Gas Transmission Winter Review & Consultation

June 2020

nationalgrid

Contents

Welcome
to our 2020 Winter Review and Consultation

Thank you for reading our Gas Winter Review and Consultation report. This report compares what happened in winter 2019/20 with our Winter Outlook Forecast. The review and consultation is designed to help the energy industry to understand what happened. It is an opportunity to look at factors that influenced differences between our forecast and actual events, together with how well challenges were both anticipated and met.

Looking back, winter 2019/20 was a mild winter comparable to 2018/19 with the National Transmission System reliably supplying gas to meet demand. In the Winter Outlook Forecast, we predicted that the global production of LNG would outstrip demand leading to high levels of LNG being supplied to GB shores. This pattern materialised and led to LNG supplies influencing the way we used our assets. However, unlike our expectations in the Winter Outlook forecast, there was a reduction in the import of gas via the interconnectors, IUK and BBL. This was driven by a combination of low UK demand, high availability of supply, with subsequent market pricing making EU to UK transit less attractive compared to previous years.

During the final eight days of the winter, the UK wide lockdown came into force as a consequence of the global COVID-19 pandemic, however this had little impact on the overall demand that was forecasted in the Winter Outlook Report. There was a reduction in overall demand when compared to the seasonal normal, but this was primarily due to falling embedded industrial demand and power station demand.

An important part of our Gas Winter Review and Consultation is hearing from industry stakeholders and our customers. If you would like to engage with us then please send us your responses using the template provided. This can be emailed to .box.OperationalLiaison@nationalgrid.com. Alternatively, you can let us know what you think on Twitter and LinkedIn. The consultation closes on 24 July. We look forward to hearing your views.

Other Gas System Operations publications in this suite are:

- **Winter and Summer Outlook, both published annually, with the next due in October 2020 and March 2021 respectively.**
- **Gas Ten Year Statement (GTYS), published annually every November.**
- **Gas Future Operability Planning (GFOP), published periodically when required.**

I hope you find the Gas Winter review and Consultation and all the documents mentioned useful. Thank you again for reading the Gas Winter Review and Consultation report.

Ian Radley
Head of Gas System Operations

Key Messages

1. **Throughout winter 2019/20 we safely and efficiently operated the gas transmission network ensuring a reliability rate of 99.999598%.**

2. **Higher levels of LNG were supplied to the network when compared to the previous winter. With supply spread more evenly across the country and geographically closer to sources of demand, we have been able to reduce the amount of compression required through the winter.**

3. **In a typical winter, we would expect the interconnectors from Belgium and Holland to predominantly supply gas to the UK. This winter the large levels of supply from LNG, coupled with lower national demand, reversed this trend.**

Executive Summary

Winter 2019/20 saw no significant events that adversely affected gas supply and demand.

LNG deliveries increased by approximately 70% on the previous winter, despite relatively static demand over the two winter periods

This year saw an overall reduction in compressor running hours compared to the previous winter and to the Winter Outlook Forecast, but saw an increase in the running hours of assets that we would not normally expect to run in the winter, again due to the high deliveries of LNG

Against the Winter Outlook forecast, there was a reduction in the import of gas via the interconnectors, IUK and BBL, with both regularly switching their flow direction to deliver gas to the continent

	Winter 2018/19		Winter 2019/20		
Demand (BCM)	2018/19 Actual Demand	2018/19 Weather Corrected Demand	2019/20 Forecast	2019/20 Actual Demand	2019/20 Weather Corrected Demand
NDM	28.7	30.0	30.6	30.7	30.9
DM + Industrial	4.4	4.5	4.7	4.5	4.5
Ireland	2.1	2.1	2.4	2.6	2.6
Total for electricity generation	12.3	12.3	11.7	10.6	10.6
Total demand	**47.6**	**49.1**	**49.4**	**48.4**	**48.7**
IUK export	0.0	0.0	0.8	0.5	0.5
Storage injection	1.5	1.5	1.9	1.4	1.4
GB Total	49.4	**50.7**	**52.3**	50.5	**50.8**

Table 1 – Break down of Gas Demand – A version in TWh can be found in the appendix

Winter Supply (BCM)		
	2018/2019	2019/2020
UKCS	18.6	18.3
Norway	18.6	15.8
BBL Import	2	0.2
IUK Import	0.3	0.1
LNG	7.8	13.4
Storage Withdrawal	1.8	2.4
Grand Total	49.2	50.3

Table 2 – Break down of Gas Supply - – A version in TWh can be found in the appendix

Non-Daily Metered Demand

Key messages: Demand from non-daily metered customers was broadly in line with our seasonal-normal forecast

Throughout winter 2019/20 the Non-Daily Metered (NDM) demand followed the seasonal normal profile and there were no significant peaks or troughs as seen in Figure 1. The demand during January was slightly lower than the seasonal norm due to the mild weather that was seen over this period. Figure 2 shows that for most of the winter period the actual CWV trended towards the warm average.

In the Winter Outlook report, the expected NDM demand was 30.6 bcm and the actual NDM demand was 30.7 bcm. The highest overall demand day this winter was 363 mcm on 21st January 2020 with the LDZ demand on that day being 238 mcm.

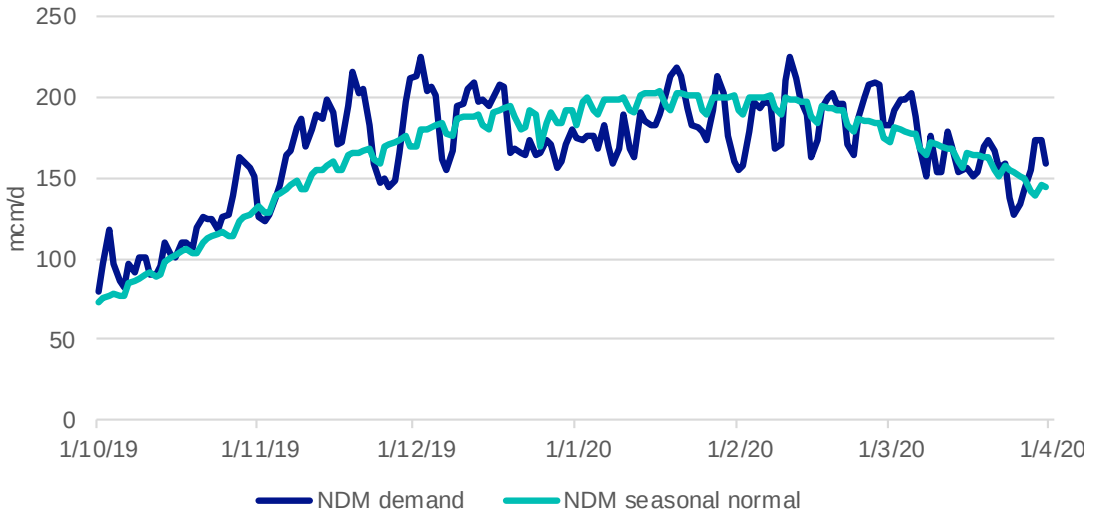


Figure 1 – NDM demand during Winter 2019/20 in relation to seasonal normal

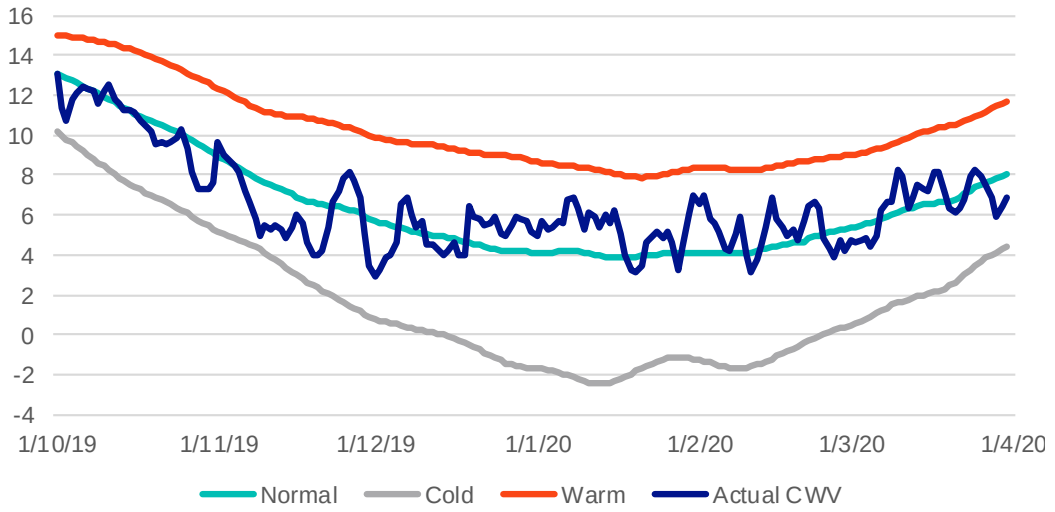


Figure 2 – CWV for Winter 19/20 in relation to seasonal normal

Demand for Electricity Generation

Key messages: Demand for gas for electricity generation has decreased compared to winter 18/19.

The overall gas demand for electricity generation was lower than forecast in the Winter Outlook Report as well as being lower than last winter's actual demand.

Supply from many competing non-fossil fuel sources of electricity generation has increased this winter, with wind having the largest impact. Electricity generation from nuclear, hydroelectric, and wind increased this year compared to last year, with wind generating 25% more. Due to the continued growth in renewable generation capacity, gas demand for electricity generation was again more volatile than the previous winter.

The rise in renewable electricity generation had also impacted the gas daily demand for electricity generation throughout last winter. The maximum and minimum daily demand both fell by 7 and 8 mcm, respectively. There were also 20 days where daily demand dropped below 30 mcm in winter 2019/20 comparing this to only 2 days in winter 2018/19. Furthermore, there were 5 days where demand exceeded 80 mcm in winter 2019/20 compared to 19 days in winter 2018/19.

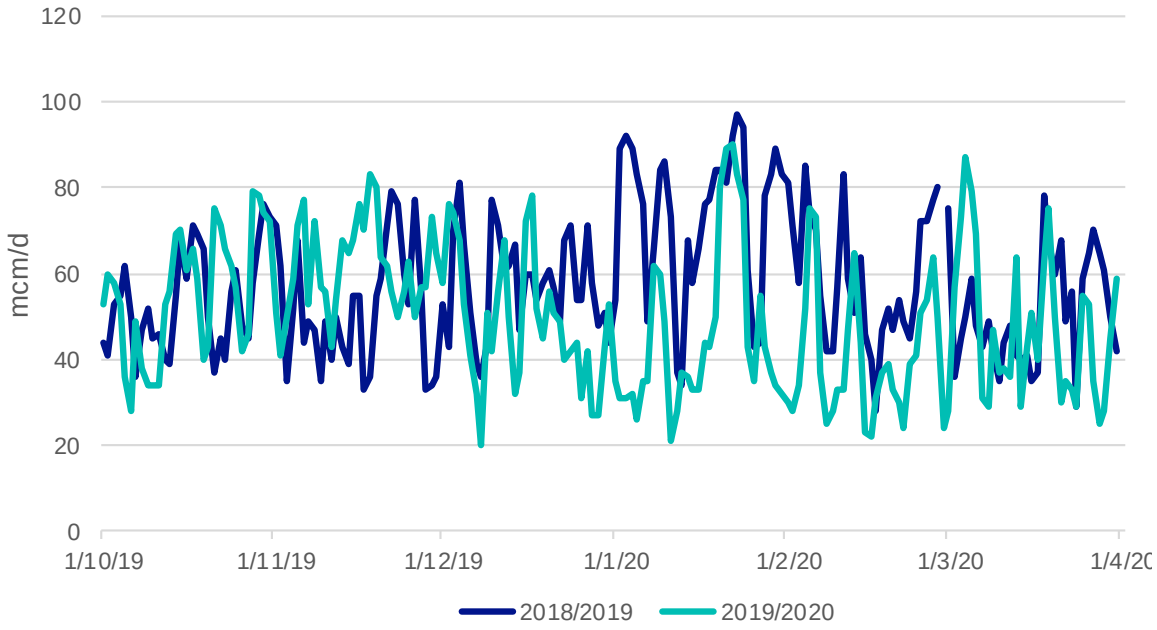


Figure 3 – Gas demand for power stations

EU Interconnectors

Key messages: Interconnector activity over the winter period was low for both imports and exports.

This year was the first winter that BBL could export gas to the continent.

Over the winter, there was a small amount of supply seen from both IUK and BBL into the UK, a maximum of 25 mcm in late February. Such low levels of imports from interconnectors, especially BBL, have not been seen for a number of years.

Typically over the winter, the NTS would expect to see imports from the EU interconnectors, however as shown in Figure 5, during Winter 19/20 the interconnectors were operating in export mode for much of the winter.

Lower than normal flows through the interconnectors was a consequence of relatively mild winters in both the UK and Europe, coupled with high supply availability in the UK and relatively high continental storage stocks. This provided minimal market incentive for large flows between the UK and Europe.

This did not negatively impact on the operability of the network with any potential shortfall being picked up by an increase in LNG. The supply from the Isle of Grain, in particular, aided operability due to its proximity to the high demand areas of Greater London. This reduced the amount of compression typically required in winter to transmit gas into the south east of the country.

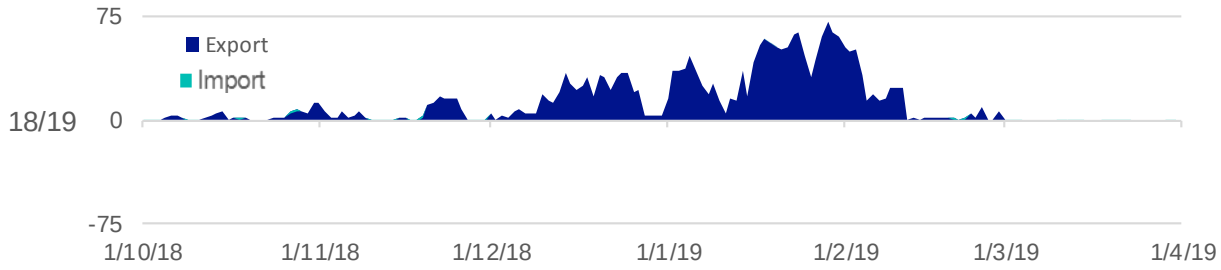


Figure 4 – EU daily interconnector important and export Winter 18/19

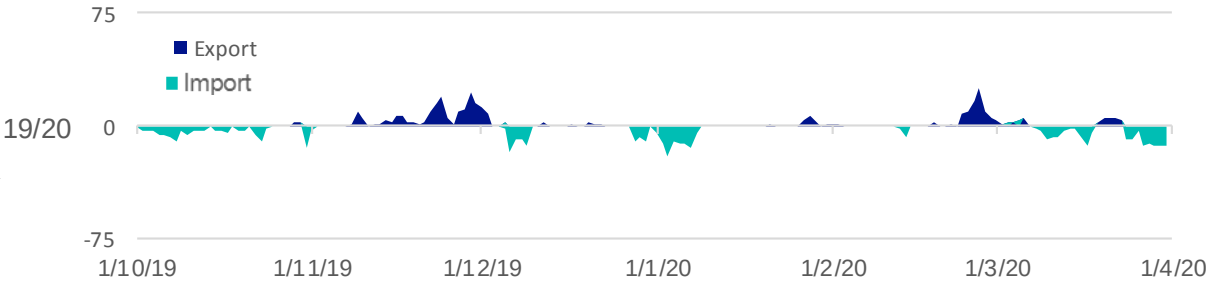


Figure 5 – EU daily interconnector important and export Winter 19/20

Storage

Key messages: Similar behavior of storage facilities in 2019/2020 winter to that of 2018/19 winter.

As forecast in the Winter Outlook Report, high supply availability from LNG depressed the required withdrawal from MRS. This remained true for the majority of the winter.

In February, inclement weather conditions at the LNG reception terminals delayed the offloading of a number of cargos, which in turn reduced supply into the NTS. During this period, MRS responded accordingly to pick up the shortfall. This behavior was expected with UKCS and Norwegian gas forming the base level of supply, with responsive balancing traditionally provided by LNG, MRS and Interconnectors.

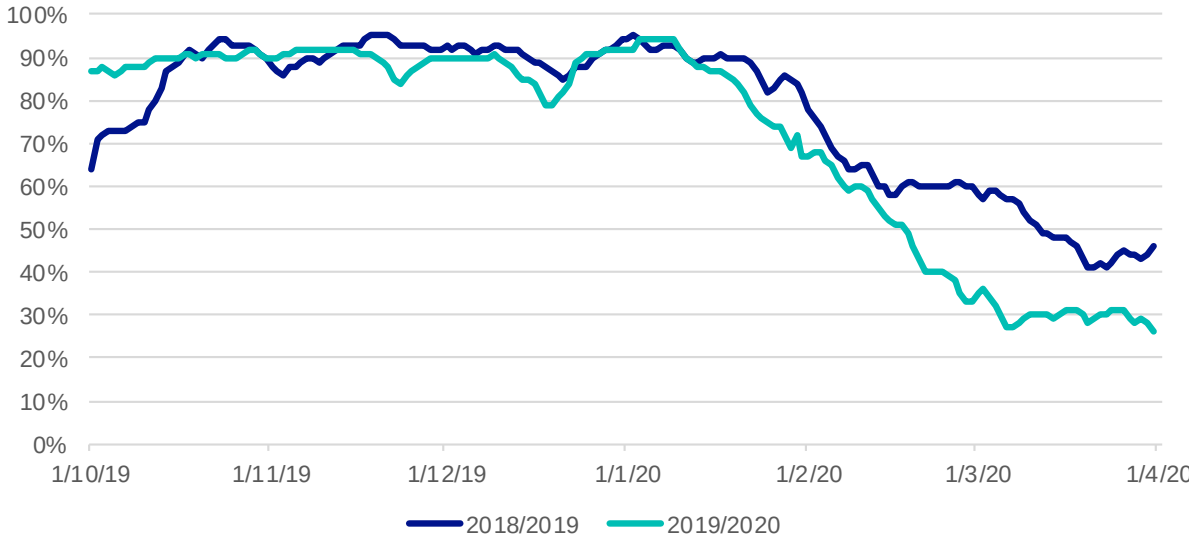


Figure 6 – Gas in medium-range storage

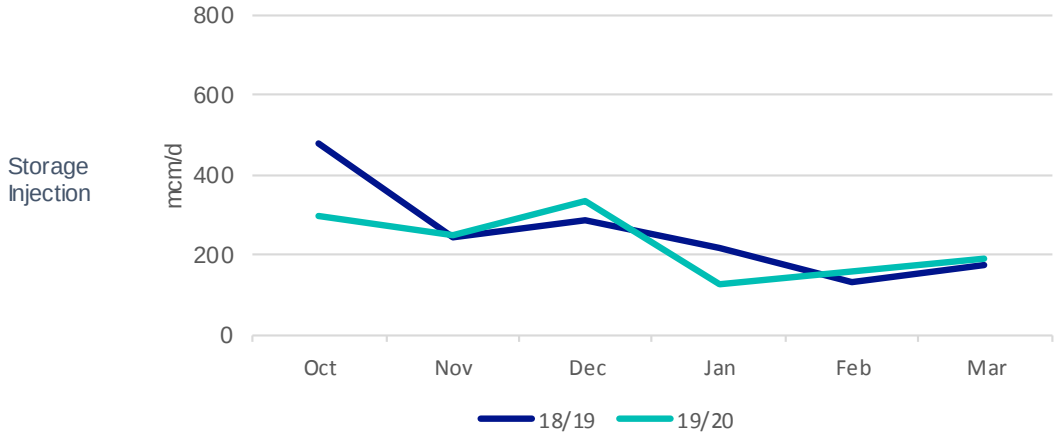


Figure 7 – Monthly storage injection

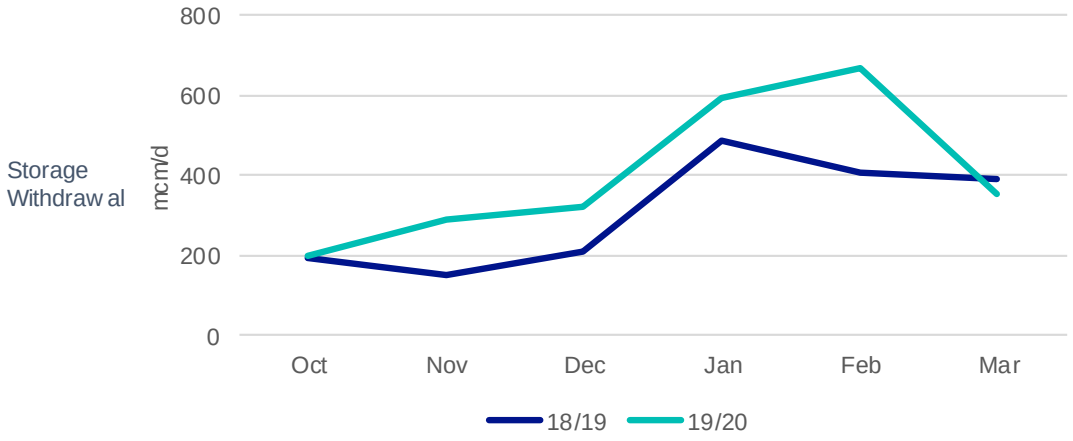


Figure 8 – Monthly storage withdrawal

Liquefied Natural Gas

Key messages: There was a high supply of gas from all LNG terminals in this winter compared to winter 2018/19.

There had been higher LNG flows in winter 2019/20 compared to winter 2018/19 across all terminals as predicted in our Winter Outlook Report.

Looking at Figure 10, it can be seen that this winter there were much larger peaks in LNG flows compared to winter 2018/19. Two days stand out, the first in early December and the second in late January. These two days show that supply from LNG terminals reached a maximum of almost 140 mcm, compared with only 80-90 mcm last year.

Due to this rise in supply of LNG, the Isle of Grain terminal exported its highest ever daily amount of gas into the UK's network this winter.

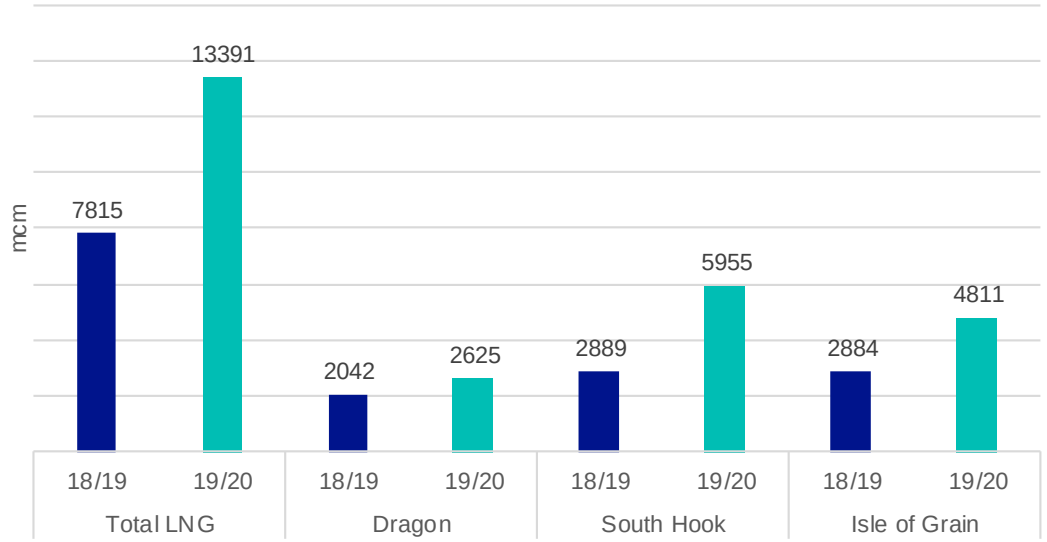


Figure 9 – Total LNG flows by terminal for entire Winter period

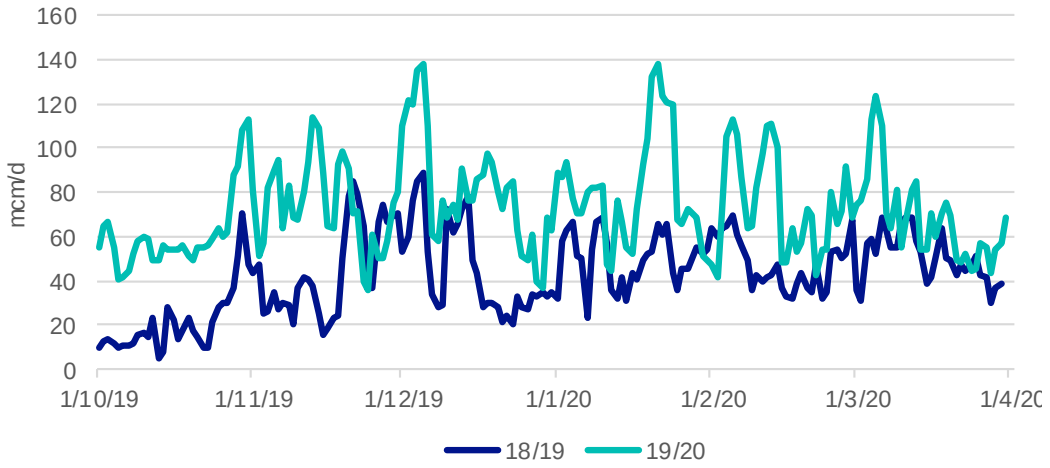


Figure 10 – Total LNG flows by day

Gas Supply/Demand Profiles

Key messages: There were sufficient supplies from a variety of sources to meet the winter 19/20 demand.

The supply and demand profiles showed a similar level of variability compared to last winter's profile; this can be seen in Figure 11. The main difference between the two winters is related to the LNG supply, supplies from Norway and the interconnectors. LNG supply was significantly higher in winter 2019/20 compared to winter 2018/19; the average supply profile for LNG from winter 2018/19 is now at the lower end of the supply profile from winter 2019/20. Furthermore, the supply coming from Norway and the interconnectors has reduced significantly from the winter previous.

Supplies from UKCS and Norway remained strong as expected but were slightly reduced. Norway and UKCS supplies had decreased on average by 15% and 1.6% respectively and LNG supplies had risen by 71%. Both storage and LNG supply was highly market-driven as expected, the highest LNG flow was 138 mcm on 15th December. Supplies from interconnectors also saw a reduction this winter.

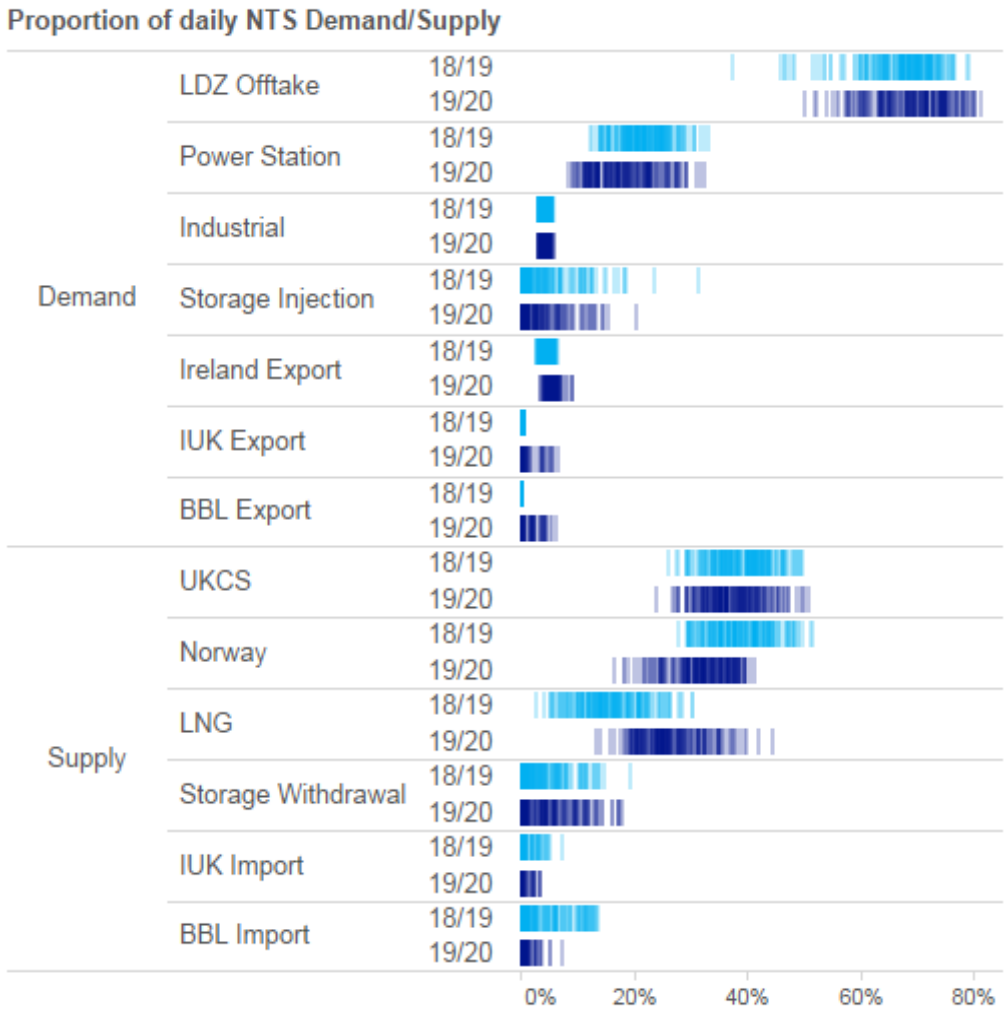


Figure 11 – Proportion of daily NTS Demand/Supply

System Operability – Winter by Winter

Key messages: Historic supply flows from the north and east of the country have once again been supplanted by high volumes of LNG

The nature of the supply make up into the UK forms the basis of the way we operate the network, in particular with respect to compression. This is shown by considering the two different scenarios below. The image on the left has a geographically balanced supply as well as a demand of 336 mcm. There is much less compression being used in this scenario compared to the image to the right which has a lower demand but a more localised supply. These two networks show that the NTS must be able to accommodate a multitude of different configurations and flow patterns.

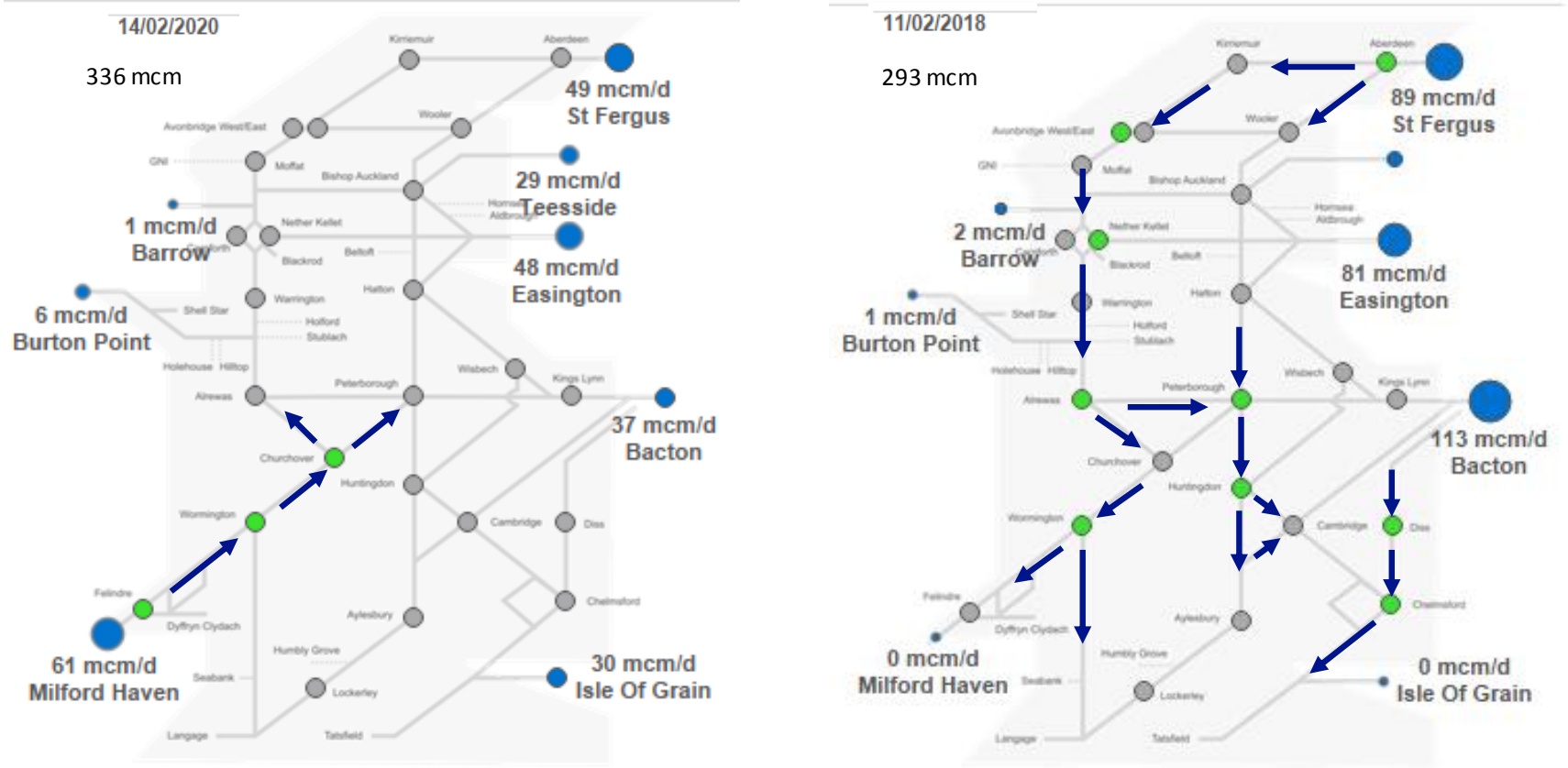


Figure 12– Supply between winter 2017/18 and winter 2019/20.

Figure 12 gives a simplified view of the NTS. Each blue circle represents a terminal and its flowrate, each green circle represents an online compressor station and the blue arrows represent the direction of the flow within the system.

System Operability – Within Day

Key messages: Market responsiveness from our customers continues to drive the need for greater flexibility in the way we operate the network

The changing nature of our customers' requirements for the network are not just apparent across seasons but are increasingly observed within the gas day, where supplies to and demands from the network can change dramatically at relatively short notice. Figure 13 shows an example of this where a large increase in the supply flows in at the Isle of Grain resulted in changes at four compressor stations; significantly altering the way gas wasflowing across the south of the network. We expect such increased need for network flexibility to continue into RIIO2.

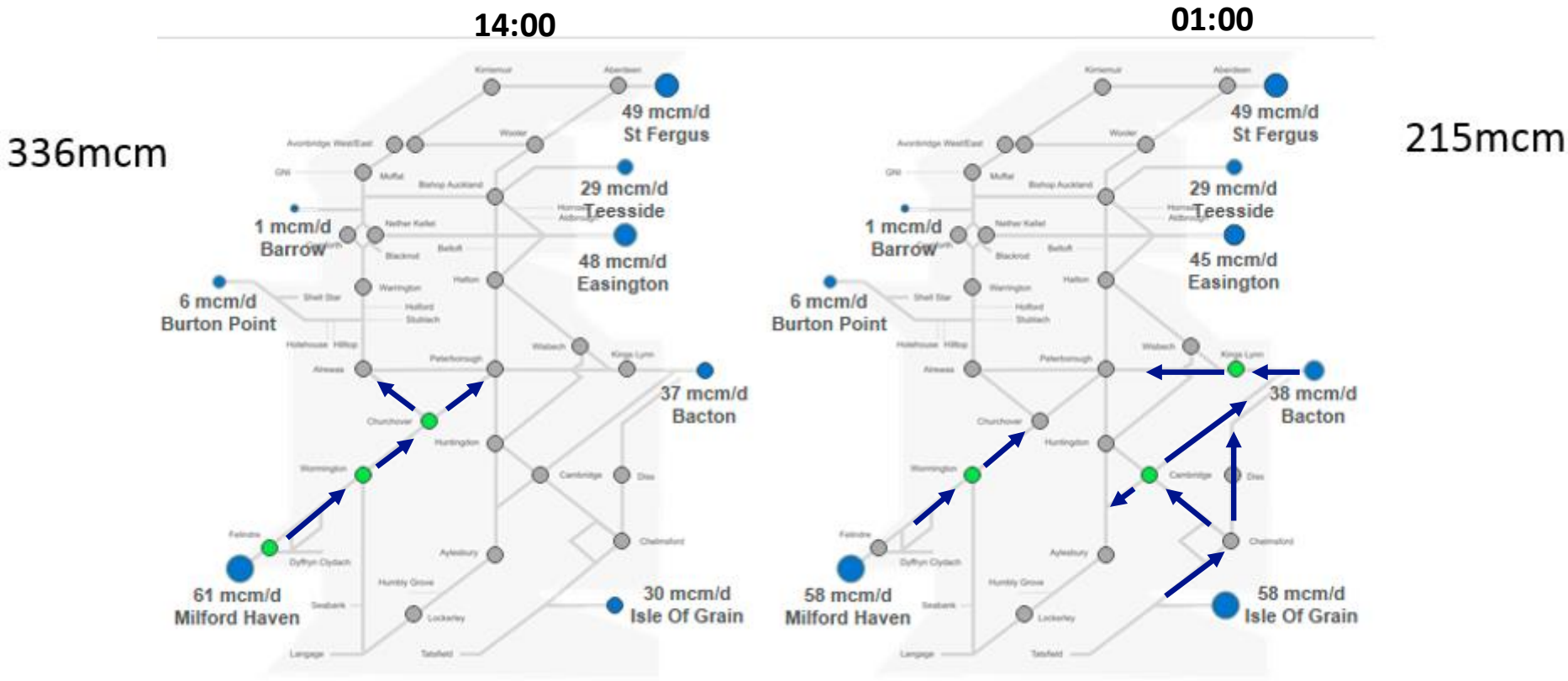


Figure 13 – Supply profiles at 14:00 and 01:00 on Gas Day 14th February 2020

Figure 13 gives a simplified view of the NTS. Each blue circle represents a terminal and its flowrate, each green circle represents an online compressor station and the blue arrows represent the direction of the flow within the system.

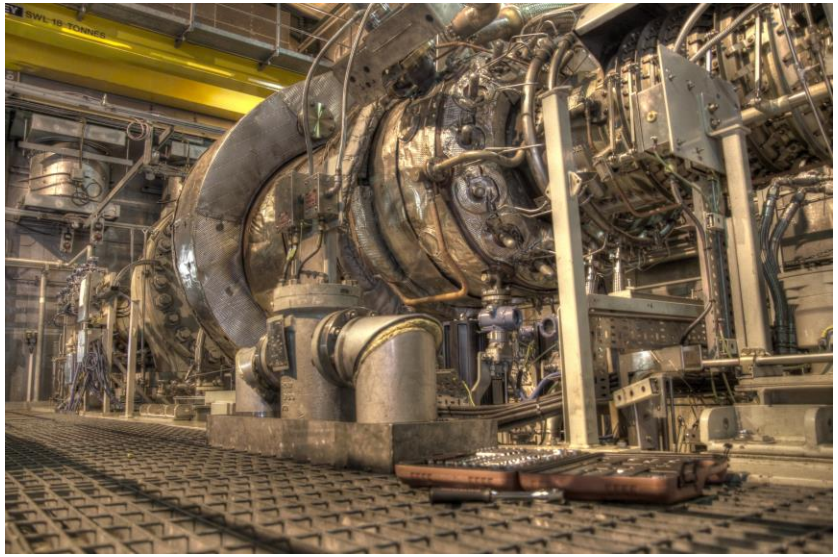
Linepack and Compressor Running Hours

Key messages: Total compressor running hours have decreased but variety of compressor configuration has increased

Throughout the years there has been steady increase in linepack swing as seen in Figure 15. Linepack swing is the difference between the volume of gas in the NTS at the start of the gas day, compared to its lowest point.

On average this winter there was a more balanced supply throughout the NTS. This meant that the sources of supply tended to be geographically closer to demand centres, reducing the amount of compressor assets required to be online.

However, there has been more non-standard compressor usage, to accommodate the high volumes of gas entering the network from locations such as LNG terminals. This increase in LNG has meant there was less of a requirement to run standard compression to push gas from the North to the South of the network.



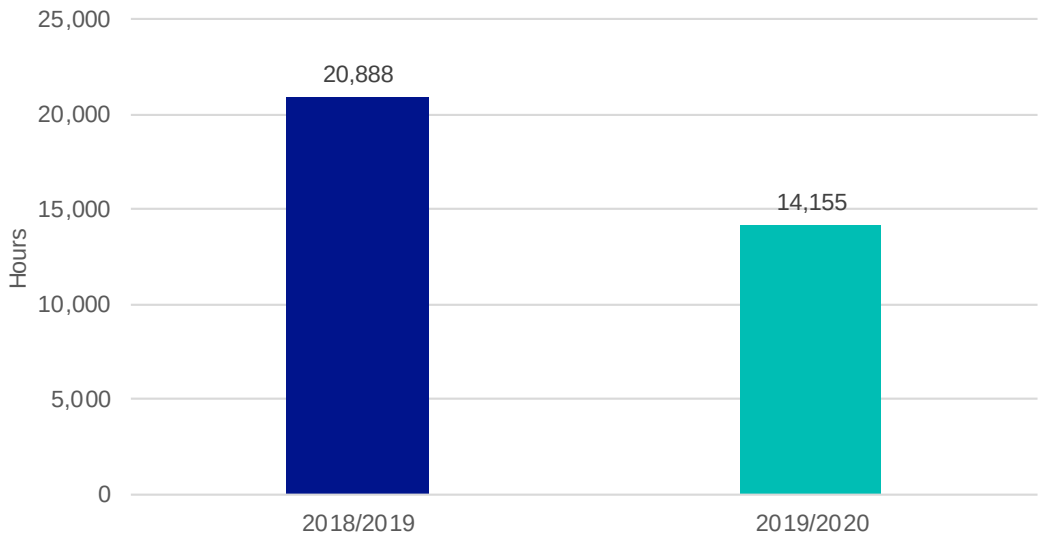


Figure 14 – Compressor running hours between winter 18/19 and winter 19/20

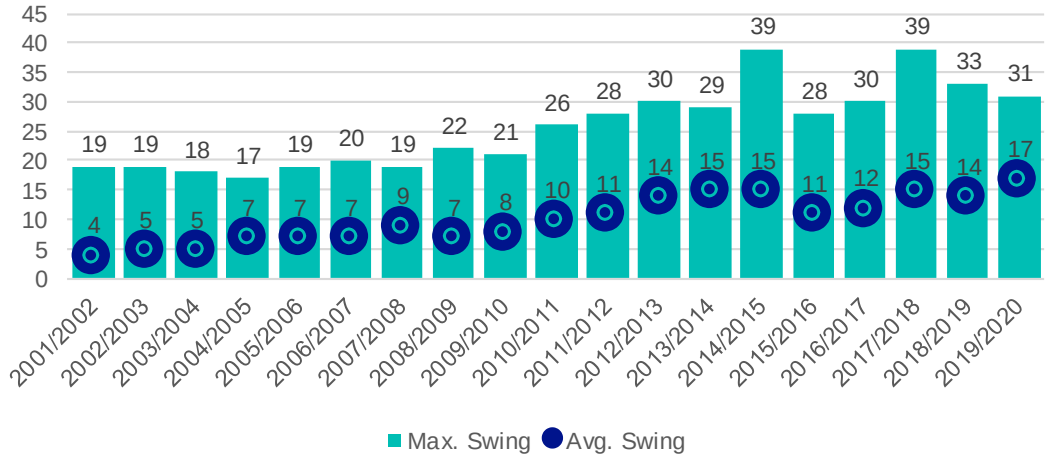


Figure 15 – Linepack swing

Consultation Questions

The consultation section is a vital element of the stakeholder engagement that feeds into our 2020/21 Winter Outlook Report.

Your views on the market and related issue are important to provide a comprehensive picture of the challenges and opportunities that lie ahead next winter. It also allows us to test how useful the suite of our publications are and to identify potential improvements.

Please send us your responses using the template provided. This can be emailed to **.box.OperationalLiaison@nationalgrid.com.** Alternatively, you can let us know what you think on Twitter and LinkedIn.

1. What do you use the Winter Review and Consultation document for?
2. What information in the report is the most useful to you for this?
3. Is there anything else that could be included in the Winter Review and Consultation?
4. How do you think the Winter Review and Consultation could be improved to increase benefit for consumers?
5. Is there anything that could impact European supply or demand that may affect interconnector flows to and from GB over winter 2020/21?
6. Do you have any other comments in relation to gas demand and supply ahead of winter 2020/21?
7. Do you have any other feedback on the format of this report and the 2019/20 Summer Outlook Report?
8. Is there anything different you would like to see in the 2020/21 Winter Outlook Report which will be published in October?
9. Are there any factors that may impact trends in LNG production, supply or prices in winter 2020/21?

The consultation closes on 24th July 2020. We look forward to hearing your views.

Glossary

Term	Description
BCM	Billions of cubic metres.
BBL	A bi-directional gas pipeline running from Balgzand in the Netherlands to Bacton in the UK.
Compressor	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.
Combined Cycle Gas Turbine (CCGT)	A combined-cycle power plant uses both a gas and a steam turbine together to produce up to 50 percent more electricity from the same fuel than a traditional simple-cycle plant.
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.
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.
Moffat interconnector	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
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

Term	Description
NTS shrinkage	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.
Renewables	Forms of energy generation from renewable resources, which are naturally replenished, such as sunlight, 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.
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.

Appendix – Data Tables in TWh

Demand (TWh)	Winter 2018/19		Winter 2019/20		
	2018/19 Actual Demand	2018/19 Weather Corrected Demand	2019/20 Forecast	2019/20 Actual Demand	2019/20 Weather Corrected Demand
NDM	315.8	330.2	336.4	337.7	340.3
DM + Industrial	48.9	49.4	52.2	49.3	49.5
Ireland	23.1	23.1	26.0	29.0	29.0
Total for electricity generation	135.6	135.6	128.7	116.8	116.9
Total demand	523.4	540.3	543.3	532.7	535.6
IUK export	0.4	0.4	8.3	5.1	5.1
Storage injection	16.9	16.9	20.7	15.0	15.0
GB Total	543.8	557.5	575.2	555.9	558.9

Table A – Breakdown of Gas Demand

Winter Supply (TWh)		
	2018/2019	2019/2020
UKCS	204.6	201.3
Norway	204.6	173.8
BBL Import	22	2.2
IUK Import	3.3	1.1
LNG	85.8	147.4
Storage Withdrawal	19.8	26.4
Grand Total	541.2	553.3

Table B – Breakdown of Gas Supply

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

Continuing the conversation

Email us with your views on the Gas Winter Review and Consultation at:

.Box.OperationalLiaison@nationalgrid.com

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