Gas Transmission

Gas Winter Review and Consultation June 2022

nationalgrid

Gas Winter Review and Consultation
June 2022

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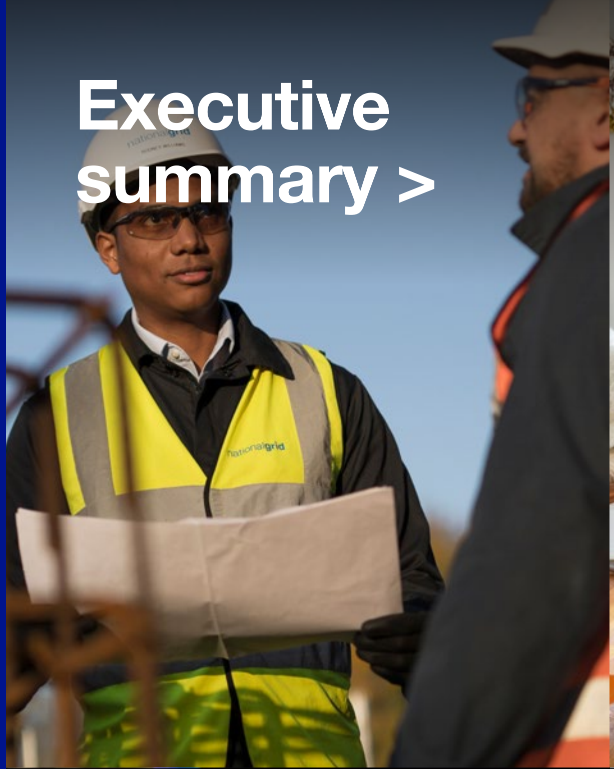
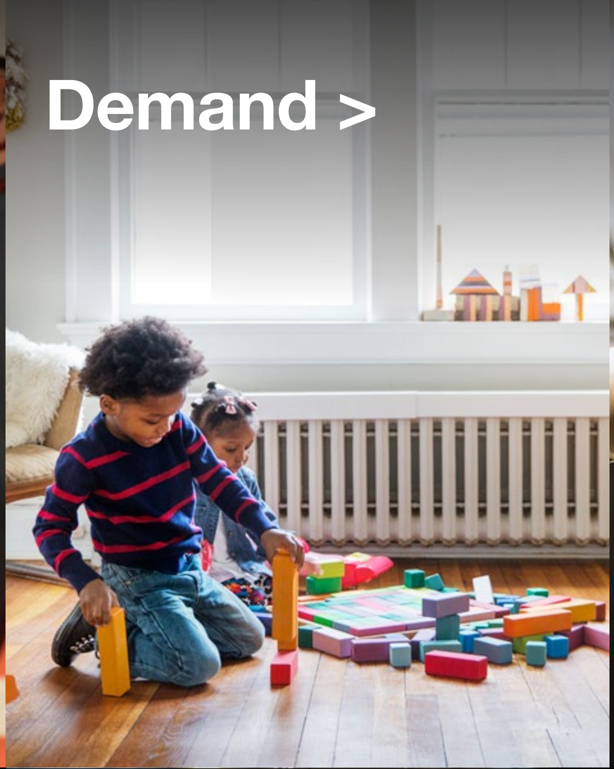
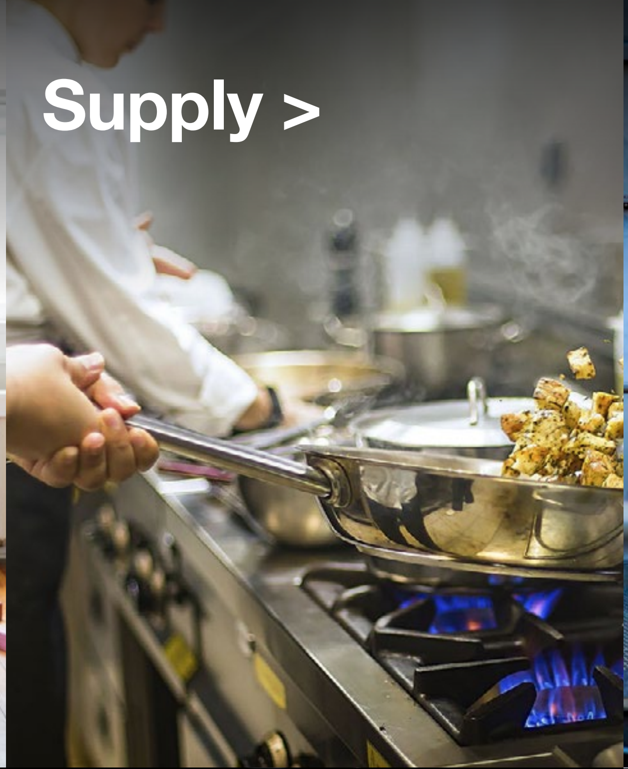
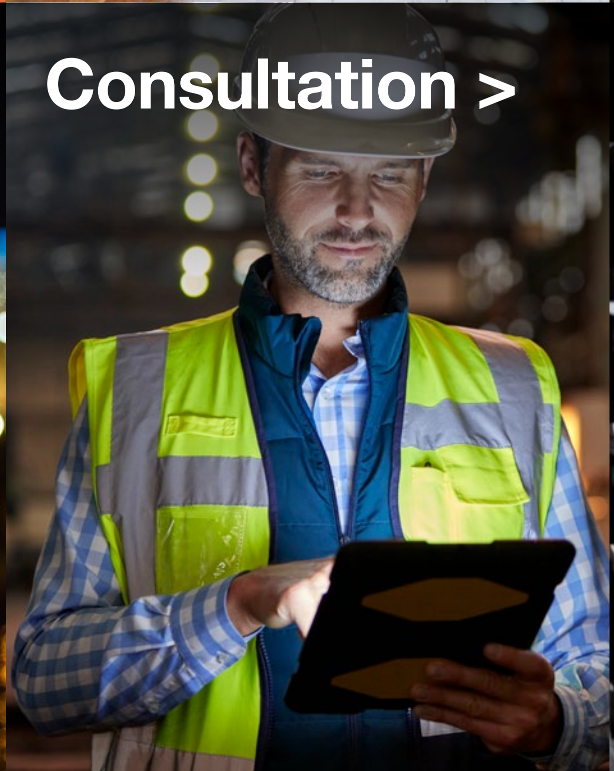
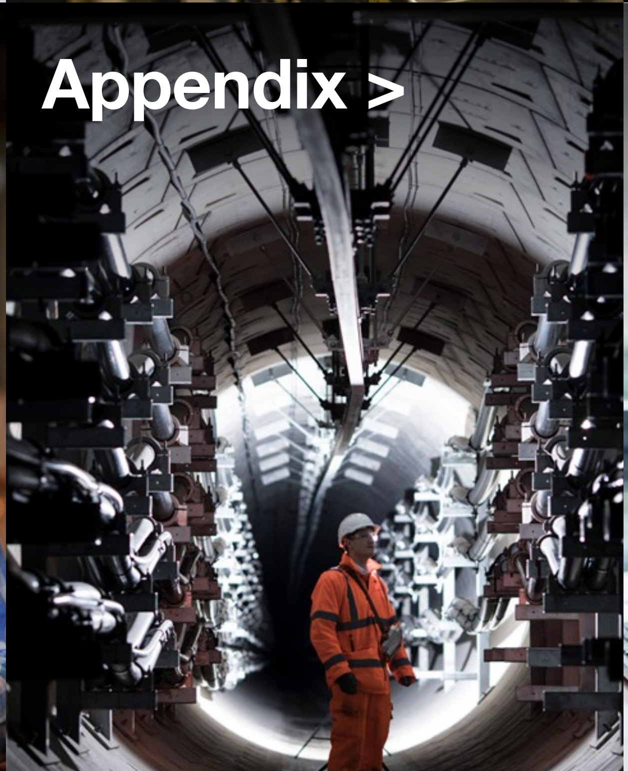










Welcome

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 2022 *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 2021 to March 2022).

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.

We have included a *Winter Outlook* session in this publication in light of the current challenges faced by the gas industry, geo-political and market volatility. We recognise the need to provide additional insight and information into how supplies may meet varying demand levels and we'd really like to hear your views. For more information click here.

Other Gas System Operations publications in this suite include:
- ***Annual Network Capability Assessment Review (ANCAR),*** with the first report due in June 2022.
- ***Winter Outlook***, published annually, with the next due in October 2022.
- ***Gas Ten Year Statement (GTYS)***, with the next due in November 2022.
- ***Gas Future Operability Planning (GFOP)***, published periodically based on stakeholder/National Grid requirements.
- ***Summer Outlook, published annually,*** with the next due in April 2023.

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

Paul Sullivan
Head of System Capability & Risk Gas Transmission

Executive summary

Summary of the winter

Table 1.1

1

Total GB Gas demand in winter 2021/22 was lower than the previous year more in line with prior winters. This was because last winter was relatively mild.

2

We saw higher levels of exports to Europe than forecast, which meant total demand on the NTS was comparable to last year. The primary reason was the need to refill the long range EU storage.

3

The network continues to show its resilience to the ever changing supply mix. The supply mix is more comparable to the supply of 2019/20 with higher levels of LNG and lower EU imports, whereas winter 2020/21 we witnessed much higher EU imports.

4

The average level of linepack swing has significantly increased this year. Higher levels of linepack swing tend to require greater utilisation of compression to aid gas transmission through the network.

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

	Winter 2020/21		Winter 2021/22		
Demand in bcm	**2020/21 Actual Demand**	**2020/21 Weather Corrected Demand**	**2021/22 Forecast**	**2021/22 Actual Demand**	**2021/22 Weather Corrected Demand**
NDM	31.3	30.3	29.7	28.1	29.7
DM + Industrial	4.5	4.4	4.5	4.0	4.0
Ireland	3.0	3.0	3.2	2.8	2.8
Total for electricity generation	11.0	11.0	11.0	10.1	10.1
Total GB demand[1]	49.8	48.7	48.4	45.0	46.6
EU export	0.0	0.0	0.5	3.7	3.7
Storage injection	1.6	1.6	1.7	1.3	1.3
Total gas demand[2]	51.8	50.7	50.9	50.4	52.0
LDZ + NTS Shrinkage	0.4	0.4	0.3	0.3	0.3

1 Excludes InterconnectorLimited, BBL exportation and storage injection flows. Total gas demand includes NTS shrinkage and will therefore not tally.
2 Includes Interconnector Limited, BBL, exportation and storage injection flows. Total gas demand includes NTS shrinkage and will therefore not tally.

Summary of the winter

Table 1.2

Table 1.2
Breakdown of Gas Supply

Winter Supply (BCM)		
	2020/2021 Actual	2021/2022 Actual
UKCS/Norway	35.7	35.8
EU Imports	4.8	0.5
LNG	8.9	11.4
Storage Withdrawal	2.1	1.9
Other Supplies	0.002	0.003
Grand Total	51.5	49.6
Storage injection	1.7	1.3
GB Total	53.2	50.9

Gas supply and demand profiles

Key observation

- There were sufficient supplies from a variety of sources to meet the total winter 2021/22 demand.
- Total GB Gas demand in winter 2021/22 was lower than the previous year because the winter was relatively mild.
- We usually see imports to GB from Europe during the winter but last year we saw higher levels of exports to Europe which meant that total demand on the NTS was comparable to last year.

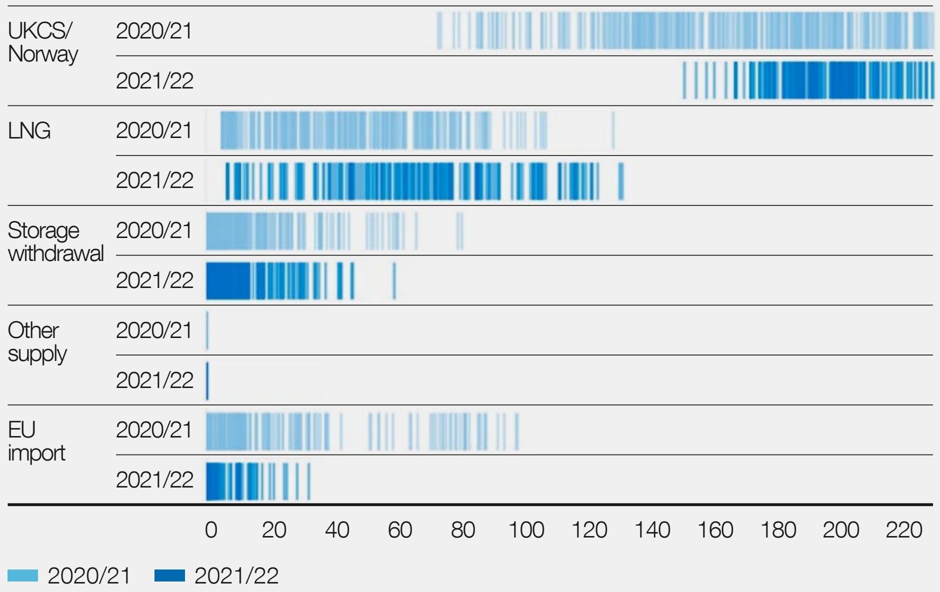
Figure 1.1 shows the supply profile over winter 2021/22 and compares this to the supply profile of the previous winter.

We saw increased LNG supplies this winter (11.4 bcm), compared with the previous winter (8.9 bcm). This rise in LNG supply was largely due to the difference in price between the European and Asian markets, largely due to milder weather in Asia.

The growing variability in supply sources means that it remains essential to have sufficient asset flexibility to operate the NTS network under different conditions both winter to winter and during the winter itself.

Figure 1.1

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



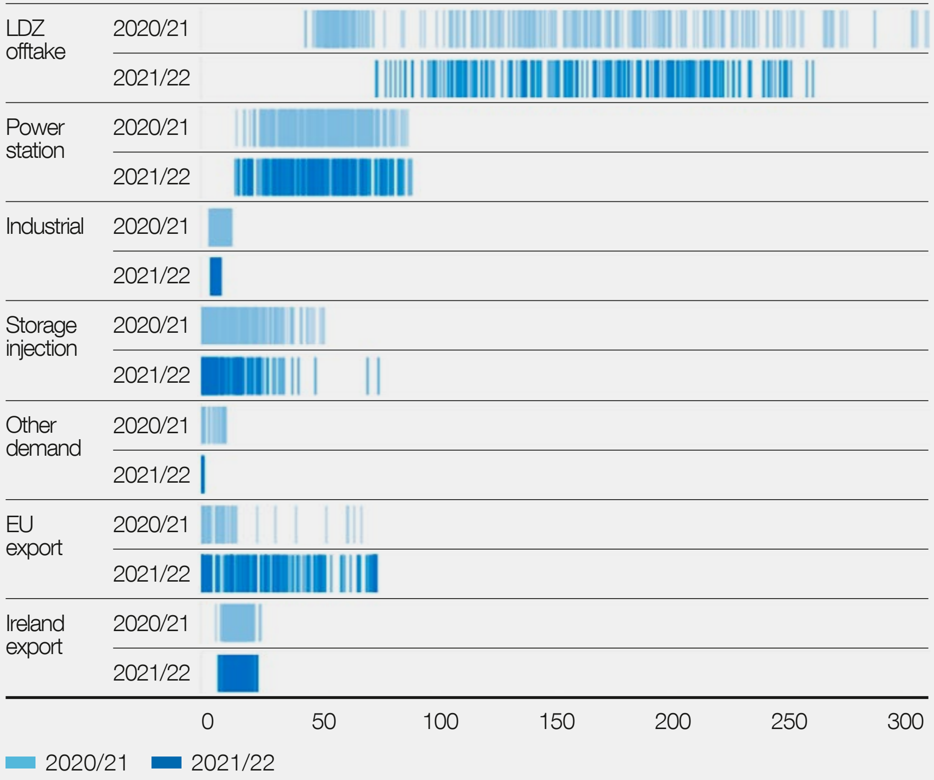
Gas supply and demand profiles

Figure 1.2 shows the demand profile for the last winter and compares it to that for 2020/21.

The key thing to note is that we saw EU exports rise by 3.2bcm, this was largely due to the low storage levels in Europe. Combined with sufficient supplies into GB and a positive price differential in favour of Europe saw GB flow higher, than forecast, levels of gas to Europe.

Figure 1.2

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



Demand

Gas demand for electricity generation

Figure 2.1 Figure 2.2

Key observation

- There was a drop (0.9 bcm) in total demand for 2021/2022 when compared with the previous winter.
- This winter we saw the highest ever instantaneous demand of 99 mcm on 29 November.

Figure 2.1 shows the demand for electricity generation over winter 2021/22 in comparison to the previous winter. Gas demand for electricity generation has been steadily declining since winter 2016/17 (see figure 2.2), and this cumulative decline is expected to continue.

Whilst the cumulative demand is expected to decline we expect the peak level of demand for electricity generation to remain similar over the forthcoming years.

We saw the highest ever instantaneous demand for electricity generation of 99 mcm. Instantaneous demand is based on the rate of gas flow at a particular time of the day and if that rate of flow continued for the whole day this would be the level of the demand for the whole day.

Gas continues to provide both baseline supply to electricity generation and more importantly the essential increasing flexibility to manage the intermittency of renewables.

Figure 2.1
Gas demand for power stations (mcm/d)

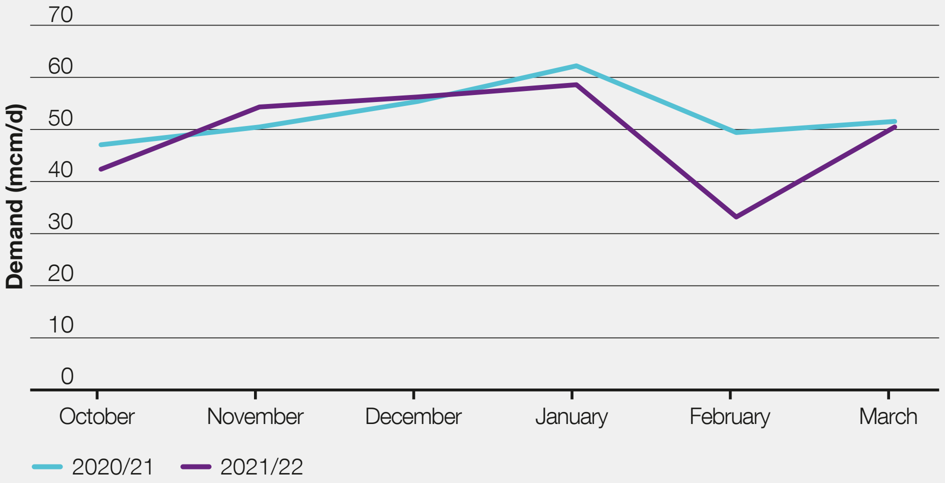
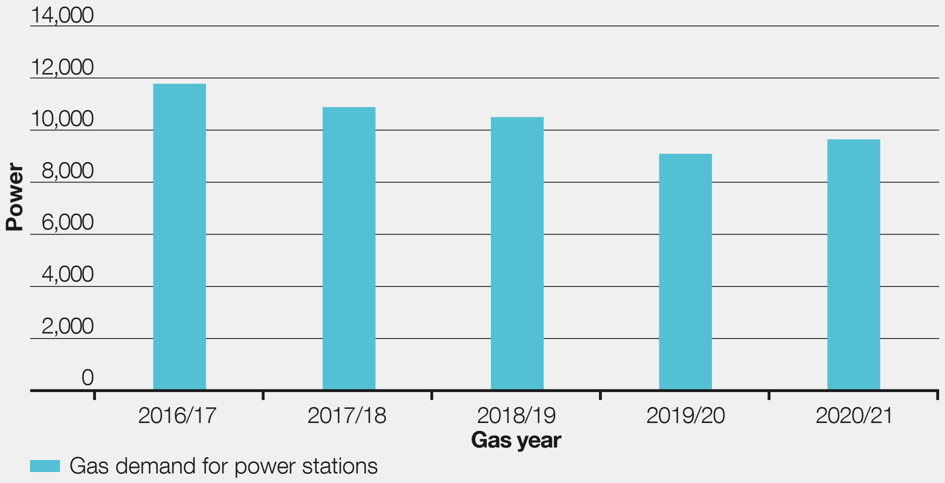


Figure 2.2
Annual as demand for power stations (mcm/d)



Non-daily metered demand

Figure 2.3 Figure 2.4

Key observation

- Demand from non-daily metered (NDM) was comparable to the seasonal-normal forecasts presented in the 2021/22 Gas Winter Outlook report.

Throughout the 2020/21 winter, the Non-Daily Metered Demand (NDM, figure 2.3) followed the seasonal normal profile, with the exception of January 2022 where there was a significant drop in NDM demand due to milder temperatures.

For the majority of previous winters, the actual Composite Weather Variable (CWV) trended towards the warm average (figure 2.4).

In 2020/21, the forecast total NDM demand was 29.7 bcm, compared to 28.1 bcm observed over October 2021 to March 2022.

Figure 2.3
NDM demand during Winter 2021/22 in relation to seasonal normal

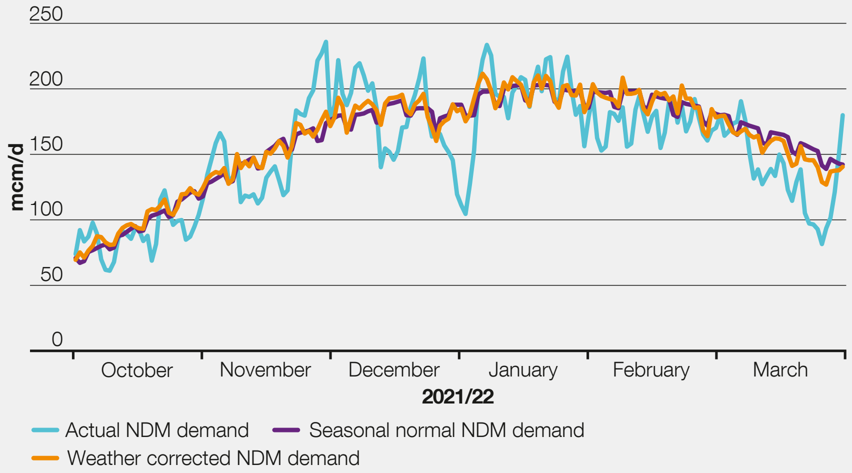
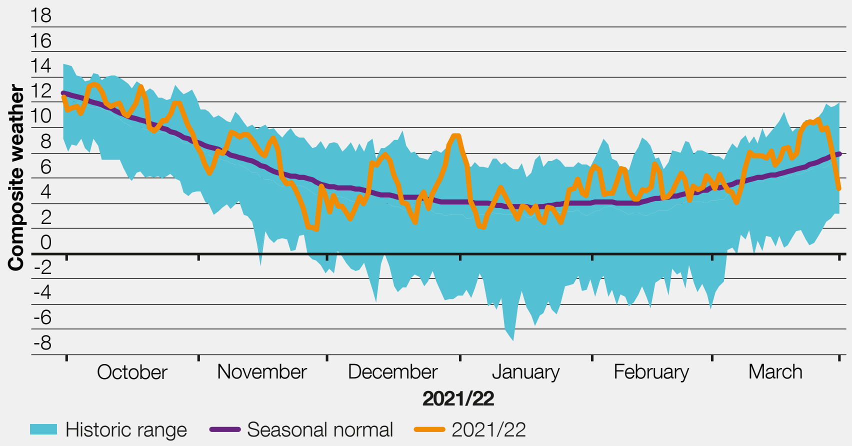


Figure 2.4
CWV for Winter 2021/22 in relation to seasonal normal[1]



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

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NBP price

Prices rose from a high of 78.9p/th in winter 2020/21 to a high of 512p/th this winter.

Some key factors that the market attributed to the rise in price included lower European storage reserves, Russian troop build up on the Ukrainian border and also lower EU nuclear output.

Warmer periods of weather and positive price differential in favour of Europe drove a reduction in premiums.

As you can see from figure 2.5 the price spiked twice this winter with highs of 450p/th in December and 512p/th in March.

Combined with a milder winter, high LNG supply, high wind production as well as lower than average demand saw the price fall in late December and early January.

Due to milder on average temperatures, this winter saw a reduction in storage withdrawal. Combining this with the differential in price between Europe and Asian and milder temperatures this winter in Asia led to LNG deliveries to Europe increasing, this then affected the storage concerns which in turn led to a reduction in the premiums lowering price. This is reflected in figure 2.6 with the decline in price from the end of December.

Another key factor in the rise in price, towards the end of the winter, was the build up of troops on the Ukrainian border. This in turn caused fears around the transit of gas through Ukraine which increased the support to higher premiums. This caused the price to rise which is shown in figure 2.6 from late February.

(Charts shown are the intellectual property of Argus Media. Opinions are that of National Grid and not of Argus Media).

Figure 2.5 Figure 2.6

Figure 2.5
NBP Price changes through winter 2021/22 in p/th taken from Argus Media

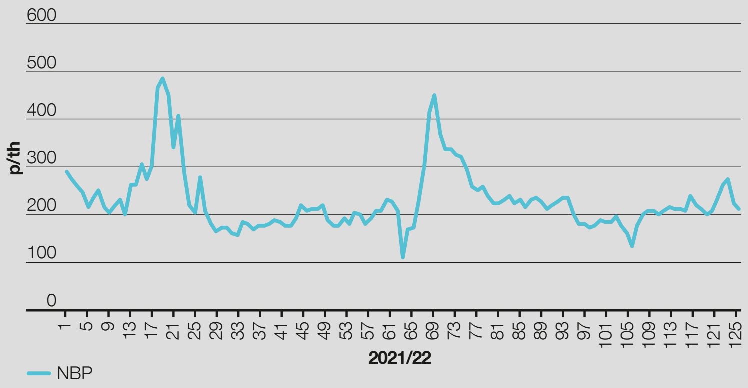
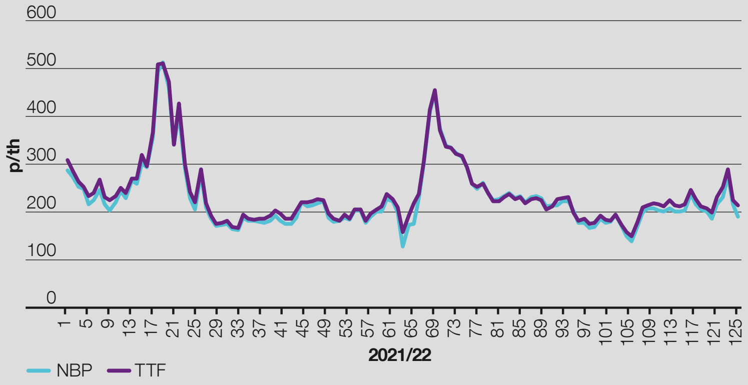


Figure 2.6
NBP vs TTF price for winter 2021/22 in p/th taken from Argus Media



EU interconnectors

Figure 2.7

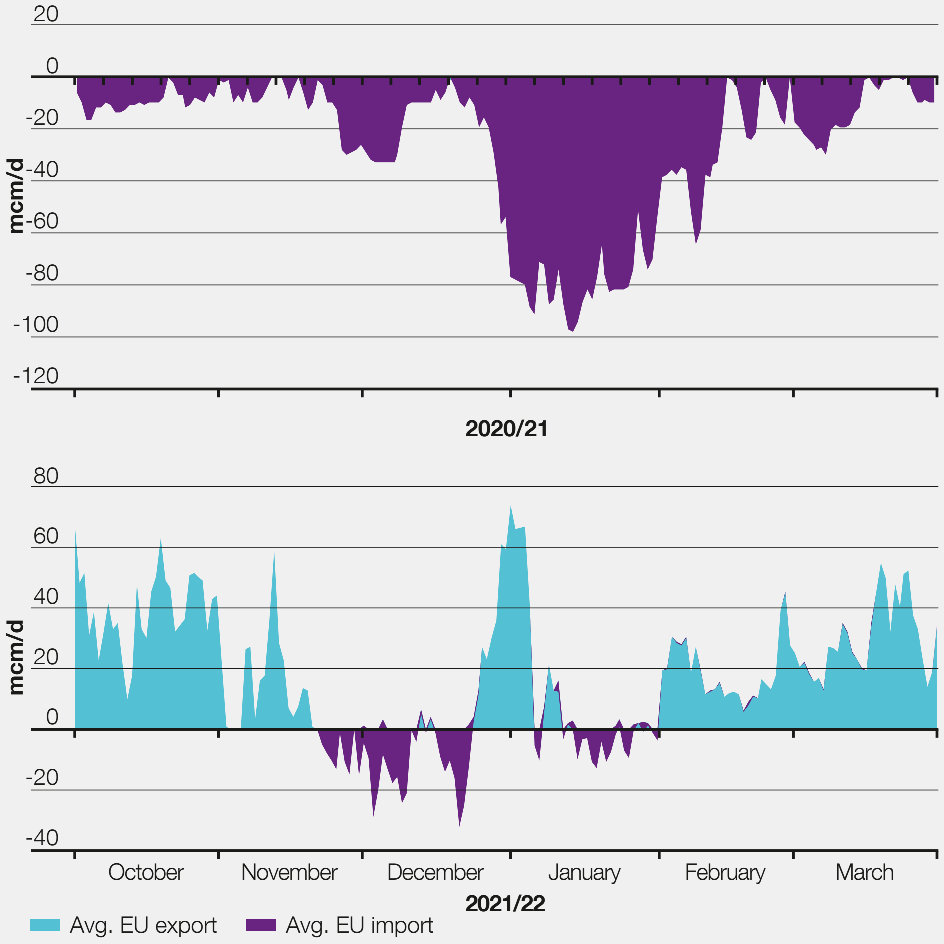
Key observation

- We saw higher exports to Europe than is usual in a winter period, this was largely due to storage stocks in Europe being lower than usual, so we saw higher interconnector exports to refill.

We saw 3.7 bcm being exported to Europe via our EU interconnectors, this was higher than was forecast in the Winter Outlook and also higher than previous years (see figure 2.7). A total of 0.5 bcm was imported to the UK compared with 4.8 bcm the previous year. Contrastingly, a total of 3.7 bcm was exported to EU compared to 0 the previous year.

The reason for this higher than expected export of gas was due to multiple factors. With the concern of Russian gas being reduced combined with lower than average storage reserves across Europe.

Figure 2.7
EU daily interconnector import and export winter 20/21 vs 21/22 (mcm/d)



Supply

Liquefied natural gas

Figure 3.1

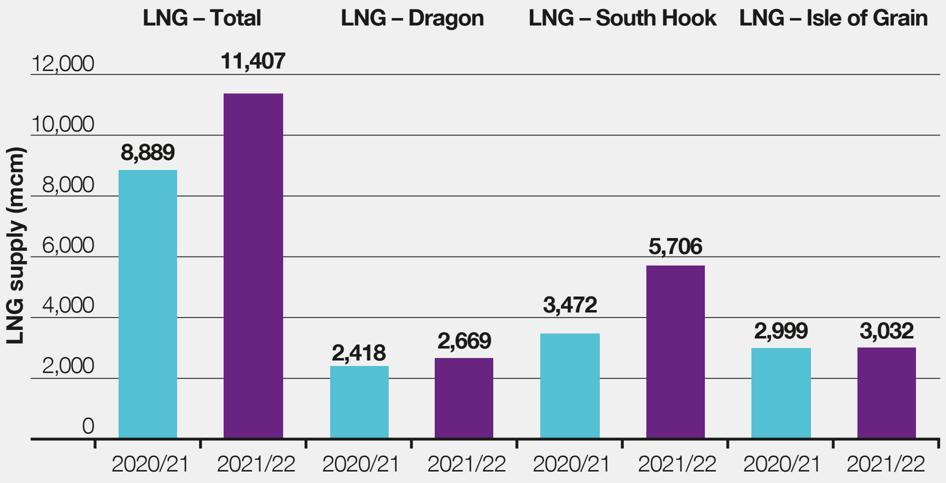
Key observation

- There was a 22% increase of LNG supply in winter 2021/22 when compared to 2020/21.

We saw an increased LNG supply this winter, 11.4 mcm compared with 8.9 mcm the previous winter, as shown in figure 3.1. We saw higher than normal supply delivered in January at almost 3 times that of last January. This was due to milder temperatures in Asia and a positive price differential in Europe.

Concerns around the volume of gas flowed from Russia through Ukraine, combined with concerns around European storage levels and the certification process of Nord Stream 2 led to European prices posting a premium compared to Asia to attract higher LNG in order to fill the storage deficit.

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



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Liquefied natural gas

Figure 3.2
Figure 3.3

LNG shipments into the UK rose by 71% this January when compared to the previous January. This is visible in figure 3.2. This led to a total rise of 22% in LNG shipments overall this winter when compared to last winter.

Whilst the remainder of the winter was in line with the previous winter this was in part due to a more positive price differential in favour of Europe. We also saw the UK becoming a transit for deliveries to Europe through the second half of the winter.

This trend has continued through the early part of the summer and we believe is set to continue. We are constantly monitoring the situation.

Figure 3.2
Monthly LNG supply (mcm/d)

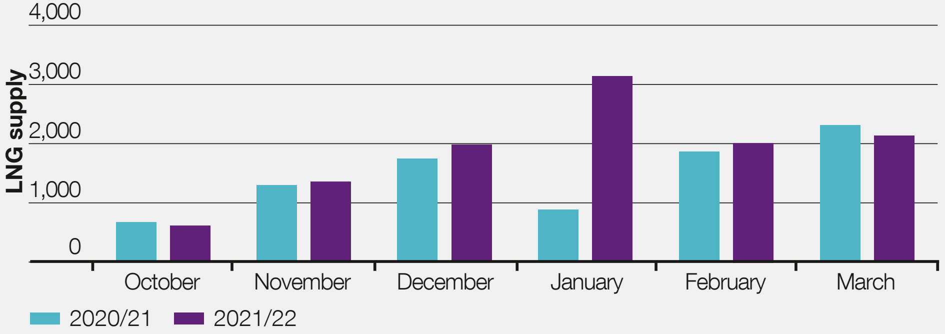
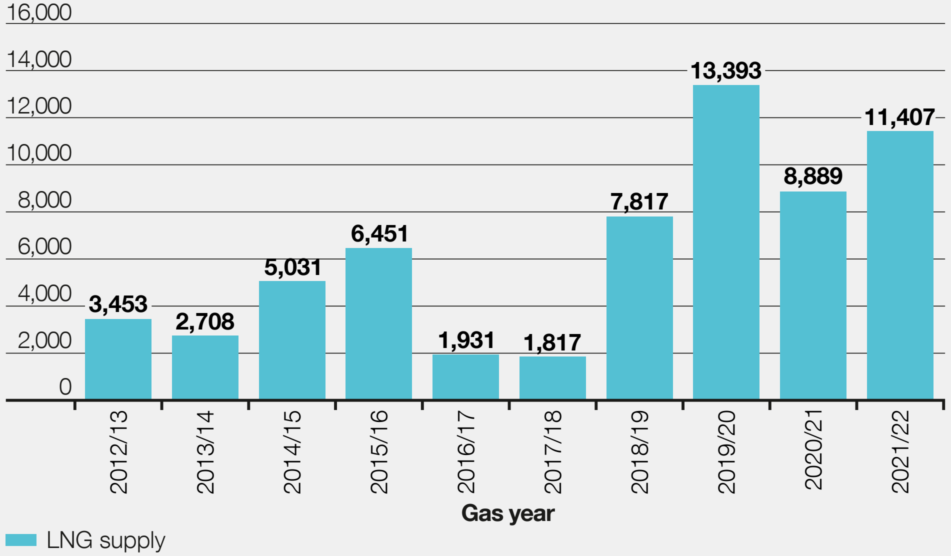


Figure 3.3
Total LNG flows since 2010/11 (mcm)



GB Storage

Figure 3.4 Figure 3.5 Figure 3.6

Key observation

- The storage facilities acted as expected providing flexible supplies onto the NTS.

In January we saw increased LNG deliveries to the UK, this aided replenishing the storage stock level, which can be seen in figure 3.5.

This winter saw the storage stock ended higher than last winter which is evident from figure 3.4. We can see from figure 3.5 that February saw a 69% year on year increase for injection, and a 58% decrease for withdrawal shown on figure 3.6.

In all of these periods the storage facilities acted as expected providing flexible supplies onto the NTS in response to market signals.

Figure 3.4
Gas in medium-range storage

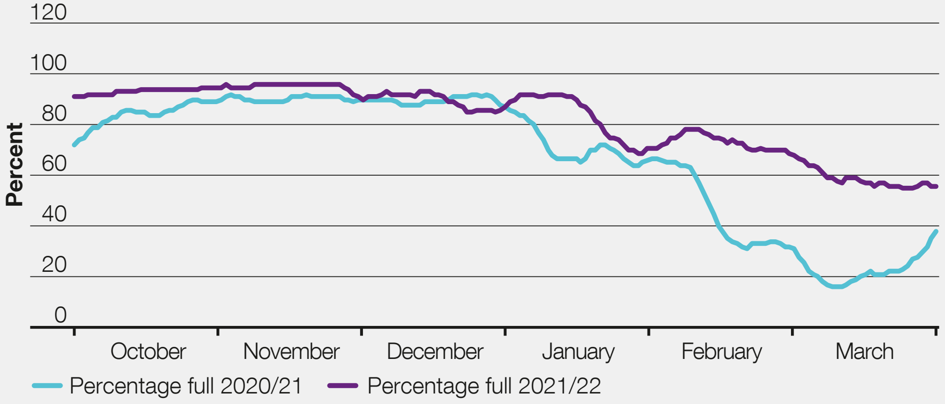


Figure 3.5
Monthly storage injection (mcm/d)

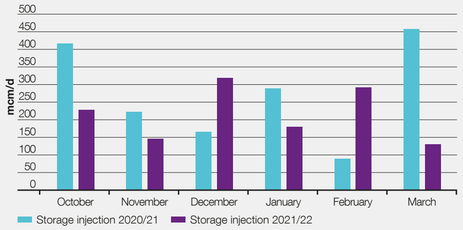
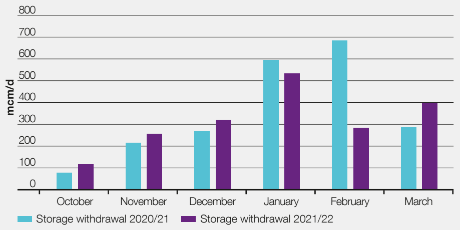


Figure 3.6
Monthly storage withdrawal (mcm/d)



System operability

Linepack

Key observation

- The maximum linepack swing has increased year on year. This year we saw the average linpack swing reduce slightly.

  Our customers have told us they value the ability to supply gas and/or take demand more flexibly through the day.

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'.

When there are higher levels of linepack swing, greater utilisation of compression is required to aid in the transmission of gas through the network. Network resilience can be reduced when there are lower levels of linepack.

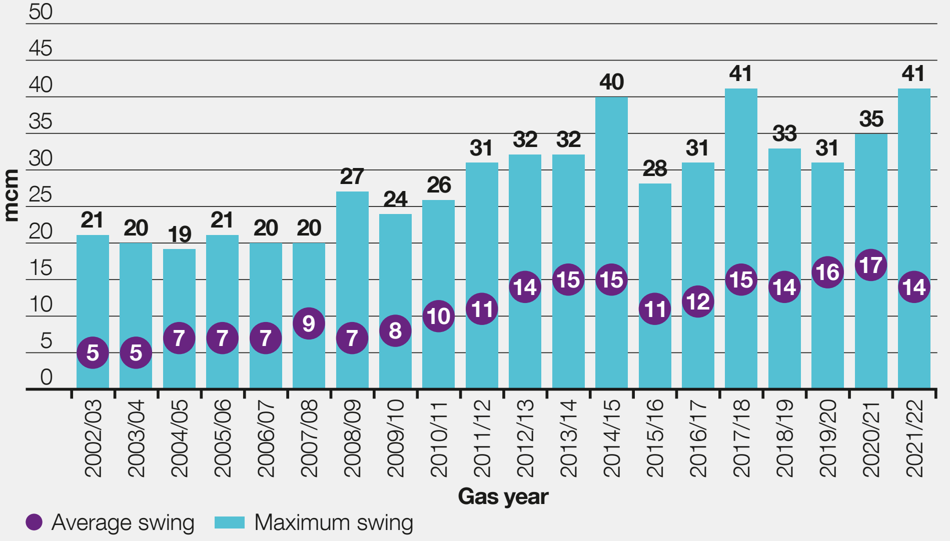
National Grid performs its role as residual balancer to alleviate this risk and ensure economic operation of the network on behalf of customers.

The maximum volume of linepack swing has been broadly increasing year-on-year.

The level of linepack swing is something that we will continue to monitor over the coming years and we will continue to assess any impact this creates on SoS.

Figure 4.1

Figure 4.1
Linepack swing



Compressor utilisation

Figure 4.2

Key observation

- Total compressor running hours were similar to that of the previous winter.
- 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 (2020/21 and 2021/22).

This demonstrates how differing supply patterns across the NTS, changes how we operate the network, with different combinations of compressors utilised to move gas from entry point to where it is needed to meet demand.

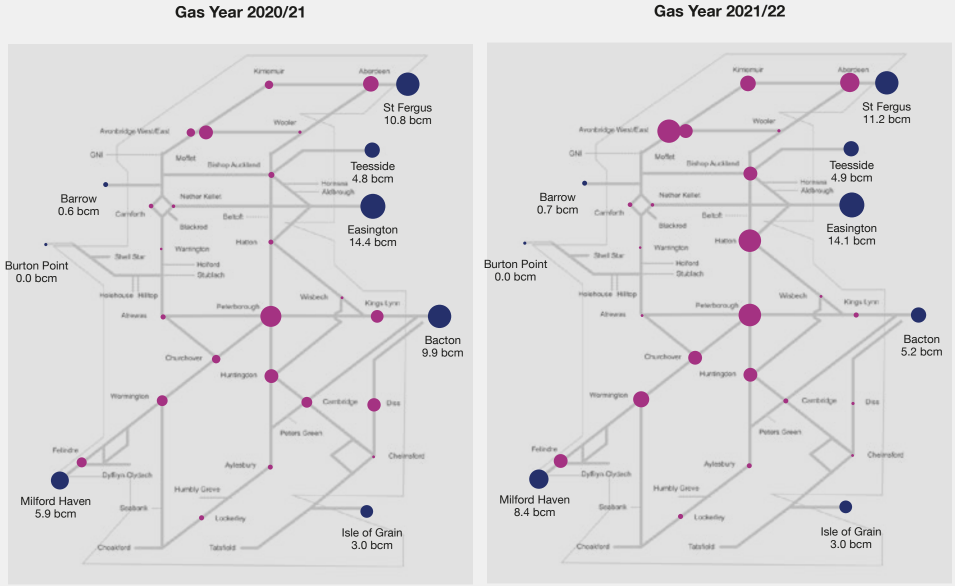
An example of this is the St Fergus terminal in Scotland: an increase in flows last winter (11.2 bcm, 2021/22) compared to the previous (10.8 bcm in 2020/21) required greater use of the Kerrimuir and Bishop Auckland compressors.

Similarly Bacton showed a decrease in flows last winter (5.2 bcm 2021/22) compared to (9.9 bcm 2020/21) which showed less requirements on the Kings Lynn compressor.

This again shows why it is essential for us to have all of our assets available and as reliable as possible. This is so we can manage the unpredictable nature of supply patterns from winter to winter and within winter itself.

All of these sites mentioned are subject to restrictions due to Medium Combustion Plan (MCP) regulations beginning on 1 January 2030 and are being addressed as part of our business planning process with Ofgem.

Figure 4.2
Variation in supply profiles and compressor running hours between 2020/21 and 2021/22



Key
- Magnitude of supply
- Magnitude of compressor running hours

Winter Outlook

Winter Outlook 22/23

Previous Winter Outlook publications focussed on the capability of entry point supplies and our infrastructure to meet supply and demand flow patterns. This still remains an essential element of the Winter Outlook publication, however in light of the current challenges faced by the gas industry, geo-political and market volatility, we recognise the need to provide additional insight and information into how supplies may meet varying demand levels in this year's Winter Outlook to allow the industry to better prepare for the winter period.

We want to understand from our stakeholders what issues and concerns they see impacting the GB market and the ability for the industry to meet the potential supply and demand challenges this winter. In our consultation approach this year we have asked for you to provide some specific information on the Winter Outlook that we will review and engage further on as we lead up to the publication of the full Winter Outlook in early October.

Our initial thoughts around the content and format for the upcoming Winter Outlook could include:

1. Use of different demand scenarios to set out the basis on which supply can be assessed
2. Use of a range of different supply scenarios which test Security of Supply and the extent of the requirement for flexible supplies (primarily LNG and Interconnectors)
3. Detail on new/additional tools, monitoring and reporting that has been developed for this coming winter
4. Provision of more information on what monitoring and reporting we undertake throughout the winter and quick links to find information.

We also plan to share additional updates on how we and the industry are progressing with winter preparations between now and October, so please keep a look out for these. We will publish such updates here.

We're really keen to understand your views on this winter and what you would like to see in the Winter Outlook this year. Please share your thoughts with us by responding to our consultation or dropping us an email at .box.OperationalLiaison@nationalgrid.com

Consultation

Consultation

We have set out below some questions we are very keen to hear your thoughts on but please also provide any other information in addition to these question via the contact details.

Your views help provide useful information around the of the challenges and opportunities that lie ahead of the forthcoming winter, and also help us understand what you find useful in our publications or what changes you would like to see.

Your responses can be emailed to .box.OperationalLiaison@nationalgrid.com This consultation closes on 29th July 2022 and we look forward to receiving your comments.

Winter Review:

1. What are your key observations from last winter?
2. What three words would you use to describe the Winter Review?
3. What one thing would you recommend we do to make the publication more engaging?
4. Is there anything additional that you would like to see in future Winter Review publications?
5. Why do you think line pack swing is increasing and do you expect this trend to continue?

Winter Outlook

1. What do you think about the proposed approach and additional content we're planning to include in the Winter Outlook this year?
2. What would you like to see happen in the industry to prepare for this winter?
3. What other/new content would you like to see in the Winter Outlook this year?
4. How would you like to receive updates on our preparation for winter?
5. Please also provide any other feedback/ thoughts.

Appendix

Data tables in TWh

Appendix – data tables in TWh

Table A
Breakdown of Gas Demand – TWh

	Winter 2020/21		Winter 2021/22		
Demand in bcm	2020/21 Actual Demand	2020/21 Weather Corrected Demand	2021/22 Forecast	2021/22 Actual Demand	2021/22 Weather Corrected Demand
NDM	344.7	332.8	326.7	309.1	326.7
DM + Industrial	49	48.6	49.5	44	44
Ireland	32.8	32.8	35.2	30.8	30.8
Total for electricity generation	121.2	121.2	121	111.1	111.1
Total demand[1]	547.8	535.3	532.4	495	512.6
EU export	0.3	0.3	5.5	40.7	40.7
Storage injection	18.1	18.1	18.7	14.3	14.3
Total gas demand[2]	570	557.6	559.9	554.4	572
LDZ + NTS Shrinkage	3.9	3.9	3.3	3.3	3.3

Table B
Breakdown of Gas Supply – TWh

Winter Supply (BCM)		
	2020/2021 Actual	2021/2022 Actual
UKCS /Norway	392.7	393.8
EU Imports	52.6	5.5
LNG	97.9	125.4
Storage Withdrawal	23.1	20.9
Other Supplies	0.022	0.033
Grand Total	566.5	545.6
Storage injection	18.7	14.3
GB Total	559.9	559.9

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

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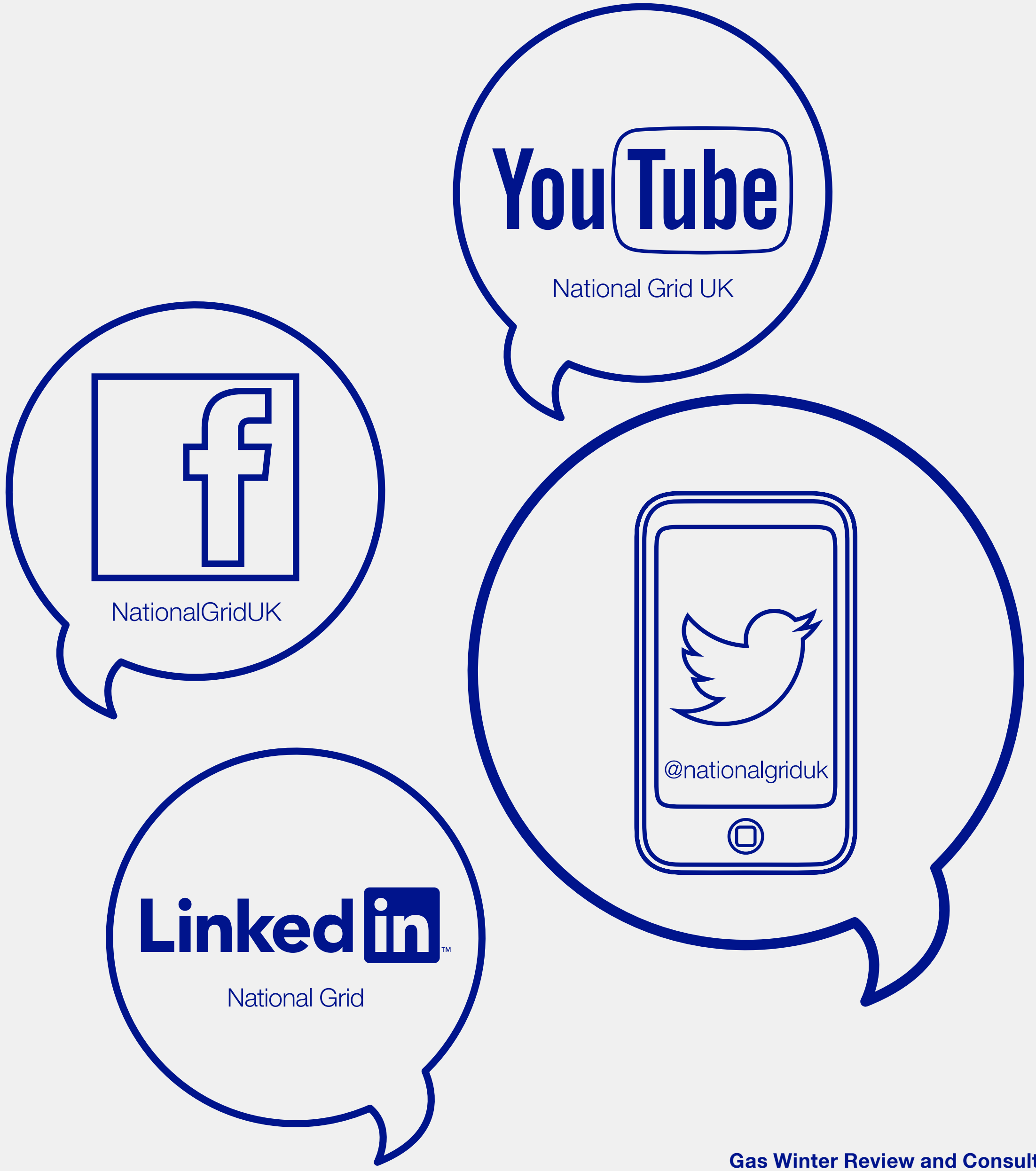
Continuing the conversation

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.

Linepack swing
The difference in linepack at the start of the gas day compared with the linepack at it's lowest point during the same gas day.

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.

Price differential
The difference in price between markets (for the same commodity).

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.