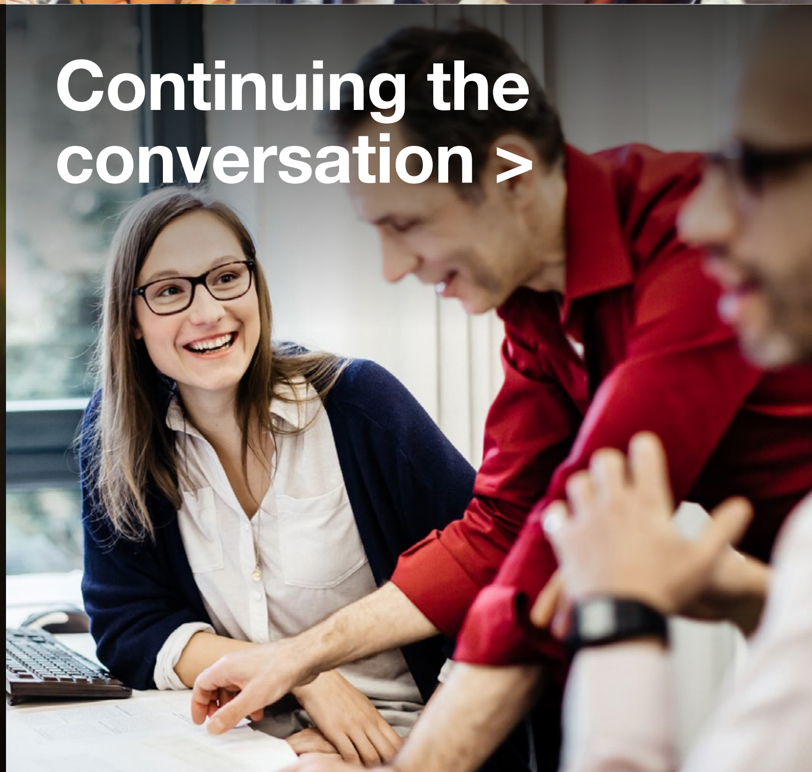
Gas Transmission

Gas Winter Review and Consultation June 2021

nationalgrid

Gas Winter Review and Consultation
June 2021



Welcome

How to use this document

We have published the *Gas Winter Review and Consultation* as an interactive document.

Home

This will take you to the home page.

Arrows

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

Enlarge/reduce

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

Glossary

Defined words and additional information (indicated by) can be viewed by clicking the yellow book symbol in the left-hand navigation bar.

'Linked' content

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

Welcome
to our *Gas Winter Review and Consultation*

The *Winter Review and Consultation* is an annual publication. It presents our review of the gas system over the past winter (October 2020 to March 2021).

The report is designed to inform the energy industry, engage with customers and stakeholders over particular issues observed in the period and support the industry's understanding of last winter's supply and demand patterns.

Other Gas System Operations publications in this suite include:

- ***Annual Network Capability Assessment Review (ANCAR),*** with the first report due in June 2021.
- ***Winter Outlook***, published annually, with the next due in October 2021.
- ***Gas Ten Year Statement (GTYS)***, with the next due in November 2021.
- ***Network Capability Annex***, published alongside GTYS, with the next due in November 2021.
- ***Gas Future Operability Planning (GFOP)***, published periodically based on stakeholder/National Grid requirements.
- ***Summer Outlook, published annually,*** with the next due in March 2022.

I hope you find the *Winter Review and Consultation* both interesting and informative. I encourage you to share your views with us to help inform our understanding of the winter period and how this can be used to better prepare for the future, including future Outlook reports. You can find details of how to do this at the end of this document in Continuing the Conversation.

Please also contact us directly via .box.OperationalLiaison@nationalgrid.com

Ian Radley
Systems Operations Director

Executive summary

Summary of the winter

1

Gas demand in winter 2020/21 was higher than forecast and higher than demand for the previous year.

This was due to various factors, one of those was the cold weather experienced in January and February, these factors resulted in peak demand almost as high as that seen during the 'Beast from the East' period in March 2018. Read more about this here.

2

Gas supply continued to be available from multiple sources however this winter we saw a different gas supply mix when compared to previous years.

This meant that we were reliant on a different mix of compressor units than expected or seen in previous years in order to move gas to where it was needed to balance the network. This resulted in an increase in compressor running hours from 14,158 hours last winter to 25,533 hours this winter. You can find out more about this here.

3

The average volume of linepack swing has been increasing year-on-year, as has the maximum observed levels of linepack swing on any given day.

Whilst this is not an overt concern, higher levels of linepack swing tend to require greater utilisation of compression to aid in the transmission of gas through the network. You can find out more about this here.

Table 1.1

Table 1.1
Breakdown of Gas Demand – a version in TWh can be found in the appendix

	Winter 2019/20		Winter 2020/21		
Demand in bcm	2019/20 Actual Demand	2019/20 Weather Corrected Demand	2020/21 Forecast	2020/21 Actual Demand	2020/21 Weather Corrected Demand
NDM	30.7	30.9	29.7	31.3	30.3
DM + Industrial	4.5	4.5	4.5	4.5	4.4
Ireland	2.6	2.6	3.2	3.0	3.0
Total for electricity generation	10.6	10.6	11.0	11.0	11.0
Total demand	48.4	48.7	48.4	49.8	48.7
IUK export	0.5	0.5	0.5	0.0	0.0
Storage injection	1.4	1.4	1.7	1.6	1.6
GB Total	50.6	50.9	50.9	51.8	50.7
LDZ + NTS Shrinkage	0.4	0.4	0.3	0.4	0.4

Summary of the winter

Table 1.2

Table 1.2
Breakdown of Gas Supply – a version in TWh can be found in the appendix

Winter Supply (BCM)			
	2019/2020 Actual	2020/2021 Forecast	2020/2021 Actual
UKCS /Norway	34.1	19.2–43.6	35.7
EU Imports	0.3	0–22.8	4.8
LNG	13.4	0.9–26.5	8.9
Storage Withdrawal	2.4	0–18.8	2.1
Other Supplies	0	0	0.002
Grand Total	50.2	20.1–111.7	51.5
Storage injection	1.4	1.4	1.7
GB Total	50.6	50.9	50.9

Gas supply and demand profiles

Key observation

- We have successfully managed a challenging winter without causing any societal or customer disruption.
- There were sufficient supplies from a variety of sources to meet the total winter 2020/21 demand.
- We saw a different supply mix in winter 2020/21 when compared to previous years. LNG supplies reduced and Interconnector Imports increased.

Figure 1.1 shows the supply profile over winter 2020/21, and compares this to the supply profile of the previous winter.

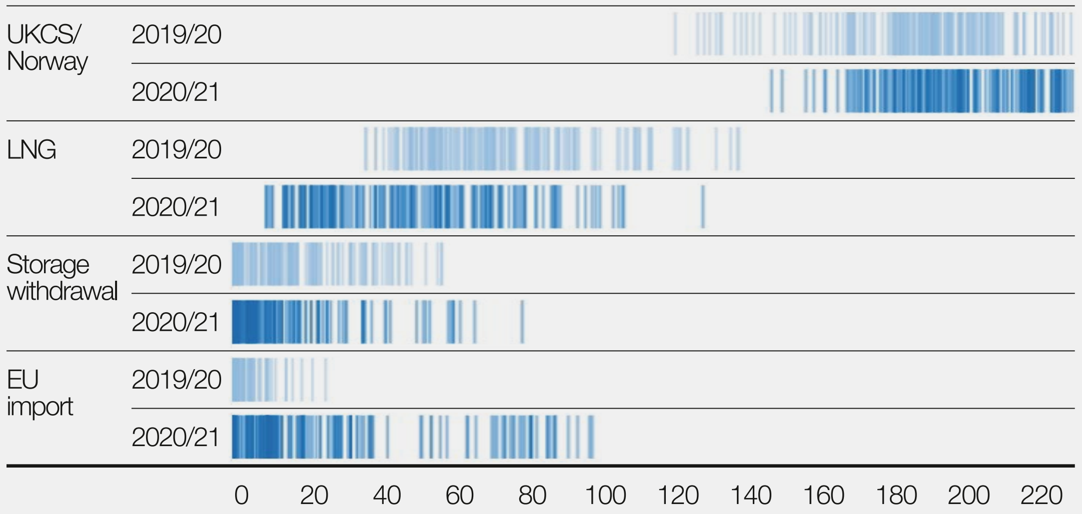
We saw reduced LNG supplies this winter (8.9 bcm), compared with the previous winter (13.4 bcm). This drop in LNG supply was largely due to higher LNG prices in Asia, which appears to have resulted in LNG cargoes sent to alternative destinations.

In contrast we saw EU Imports rise by 4.3 bcm this winter because it was commercially favourable, the EU/UK price differential was positive in favour of the UK. Read more about this on page 16.

The significant change in the supply mix between the past two winters led to a different operational strategy in the 2020/21

Figure 1.1

Figure 1.1
Proportion of daily NTS Supply (mcm/d)



winter, which placed a higher reliance on different assets and compressors to move gas from entry to exit points on the National Transmission System (NTS).

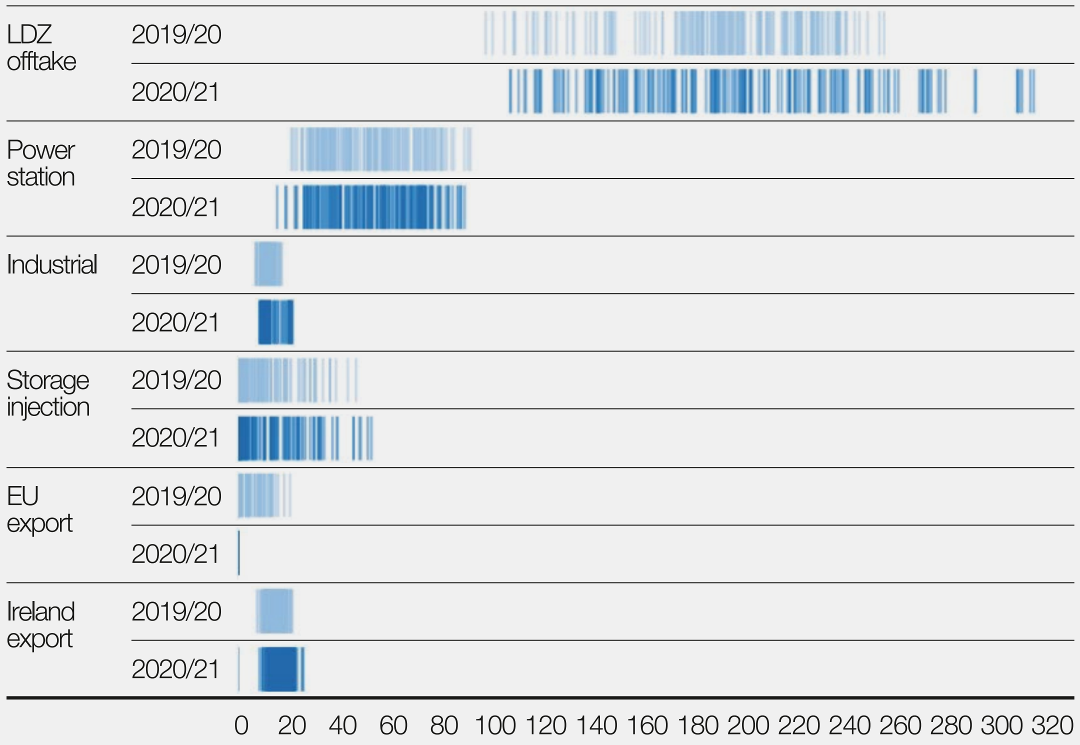
The growing variability in supply sources means that it remains essential to have sufficient flexibility to operate the NTS network under different conditions. Read more about this on page 21.

Gas supply and demand profiles

Figure 1.2 shows the demand profile for the last winter and compares it to that for 2019/20. The key thing to note is the wider range of Local Distribution Zone (LDZ) demand, this is due to the effects of the periods of high-demand seen in January and February.

Figure 1.2

Figure 1.2
Proportion of daily NTS Demand (mcm/d)



Demand

Spotlight

High demand days in February 2021

Spotlight

The average demand in week commencing the 8 February 2021 was 385 mcm.

This is the highest weekly demand on the NTS in the last 10 years.

Wednesday 10 February was the 2nd highest demand in the last 10 years.

All weekdays of week commencing 8 February feature in the highest 30 demand days of the last 10 years.

The demands were comparable to those experienced during the storms of 2018, known as the 'Beast from the East' which brought significant operational challenges to the gas network. By contrast, the period of February 2021 was largely stable.

The difference between the two events was largely due to the stability of offshore supply, with 2018 characterised by multiple supply losses, negatively impacting on the system pressures.

This was also supported by a number of operational changes implemented following a review of 2018, including an enhanced maintenance and pre-winter testing regime to further improve the reliability and availability of critical plant and equipment on the network; coupled with a change in methodology in how we manage the volume of gas (linepack) contained within the network at any one time. This also allows us to better balance the risk of entry constraints against the risk of exit constraints. The additional linepack being held allows the network to better absorb the impact of loss of supply, ensuring continued supply of gas to our customers during periods of high demands. Read more about this on page 19.

Key
- High demands days not within the week commencing 8 February 2021
- High demand days within the week commencing 8 February 2021

Figure 2.1
Highest demand days on the NTS wihtin the past 10 years (mcm/d)

Rank	Date	Demand (mcm/d)	Rank	Date	Demand (mcm/d)
1	01/03/2018	417	16	27/02/2018	392
2	10/02/2021	415	17	02/03/2018	391
3	02/02/2012	415	18	16/01/2013	391
4	08/01/2021	409	19	06/01/2021	390
5	07/01/2021	408	20	30/01/2019	389
6	08/02/2012	407	21	12/12/2012	388
7	11/02/2021	405	22	23/01/2013	387
8	09/02/2021	404	23	07/02/2012	387
9	03/02/2012	402	24	12/02/2021	387
10	23/01/2019	402	25	04/02/2012	387
11	31/01/2019	401	26	06/02/2018	385
12	28/02/2018	400	27	11/12/2017	384
13	01/02/2019	396	28	10/02/2012	384
14	08/02/2021	394	29	01/02/2012	384
15	09/02/2012	394	30	24/01/2019	383

Gas demand for electricity generation

Figure 2.2
Figure 2.3

Key observation

- There was a rise in gas demand for electricity generation compared to winter 2019/20.
- Whilst peaks of demand are expected to continue the cumulative demand is expected to decrease over the longer term due to a rise in installed renewable generation.

There was a rise in gas demand for electricity generation in winter 2020/21 compared to 2019/20, this was in line with the forecast. This slight rise was due to weather condition such as wind speed and non-gas-fired electricity supply such as nuclear power station availability and electricity interconnector availability. These can cause the need for gas-fired power stations demand to rise slightly given the correct conditions.

Despite this rise, gas demand for electricity generation has been steadily declining since winter 2016/17 (see figure 2.3), and this cumulative decline is expected to continue.

We forecast that the peak level of demand for electricity generation is likely to remain similar over the forthcoming years, whilst the total cumulative demand reduces.

This shows that the role that natural gas will play in the electricity generation market will be different moving forward, it is expected that instead of providing base load generation it will provide the necessary flexibility during times when renewable generation cannot produce sufficient power.

Figure 2.2
Gas demand for power stations (mcm/d)

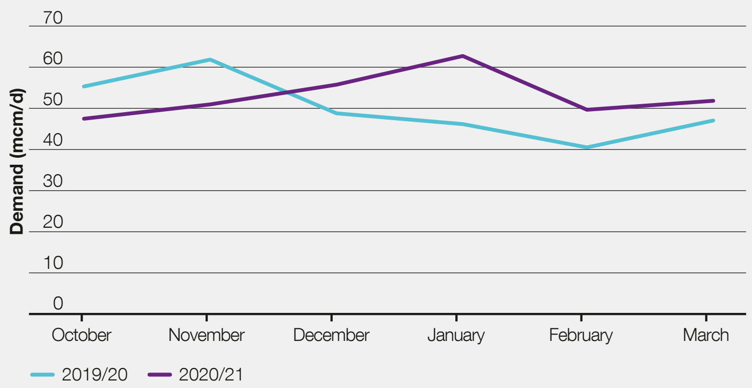
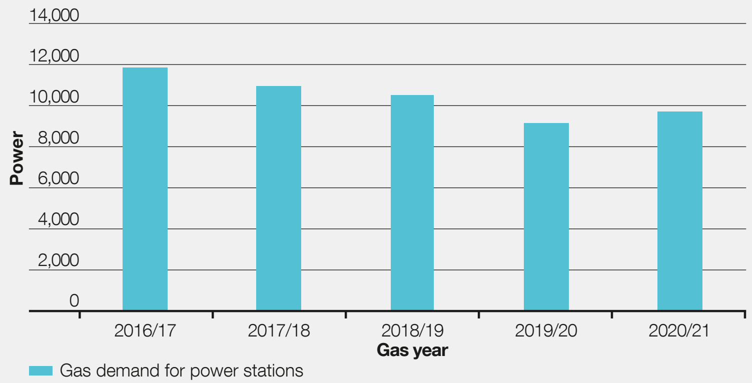


Figure 2.3
Annual as demand for power stations (mcm)



Non-daily metered demand

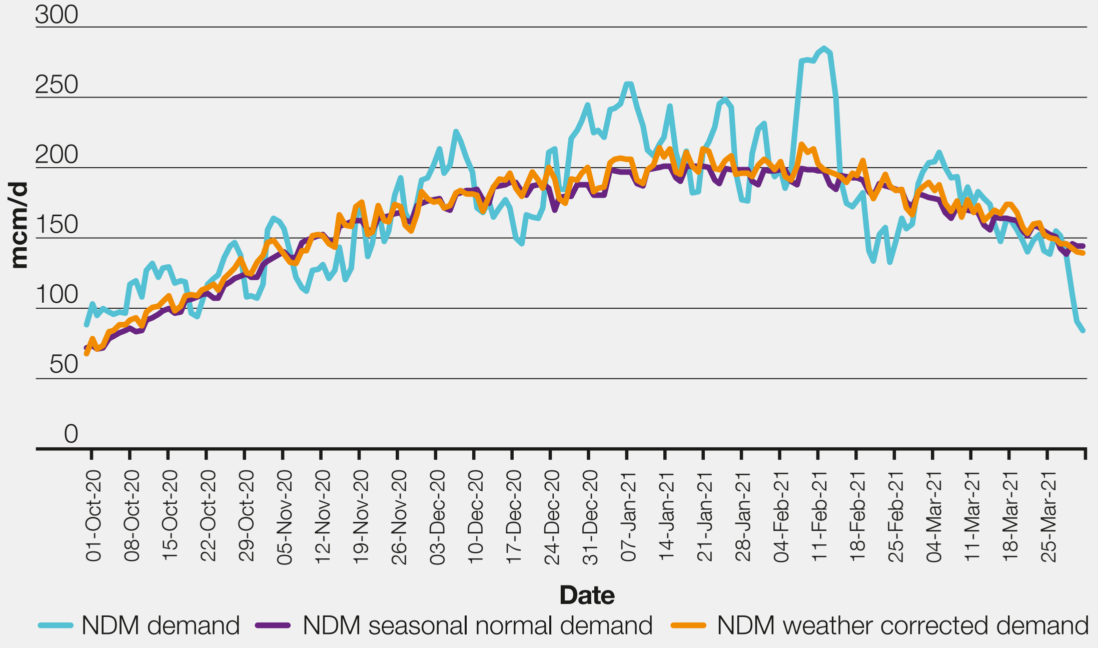
Figure 2.4

Key observation

- Demand from non-daily metered (NDM) consumers was comparable to the seasonal-normal forecasts presented in the 2020/21 Gas Winter Outlook report.

Throughout the 2020/21 winter, the non-daily metered (NDM, figure 2.4) demand followed the seasonal normal profile, with the exception of February 2021 where there was a significant peak in NDM demand due to the cold weather experienced that month.

Figure 2.4
NDM demand during Winter 2020/21 in relation to seasonal normal



Non-daily metered demand

For the majority of the past winter, the actual Composite Weather Variable (CWV) trended towards the warm average (figure 2.5).

In the 2020/21 Gas Winter Outlook report, forecast total NDM demand was 29.7 bcm, compared compared to an actual of 31.3 bcm.

The highest total NTS demand day of the 2020/21 winter was 415 mcm on 10 February 2021, with an NDM demand of 275 mcm.

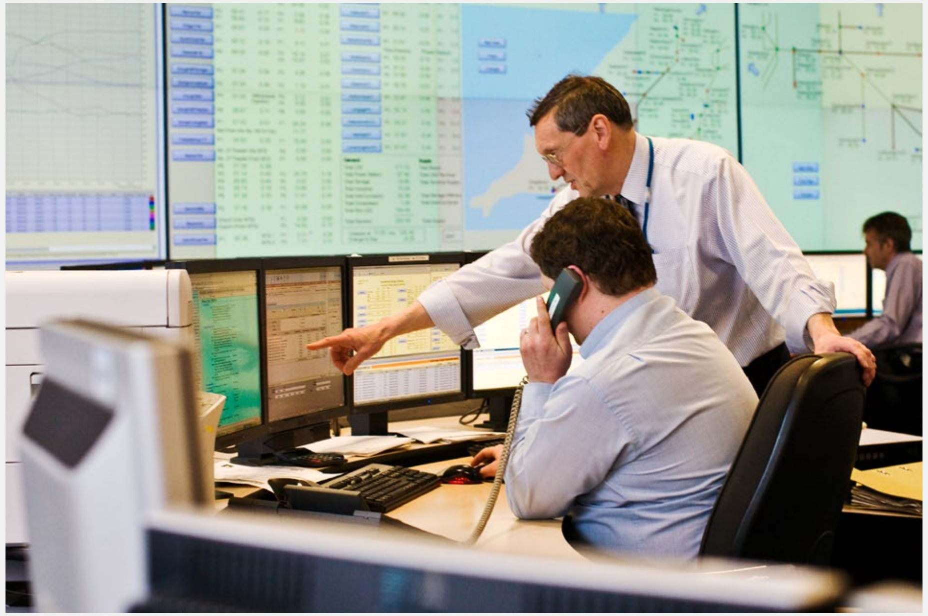
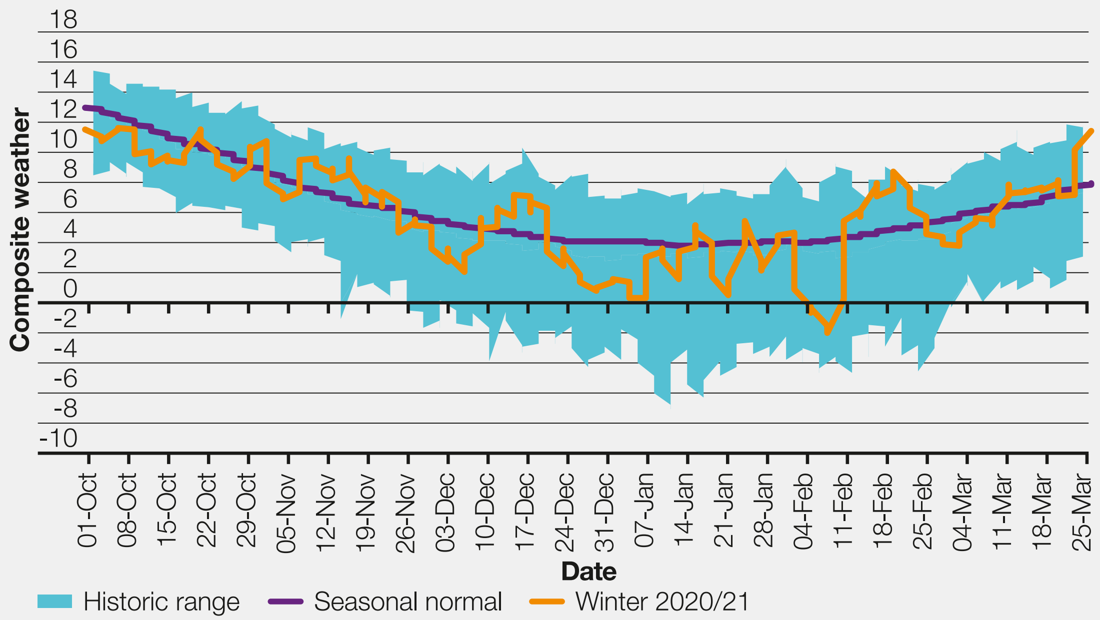


Figure 2.5

Figure 2.5
CWV for Winter 2020/21 in relation to seasonal normal[1]



[1] Historic range refers to the past 60 years (1960/61–2020/21)

Supply

Liquified natural gas

EU Interconnectors

Storage

Liquefied natural gas

Figure 3.1

Key observation

- There were lower levels of LNG supply in winter 2020/21 when compared to 2019/20.
- This was due to higher prices in Asia, making them a commercially preferential market for LNG cargoes.

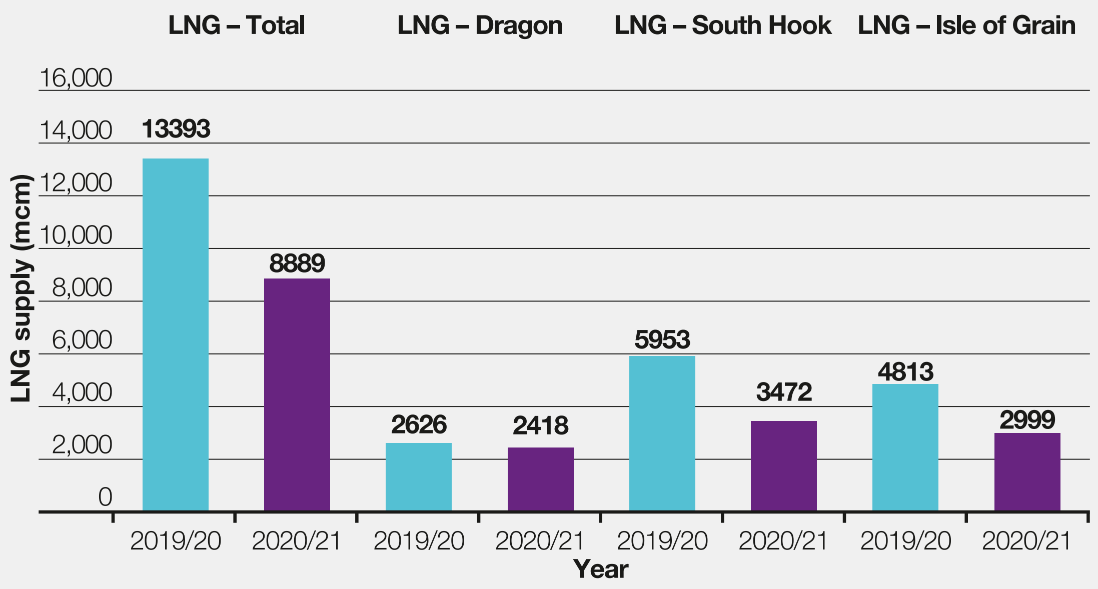
We forecasted LNG supply to form a relatively large proportion of the UK gas mix over the 2020/21 winter period. This was based on the trend of supplies in recent years and the forward price of the National Balancing Point (NBP) market being sufficient to attract LNG to the NTS given that global LNG supply capability continues to exceed global demand.

However, there was a reduction in LNG supply to the NTS over this winter, supplying 8.9 bcm compared with 13.4 bcm the previous year. the previous year, see figure 3.1.

This reduction in LNG supply was due to colder weather in Asia which increased Asian LNG prices and thus saw LNG cargoes head to that part of the world instead of the UK. LNG shipments into the UK began to increase in March this year. which shows that although levels were lower this year the UK continues to be a fundamentally attractive market for LNG supplies.

This significant reduction in LNG supply during winter 2020/21 shows the variability of the UK supply mix.

Figure 3.1
Total LNG flows by terminal for entire Winter period (mcm)

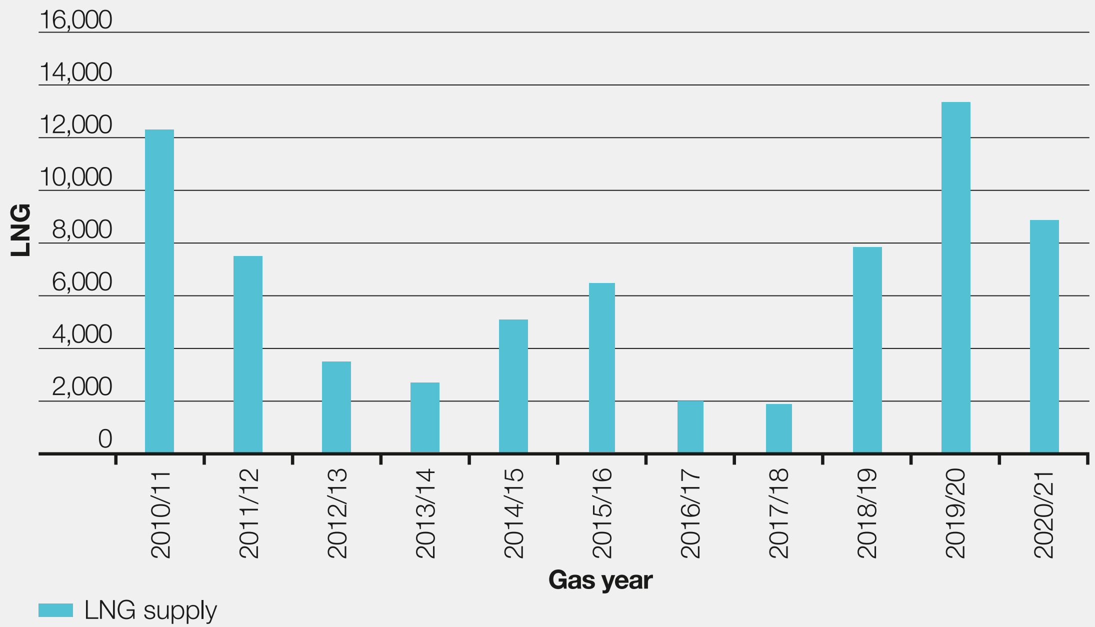


Liquefied natural gas

Figure 3.2

LNG shipments into the UK began to increase in March 2021, which indicates that although total levels of LNG supplied to the NTS were lower over the winter period, the UK continues to be an attractive market for global LNG supplies.

Figure 3.2
Total LNG flows since 2010/11 (mcm)



EU interconnectors

Figure 3.3 Figure 3.4

Key observation

- EU interconnector flows over the winter period were significantly higher than forecast for imports, exports were within forecast.

We saw a large amount of gas being imported to the UK via our EU interconnectors, this was not forecast in the winter outlook document. A total of 4.8 bcm was imported to the UK compared with 0.3 bcm the previous year. This 16 fold increase was the result of interconnector imports responding to a significant price differential between Title Transfer Facility (TTF)/Zeebrugge and the NBP market which is to have been a consequence of the reduction in LNG supplies.

Figure 3.3
EU daily interconnector import and export winter 2019/20 (mcm/d)

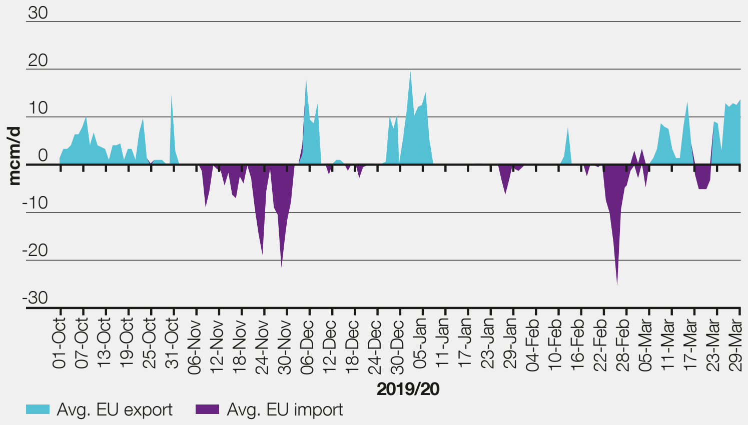
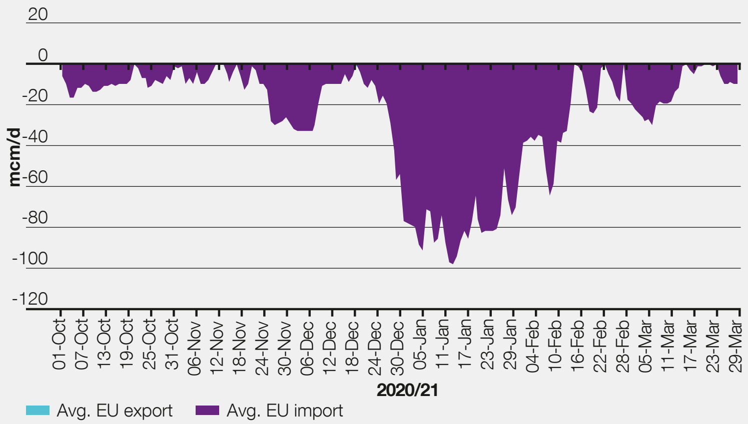


Figure 3.4
EU daily interconnector import and export winter 20/21 (mcm/d)



Storage

Figure 3.5 Figure 3.6 Figure 3.7

Key observation

- There were three periods this winter when we saw increased rates of withdrawal with increased levels of injection towards the end of the winter period.
- The storage facilitates acted as expected providing flexible supplies onto the NTS.

This winter there were three periods that saw increased rates of withdrawal when compared to 2019/20. These can be seen on figure 3.5 at the start of January, February and March.

In January we saw reduced LNG delivers into the UK due to the higher LNG prices in Asia, as detailed on page 14, combined with cold weather. In February we saw the very high demands on the NTS, as detailed on page 9, combined with outages in Norwegian that reduced supplies to the UK. At the start of March we saw another period of high demand before a period of low demand with increased levels of LNG. This resulted in higher levels of injection when compared to 2019/20.

In all of these periods the storage facilitates acted as expected providing flexible supplies onto the NTS.

Figure 3.5
Gas in medium-range storage

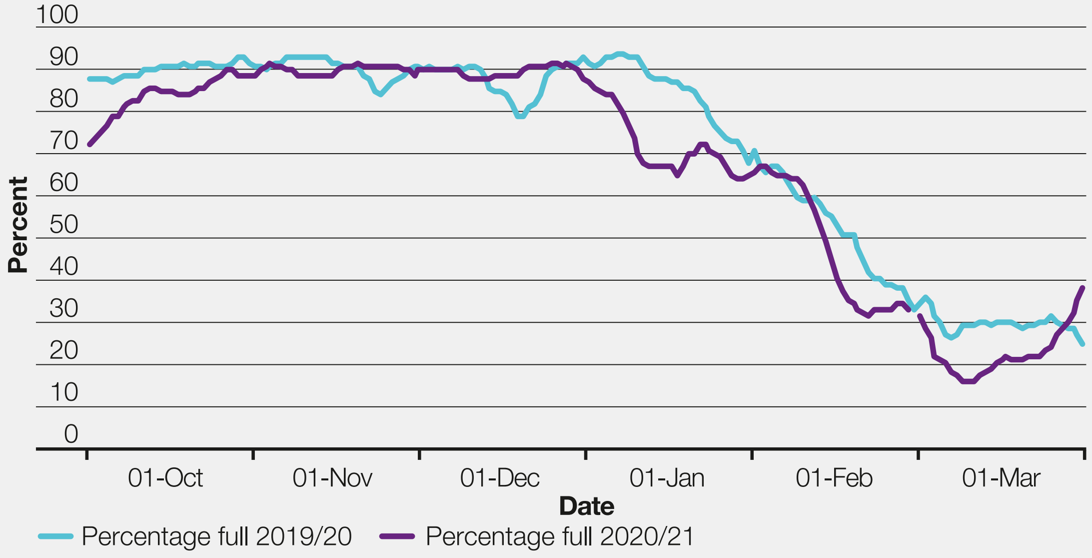


Figure 3.6
Monthly storage injection (mcm/d)

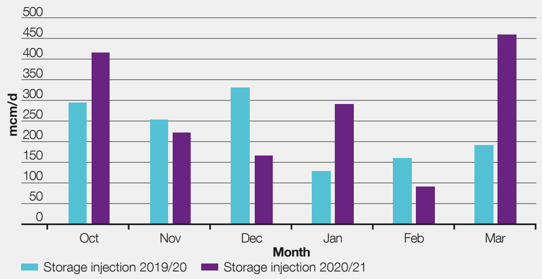
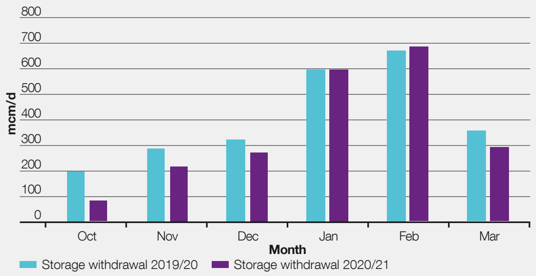


Figure 3.7
Monthly storage withdrawal (mcm/d)



System operability

Linepack

Figure 4.1

Key observation

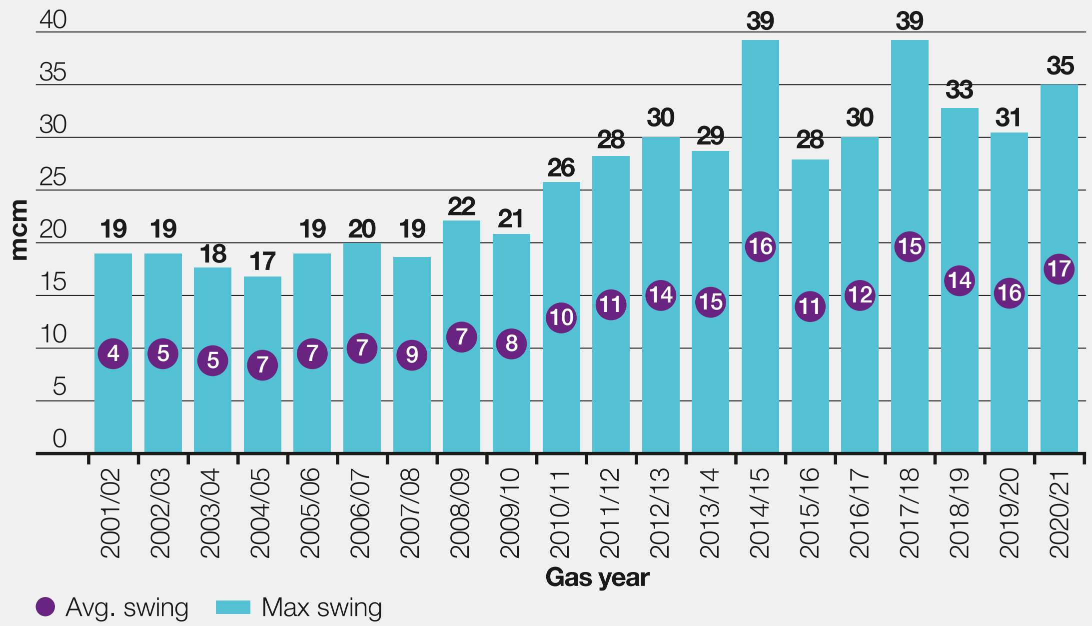
- The level of the maximum and average linepack swing continues to grow this year.

Linepack is a critical aspect in the management of the gas network. It refers to the volume of gas contained within the pipework at any one time, with a higher linepack resulting in a higher average gas pressure. It is this stock that allows the network to operate when the volume of supply is different to the volume of demand. During daily periods of peak demand (typically in the morning and early evening), demand often significantly outstrips supply, with the shortfall being supplied by the system linepack.

The gas network offers a great deal of flexibility in this regard, and is regularly utilised by our customers. The flexibility offered may be visualised by comparing the starting linepack position on a specific day, compared to the minimum position during the same day, known as 'linepack swing'.

The average volume of linepack swing has been broadly increasing year-on-year, as has the maximum observed levels of linepack swing on any given day. Whilst this is not an overt concern, days epitomised by higher levels of linepack swing tend to require greater utilisation of compression to aid in the transmission of gas through the network. Overall network resilience can also be reduced due to a lower minimum linepack position. National Grid performs its role as residual balancer to alleviate this risk and ensure economic operation of the network on behalf of customers.

Figure 4.1
Linepack swing



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Compressor utilisation

Figure 4.2

Key observation

- Total compressor running hours increased from 14,158 hours in winter 2019/20, to 25,533 hours in 2020/21.
- The utilisation of individual compressor sites varied significantly across the two winters, due to the range of different daily supply patterns on the NTS.

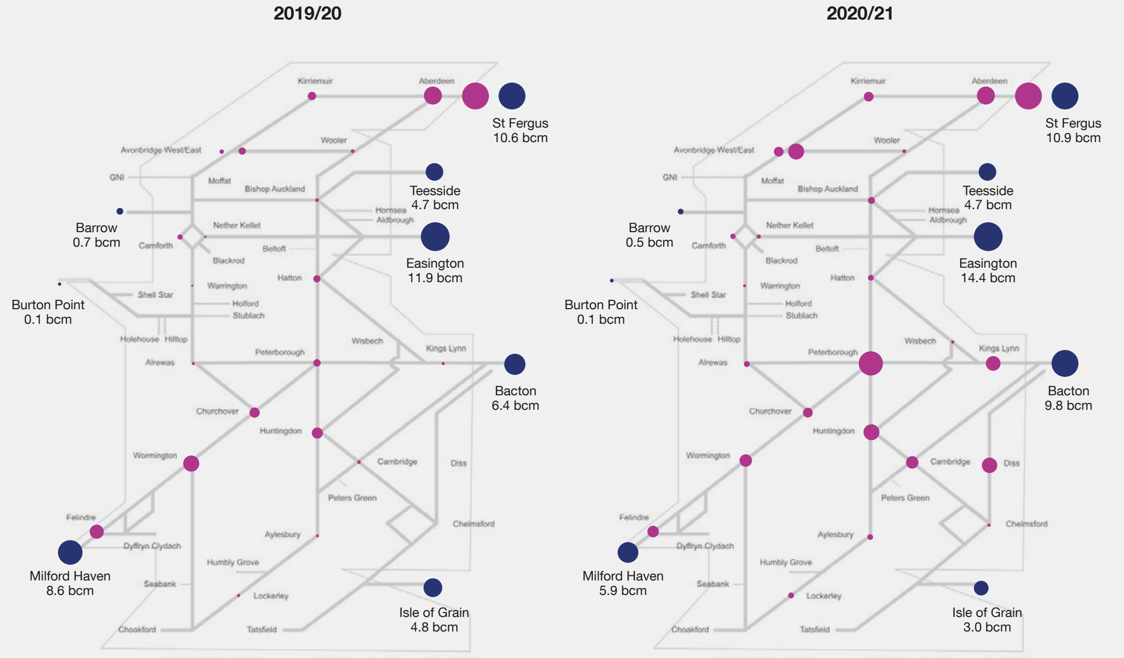
Figure 4.2 shows the total supply volumes into each terminal on the NTS (bcm, blue circles), and the compressor utilisation (hours, purple circles) over the past two winters (2019/20 and 202021).

This demonstrates how a range of unique supply patterns across the NTS, changes how we operate the network, with different combinations of compressors utilised to move gas from entry point to meet demand.

An example of this is the Bacton terminal on the East of the NTS: an increase in flows last winter (9.8 bcm, 2020/21) compared to the previous (6.4 bcm in 2019/20) required greater use of the Kings Lynn and Peterborough compressors. Both of these sites are subject to restrictions due to Medium Combustion Plan (MCP) regulations beginning on 1 January 2030.

This again shows why we need our assets to be available and reliable in order to be able to manage these supply or demand situations.

Figure 4.2
Variation in supply profiles and compressor running hours between 2019/20 and 2020/21



Key
- Magnitude of supply
- Magnitude of compressor running hours

This is so we can manage the unpredictable nature of supply patterns from winter to winter and within winter, read more about this on page 21.

Spotlight

Figure 4.3

Compressor utilisation within winter

Spotlight

We have explained how the variation in supply behaviour resulted in a higher requirement for compressors to manage the change in geographical supply when compared to the previous year.

Although we have focused solely on supply and compressor usage trends between two different years, the same can happen through the same winter period.

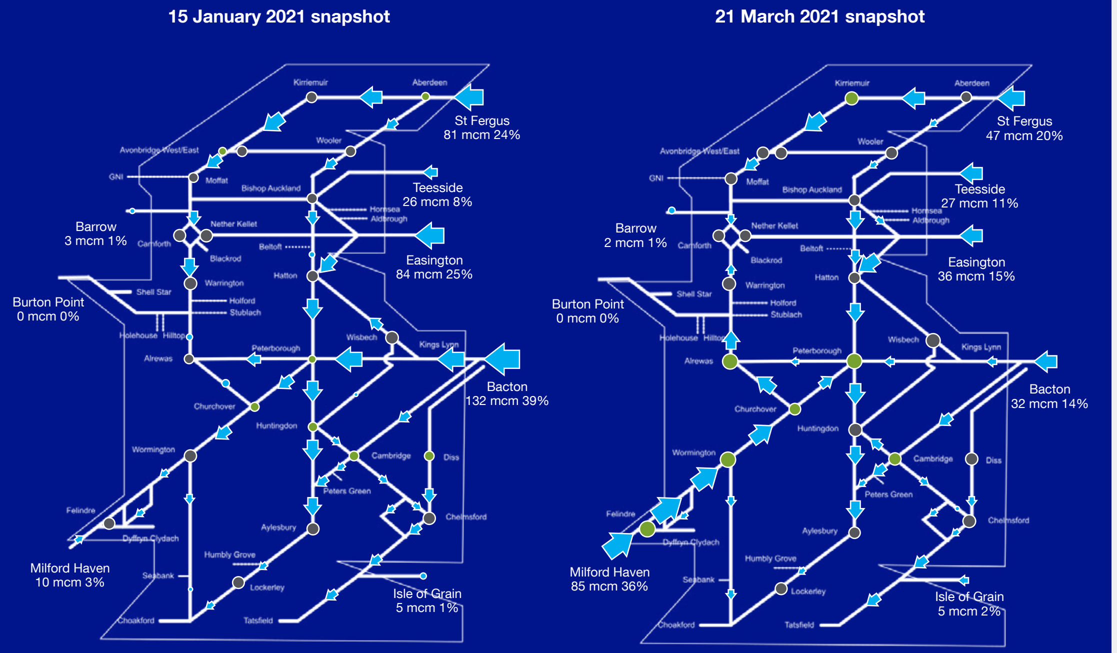
An example of this is shown in figure 4.3. On the 15 January we saw an East coast supply pattern with low levels of LNG. This required use of compressors within the East of England as well as the Midlands to support entry pressures at the Bacton terminal.

Then on the 21 March we saw high levels of supply from the Milford Haven terminal. This resulted in compression being required in South Wales and throughout the Midlands to support entry pressure at Milford Haven.

With the UK becoming more dependant on imports from either the EU (from Bacton) or from LNG (Milford Haven and Isle of Grain) as UKCS supplies decline it is critical we maintain compression for flows from these sites.

We will continue to review what compression capability we believe is required to meet the needs of our customers and stakeholders going forwards through the Annual Network Capability Analysis Report (ANCAR) process.

Figure 4.3
Variation in supply profiles and compressor running hours between 15/1/2021 and 21/3/2021



Consultation questions

We set out below some formal questions as part of our consultation over the Winter Review document, but we would be pleased to hear from you on other observations, issues or concerns you may have.

Please let us have your feedback, including:

- what information and content is most useful to you in the *Gas Summer* and *Winter Outlook Report*, *Winter Review and Consultation* documents
- anything that you think could impact supply or demand, or may affect interconnector flows to and from GB over winter 2021/22
- factors that may impact trends in LNG production, supply or prices in winter 2021/22.

The feedback we receive on this *Winter Review*, and the forthcoming *Annual Network Capability Assessment Report (ANCAR)*, helps shape the development of our next *Winter Outlook* report, to be published in late Autumn 2021.

Your views on the market and related issues provide both useful information of the challenges and opportunities that lie ahead of the forthcoming winter, and allow us to understand how useful you find our suite of publications.

Your responses can be sent using the template provided, emailed to .box.OperationalLiaison@nationalgrid.com

Alternatively, you can contact us using Twitter and LinkedIn.

This consultation closes on 24 July 2021 and we look forward to receiving your comments.

Appendix

Data tables in TWh

Appendix – data tables in TWh

A good guide for converting to energy in watt hours from gas volume in cubic metres is to multiply by 11.

So, for example, 4 mcm approximates to 44 GWh, and 80 bcm approximates to 880 TWh.

Note: 1 TWh = 1000 GWh, and 1 bcm = 1000 mcm

Table A
Breakdown of Gas Demand – TWh

	Winter 2019/20		Winter 2020/21		
Demand in TWh	**2019/20 Actual Demand**	**2019/20 Weather Corrected Demand**	**2020/21 Forecast**	**2020/21 Actual Demand**	**2020/21 Weather Corrected Demand**
NDM	337.7	340.3	326.4	344.7	332.8
DM + Industrial	49.3	49.5	49.4	49.0	48.6
Ireland	29.0	29.0	35.3	32.8	32.8
Total for electricity generation	116.8	116.9	121.1	121.2	121.2
Total demand	532.7	535.6	532.2	547.8	535.3
IUK export	5.1	5.1	5.3	0.3	0.3
Storage injection	15.0	15.0	19.0	18.1	18.1
GB Total	**556.7**	**559.6**	**559.5**	**570.0**	**557.6**
LDZ + NTS Shrinkage	3.9	3.9	3.1	3.9	3.9

Table B
Breakdown of Gas Supply – TWh

Winter Supply (BCM)			
	2019/2020 Actual	**2020/2021 Forecast**	**2020/2021 Actual**
UKCS/Norway	375.1	211.2–479.6	392.7
EU Imports	3.3	0–250.8	52.6
LNG	147.4	99.9–291.5	97.9
Storage Withdrawal	26.4	0–206.8	23.1
Other Supplies	0	0	0.022
Grand Total	552.2	221.1–1228.7	566.5
Storage injection	1.4	1.4	1.7
GB Total	**50.6**	**50.9**	**50.9**

Continuing the conversation

Email us with your views on the *Gas Winter Review and Consultation* Report at: .Box.OperationalLiaison@nationalgrid.com

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Glossary

BCM
Billion cubic metres.

BBL
A bi-directional gas pipeline running from Balgzand in the Netherlands to Bacton in the UK.

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

Composite 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.

Daily metered (DM) demand
A classification of customers where gas meters are read daily. These are typically large-scale consumers.

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

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

LDZ
This refers to the total amount of gas used by gas consumers connected to the gas distribution networks. This includes residential demand, and most commercial and industrial demand.

Liquefied natural gas (LNG)
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.

Medium-range storage (MRS)
Gas storage facilities designed to switch rapidly between injection and withdrawal to maximise the value from changes in gas price.

National balancing point (NBP)
The national balancing point is a virtual trading location for the sale and purchase and exchange of UK natural gas.

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.

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.

Glossary

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

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

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.

Seasonal normal forecast
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.

Transit gas
Gas that enters and exits the national transmission system without being consumed in GB and Ireland.

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 (demand)
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.

Withdrawal
Gas for storage withdrawal. This is gas which is taken from (‘withdrawn’) from a gas storage facility.