Short Term Outlook Q2

Impact on interconnector flows Spotlight

We have seen record levels of interconnector exports to continental Europe over the last 18 months (see figure 14).

The rise in exports of gas from GB to Europe was largely due to the impact of reduced gas flows from Russia, combined with Europe’s target to have storage stocks 90% full by 1 November 2022.

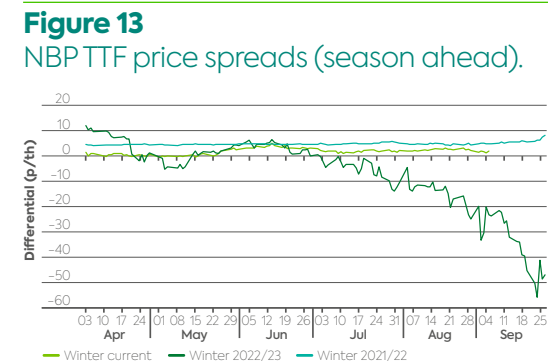
With European storage starting the summer fuller, following a milder winter and significant demand reductions in Europe, the need for exports from GB has reduced during summer 2023. While these continued at high levels at the start of the summer, in part due to the availability of LNG and in part the impact of Norwegian maintenance on European flows, these exports have reduced in recent months (see figure 14).

The reduced requirement in Europe for imported gas from GB has been reflected in the price spreads, which largely drive interconnector behaviour, between the GB price (NBP) and European prices (TTF). As shown in figure 13 the difference between the forward prices for the winter has reduced significantly compared to last year. In 2022/23 the TTF price for the winter was significantly higher than the NBP,

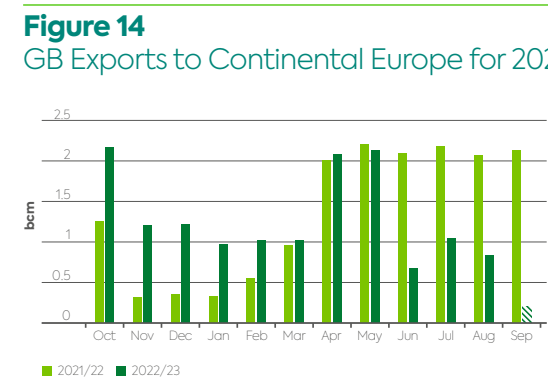
indicating the market expected a significant need for exports to Europe. This year we have not seen these premiums materialise with forwards for TTF and NBP at similar levels for the winter ahead.

This lower price signal, along with the European storage position are the primary drivers for the reduction in our forecast for exports to Europe over the winter. The lack of a forward price signal does not rule out exports; there was a similar pattern ahead of winter 2021/22 and, while significantly lower than last winter, we did see exports at times throughout the winter.

For this winter we would expect a similar pattern to the trend we saw in 2021/22, with exports in October before reducing into November. For the bulk of the winter, we would expect to see the interconnectors in float with little flows in either direction, but responding to short-term market signals with imports to GB/exports to the EU when required – either due to cold weather or covering for short term changes to other supplies.



Source: Argus Direct



The European supply analysis



European storage levels and mandated targets

Under a cold winter scenario the UK would require imports from Europe to balance supply and demand. While, under our current supply assumptions, the overall volumes are low, these supplies are an important component in balancing the market under cold conditions. Further details on the volumes required can be seen in our winter scenarios, which model the market under different conditions.

To test how reliable these supplies would be we have analysed a number of scenarios for the European market for the winter ahead. We have based this assessment on the entire European market, since in recent years we have seen the importance of a co-ordinated response across the continent to ensure security of supply. The data is based on data from Wood Mackenzie's Q3 Europe Gas and Power Market Short Term Outlook and ENTSOG's Summer Supply Outlook 2023 with Winter 2023/24 Overview.

Average winter demand is based on the 5-year average from the ENTSOG data, but adjusted for current market conditions based on the Wood Mackenzie outlook. The supply outlook predicted stocks at the start of winter is based on the Wood

Mackenzie short term outlook. Based on these assumptions for an average winter we would expect European storage stocks to end the winter at about 42 bcm or just under 40% full.

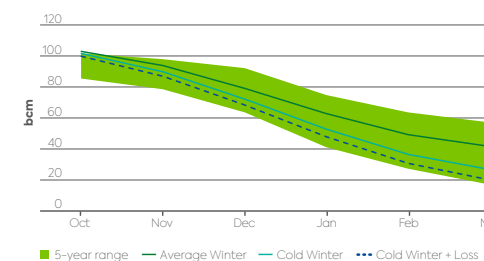
To test the impact of cold conditions we increased demand by 10% or around 26 bcm. To respond to this we increased supply from LNG by 11 bcm, utilising the existing LNG capacity by about 82%. This utilisation would drop to 75% if we include the additional LNG capacity expected to be operational during the winter. The remainder of the additional demand is met by increased storage use, with storage ending the winter at 27 bcm, or just over 25% full.

To further test the market we set all of the remaining Russian pipeline imports to 0, a loss of 11 bcm. This was balanced by a further 4 bcm of LNG and 7 bcm of storage. This still does not utilise all of the existing LNG capability.

Under all scenarios European storage remains within the range seen over the last 5 years. This would be a positive indicator that the European market should retain the flexibility to supply volumes through the interconnectors when required.

Figure 15

European storage under average, cold and supply loss conditions.



Source: Wood Mackenzie Short Term Outlook Q3 & ENTSOG Summer Supply Outlook 2023 – with winter 2023-24 overview

Table 4

European demand and flexible supply under average, cold and supply loss conditions.

(bcm)	Demand	Unused LNG capacity (existing)	Storage stocks remaining
Average winter	263	30	42
Cold winter	289	19	27
Cold winter + 0 Russian piped	289	15	20



Supply and demand scenarios

Our demand scenarios

Scenario 1: typical winter, European imports minimised

Scenario 2: cold winter, increased gas for power, European imports minimised

Scenario 3: cold snap



Our demand scenarios

The Winter Outlook presents three scenarios that illustrate how the NTS could be balanced under a range of credible demand profiles.

It is important to note that none of our scenarios are intended to illustrate a best or worst case for the forthcoming winter. The aim is to provide a range of scenarios that highlight the extent to which flexible sources of supply are available to GB to meet different demand levels.

The chart to the right shows the range of NTS demands experienced over 12 winters, represented by the grey shaded area. Highlighted on this chart are our three demand scenarios, as summarised in the table above it.

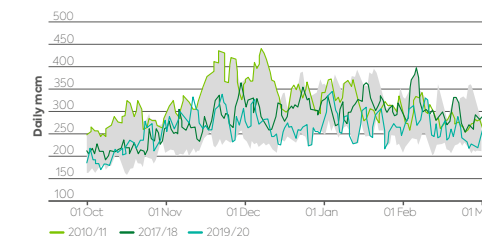
To understand more about how we have developed our scenarios and the assumptions behind them, please see the [appendix](#).



Table 5
Scenarios

Scenario	Rationale
Scenario 1: Typical winter (2019/20)	We simulated demand based on the weather experienced in winter 2019/20 as being representative of the daily demand we would expect in a typical winter.
Scenario 2: Cold winter (2010/11)	We have simulated demands from winter 2010/11 as representative of a cold winter, as this period contains the highest-ever daily gas demand level seen on the NTS, with sustained high demands throughout the majority of the winter.
Scenario 3: Cold snap (2017/18)	We have simulated demands from winter 2017/18 as representative of demand levels during an extreme cold snap as this period contains the 'Beast from the East' which resulted in some of the highest daily demand levels seen in the last five years, and also included the coldest CWV day in the last 20 years.

Figure 16
NTS demand range for 12 winters with the three scenarios highlighted.





Scenario 1: typical winter, European imports minimised

This scenario is based on the weather conditions experienced in the 2019/20 winter.

The NDM, DM and Ireland demands are calculated on the same basis as our current winter forecast and adjusted for the weather (table 6). NTS Industrial demand is based on our current winter forecast as this does not show significant weather sensitivity. Power Generation has been updated to reflect our current forecast.

In line with prevailing forward price differentials, we have assumed exports to continental Europe in October and November, with the volume of export shown in table 6.

This scenario illustrates a level of LNG supply that could be required to achieve a supply-demand balance in winter with a typical weather profile, and elevated demand for gas for power, without requiring any imports from continental Europe.

On the highest demand day (5 March) the market was balanced with 92 mcm of UKCS, 84 mcm of Norway, 111 mcm of LNG and 62 mcm of storage.

Table 6
Total winter demand in scenario 1.

Type	Total winter demand (bcm)		
	2019/20	Change	Scenario 1
Non-daily Metered	30.9	-2.7	28.2
Daily Metered	4.5	0.1	4.6
NTS power generation	10.6	-2.8	7.8
Continental Europe	0.5	2.6	3.1
Ireland	2.6	1.3	3.9
Total	49.1	-1.6	47.5

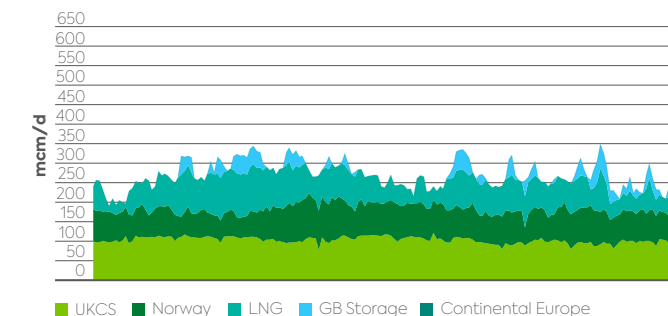
Key observations

- European imports are not required in this typical winter scenario if sufficient alternate flexible supplies come to GB. Our scenario prioritises LNG supplies to illustrate a level of supply that is elevated compared to recent Winters, but well within system capability.
- The volume of LNG required to balance the scenario could be reduced by higher supplies from UKCS or Norway, or by lower levels of exports earlier in the winter.
- GB Storage is utilised throughout the winter to meet higher demands. Periods of lower demand provide the opportunity for GB Storage to refill.

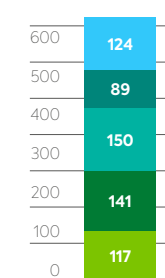
Table 7
Total winter supply and utilisation of peak capability.

Source	Total winter supply (bcm)		
	bcm	%	Utilisation (%)
UKCS	18.8	39	88
Norway	14.4	30	56
LNG	13.2	27	51
Continental Europe	0.0	0	0
Storage	2.4	5	81
GB Total	48.8		

Figure 17
Scenario 1 supply.



Peak Day capability





Scenario 2: cold winter, increased gas for power, European imports minimised

This scenario is based on the weather conditions experienced in the 2010/11 winter.

The NDM, DM and Ireland demands are calculated on the same basis as our current winter forecast and adjusted for the weather (table 8). NTS Industrial demand is based on our current winter forecast as this does not show significant weather sensitivity. Power Generation has been updated to reflect our current forecast, but volumes have been increased by assuming reduced electricity interconnector imports are available.

In line with prevailing forward price differentials, we have assumed exports to continental Europe in October and November, with the volume of exports shown in table 8.

This scenario illustrates that in a very high demand winter, imports from continental Europe may be required to achieve a supply-demand balance. In such a scenario, in which GB prices would need to show a premium to those at European hubs to incentivise imports, we would also expect to see a response from other sources, particularly Norway.

On the highest demand day (21 December) the market was balanced with 113 mcm UKCS, 105 mcm Norway, 140 mcm LNG, 41 mcm storage and 25 mcm of EU imports.

Table 8
Total winter demand in scenario 2.

Type	Total winter demand (bcm)		
	2019/20	Change	Scenario 2
Non-daily Metered	34.6	-3.6	31.0
Daily metered	5.8	-1.1	4.7
NTS power generation	12.5	-3.7	8.8
Continental Europe	2.1	0.7	2.8
Ireland	3.6	0.4	4.0
Total	58.6	-7.3	51.2

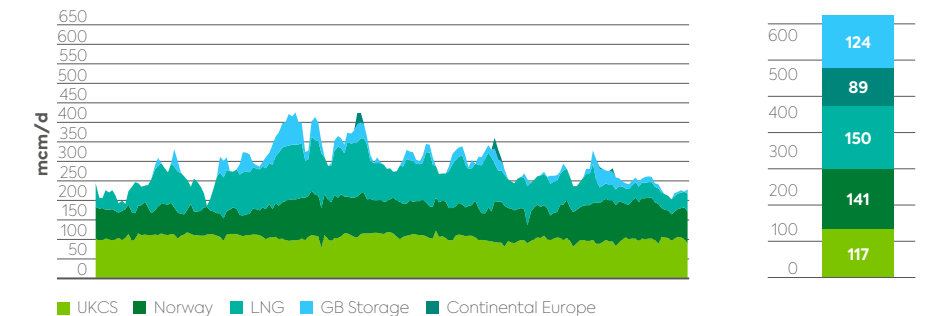
Key observations

- Additional flexible supplies are required in this cold weather scenario to supplement LNG, which reaches maximum capability on several days during the winter.
- The volume of European imports shown could be reduced by higher supplies from UKCS or Norway, or by lower levels of exports earlier in the winter.
- GB Storage is utilised throughout the winter to meet higher demands. Periods of low demand provide the opportunity for storage to refill.

Table 9
Total winter supply and utilisation of peak capability.

Source	Total winter supply (bcm)		
	bcm	%	Utilisation (%)
UKCS	18.8	36	88
Norway	15.2	29	59
LNG	15.4	29	60
Continental Europe	0.1	0	1
Storage	2.9	5	97
GB Total	52.4		

Figure 18
Scenario 2 supply.



Scenario 3: cold snap

This scenario is based on the ‘Beast from the East’ cold snap experienced in February and March 2018, this included the coldest CWV day in the last 20 years.

This cold snap period was the most recent example of market tightness in GB. We cannot accurately predict this far in advance if and when a cold snap may occur this Winter, or what level GB Storage stocks would be at that point. Therefore, these illustrations highlight the deliverability difference of GB Storage at stock levels of 75% and 25% full and how that impacts the need for alternative sources of supply*.

Figures 19a and 19b are focussed on the flexible sources of supply LNG, GB Storage, and imports from continental Europe. UKCS and Norway supplies are consistent with our other scenarios.

Maximum storage deliverability is shown on the charts as a percentage. This is the maximum percentage of supply storage can provide at its current stock level.

* To make this comparable to last year’s assessment we have modelled based on the MRS stock at 75%/25%. In both sets of analysis Rough stocks are about 25%.

Table 10
GB Storage stock levels for scenario 3.

Storage % full	Total GB Storage stock on first day of cold snap (mcm)	Total GB Storage volume used during cold snap (mcm)
75	1578	427
25	730	211

Key observations

- GB Storage historically acts as a short-term balancing source of supply during periods of higher demand as shown in this scenario.
- Additional flexible supplies are required when storage levels are low to supplement LNG, which reaches maximum capability during the cold snap.
- The higher demand is a partial reversal of the reduction in domestic consumption due to prevailing high energy prices, demand may not respond to the weather trigger if price is still a critical factor for consumers.
- The volume of European imports shown could be reduced by higher supplies from UKCS or Norway.

Figure 19a
Cold snap supplies with 75% full storage.

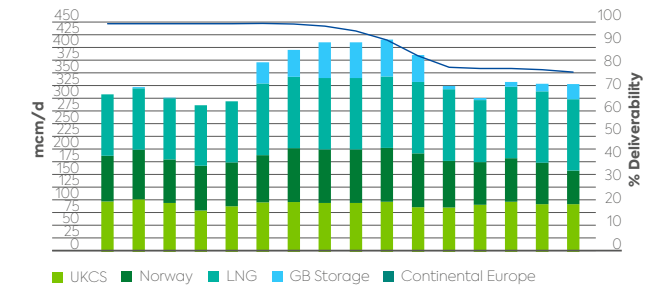
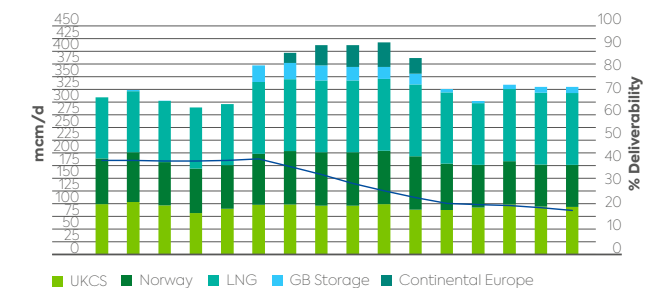


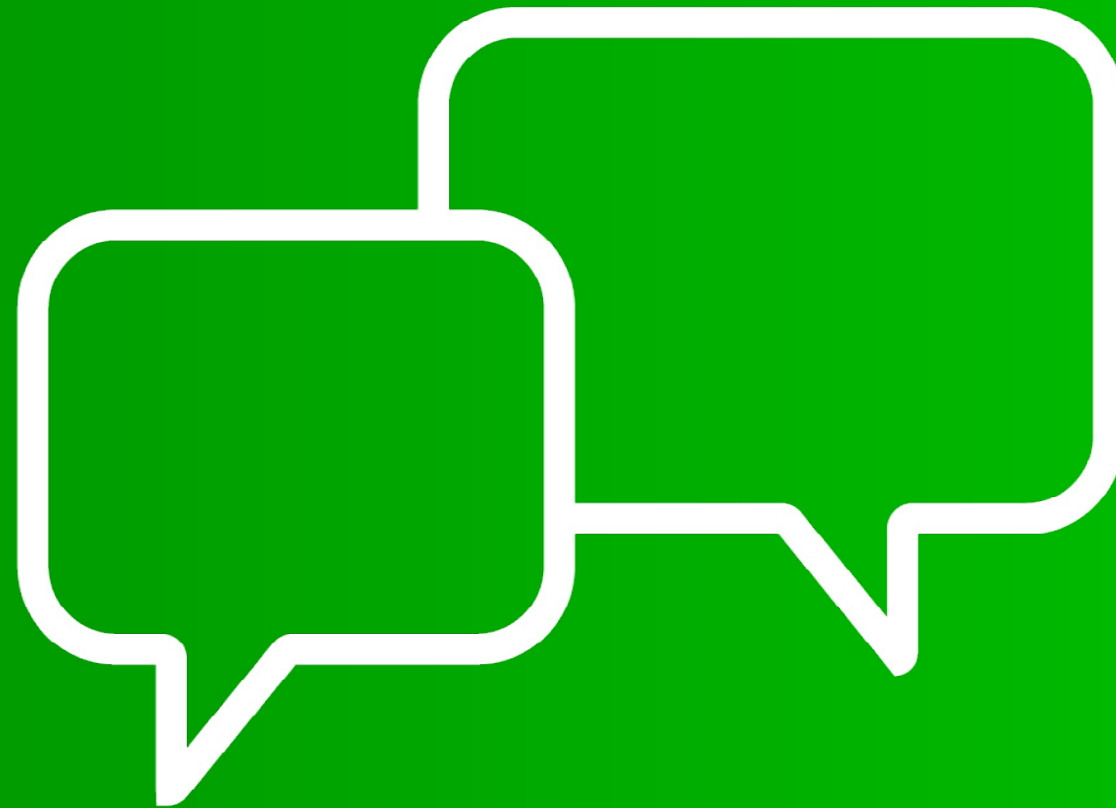
Figure 19b
Cold snap supplies with 25% full storage.





Contact us

Continuing the conversation



Continuing the conversation

We look forward to continuing the conversation with you at our upcoming engagement forums. The dates for our next Gas Operational Forums are available in the box to the left.

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Upcoming Gas Operational Forum dates:

- 19 October 2023
- 23 November 2023.

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Contextual information

- [GB Sources of demand](#)
- [Historic demand behaviour by source](#)
- [GB sources of supply](#)
- [Historic supply behaviour by source](#)
- [How we've defined our demand scenarios](#)
- [Our modelling assumptions – demand](#)
- [Our modelling assumptions – supply](#)
- [How to read the scenario charts](#)



GB sources of demand

The various types of GB demand, and what they mean, are split out below.

Non-daily Metered demand	Non-daily Metered (NDM) demand is associated with users where the meter is not read every day, such as residential properties and small to medium-sized industrial premises. This demand is predominantly for heating and is therefore strongly weather driven. On cold days NDM consumption will be the highest proportion of demand.
Daily Metered demand	Daily Metered (DM) demand is associated with users where the meter is read every day, such as large industrial premises and small generators connected to the distribution networks. DM demand also includes a few large industrial loads directly connected to the National Transmission System (NTS).
NTS power generation	NTS power generation demand is associated with large power stations, usually Combined Cycle Gas Turbines (CCGTs), that are directly connected to the NTS. Gas-fired generation usually acts as a 'balancer' on the electricity network, filling the gap when more variable sources of generation such as wind and interconnectors are not available.
Ireland exports	Ireland has some indigenous gas supplies, provided by the Corrib gas field. This field is in decline and imports from the NTS meet around 75% of Ireland's gas demand, which predominantly consists of power generation, industry and residential.
Continental Europe exports	This source of demand is responsive to prevailing market conditions and is highly flexible. GB is physically connected to continental Europe via two gas interconnectors (Belgium and Netherlands). Both interconnectors can export from GB to continental Europe with a combined maximum export capability of 75 mcm/d.



Historic demand behaviour by source

The historic behaviour of GB demand can be visualised reviewing the range (minimum, maximum, average) of supplies over the past five winter periods. Key observations include:

- **Exports to continental Europe** have historically occurred in the earlier and later months of winter when GB demand is generally lower. However, over the last couple of winters exports to continental Europe were higher throughout winter. This was particularly notable in winter 2022/23, with consistently high exports largely due to the war in Ukraine.
- **Daily Metered demand** range is fairly consistent throughout winter with limited variability due to weather.
- **Non-daily Metered demand** is strongly weather driven and therefore there is historically a rise in demand during the typically colder months of winter. During winter 2022/23 we saw a level of demand suppression due to high prices.
- **NTS power generation** is historically highly dependant on the levels of renewable electricity generation available and whether electricity interconnectors are importing to GB.



Figure 20a
LDZ

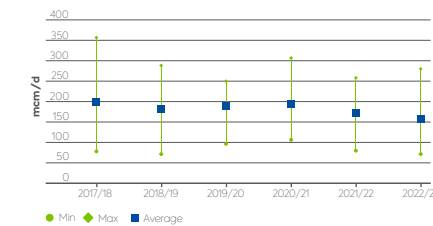


Figure 20b
Power

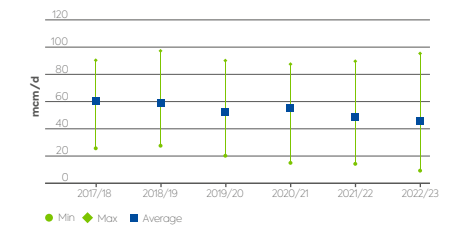


Figure 20c
Industrial

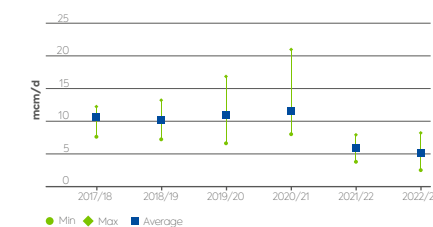
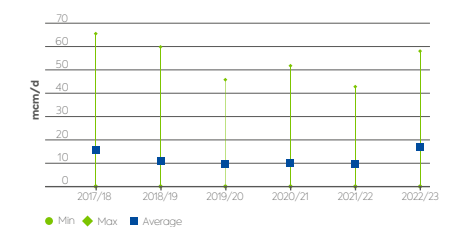


Figure 20d
Storage injection

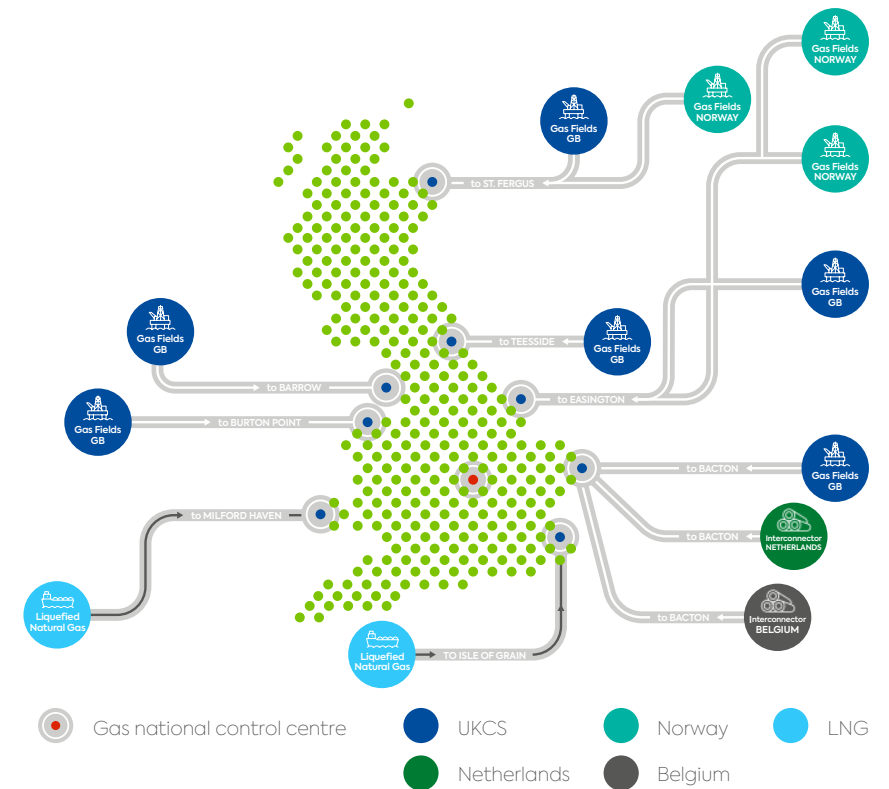


GB sources of supply

GB benefits from diverse and flexible sources of supply via several large supply points. The physical capability of these supply points, in aggregate, can deliver daily volumes of gas in excess of that required to meet maximum (peak day) GB demand.

UK Continental Shelf (UKCS) and Norway	These sources of supply historically deliver up to 117 mcm/d (UKCS) and 100 mcm/d (Norway) throughout winter. Norway's maximum supply capability to GB is 141 mcm/d, approximately 60 mcm/d of this supply capability is price sensitive at maximum production rates. GB market conditions need to be favourable to continental Europe for this additional 60 mcm/d of supply capability to flow to GB.
GB Storage	This source of supply typically provides a means of short-term balancing, with withdrawals increasing to meet periods of high demand or responding to unforeseen supply interruptions. Sites typically maintain stock levels in the earlier part of the winter by limiting delivery, or take advantage of lower demand periods by restocking their storage position. Deliverability varies depending on storage stock levels, with a maximum capability of 124 mcm/d.
Liquefied Natural Gas (LNG)	This source of supply is responsive to prevailing market conditions. GB has one of the largest LNG re-gasification capabilities in Europe, with the ability to deliver up to 150 mcm/d. Sustaining flows at this level would require regular LNG cargoes throughout winter. LNG is a global commodity; GB market conditions would need to be favourable to other markets to attract LNG cargoes not secured via long-term contracts.
Continental Europe imports	This source of supply is responsive to prevailing market conditions and is highly flexible. GB is physically connected to continental Europe via two gas interconnectors (Belgium and Netherlands). Combined, these interconnectors have the capability to deliver up to 125 mcm/d.

Sources of gas into GB today



Historic supply behaviour by source

The historic behaviour of GB supply points can be visualised by reviewing the range (minimum, maximum, average) of deliveries over the past five winter periods. Key observations include:

- **UKCS and Norway** have provided a continuous base load of supply throughout the period. Reductions in deliveries are predominantly driven by short-term asset faults, with minimal price sensitivity.
- **Interconnectors** have historically supplied gas to GB in the winter. Over the last 2 winters we have witnessed lower levels of imports to GB. In winter 2022/23 we witnessed the lowest level of imports to date (and the highest level of exports) mostly due to the demand for gas in Europe as a consequence of reduced supplies from Russia.
- **LNG** is highly flexible and responds heavily to price signals. Deliveries during the coldest periods of the previous five years have approached the theoretical maximum capability of our LNG terminals, whilst reducing to near zero when the supply has not been required.
- **Storage** withdrawal is highly flexible and is used to manage short-term supply disruptions, or to top-up base supply during peak periods.



Figure 21a
LNG

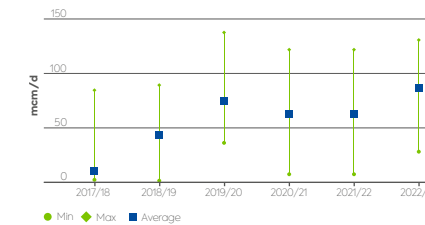


Figure 21b
Terminal

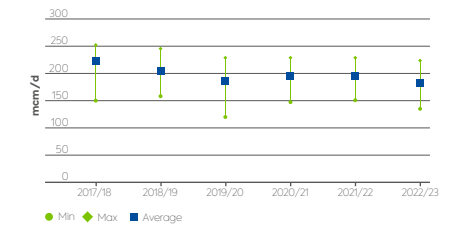


Figure 21c
Storage withdrawal

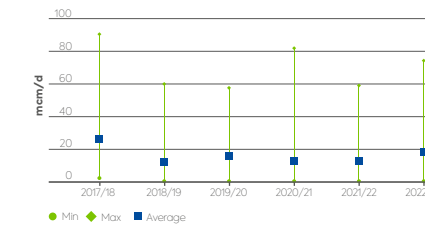
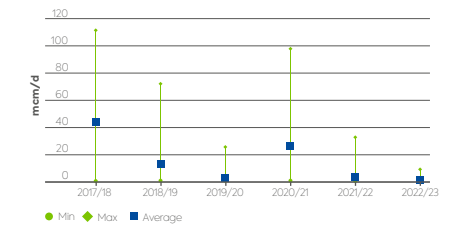


Figure 21d
Import





How we've defined our demand scenarios

How have we defined typical and cold demand?

The demand profile on the GB gas network has changed dramatically since natural gas was first introduced in 1972, and as such it is not possible to use historic demand levels to categorise our different scenarios.

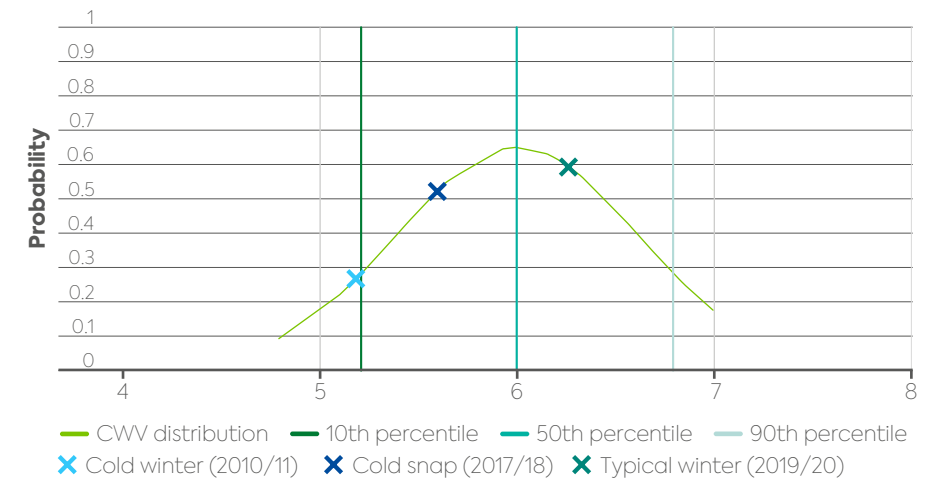
During the winter period, the majority of GB gas demand has historically been driven by domestic gas central heating and therefore is highly influenced by the weather, particularly temperature. The Composite Weather Variable (CWV) is a single measure of weather which takes into account the actual temperature, wind speed, effective temperature and seasonal normal effective weather and has a linear relationship with domestic gas demand. By taking recent winters with supply/demand conditions and infrastructure similar to the current environment we are able to display them against historic winter CWVs to define cold and mild scenarios.

The chart to the right (figure 22) illustrates the distribution of temperature in the UK from 1992 to 2022, expressed as a function of the CWV.

- Our **typical winter** scenario is within the top 50% of winter temperatures that have been observed over the previous 30 years and was experienced in 2019/20.
- Our **cold snap** scenario is generally close to the mean temperature observed over the previous 30 years, but contains a short cold period experienced in 2017/18.
- Our **cold winter** scenario is within the coldest 10% of the previous 30 winters and was experienced in 2010/11.

Figure 22

The normal distribution of temperature (expressed as CWV) in the UK from 1992 to 2022.



Our modelling assumptions – demand

Our scenarios are based on historical weather patterns. By using these weather patterns with our latest models we are able to simulate daily demands for the coming winter based on historical weather conditions. This ensures structural changes to the market are accounted for, such as changes to domestic heating, increased insulation and current profile of industrial and commercial customers.

Non-daily Metered demand	Non-daily Metered demand (domestic properties and small to medium-sized industrial premises) is calculated based on the weather profiles using our demand models. This ensures the daily demand accounts for increased boiler efficiency, new homes, heat pumps and the impact of high energy prices.
LDZ Daily Metered demand	LDZ daily metered demand (such as large commercial and industrial premises) is calculated based on the weather profiles using our demand models. While elements of this demand are not weather sensitive there is still a significant amount of heating in this sector, so would be expected to increase during a colder winter.
NTS industrial demand	NTS industrial demand is in line with our forecast for the current winter, as we would not expect significant weather sensitivity from this source.
NTS power	The starting point for our scenarios is our current winter forecast. Given the changes in the generation profile using historic actuals would not be representative of the demands which would be expected today. To best reflect what could be expected we have based the profiles on the historical data, but adjusted to reflect the volatility seen in winter 2022/23. This is then scaled so the total volume matches our current winter 2023/24 forecast to account for the latest expectations for the electricity market.





Our modelling assumptions – supply

Due to the complex global economic factors involved, no one can predict precisely how the GB and global markets will behave throughout winter. However, based on historical GB market behaviour and our knowledge of market operation, we can outline the potential order in which supplies may respond to balance the NTS in different situations.

Our key assumptions, which underpin our scenario analysis, are as follows:

UKCS and Norway	We expect the drivers that will influence both UKCS and Norwegian supplies this winter will be very similar to last winter. In particular, high prices will continue to incentivise both sources to maximise production; and high European prices will incentivise Norwegian supplies to maximise supply to continental Europe in preference to GB. We have therefore used historical data from last winter (2022/23) for both UKCS and Norwegian supplies to build some natural variability into our scenarios and represent a likely supply profile for this winter.
GB Storage	In line with historic behaviours, we have assumed that GB Storage will act as a short-term balancing source of supply, with withdrawals increasing to meet periods of higher demand or responding to unforeseen supply interruptions. Storage sites typically maintain stock levels in the earlier part of the winter by limiting delivery, or taking advantage of lower demand periods to restock their storage position. We have assumed GB Storage will re-fill when there is a GB supply surplus.
LNG	We assume LNG supplies will increase throughout the winter period based on overall GB demand and act as the primary supply-side balancing mechanism. The potential for reduced imports from continental Europe would necessitate increased LNG supplies, all other factors being equal. The reverse is true whereby imports from continental Europe will reduce GB reliance on LNG.
Continental Europe imports/ exports	Typically, the behaviour of the European interconnectors is price sensitive and therefore highly flexible. We assume there will be exports from GB to continental Europe early on in the winter when there is a supply surplus in GB. Should GB require gas imports beyond the levels that can be fulfilled by LNG, we assume the market will respond accordingly and create the required pricing signals for continental Europe to export to GB.

In summary
Our scenarios seek to achieve a network balance in the following manner:

Supply Surplus
In the event the NTS is over-supplied, gas is presumed to be injected into GB Storage and/or gas exports to continental Europe will increase, before LNG supplies are reduced.

Supply Deficit
In the event the NTS is under-supplied, it is presumed there will be an increase in storage withdrawal, Norwegian imports and LNG deliveries, whilst reducing any continental Europe exports, prior to requiring continental Europe imports and maximising storage withdrawal.



How to read the scenario charts

We are presenting additional charts and data relating to our scenarios and assumptions. The visual aids to the right have been created to explain how we are presenting our scenarios. Please note that the tables and charts on this page contain simulated data for illustrative purposes only and do not represent any of our Winter Outlook scenarios.

Winter supply and demand

Illustrates the demand profile for the entire winter period (dark blue line), with the volume of each supply source used to meet this demand illustrated below it.

Peak Day capability

Each winter supply and demand chart is compared with the Peak Day capability forecast. This allows you to compare the modelled supply and demand chart levels with the full potential supply capability.

Demand table

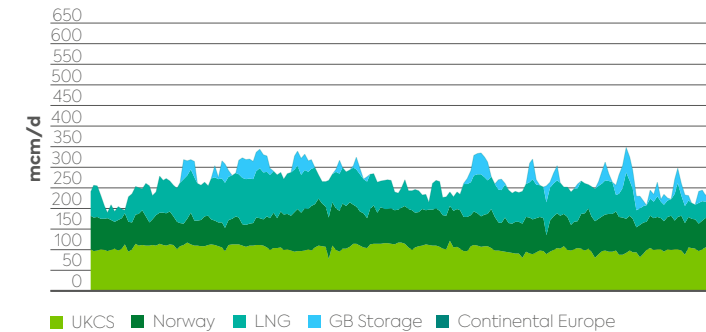
Provides a trace between the historic actuals for the base demand scenario, and the aggregate impact of the adjustments made for the impact of gas prices and higher levels of gas for electricity generation.

Supply table

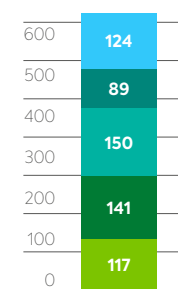
Illustrates the aggregate volume of supply from each source for that scenario and the percentage of the total supply. Percentage utilisation is calculated as the average daily supply divided by the peak day capability, except for storage where utilisation is calculated as total withdrawals divided by total working gas volume across all of the sites (excluding Rough).

Examples below:

Winter supply and demand



Peak Day capability



Demand table

Type	Total winter demand (bcm)		
	2019/20	Change	Scenario 1
Non-daily Metered	30.9	-2.7	28.2
Daily Metered	4.5	+0.1	4.6
NTS power generation	10.6	-2.8	7.8
Continental Europe	0.5	+3.2	3.7
Ireland	2.6	+1.3	3.9
Total	49.1	-4.1	47.5

Supply table

Source	Total winter supply (bcm)		
	bcm	%	Utilisation (%)
UKCS	16.4	34	77
Norway	16.8	35	65
LNG	13.6	28	53
Continental Europe	0	0	0
GB Storage	1.5	3	7
GB Total	54.0		



Appendix

Appendix – mcm to GWh conversion



Appendix – mcm to GWh conversion

Table 1

Forecast total gas demand for winter 2023/24, and weather corrected actual demand for 2022/23.

Winter demand (bcm)	2022/23 Actual Demand (Weather Corrected)	2023/24 Forecast demand	Change	% change	
Non-Daily Metered (NDM)	25.9	27.9	2	7.7	△
Daily Metered (DM)	3.8	3.5	-0.3	-7.9	▽
NTS Industrial	0.5	0.7	0.2	40	△
Power generation	9.3	7.8	-1.5	-16.1	▽
Total GB demand	39.5	39.9	0.4	1	△
Ireland exports	3	3.7	0.7	23.3	△
Interconnector exports (EU)	7.6	3.2	-4.4	-57.9	▽
Total NTS Demand	50.1	46.8	-3.3	-6.6	▽

Table 3

Peak day supply margin for winters 2022/23 and 2023/24.

Forecast (GWh)	2022/23	2023/24	
1-in-20 peak demand	5313	5082	▽
1-in-20 non-storage supply	5368	5467	△
1-in-20 storage supply	1287	1364	△
Total 1-in-20 supply	6655	6831	△
1-in-20 margin	1342	1749	△

Table 2

Observed daily max, min, average supplies in winter 2022/23 and max capability.

	Observed daily values in winter 2022/23 (GWh)			Max capability (GWh)
	Max	Min	Average	
UKCS*	1309	881	1133	1287
NCS*	1243	509	870	1551
LNG	1507	307	950	1650
EU Imports	86	0	3	1375
GB Storage	814	0	194	1364

* Due to the offshore configuration at St Fergus we are unable to measure UKCS and Norwegian supplies separately as they enter our system at the same point. Therefore the individual contribution of these supplies is partially based on our estimates of the split at St Fergus.

Table 4

European demand and flexible supply under average, cold and supply loss conditions.

(GWh)	Demand	Unused LNG capacity (existing)	Storage stocks remaining
Average winter	2,890,946	332,472	459,585
Cold winter	3,180,041	208,217	294,745
Cold winter + 0 Russian piped	3,179,000	160,586	221,228

Appendix – mcm to GWh conversion

Table 6

Total winter demand in scenario 1.

Type	Total winter demand (GWh)		
	2019/20	Change	Scenario 1
Non-daily Metered	339,900	-29,589	310,311
Daily Metered	49,500	1030	50,530
NTS power generation	116,600	-30,800	85,800
Continental Europe	5,500	28,105	33,605
Ireland	28,600	13,807	42,407
Total	540,100	-17,447	522,500

Table 7

Total winter supply and utilisation of peak capability.

Source	Total winter supply (GWh)		
	GWh	%	Utilisation (%)
UKCS	206,765	39	77
Norway	158,843	30	65
LNG	145,127	27	53
Continental Europe	0	0	0
GB Storage	26,285	5	81
GB Total	537,020		

Table 8

Total winter demand in scenario 2.

Type	Total winter demand (GWh)		
	2019/20	Change	Scenario 2
Non-daily Metered	380,600	-40,028	340,572
Daily Metered	63,800	-12,493	51,307
NTS power generation	137,500	-40,700	96,800
Continental Europe	23,100	8,079	31,179
Ireland	39,600	4,400	44,000
Total	644,600	-80,742	563,200

Table 9

Total winter supply and utilisation of peak capability.

Source	Total winter supply (GWh)		
	GWh	%	Utilisation (%)
UKCS	206,765	31	77
Norway	167,175	32	66
LNG	169,290	31	64
Continental Europe	1,432	1	1
GB Storage	31,645	4	97
GB Total	576,306		

Table 10

GB Storage stock levels for scenario 3.

Storage % full	Total GB Storage stock on first day of cold snap (GWh)	Total GB Storage volume used during cold snap (GWh)
75	17,362	4,698
25	8,034	2,324

* Conversions from mcm to GWh have been made with a CV of 35.17MJm³



Glossary

List of glossary terms





Glossary

1-in-20 obligation

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

Asset

Any physical part of the network and includes: compressors, pipelines, flow valves and regulators.

Automated Programmable Interfaces (API)

A code that automatically selects data of interest for users of the National Gas Data Portal to download.

BBL (interconnector)

A bi-directional gas pipeline connecting Bacton in the UK and Balgzand in the Netherlands.

Bcm

Billions of cubic metres.

Cold day

The supply or demand for the coldest day in an average (or seasonal normal) winter. The cold day is taken as day 1 of the Average Load Duration Curve, with calculations using weather history over the period 1960 – 2012.

Combined Cycle Gas Turbines (CCGT)

A combined-cycle power plant uses both a gas and a steam turbine together to produce up to 50% more electricity from the same fuel than a traditional simple-cycle plant. The waste heat from the gas turbine is routed to the nearby steam turbine, which generates extra power.

Combined Weather Variable (CWV)

The Composite Weather Variable (CWV) is a single measure of daily weather in each LDZ and is a function of actual temperature, wind speed, effective temperature and seasonal normal effective temperature.

Commercial actions

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

Compressor

Compressors are used to move gas around the transmission network through high pressure pipelines. These compressors move the gas from entry points to exit points on the gas network. They are predominantly gas driven turbines that are in the process of being replaced with electric units.

Constraints

A restriction affecting part of the system which results in the gas flows in that part of the system being limited. Entry – where a pressure Terminal Flow Advice is in place at an ASEP and firm entitled flow rate is greater than the capability/TFA. Exit – Failure (or forecast) to meet a required offtake pressure obligation. Either the User elects not to offtake gas at a pressure lower than obligated or NTS pressure so low that gas will physically not flow through offtake and down stream users affected or low pressure safety limit reached.

Daily Metered (DM) demand

A classification of customers where gas meters are read daily. These are typically large-scale consumers.

Demand Side Response (DSR)

Demand Side Response is a service that was developed by gas industry representatives to encourage daily metered (DM) consumers to offer to reduce their gas demand during times of system stress.

DESNZ

Government Department for Energy Security and Net Zero.

ENTSOG

The European Network of Transmission System Operators for Gas. ENTSOG was established in 2009 and as a cooperation initiative of the European gas TSOs. The focus is to develop competitive markets and enable security of supply, both in the interests of the European consumers and to facilitate the TSO cooperation to fulfil the regulatory, binding obligations of Gas Regulation (EC) No 715/2009.

Electricity (power) generation

Electricity generated by the burning of gas.

European interconnectors/interconnector

A term used to describe both of the bi-directional gas pipelines that connect Bacton in the UK to Balgzand in the Netherlands (BBL) and to Zeebrugge in Belgium (Interconnector Limited).

Export

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



Glossary

forward price curve

Forward curves represent the market's best estimate for what the eventual spot market price will be for a particular month at a particular location.

FSRU

FSRU vessels can be classified either as ships or offshore installations depending upon the design they incorporate. FSRUs can be equipped in two ways: either they can be installed as a separate unit aboard the LNG carrier itself or, an old gas carrier can be converted into an independent unit and placed in a particular destination as an offshore installation

Gas Data Portal

The Gas Data Portal is a web-based, information platform that serves market participants with a wide-ranging view of Gas Transmission operational data.

Gas fired generation

Electricity generated by the burning of gas.

Gassco

Gassco is responsible as operator for transporting Norwegian gas to continental Europe and the UK through its network of pipelines.

GB Demand

Demand excluding interconnectors, storage injection & exports to Ireland.

GWh

Gigawatt hours.

Injection

Gas for storage injection. This is gas which is put ("injected") into a gas storage facility.

Intact Capability

All compressors are available and reliable.

Interconnector Limited

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

LDZ

Local Distribution Zone.

LNG

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

Margin

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

Market Information Provision Initiative (MIPI)

Market Information Provision Initiative (MIPI) is a web-based, information platform that serves market participants with a wide-ranging view of Gas Transmission operational data. This has now been replaced by the Gas Data Portal.

Market participants/industry participants

Those involved in buying and selling gas on the NTS

Mcm

Million cubic metres.

Moffat

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

MRS (Medium-range storage) GB Storage

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

N-1 largest loss / 'Under N-1 conditions'

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

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



Glossary

Network Gas Supply Emergency (NGSE)

A network gas supply emergency (NGSE) occurs when we are unable to maintain a supply – demand balance on the NTS using our normal system balancing tools. As a consequence of the imbalance between supply and demand, pressures in the system fall and it may not be possible to safely maintain gas supplies to industrial and domestic gas consumers who are supplied with gas either directly or indirectly from the NTS. A network gas supply emergency (NGSE) may be caused by unforeseen circumstances, such as pipeline or equipment failure, or where system demand exceeds either total supply or planned system capacity.

National Transmission System (NTS)

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

NBP

The National Balancing Point (NBP), is a virtual trading location for the sale and purchase and exchange of UK natural gas.

Network capability

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

Network Emergency Coordinator (NEC)

The NEC is responsible for coordinating actions across the affected parts of the gas network to take action to prevent, as far as possible, a supply emergency developing, and where it cannot be prevented, to take timely decisions in order to minimise the safety consequences. The NEC is independent from any commercial interests of gas industry participants. Industry participants such as gas transportation and gas shipping companies have a legal duty to cooperate with the NEC.

Non-daily Metered (NDM) demand

A classification of customers where gas meters are read monthly or at longer intervals. These are typically residential, commercial or smaller industrial consumers.

Non-storage supply

Gas that comes from sources other than gas storage. This includes supply from the UK Continental Shelf (UKCS), Norwegian imports, European imports and imports of Liquefied natural gas (LNG).

Norway/Norwegian Continental Shelf (NCS)

Gas supplied to the NTS via pipelines from Norway.

OCM

On-the-day commodity market. The OCM is the market we use in our role as residual balancer. The balancing market is operated by the ICE Exend exchange, as appointed by National Gas.

Ofgem

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

Operating Margin

Operating Margins (OM) relate to how we use gas to manage short-term impacts of operational stresses (e.g. supply loss) where the market response is not sufficient, or during a gas system emergency.

Peak day capability

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

Peak demand

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

Peak supply

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

Physical Capability

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

price differential

The difference in price between markets e.g. GB and continental Europe. Energy supplies tend to flow to whichever market has the highest price.

Glossary

Renewable

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

Seasonal normal conditions

A set of conditions representing the average weather that we could reasonably expect to occur. We use industry-agreed seasonal normal weather conditions. These reflect recent changes in climate conditions, rather than being a simple average of historic weather.

Seasonal normal demand (SND)

The level of gas demand that would be expected on each day of the year. It is calculated using historically observed values that have been weighted to account for climate change.

Total Demand

All NTS demand, including interconnectors, storage injection & exports to Ireland.

TTF

TTF is the virtual trading point of the Title Transfer Facility or the Netherlands Securities Transfer Fund, which is used as a reference gas market at European level.

UK Continental Shelf (UKCS)

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

Weather corrected

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



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