Winter Outlook

2019/2020

nationalgridSO

How to use this interactive document

Welcome

Welcome to our 2019/20 *Winter Outlook Report*. This report draws together analysis and feedback from across the industry to present a view of supply and demand for the winter ahead. It examines supply and demand margins for gas and electricity and the associated implications for security of supply for the upcoming winter.

On 1 April 2019, the *Electricity System Operator (ESO)* became a new legally separate entity that will carry out our ESO function within the National Grid Group. Whilst this provides focus to our electricity activities, one of our key goals is to facilitate successful whole energy system outcomes to help maximise consumer benefit. With increasing interactions between gas and electricity markets and operations, it remains essential that documents such as the *Summer* and *Winter Outlooks* continue to be produced on a dual fuel basis. We will continue to draw out and explore whole energy system themes in this year's *Winter Outlook*.

Weather continues to have a significant impact on how we balance the gas and electricity systems, increasingly affecting available supply as well as demand. With the increasing prevalence of extreme weather events, we continue to ensure that we have the range of tools available to us to manage challenging operational conditions on both the gas and electricity systems. As discussed in the *Winter Review and Consultation* document, last year was the lowest carbon intensity winter on record in terms of electricity generation. If weather conditions are similar this winter, we expect this positive trend to continue and anticipate more records being broken in terms of increasing renewable generation and coal-free running.

As always, we would really welcome your feedback so we can ensure our documents are as useful as possible. Email us at **marketoutlook@nationalgridso.com**. Alternatively, you can join the conversation using social media via LinkedIn, Facebook and Twitter, **#NGWinterOutlook**.

Fintan Slye
Director, UK System Operator

Introduction

About this document

The *Winter Outlook Report* provides our view of the gas and electricity security of supply for the forthcoming winter. It is informed by insight received from stakeholders across the energy industry via responses to our *Winter Review and Consultation* and through regular conversations with industry participants.

We continually evolve our outlook reports in line with the feedback you provide us each year. We listen to your views on the information you value and how we present it. We also use your insights to improve our forecasting assumptions. In this way, we can make sure the publication enables you to prepare for the seasons ahead, and in turn provide value to consumers.

You said	We did
You like the new format and layout, but don't want us to reduce content.	The body of the document contains more concise messaging to suit the informed reader, and we use interactive pop-ups to provide additional detail, definitions and insights.
You value the deep-dives and insights.	We continue to include spotlight features and have aligned them to your suggested topics where possible.
You would like more content on wider issues e.g. continental markets.	We have tried to introduce more insights on how continental markets impact our outlook, both in terms of forecast and risk.

Our mission is to enable the transformation to a sustainable energy system and ensure the delivery of reliable, affordable energy for all consumers. Consumers benefit from our activities in five ways:

- Improved safety and reliability
- Improved quality of service
- Lower bills than would otherwise be the case
- Benefits for society as a whole
- Reduced environmental damage

Please tell us what you think

We want to make sure that we continue to provide you with the right information to support your business planning. To do this, we'd like to know what you think about this publication, or how we can better stay informed of your needs. You can share your feedback at any time by emailing us at **marketoutlook@nationalgridso.com**

Introduction
Our publications

The *Winter Outlook Report* is just one of the documents within our System Operator suite of publications on the future of energy.

Each of these documents aims to inform the energy debate and is shaped by engagement with the industry.

Future Energy Scenarios
July
A range of credible pathways for the future of energy from today to 2050. Scenarios are unconstrained by network issues.

The *ETYS* and *GTYS* take the unconstrained scenarios in *FES* to develop requirements for planning and operating the electricity and gas transmission systems over the next 10 years.

The operability publications consider the unconstrained scenarios in *FES* to explore operability risks and associated requirements of the transmission networks and services.

Needs case

Electricity Ten Year Statement
November
The likely future transmission requirements on the electricity system.

Gas Ten Year Statement
November
How the gas network is planned and operated, with a ten-year view.

Options

Network Options Assessment
January
The options available to meet reinforcement requirements on the electricity system.

Ten Year Network Development Plan
Overview of the European gas and electricity infrastructure and its future developments.

System Operability Framework
How the changing energy landscape will impact the operability of the electricity system.

Gas Future Operability Planning
How the changing energy landscape will impact the operability of the gas system.

Ad-hoc, insights -led productions and reports

Operability Strategy Report
Highlights the challenges we face in maintaining an operable electricity system, and summarises the work we are undertaking to ensure we meet those challenges.

Future Gas Supply Patterns
How variability in supply pattern seasonally and day-to-day has changed, and could change in the future.

Ad-hoc reports that develop shorter-term plans for more specific elements of operational assets and services, where the need arises.

Annual short-term reports that explore any security of supply or operational challenges anticipated over the summer and winter periods.

System Needs and Product Strategy
Our view of future electricity system needs and potential improvements to balancing services markets.

Product Roadmap for Restoration
Our plan to develop restoration products.

Transmission Thermal Constraints Management
Our plan for the management of thermal constraints.

Wider Access to the Balancing Mechanism Roadmap
Our plan to widen access to the balancing mechanism.

Product Roadmap for Reactive Power
Our plan to develop reactive power products.

Winter Review and Consultation
June
A review of last winter's forecasts versus actuals and an opportunity to share your views on the winter ahead.

Summer Outlook Report
April
Our view of the gas and electricity systems for the summer ahead.

Winter Outlook Report
October
Our view of the gas and electricity systems for the winter ahead.

Electricity Capacity Report
Capacity Market auctions for delivery in a year ahead and four years ahead.

> 1 Executive summary

> 2 Whole energy system

> 3 Gas

> 4 Electricity

1 Executive summary

Key messages
Executive summary

1
The margin on the electricity system is greater than last winter and well within the Reliability Standard set by the Government.

2
The gas supply margin is expected to be sufficient in all of our security of supply scenarios.

3
We anticipate no additional adequacy or operability challenges for the coming winter as a result of the UK's planned exit from the EU. We have tested our planning assumptions in a broad range of scenarios and via engagement with industry.

4
We have the tools and services we need to enable us to manage anticipated gas and electricity operability challenges across the winter period.

Key statistics – Gas

Executive summary

Gas				
	2018/19 Forecast	2018/19 Weather corrected	2018/19 Actual	2019/20 Forecast
Total winter demand	46.6 bcm	50.7 bcm	49.4 bcm	52.3 bcm
1-in-20 peak day demand	472 mcm/d	-	-	499 mcm/d
1-in-20 peak day supply	575 mcm/d	-	-	588 mcm/d
Cold day demand	407 mcm/d	-	-	412 mcm/d
Cold day non-storage supply forecast	360 mcm/d	-	-	362 mcm/d
Demand for electricity generation	7.0 bcm	12.3 bcm	12.3 bcm	11.7 bcm
Safety monitor level	429 GWh space 387 GWh/d deliverability	-	-	356 GWh space 313 GWh/d deliverability

- GB gas supply sources are diverse and flexible and we expect there to be sufficient supplies to meet demand this winter.
- With global production of Liquefied natural gas (LNG) currently outstripping demand, we expect to see high levels of LNG being supplied to GB shores this winter; similar to last winter. LNG is typically challenging to forecast and is subject to uncertainties associated with Asian gas prices and shipping costs.
- Our analysis in relation to the UK's planned exit from the European Union shows margins that are sufficient even in a scenario with no interconnector flows between GB and continental Europe; however, the market would need to attract regular LNG supplies to the UK.
- Based on seasonal normal conditions, gas demand for winter 2019/20 is expected to be higher than last year's weather corrected demand.
- Gas demand for electricity generation is forecast to be lower this winter than was experienced in winter 2018/19 and remains dependent on levels of renewable generation output.

Key statistics – Electricity

Executive summary

Electricity				
	2018/19 Forecast	2018/19 Weather corrected	2018/19 Actual	2019/20 Forecast
De-rated margin at underlying demand level (GW)	7.1 GW	-	-	7.8 GW
De-rated margin at underlying demand level (%)	11.7%	-	-	12.9%
Loss of load expectation (LOLE)	<0.1 hours/year	-	-	<0.1 hours/year
ACS peak underlying demand	60.5 GW	-	-	60.4 GW
Peak transmission system demand/Normalised demand	48.2 GW	48.5 GW	48.8 GW	46.4 GW
Minimum demand	20.8 GW	21.0 GW	21.6 GW	19.7 GW
Total maximum technical capability from generation	104.7 GW	-	-	106.7 GW
Interconnectors net imports	2.6 GW	-	-	2.7 GW
Maximum Triad avoidance	2 GW	-	2.4 GW	2.6 GW

- We expect there to be sufficient generation and interconnector imports to meet demand throughout winter 2019/20.
- The de-rated margin at underlying demand level is higher than last year, and the associated loss of load expectation is less than 0.1hours/year. It is therefore within the Reliability Standard of three hours set by the Government. We are confident that we have the right tools in place to help us balance the system.
- We expect normalised transmission system demand to peak this winter at 46.4 GW, which is lower than last winter. Based on the data provided to us by generators on 26 September 2019, normalised demand can be met in all weeks across the winter under a full range of interconnector scenarios.
- Our analysis in relation to the UK's planned exit from the European Union shows margins that are sufficient even in a scenario with no interconnector flows between GB and continental Europe.
- However, our analysis of forward electricity prices suggests that there will be net imports of electricity from continental Europe to Great Britain at peak times during winter 2019/20. We also expect there to be net exports to Ireland during peak periods. This is subject to changes relating to variances in renewable generation and relative electricity prices.

2 Whole energy system

This chapter explores the relationship and interdependencies of the gas and electricity systems. Our whole energy system understanding continues to improve as we learn from operational events.

Overview

Whole energy system

Figure 2.1

Figure 2.2

Gas continues to be the dominant fuel when considering energy demand from consumers on a whole energy system basis, although a proportion of gas demand is for the generation of electricity.

This winter we expect…

- total gas demand over the winter period to be 3.9 times higher than electricity demand
- 23.5 per cent of gas demand to be for electricity generation.

Did you know?

When we compare gas and electricity demand in the same **units** (TWh), it is clear to see that gas currently delivers significantly more energy than electricity, although a proportion of that gas is not for end-consumers but is transformed into electricity via gas-fired power plants (as seen in figure 2.1).

This is why we must continue to consider energy demand from a whole-system perspective. Forecasting of gas demand is becoming increasingly reliant upon an understanding of the relative mix and merit order of electricity generation.

As more electricity generation capacity becomes available from renewables, less will be required from gas-fired power plants – particularly when viewed across the whole of the winter. However, the actual demand for gas-fired generation on a day-to-day basis (and also within-day) has become far more weather dependent. With peak-day flow for gas also being far higher than for electricity, the impact of such variation on operability can be also magnified.

[1] For outturns, peak and minimum are the highest and lowest demands respectively for both fuels (not including exports).

Figure 2.1
Total energy flow, outturn from winter 2018/19 and forecast for winter 2019/20 (transmission level demand only)

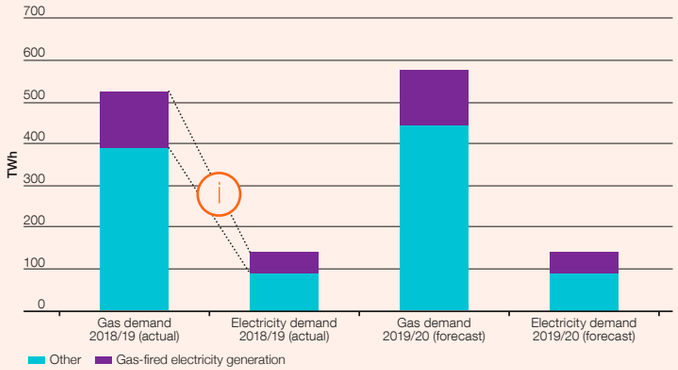
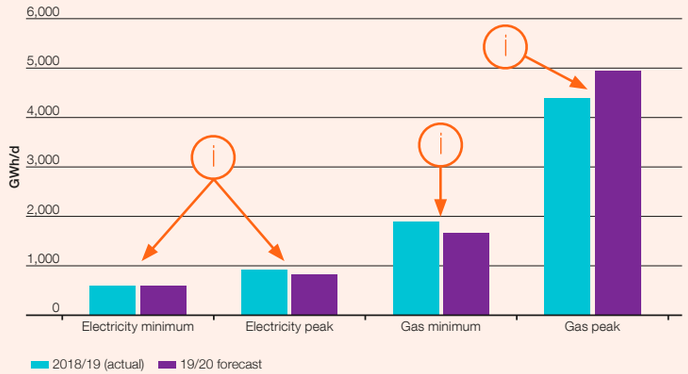


Figure 2.2
Minimum to peak day transmission level demands for gas and electricity (outturn from winter 2018/19[1] and forecast for winter 2019/20)



System operability
Whole energy system

Figure 2.3
Figure 2.4

We continue to see increasing interaction between electricity and gas networks as the weather sensitivity of renewable generation has a knock-on effect on gas demand for electricity generation. The demand for gas-fired generation is also highly sensitive to price trends.

This winter we expect…

- gas demand for electricity generation to continue to respond to peaks and troughs of wind and solar generation as it did last winter
- based on current forward fuel prices, gas generation will typically be in merit over coal through the winter (see figure 2.3).

Did you know?

Output from gas-fired generation mirrors the output from renewable generation, increasing when renewable output decreases and vice versa. The running patterns for winter 2018/19 can be seen in figure 2.4 demonstrating these effects.

Last winter had several interesting features from a whole energy system perspective. Wind levels were high over the winter meaning that wind generation displaced a lot of thermal electricity generation. This would normally lead to less gas demand for power. However, a reduced gas price meant that gas was in merit over coal for generators. This contributed to winter 2018/19 having the highest single day for gas demand for electricity generation on record (97.2 mcm). This occurred on a day when wind output was low and electricity demand was met mostly by gas rather than coal plant.

Figure 2.3
Closing prices of clean spark spreads and clean dark spreads for winter 2019/20[2]

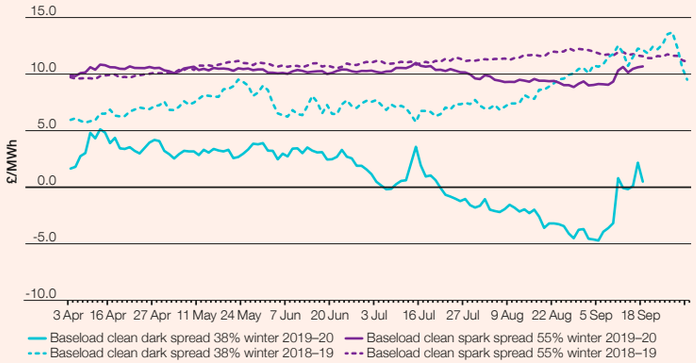
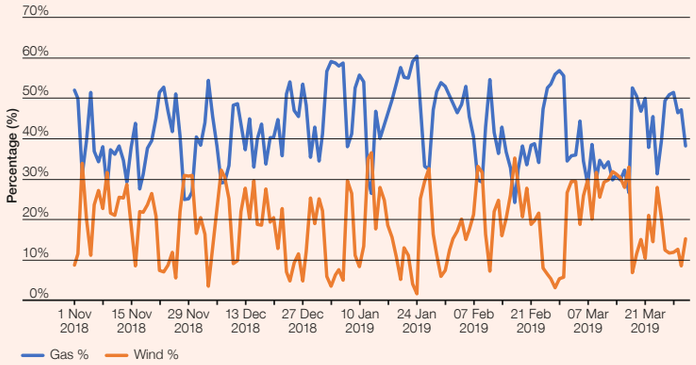


Figure 2.4
Load factors for wind generation for electricity and gas-fired generation in winter 2018/19



[2] This chart has been developed by National Grid using confidential proprietary data from the Argus Media Group under licence. Argus shall not be liable for any loss or damage arising from any party's reliance on this data.

3 Gas

This chapter sets out our current view of the gas system for winter 2019/20. It details our analysis of supply and demand, and the preparations we have made for the winter ahead.

Winter view
Gas

Figure 3.1

We expect that there will be sufficient supply margin to accommodate a wide range of security of supply scenarios relating to winter 2019/20 and the N-1 test is passed.

This winter we expect…

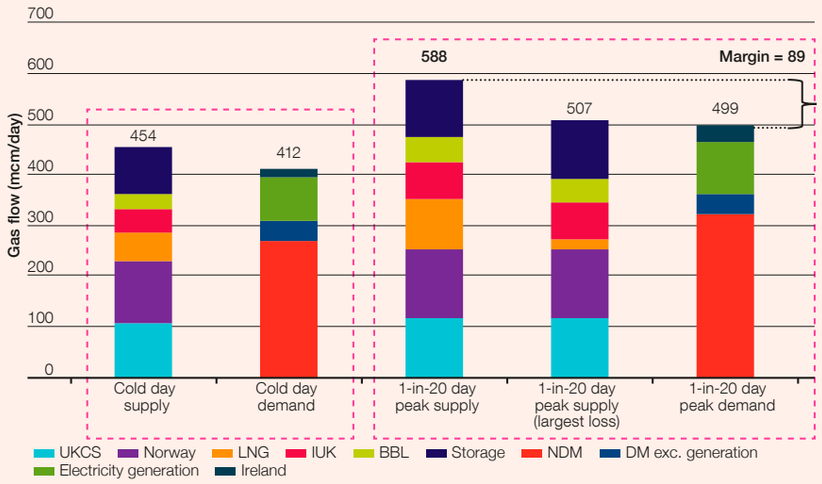
- for our cold day forecast, supply to be in excess of demand
- the N-1 test is passed as the margin (at 89 mcm) is greater than the loss of supply associated with the failure of the largest piece of gas infrastructure
- the statistical 1-in-20 peak demand to be greater than the highest recorded gas demand.

Did you know?

The impact of increased renewable electricity generation has a different effect on gas demand, depending on whether we are considering peak day demand or total demand across the winter. When we look at demand across the winter, we are typically seeing increasing amounts of gas-fired electricity generation being replaced by renewables. However, on a peak demand day, the story can be completely different. Weather conditions on a peak demand day could mean that renewables may not be generating (for example, a cold, non-windy day) and so gas-fired generation is increasingly used as back-up peaking plant, leading to ever greater swings in winter consumption patterns. See our **whole energy system** section for more information.

1-in-20 peak demand forecast	499 mcm/d
1-in-20 non-storage supply forecast	475 mcm/d
Storage for 1-in-20 supply forecast	113 mcm
Supply margin under 1-in-20 conditions	89 mcm
Cold day demand forecast	412 mcm/d
Cold day non-storage supply forecast	362 mcm/d

Figure 3.1
Supply and demand[1] on a cold day and a 1-in-20 peak day



[1] Peak demand includes 1.5 mcm/d of NTS shrinkage

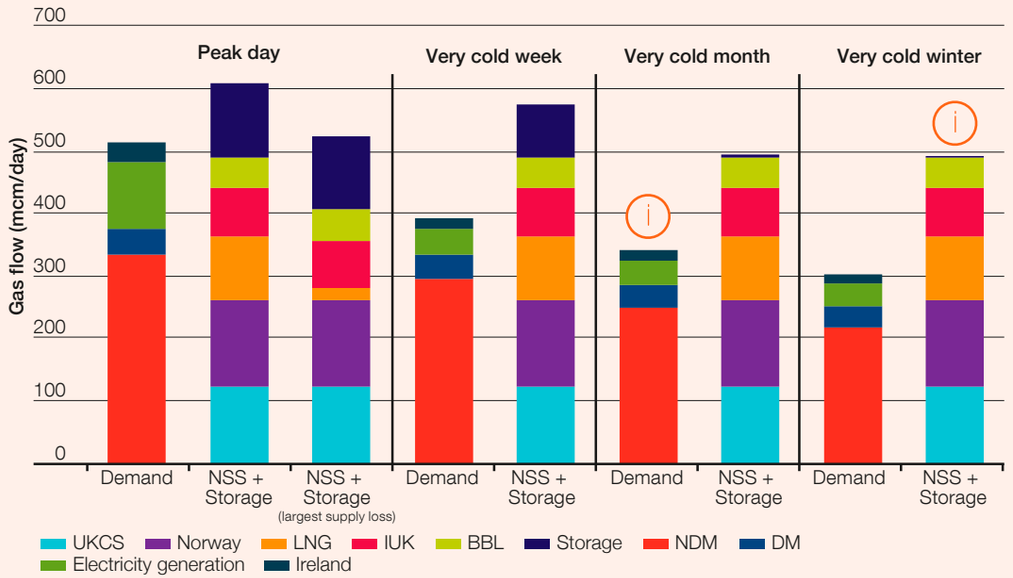
Winter view
Gas

Figure 3.2

Did you know?
When we assess the risks associated with extreme weather during the winter, we not only consider a cold day and a 1-in-20 peak demand day, but we also assess the risks of prolonged cold periods. We use the very cold week, very cold month and very cold winter defined in the load duration curves published in the *Gas Ten Year Statement*.

Our analysis for winter 2019/20 shows that for all time periods, the modelled supply is sufficient to meet demand (see figure 3.2).

Figure 3.2
1-in-20 peak day and demand for prolonged periods of cold weather



Gas demand

Gas

Figure 3.3

Table 3.1

We expect that gas demand for winter 2019/20 will be slightly higher than last winter. Although gas demand for electricity generation continues to reduce due to increasing levels of renewable generation, exports to both Ireland and Europe are expected to be higher than last winter.

This winter we expect…

- gas demand (52.3 bcm) to be slightly higher than last winter
- export to Ireland increasing as a result of growth in demand and reduced production levels from Ireland's Corrib gas field
- demand for gas-fired electricity generation (11.7 bcm) to be lower than last winter due to growth in renewables.

Did you know?

The demand for non-daily metered (NDM) customers is the most sensitive to variations in the weather across the winter season, and is the largest element of total demand (as seen in figure 3.3). Weather corrected demand in this element has fallen steadily since around 2000 as energy efficiency in buildings has improved, due to more efficient gas boilers and cheap insulation retrofits such as double glazing. However, in recent years, energy efficiency improvements have slowed and NDM demand has generally increased slightly due to growth in the number of properties connected to the gas network.

The underlying trend shows gas demand for electricity generation continuing to reduce as more and more electricity generation comes from renewables such as wind and solar, but there are many factors that contribute to the uncertainty of this forecast. See our **spotlight** for more details.

[2] Total also includes NTS shrinkage which is not detailed in the table.

Figure 3.3
Forecast daily gas demand 2019/20 under seasonal normal conditions

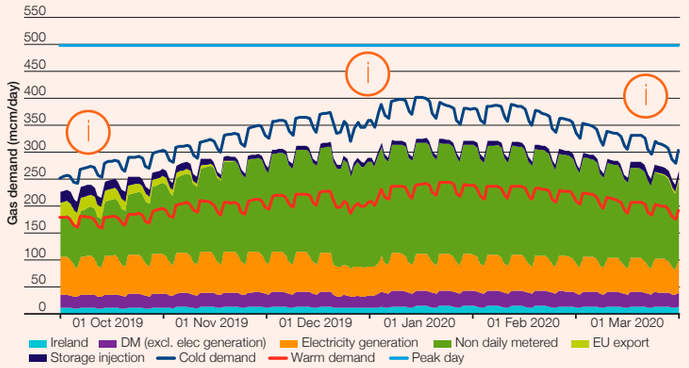


Table 3.1
Winter demand – forecast and weather corrected history

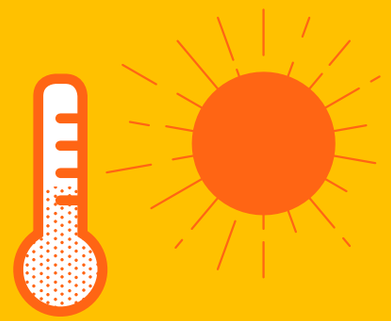
October to March	Weather corrected history						Forecast
bcm	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
NDM	29.0	29.3	29.6	29.7	30.6	30.0	30.6
DM (excl. elec generation)	5.2	4.9	4.7	5.0	4.8	4.5	4.7
Electricity generation	7.9	8.7	10.4	13.8	12.8	12.3	11.7
Ireland	2.9	2.9	2.6	1.6	1.8	2.1	2.4
EU export	0.6	1.5	2.7	0.8	0.7	0.0	0.8
Storage injection	1.8	0.9	1.2	1.8	2.3	1.5	1.9
Total[2]	47.5	48.3	51.4	52.9	53.3	50.7	52.3

Spotlight

Gas demand for electricity generation

There are a number of factors which can affect the certainty of our forecast of gas demand for electricity generation.

- As the volume of installed wind and solar generation capacity has increased, the overall demand for fossil fuel-fired generation has decreased. Over the last three years, total renewable capacity has increased by over 30 per cent (around 8 GW) with wind, which has more impact than solar in the winter months, almost doubling its available capacity.
- However, our forecast for gas-fired generation is not a direct mirror of installed renewable capacity. We must also account for weather dependency, and the fact that thermal generation (coal or gas) is increasingly used in the role of peaking plant – helping to meet peak demand on days when the wind isn't blowing.
- Over recent years, more and more coal plants have been, and continue to be, decommissioned due to their age and more importantly the drive to meet decarbonisation targets. The increasing costs of emitting carbon have a corresponding impact on the relative costs of gas and coal fuels. This in turn has increased the overall demand for gas as burning gas emits less carbon into the atmosphere.
- For remaining fossil-fuel fired units, selection of gas or coal in the running order is typically driven by price. When gas prices are low, gas will take precedence over coal in the generation running order. But there are many interrelated factors that influence gas and coal prices, not only in the UK but worldwide, making forecasting extremely challenging.
- In addition, when coal stations are close to decommissioning, they have a further incentive to generate as this runs down their coal stocks which are otherwise expensive to remove. This can impact the typical profiles of coal generators and hence influence gas demand.
- Historically, one of the biggest factors that affected the demand for gas-fired electricity generation was the availability of baseload generation, such as nuclear or biomass. A significant change in availability of these types of electricity supply assets will have a consequential impact on gas demand for electricity generation.
- Finally, we must consider electricity interconnector capacity, in combination with the effect of the UK Carbon Price Support (CPS) which, since its implementation, has resulted in the UK typically having high power prices compared to the rest of North West Europe. As more electricity is imported (Nemo Link recently increased import capacity by 1 GW), there is less domestic (GB) demand that needs to be satisfied by GB sources of generation and hence less of a need for domestic gas-fired generation.



Gas supply

Gas

Figure 3.4

Table 3.2

There are sufficient gas supplies from a variety of sources to meet winter 2019/20 gas demand.

This winter we expect…

- strong flows once again from beach supplies, similar to last winter. The lowest daily flow was higher last winter than the year before, and we expect a similar range this winter.
- non-beach supplies from storage (MRS), LNG and interconnector imports to be more responsive to gas prices, both in the GB and global markets.
- to see relatively low storage withdrawals (similar to last winter) if LNG supply is high once again. Stocks are currently at very high levels.
- 1-in-20 total supply to increase from 575 mcm to 588 mcm due to expansion at a number of storage sites.

Did you know?

Beach supplies are those provided by the UK Continental Shelf (UKCS) and from Norway, and they typically run close to maximum levels through most of the winter. Our UKCS projections are based on information received from producers as part of our annual Future Energy Scenarios stakeholder engagement.

The non-storage supply (NSS) forecast for a cold day included in table 3.2 is the one used in the Margins Notice process. Background to the Margins Notice is covered in the **operational toolbox section** and, in addition, changes to this process have been highlighted in our **spotlight**.

Figure 3.4
Historic and forecast ranges for gas supply[3]

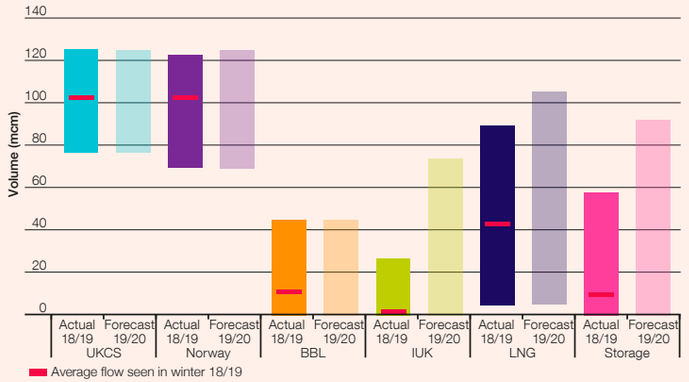


Table 3.2
Historic and forecast ranges[3] on a cold day and any days where total supply exceeded 350 mcm/day

	2018/19			2019/20	
mcm/d	Observed range	Cold day	350+ range	Forecast range	Cold day
UKCS	77–125	115	104–125	77–125	109
Norway	69–122	120	115–122	69–125	120
BBL	0–45	30	14–45	0–45	30
IUK	0–27	45	0–27	0–74	45
LNG	5–89	50	41–70	5–100	58
Total NSS		**360**			**362**
Storage	0–58		9–58	0–92	

[3] For the winter ahead we do not forecast an expected volume of gas from each source, but instead reflect the likely range as this is considered more useful from an operational viewpoint.

Europe and connected markets
EU interconnectors – Gas

Figure 3.5

Booked capacity for the European interconnectors is currently much lower than last winter, however actual flows will be highly dependent on market prices.

This winter we expect…

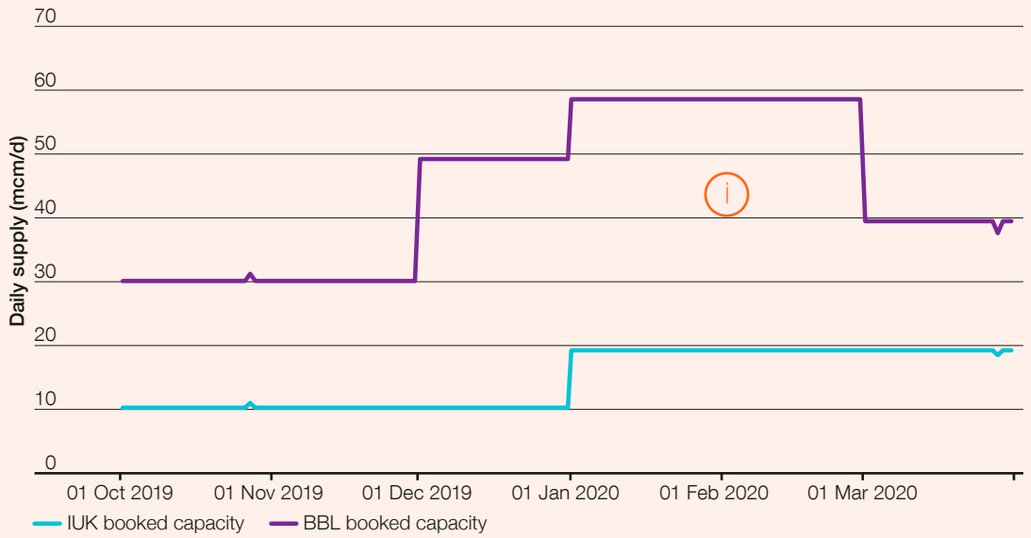
- the majority of GB imports to be via **BBL**. This would be similar to the pattern experienced last winter with **IUK** flows picking up when BBL reached capacity during January and February.
- additional interconnector capacity to be bought in the short-term markets for the winter period.
- interconnector supply to continue to compete with LNG when demand increases.

Did you know?
Historically, we have seen that when LNG imports increase, interconnector imports can decrease as the market balances out supply and demand, based on price signals. These effects were experienced last winter and we anticipate similar potential this winter.

Although the UK typically imports gas from Europe during the winter months, the BBL pipeline can now transport gas in both directions between the UK and the Netherlands.

See the EU exit page (page 24) for details of our contingency planning associated with the UK's planned exit from the European Union.

Figure 3.5
IUK and BBL booked capacity for winter 2019/20



Europe and connected markets
EU Interconnectors – Gas

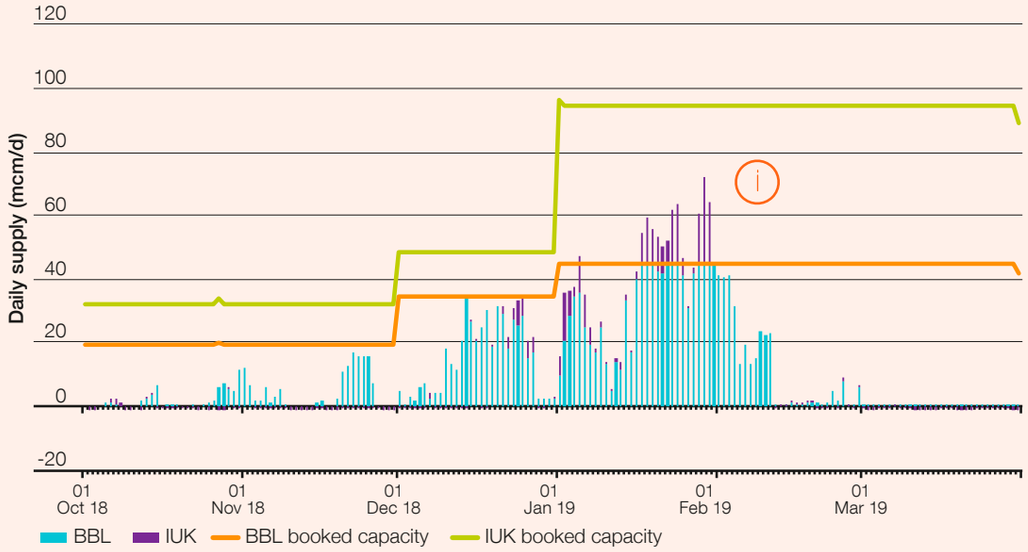
Figure 3.6

Did you know?

Output levels from the Groningen field in the Netherlands can influence imports to GB via the BBL interconnector. There continues to be seismic activity resulting in reduced output from the Groningen field. However, measures are being put in place to manage any consequences and as a result we do not forecast any significant direct impact on BBL imports.

The current deal for Russian gas to transit Ukraine into Europe ends on 31 December 2019. Talks are underway between the two countries, however, a deal may not be reached before that date. There is currently uncertainty around whether the construction of pipes that will bypass this border crossing will be ready to flow commercially this winter. In preparation for all eventualities, Ukrainian storage levels are high compared to previous years. This has also contributed to high European storage levels which are already around 95 per cent full. We don't currently anticipate any significant operational risks as a result of this.

Figure 3.6
Interconnector flows and booked capacity for winter 2018/19



Europe and connected markets

LNG – Gas

Figure 3.7

Robust supplies of LNG are expected to be available again to GB this winter.

This winter we expect…

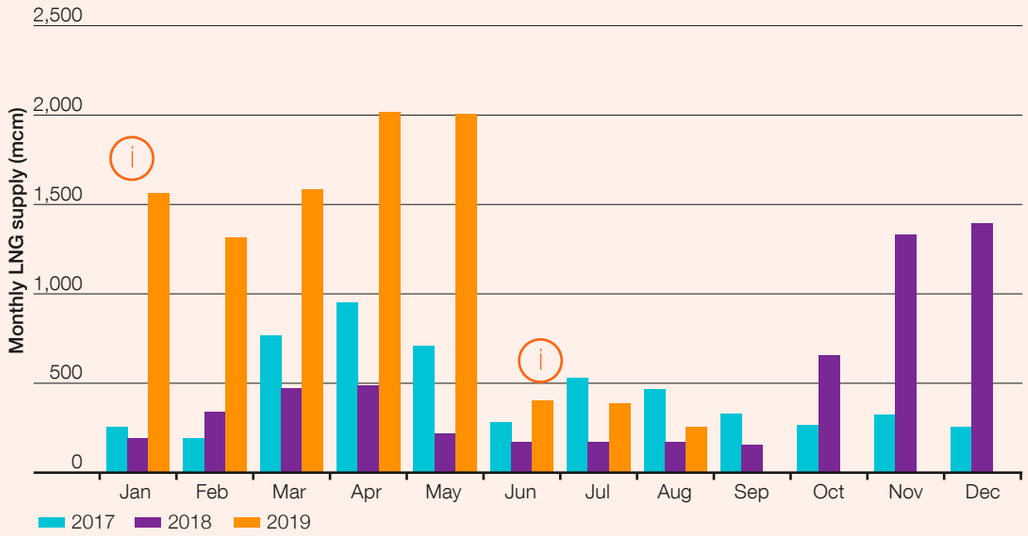
- global supply of LNG to exceed overall demand
- LNG supply to GB shores to continue to be highly sensitive to global market prices and shipping costs
- despite uncertainty, robust supplies of LNG to GB through winter 2019/20.

Did you know?

Production forecasts indicate that global supply of LNG will outstrip demand for the next few years, with the market beginning to tighten from the early to mid-2020s. Whilst uncertainty still remains (e.g. political tension in the Persian Gulf), we still anticipate high levels of LNG in the global market over the coming winter and sufficient supply to meet GB's needs.

Our forecasts of LNG can be affected by a number of factors (e.g. Asian prices, shipping costs, weather sensitivity). When Asian prices are high, this makes for a more attractive market for LNG that has been produced, and reduces the amount of LNG available for Europe. When shipping costs are high, LNG ships will attempt to minimise the distance travelled. This makes the UK more attractive to ships from the US than when these costs are low. There is also a level of weather sensitivity as extreme weather conditions can affect the transport routes and change patterns of shipping.

Figure 3.7
Monthly LNG supply for the last three years



Operational toolbox
Gas

Gas notices: our role

In our role as System Operator of the high pressure gas network, we act as Residual Balancer. This means that we must ensure the overall balance of gas on the NTS is within safe physical operating limits at all times. A selection of operational tools can be used to achieve this, including some that are mainly used when conditions on the network are more challenging.

Key changes
For winter 2019/20, changes have been made to both the Gas Margins Notice, and the Gas Balancing Notification.

Gas Margins Notice (MN)
A Margins Notice is a day-ahead announcement to the market indicating there is a potential gas supply and demand imbalance for the next gas day. The MN is designed to encourage NTS users to reassess their balancing position against the forecasts in the rolling Daily Margins Notice Report. This report gives all energy industry participants a rolling five day view of gas supply and demand, as well as data relating to the storage safety monitors, and is published on our **website**. Once an MN notice has been issued, it cannot be withdrawn and will stay in place until the end of the gas day to which it applies, unless it is superseded by a Gas Balancing Notification (formerly known as a Gas Deficit Warning). This year, together with industry, we have reviewed our processes and calculation methodology in relation to Margins Notices and have proposed a package of reforms via **UNC Modification Proposal 0698**. The proposals include a new methodology to determine the contribution from LNG to the expected level of supply capability and an additional 'early warning' notification to shippers when 95 per cent of the MN trigger level is reached. We are currently working towards implementation of these changes for this winter.

For a more detailed explanation of the Margins Notice changes, please **see our spotlight**.

Gas Balancing Notification (GBN)
Following an industry review process this year, the Gas Deficit Warning (GDW) notification has been re-named to be a Gas Balancing Notification. The purpose of a GBN is to provide a within-day message to GB market participants to provide more gas or reduce demand. We will issue a GBN if there is a shortfall in gas supply compared to gas demand that presents a material risk to the end of day system balance. There are no pre-defined triggers for a GBN, which is based on the judgement of the Gas National Control Centre. A GDW was issued for the first time on 1 March 2018, as discussed in our ***2018 Winter Review and Consultation* document**. Both the MN and the GBN processes are described in more detail on our **website**.

Operational toolbox

Gas

Operating margins (OM)

OM is an amount of gas that we purchase each year. OM gas can be used in the immediate period following operational stresses to maintain system pressures in the period before other balancing measures become effective. It can also be used to ensure the safe rundown of the gas system in the event of a Network Gas Supply Emergency. The full criteria for the use of OM are set out in the **System Management Principles Statement**.

We have obligations under the UNC and the Safety Case to maintain OM at various levels and at various locations throughout the year. Further information about operating margins can be found on our **website**.

Safety monitor

The safety monitor describes an amount and deliverability of gas that needs to remain in storage over the winter period in order to supply customers that cannot be safely or immediately isolated from the gas network. The safety monitor calculates how much gas is required to supply these customers across the whole of a severe 1-in-50 winter. The safety monitor exists to maintain the safe operation of the gas system by maintaining adequate pressures on the network, rather than to support security of supply. The space requirement of the safety monitor is made up of the 'protected by monitor' and 'protected by isolation' elements:

- **Protected by monitor** applies to sites that cannot be safely isolated from the gas network; for example, domestic properties. Where there is not enough non-storage supply across the winter to meet this demand, this is the volume of gas that needs to be available in storage to ensure these properties are never isolated from the network.
- **Protected by isolation** applies to sites that could be safely isolated from the gas network, but not immediately.

As a result, there is an additional gas demand associated with the time it would take to safely isolate them from the gas network. The total space requirement from these two elements is then divided across storage facilities. There has not been a breach of the safety monitor level since it was introduced in 2004.

We set a preliminary safety monitor well ahead of the winter period, with a further update in the autumn. This is then kept under review for the whole winter. You can find more information about the safety monitor on our **website**. The preliminary safety monitor storage space requirement for winter 2019/20 has been set at 365 GWh of space, with deliverability of 313 GWh/day.

Spotlight

Changes to the Gas Margins Notice

As discussed in the operational toolbox section, there have been a few changes going into this winter regarding some of our operational notifications.

Firstly, the Gas Deficit Warning has been renamed as a Gas Balancing Notification to better represent its purpose.

Secondly, there have been a number of changes relating to the Gas Margins Notice.

- There will be an early notification at 95 per cent of the Margins Notice trigger level.
- The Margins Notice will only be for the winter months, 1 October to 31 March.
- There will be an obligation on us to monitor the non-storage supply number throughout winter.
- There is a change to the calculation for how LNG is reflected in the Margins Notice trigger level.

The non-storage supply numbers are set at the start of winter and reviewed periodically throughout the winter. Previously, the LNG forecast included in the calculation was simply an educated view based on historical LNG flows.

The new method looks at the flow rates over the last three years and sets the expected cold day flow rate to be in the 95th percentile of this range. This adds more value to the Margins Notice process as it gets triggered more frequently.

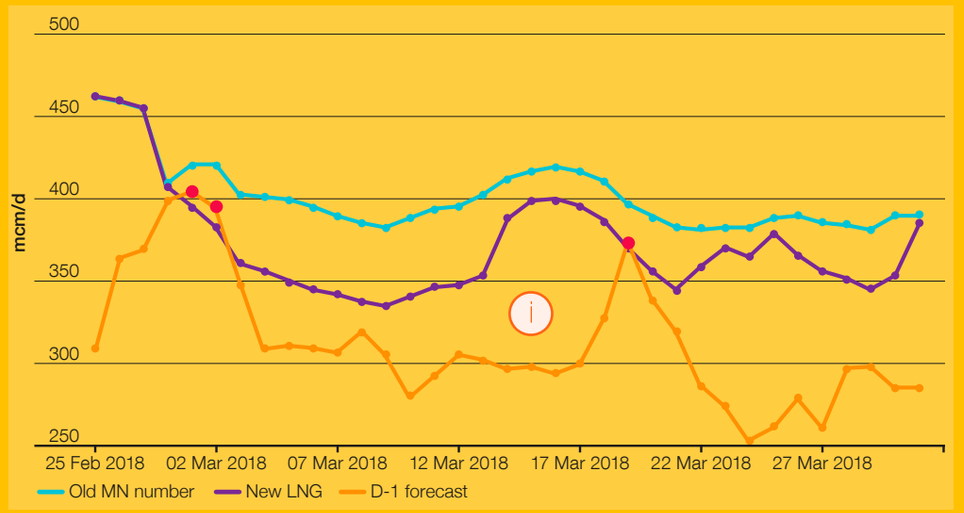
In addition to this, the LNG stock levels will also be continually monitored. If the level of LNG available to flow for the next two days is lower than the cold day rate that was previously calculated, the value will be reduced.

Taking this methodology and applying it to early March 2018 (when the 'beast from the east' was impacting GB), we can see that the Margins Notice would have been triggered around this time and also on another occasion later in the month.

What this means for this winter is that there is a higher likelihood that we will see a Margins Notice being triggered. However, this does not mean that the NTS is approaching emergency conditions. It is instead a day-ahead notification to let the industry know that they should be more vigilant the next day. Put another way, it is the methodology, and not the risk itself, that has changed.

Figure 3.8

Figure 3.8
Margin notice trigger points (old and new methodology)



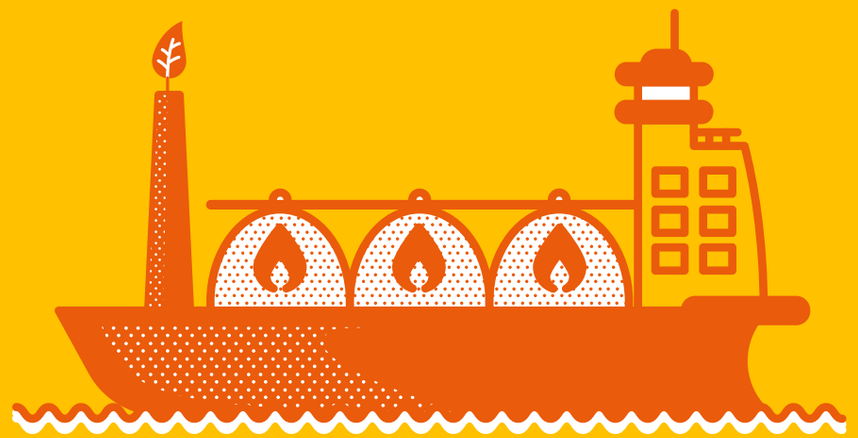
Hot topics
Gas

EU exit risk analysis

As part of our contingency planning, we have carried out analysis on a range of scenarios to test the risks associated with the UK's planned exit from the European Union.

- The central assumption is that in a no-deal situation there will be no impact on the trading arrangements for the gas interconnectors. As part of our planning for this scenario, we have been validating the assumptions with the interconnector parties and our partner TSOs.
- As a prudent System Operator, we have also assessed a scenario where there are no flows on the Belgium and Dutch gas interconnectors from EU exit day one. Gas continues to flow to the island of Ireland from Moffat. In both scenarios, flows from Norway, UKCS, LNG and storage are unaffected by the UK's planned exit from the European Union.
- In this very unlikely scenario, there will still be sufficient sources of gas supplies to meet peak demand, even in a 1-in-20 day. There would need to be sufficient price signals in the market to attract regular LNG cargoes to the UK, an obligation that sits with the shipper community.
- Market intelligence continues to indicate that LNG will flow more frequently with it being a favourable supply source, even at lower market prices, a key change from 2018.

More information on trading gas with the EU in a no-deal scenario can be found here.



4 Electricity

This chapter sets out our current view of the electricity system for winter 2019/20. It details our analysis of expected demand and available generation, and outlines the tools and notifications we have available to help us balance the system.

Our winter view is an assessment of security of supply for winter 2019/20, based on probabilistic modelling. In comparison, the week-by-week view is based on data provided to us by generators, updated weekly. As a result, while both sets of information are often similar, they are not directly comparable.

Winter view
Electricity

The margins on the electricity system are greater than last winter and forecasts are well within the national Reliability Standard. Our analysis is based on the EMR Base Case supply and demand assumptions[1].

This winter we expect…

- the de-rated margin for winter 2019/20 to be greater than last year
- the corresponding loss of load expectation (LOLE) to be well within the national Reliability Standard level of three hours per year.

Did you know?

When we calculate the de-rated margin for the winter, we use the total demand across both the transmission and distribution systems. This allows us to account for the growth in embedded generation and the impact of the Capacity Market (CM) when we assess security of supply.

However, throughout the rest of the *Winter Outlook* publication, electricity demand is purely transmission system demand (TSD). As the System Operator of the high voltage electricity transmission network, we balance supply and demand at transmission level across Great Britain. As such, this *Winter Outlook* represents our forecast of transmission supply and demand and the associated operational outlook.

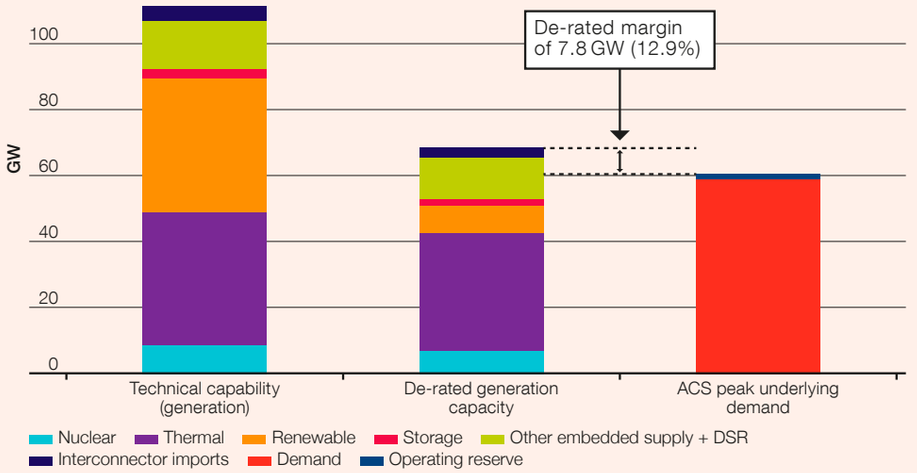
[1] https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/Electricity%20Capacity%20Report%202019.pdf

[2] This capacity covers all generation, not just transmission connected, and includes wind and solar, however, it excludes interconnectors.

Figure 4.1

De-rated margin at underlying demand level	7.8 GW
Margin as a percentage of underlying demand	12.9%
LOLE at underlying demand	<0.1 hours/year
Total maximum technical capability[2]	106.7 GW
Total average cold spell (ACS) peak underlying demand (including operating reserve)	60.4 GW
Operating reserve	1.5 GW
Net interconnector import flows	2.7 GW

Figure 4.1
Supply margin in relation to generation capacity and demand



Week-by-week view
Electricity

We expect there to be sufficient operational surplus for each week of winter 2019/20[3]. Normalised peak transmission demand is expected to occur in the first half of December and the operational surplus is also projected to be lowest at this time.

This winter we expect…

- the operational surplus to be higher than last year due to lower forecast transmission demand levels
- weather corrected demand (normalised) to be met under all interconnector scenarios
- average cold spell (ACS) demand to be met in all weeks under the base and high import interconnector scenarios and in all but three weeks for the low import scenario
- weather corrected transmission system demand to be lower than weather corrected outturns in previous years, primarily due to increased distribution connected generation.

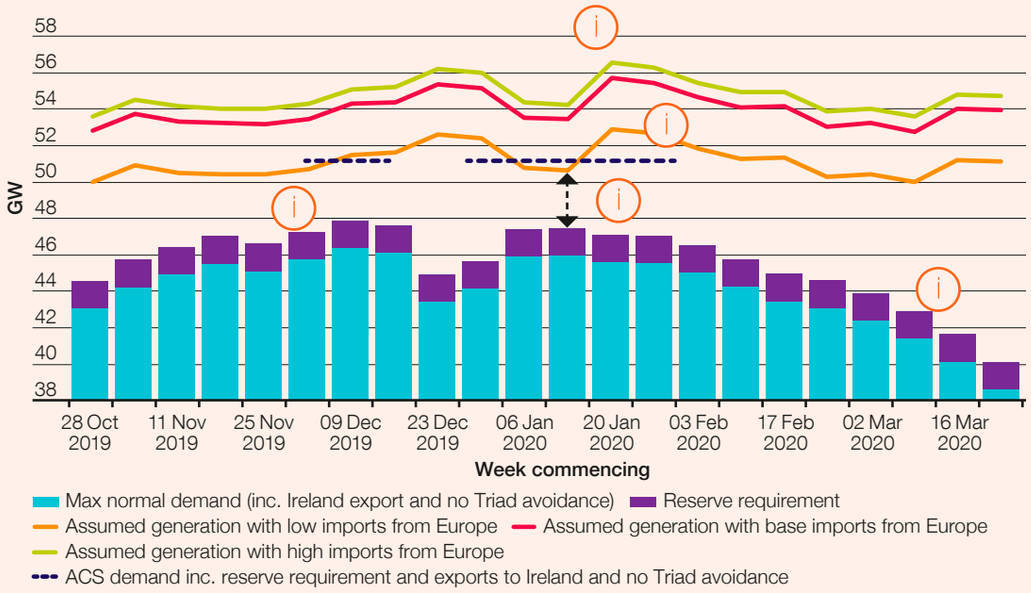
Did you know?

We analyse three levels of electricity supply, which includes a view of generation accounting for breakdown rates and a range of interconnector flows. We don't include potential market responses to higher demand or tighter conditions, such as power stations increasing their output levels for short periods. During periods of low operational surplus, generators may be incentivised to reschedule planned outages by Capacity Market obligations (if applicable) or through revenue opportunity from higher prices in the market. ACS demand has historically always occurred between the first week in December and the first week in February, but never during the Christmas fortnight.

Figure 4.2

Normalised peak transmission system demand	46.4 GW
Minimum demand	19.7 GW
Maximum Triad avoidance	2.6 GW

Figure 4.2
Week-by-week view of operational surplus for winter 2019/20



[3] Our analysis is based on generation availability data, otherwise known as Operational Code (OC2) data, provided to us by generators as at 26 September 2019.

Electricity demand

Electricity

Weather corrected peak demand for winter 2019/20 is expected to be lower than the previous two winters, largely as a result of additional embedded generation. Weather corrected minimum demand is also expected to be lower than last winter.

This winter we expect…

- weather corrected peak transmission system demand (TSD) to be 46.4 GW, based on assumptions in the table below
- weather corrected minimum demand to be 19.7 GW (assuming no interconnector exports overnight), see table 4.1.

Transmission connected power station demand	600 MW
Base case interconnector exports	750 MW
Embedded wind capacity	6.2 GW
Embedded solar capacity	13.1 GW
Pumped storage[4]	0 GW

Did you know?

When we forecast demand in this section, it is transmission system demand (TSD) which includes the demand from power stations and interconnector exports. We base our peak demand forecasts on seasonal normal weather, applying regression models to the average of various weather variables for the past 30 years. We then adjust our forecast to account for a standardised daily amount of embedded wind and solar generation (based on the seasonal normal weather and historical load factors).

[4] Pumped storage facilities typically replenish their lakes overnight when electricity is cheaper.

At peak times, interconnectors are typically exporting across the Moyle and EWIC interconnectors which connect GB to Ireland and so our peak TSD forecast accounts for this demand. This forecast is based on historical data statistics and current market conditions.

Minimum demand typically occurs during the night, and so our interconnector assumptions are based on historical overnight flows. These indicate that the interconnectors are more typically importing overnight, so no adjustment is made to minimum demand.

Figure 4.3

Historical and forecast normalised weekly peak winter demand

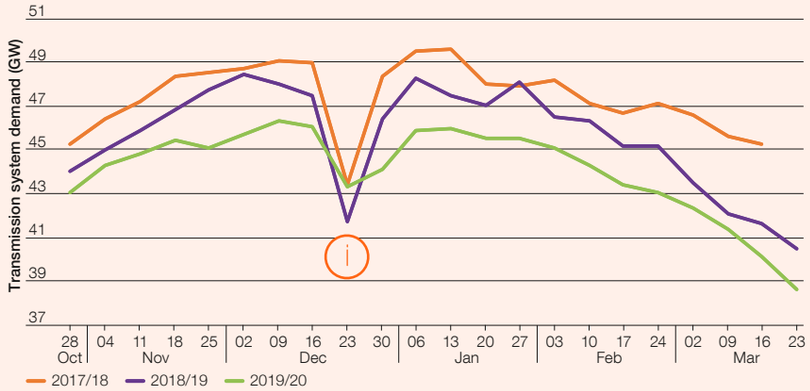


Table 4.1

Historical interconnector flows to Ireland overnight

Interconnectors	Import	Floating	Export	Total
EWIC	45.6%	22.4%	32.0%	100.0%
Moyle	52.3%	0.1%	47.6%	100.0%

Spotlight
Triad avoidance

Triads are the three half-hour settlement periods of highest demand on the GB electricity transmission system between November and February (inclusive) each year, separated by at least ten clear days. We use the Triads to determine transmission network use of service (TNUoS) demand charges for customers with half-hourly meters.

We do not publicly forecast the Triads in advance, they are only published post-February after the winter period has concluded. Triads encourage demand customers to reduce their usage of the system during peak times. Historically, this avoided the need for expensive infrastructure investment that all customers would need to pay for. The Triad avoidance (TA) season runs from 1 November to the end of February.

During a mild winter, it is generally harder to know which days are likely to be the indicative Triad demands. Hence, there is more likely to be Triad avoidance activity spread across the TA season during a mild winter.

The maximum Triad avoidance is seen to be increasing in recent years. This is believed to be linked to the growing capacity of batte distributed generation. Last winter, for the first time, we saw frequency deviations in the settlement period before expected Triad avoidance activity. We believe this is as a result of batteries switching from charging to discharging.

During this summer, we have occasionally seen transmission demand change abruptly in response to the wholesale electricity market price. This is also thought to be as a result of changes in battery generation. We anticipate that this behaviour may combine with traditional Triad avoidance during this winter making Triad avoidance forecasting more difficult. Some suppliers and consultancies provide a Triad forecasting service to notify their customers when they believe a Triad is likely to occur. Historic Triad avoidance data and associated guidance can be found **here**.

The table below shows how many instances of Triad avoidance activity that exceeded 500 MW were observed during the Triad avoidance season, alongside the maximum Triad avoidance for that same time period.

Table 4.2
Historical view of Triad avoidance

TA season	No. of occurrences	Max TA (GW)
2009/10	15	1
2010/11	14	1.2
2011/12	18	1
2012/13	14	1.2
2013/14	22	1.8
2014/15	24	1.2
2015/16	36	2
2016/17	48	2
2017/18	33	2
2018/19	30	2.4

Electricity generation

Electricity

Figure 4.4

We currently expect there to be sufficient levels of generation and interconnector imports to meet demand throughout the winter.

This winter we expect…

- gas to be ahead of coal in the generation running order, based on current forward fuel prices.

Did you know?

Our generation forecasts are based on published OC2 data, to which we apply a breakdown rate for each fuel type, in order to account for unexpected generator breakdowns, restrictions or losses close to real-time.

Our forecast explores the running order expected over the winter period based on the cost of producing energy. In figure 4.4, the order of the column stack reflects the expected running order.

Power stations with lower production costs will tend to run more often, and so our forecast is heavily dependent on fuel prices.

The assumed breakdown rates are based on historic data to reflect how generators performed against their planned availability during peak demand periods over the last three winters (see table 4.3). For wind generation, we assume an equivalent firm capacity (EFC) of 18 per cent.

Figure 4.4
Generation by fuel type (including breakdown rates)

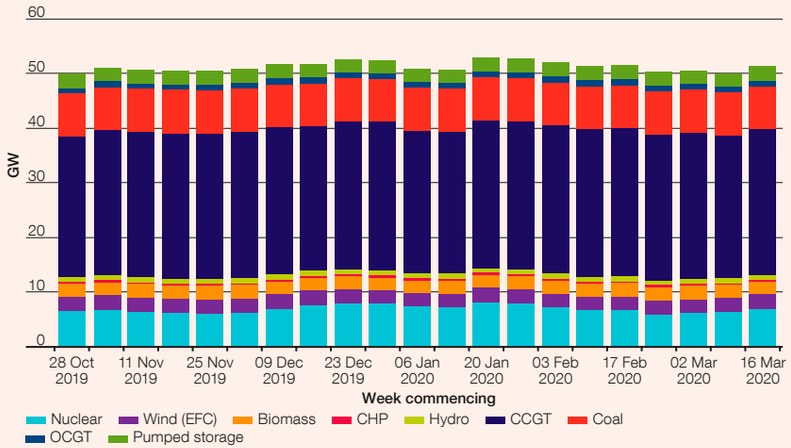


Table 4.3
Breakdown rates by fuel type (based on a 3 year rolling average)

Power station fuel type	Assumed breakdown rate	
	18/19	19/20
Coal	10%	7%
CCGT	6%	6%
Nuclear	8%	9%
OCGT	3%	4%

Power station fuel type	Assumed breakdown rate	
	18/19	19/20
Biomass	11%	3%
Hydro	3%	8%
Wind EFC	15%	18%
Pumped storage	3%	3%

Europe and interconnected markets
Electricity

Figure 4.5

We expect net imports of electricity on interconnectors from continental Europe to GB for most of the winter. We expect to typically export from GB to Northern Ireland and Ireland during peak times.

This winter we expect…

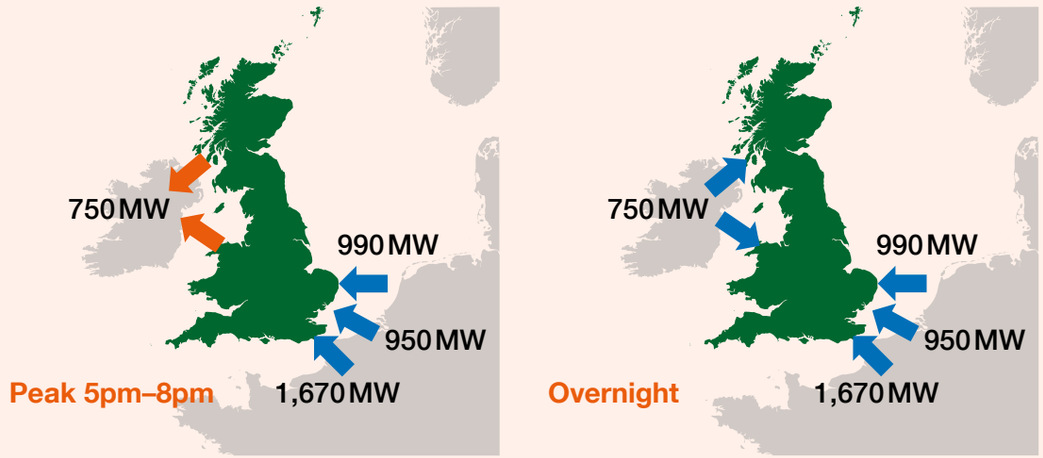
- electricity forward prices to remain higher in GB than continental Europe for winter 2019/20
- imports into GB at peak times via the IFA, BritNed and Nemo Link interconnectors, although occasionally not at full import and subject to weather variations
- Moyle and EWIC interconnectors to typically be exporting from GB to Northern Ireland and Ireland during peak times
- some import through Moyle and EWIC at times of high wind output in Ireland or during periods of system stress in GB.

Did you know?

We explore the potential range of interconnector flows each winter using a set of three scenarios and an additional scenario that includes an extra 1,000 MW import via ElecLink (subject to commissioning work). Each scenario includes a varying level of imports via IFA, BritNed and Nemo Link interconnectors.

Scenarios assume a 750 MW export to Ireland via the EWIC and Moyle interconnectors during peak times.

Figure 4.5
Forecast flows (high import scenario) on the interconnectors for winter 2019/20



See the **EU exit page** (page 41) for details of our contingency planning associated with the UK's planned exit from the European Union.

Scenario	Resulting in
Low (0 MW)	net export (750 MW) from GB
Base/Medium (2,800 MW)	net import (2,050 MW) to GB
High (3,610 MW)	net import (2,860 MW) to GB

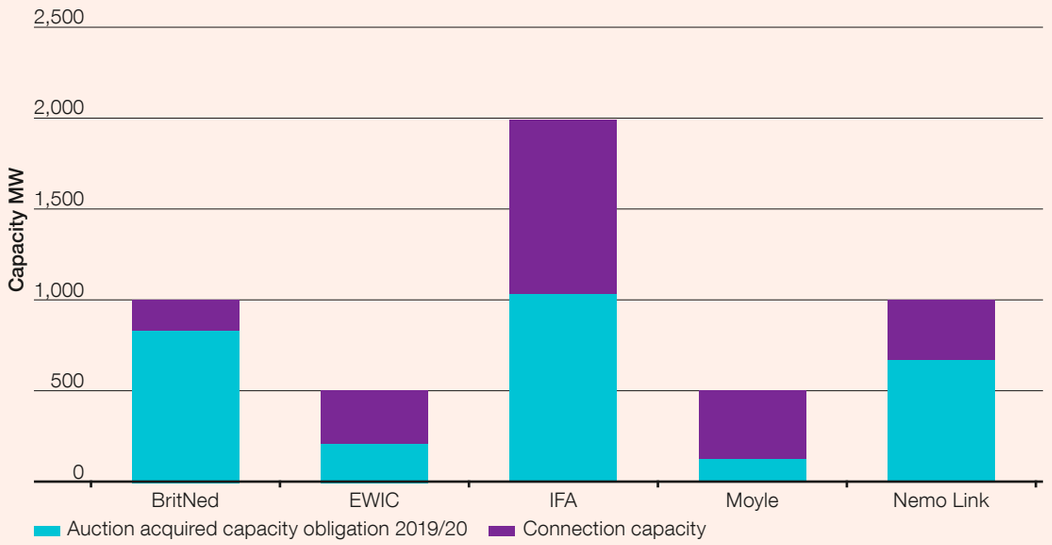
Europe and interconnected markets
Electricity

Figure 4.6

Capacity Market

Although the Capacity Market (CM) has currently been suspended, EWIC, Moyle and Nemo Link interconnectors won conditional Capacity Market agreements in the T-1 auction for 2019/20. Meanwhile, BritNed and IFA interconnectors have held Capacity Market obligations for 2019/20 since the T-4 auction in 2015.

Figure 4.6
Conditional Capacity Market agreements 2019/20



Europe and interconnected markets
Electricity

The flow of electricity on the interconnectors will depend on a number of factors.

1. Physical capabilities

Interconnector capability (shown in figure 4.7) will be affected by the following outages.

Table 4.4
Planned interconnector outages for winter 2019/20

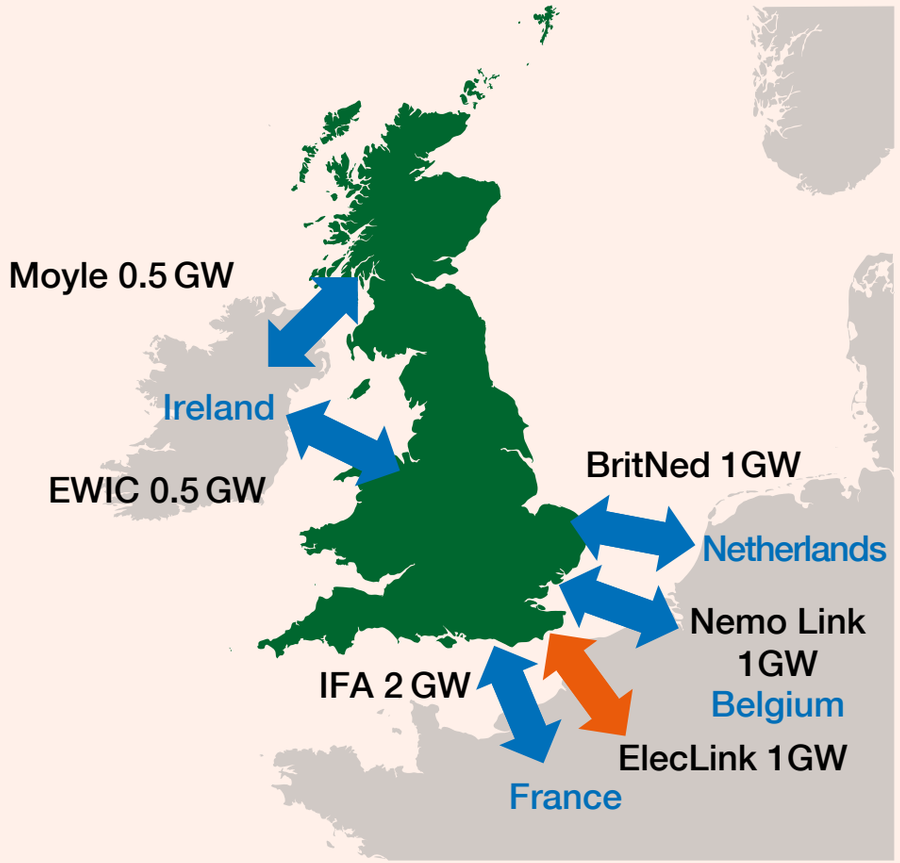
Interconnector	Planned outages (resulting capacity)
IFA	None
BritNed	None
Nemo	None
EWIC	31 Oct – 1 Nov (0 MW) 5 Feb – 6 Feb (0 MW)
Moyle	None

The Nemo Link went live on 31 January 2019, providing an additional 1 GW capability between Belgium and GB.

A new interconnector "ElecLink" is under construction, which may come into operational service over the winter period. Once commissioned, it will provide an additional 1 GW capability between France and GB. There are plans to carry out commissioning tests for ElecLink between Dec 2019 – Jan 2020.

[5] Please note the values quoted in figure 4.7 are maximum physical capacity and not expected flows.

Figure 4.7
GB's electricity interconnectors maximum physical capacity[5]



Europe and interconnected markets
Electricity

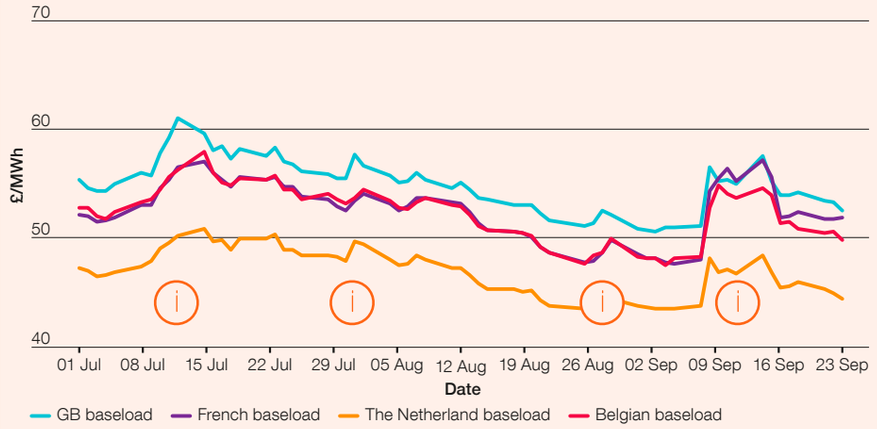
Figure 4.8
Figure 4.9

2. European forward prices

Energy flows through the interconnectors are primarily driven by the price differentials between the markets.

Forward prices for baseload electricity for winter 2019/20 in GB are still higher than the corresponding prices in the French, Dutch and Belgian markets (see figure 4.8). Therefore, we expect to see similar import/export patterns over the interconnectors as experienced last winter. ElecLink, as a new interconnector between the GB and French markets, is expected to behave similarly to the current IFA interconnector.

Figure 4.8
Winter 2019/20 electricity baseload forward prices

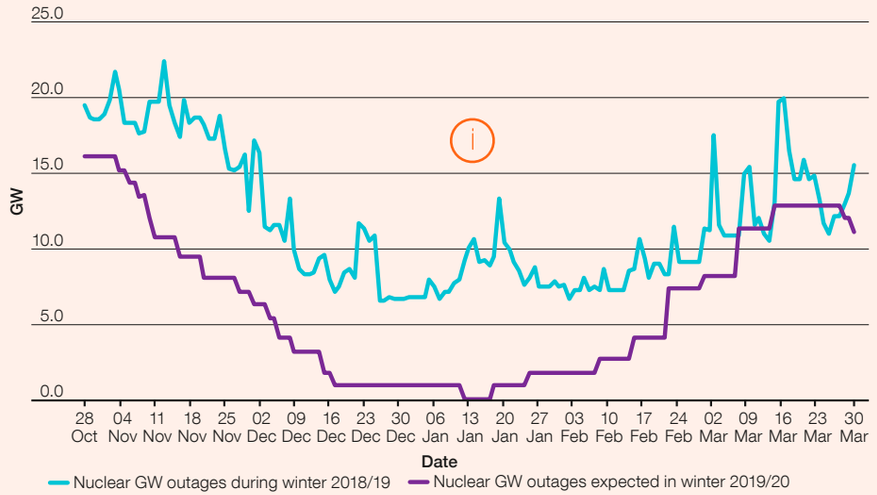


3. Network access constraints

Transmission outages in the regions where interconnectors are connected could cause power flow constraints resulting in disruption to the flows through the interconnectors.

In previous years, there were some periods when IFA exported from GB to France during the winter, driven by lower available French generation as a result of nuclear plant outages. Figure 4.9 shows that the planned French nuclear outages for this year are lower than the previous winter, so are not expected to significantly affect the interconnector flows.

Figure 4.9
The impact on French nuclear capacity from planned outages in 2019/20 and last winter's actuals



Europe and interconnected markets
Electricity

Figure 4.10
Figure 4.11

Overview of continental European interconnectors

Based on **forward prices** for the 2019/20 winter products, and no planned outages on continental interconnectors, we expect **imports** into GB at peak times from France, the Netherlands and Belgium under normal network operating conditions during the coming winter. Occasionally, these may not be at full import due to weather variations, which could push demands higher during cold spells or affect renewable generation across the region. See examples of this from last winter in figure 4.10.

The flow over the new **ElecLink** is expected to be similar to the IFA interconnector, depending on the outcome of the planned commissioning work. Once in service, ElecLink is expected to provide an additional 1 GW of capacity between the GB and French markets.

Figure 4.10
Daily peak time flows across the continental interconnectors in winter 2018/19 (positive MW values mean imports into GB)

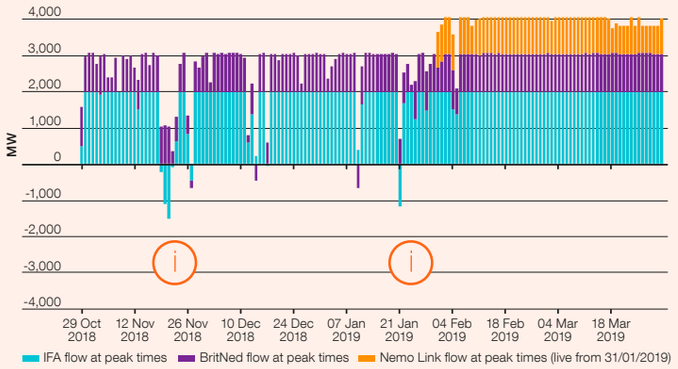
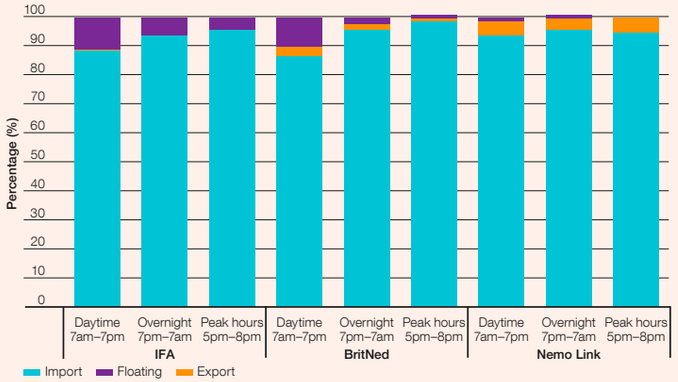


Figure 4.11
Proportion of import and export for continental interconnectors during winter 2018/19



Europe and interconnected markets
Electricity

Figure 4.12

Figure 4.13

Overview of Irish interconnectors

During winter 2019/20, we expect GB to export to Northern Ireland and Ireland during peak times on the Moyle and EWIC interconnectors. This may, however, be reversed to import into GB during periods of high wind and system stress. Figure 4.12 shows examples of where market conditions and weather variance affected the flows last winter.

One of the major coal-firing units in Northern Ireland has been awarded a capacity contract for 2019/20 via the T-1 auction to support supply should other units close or run less frequently due to carbon reduction targets, this may encourage more imports from GB through the Moyle interconnector.

Figure 4.12
Daily peak time flows across the Irish interconnectors in winter 2018/19 (positive MW values mean imports into GB)

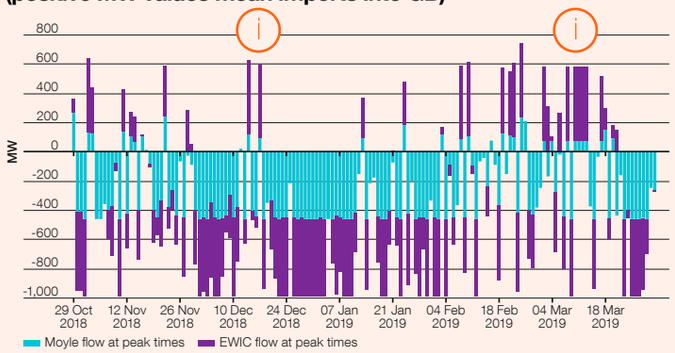
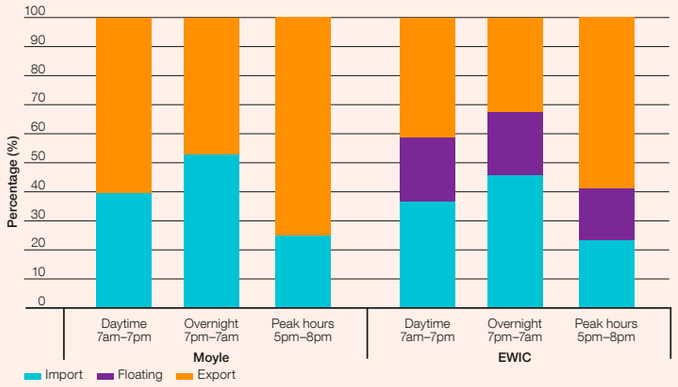


Figure 4.13
Proportion of import and export for Irish interconnectors during winter 2018/19



Spotlight

Wider Access to the BM and Project TERRE

Wider Access

The aim of Wider Access (WA) is to remove barriers to entering the GB Balancing Mechanism (BM) market for smaller, non-traditional providers, and to enable access to the Trans-European Replacement Reserve Exchange (TERRE) market. This will open new revenue streams for market participants and provide us (as National Grid ESO) with a greater range of options for managing operability challenges.

Barriers will be reduced by:

- reducing the lower limit of generation capacity from >100 MW to >1 MW so that small, non-traditional generating units can participate as secondary BM units (SBMUs)
- allowing SBMUs within a regional distribution network (DN) to aggregate and submit data at an aggregated level
- introducing the concept of a Virtual Lead Party (VLP), a legal entity that will be able to register and be responsible for SBMUs, just as a Lead Party is responsible for a traditional primary Balancing Mechanism Unit (BMU)
- enhancing the IT interface between NGESO and market participants so data submission is more efficient and cost effective for smaller and aggregated units.

To enable Wider Access to the GB BM and the European Replacement Reserve (RR) market, we are working with groups of 'early adopter' market participants to build a web-based application programming interface (API) and a new operational metering data aggregator system.

The new Replacement Reserve (RR) market was due to go live in December 2019. However, to allow more time for development, participating TSOs are requesting an extension or 'derogation' to delay the go-live of TERRE from December 2019 to June 2020. The associated testing and implementation timelines for the ESO API and data aggregator system used for TERRE will now be re-planned accordingly.

Wider Access will still go live in December 2019 and isn't affected by the TERRE delay.

The **Trans-European Replacement Reserve Exchange (TERRE)** project, set up by ENTSO-E, is implementing a new Replacement Reserve (RR) balancing product for use by national transmission system operators (TSOs) to support their Balancing Mechanisms (BMs).

This product will be traded in 15 minute blocks with an activation time of 30 minutes (the time during which a provider must reach full delivery following an instruction from the System Operator).

For more information…

General website
nationalgrideso.com/balancing-services/wider-access

Latest update 'newsletter'
nationalgrideso.com/document/150291/download

Q&A document
nationalgrideso.com/document/150296/download

Entering the BM guide (slides 3, 10 and 15)
nationalgrideso.com/document/150276/download

Operational outlook
Electricity

Decarbonisation, decentralisation and digitalisation are driving significant change across the electricity network. They are already impacting the operational outlook as what used to be summer operability issues are now impacting the system year-round.

As National Grid ESO, we may need to take actions across our five core security areas to ensure operational security.

Thermal
The import and export from the South East of England and from Scotland have presented significant operability challenges in the past. This winter we expect the transmission capacity at these boundaries to be intact, unless there is a significant network fault or overrun of the outage plan. With the commissioning of ElecLink and return of Dungeness from planned outage, there is a risk that we will need to manage interconnector flows in the South East ahead of planned network reinforcement.

The Western High Voltage (HVDC) link will further help relieve congestion between Scotland and England. The return of Hunterston power station also means that we do not expect any additional mitigating action will be required to manage the operability issues relating to the import of energy into Scotland.

Voltage
Managing reactive power and voltage levels will continue to be challenging. The actions needed could include:

- contracting in advance with appropriate generators so that they are energised (and hence able to provide reactive power) in periods where they might otherwise have been uneconomic
- taking within-day trading actions, or bid/offer acceptances, via the Balancing Mechanism, so that generators provide reactive power capability.

Stability and frequency
In periods of low demand, high volumes of low inertia generation can cause operational issues such as high rates of change of frequency (ROCOF). In such circumstances, we will need to either reduce the size of the largest loss or increase system inertia by bringing on inertia providing plant (i.e. thermal generation like gas or coal).

Work continues to move smaller generation to new protection settings, which will reduce the need to manage system stability using operational tools.

Restoration
Availability of Black Start services is generally good over winter, with few stations having planned outages and more stations running economically in the market without requirement for additional warming to maintain capability. Availability is continuously monitored and actions will be taken if required.

Operational toolbox
Electricity

Electricity notices:

The Capacity Market (CM) was introduced by the UK Government as part of the Electricity Market Reform (EMR) programme. It aims to ensure the future security of our electricity supply by providing a payment for reliable sources of capacity, alongside electricity revenues, to ensure the delivery of energy when it's needed. With the introduction of the CM came two new notifications which we can use to manage security of supply. Here, we provide you with an explanation of each to remind you of the tools we may call upon during times of system stress. We have also provided some important links to further information and to our dedicated website.

Electricity margin notice (EMN)
The EMN is the first of the hierarchy of notifications we issue to manage security of supply. An EMN can be issued at any time by our Control Room via BM reports, but is usually within 24 hours of the expected period of tightness. It is a routine tool that is designed to inform the industry of the forecast position and to request additional capacity to be made available. Additional capacity is mostly required for the evening peak demand period. In response to an EMN being issued, we would typically expect more plant to be made available to the market and existing plant to run more reliably. In most cases, this would prevent the need for further action and allow the notification to be withdrawn later. If the market does not respond when an EMN is issued, or the response is not enough, there are a number of further actions that we can take. If all market options have been exhausted, we can then use other services, such as maximum generation. This is a request made to power stations to generate at their highest possible output, in excess of normal technical and commercial parameters.

High risk of demand reduction (HRDR)
An HRDR notification is an early notification to inform distribution network operators (DNO) and transmission connected customers of the increased risk of a demand reduction and the location of that potential reduction. Industry participants are required to prepare their demand reduction arrangements.

Operational toolbox
Electricity

Capacity Market notice (CMN)
A decision to issue a CMN is based on data provided by industry participants. A calculation predicts the shortfall between forecast volumes of demand on the electricity transmission system (plus the volume of operating margin we hold in reserve) and the supply declared by generators. If there is a risk of a national shortage of generation (500 MW or less), we generate an automated notice four hours in advance. The market is expected to respond to this notice by adjusting its position, with providers either delivering energy or reducing demand against their agreement. Capacity providers are required to meet their capacity obligations. Failure to do so will result in financial penalties.

Alternatively, if they over-deliver on their obligations, they may be eligible for additional payments. There is no formal dispatch mechanism in the CM. In the event of a CMN being issued, we recommend that industry participants make themselves aware of further operational information available to the industry closer to the notice activation time. These include, for example, the **BM reports website**. We will issue a CMN via a dedicated **website**. All industry participants and stakeholders can view this website. They can also subscribe for automated email and SMS alerts. The CMN can be cancelled if the situation improves, based on data being updated in real-time.

More information can be found at:

EMR delivery

Capacity Market rules

BM reports

Demand control imminent (DCI)
A DCI notice may be issued to provide short-term notice when a demand control instruction is expected in the following thirty minutes. The warning is sent to the DNOs and transmission connected demand that a DCI has been published on the BM reports website.

Demand control instruction
This instruction can be spread nationally to manage a system margin shortfall or concentrated locally, for other system operation challenges, to limit the consequences on the wider network. The instruction will contain the level of reduction required to avoid the shortfall and specifies the demand control stages required. The DNO can reduce voltage on its network without affecting customer supplies and, in subsequent stages, they can disconnect portions of demand. The instruction can relate to up to 40 per cent of the DNO's total demand and is split into stages of voltage reduction and demand disconnection.

Hot topics
Electricity

EU exit risk analysis

As part of our contingency planning, we have carried out analysis on a range of scenarios to test the risks associated with the UK's planned exit from the European Union.

- The central case is that the interconnectors continue to flow and we can continue to manage the system as at present. There will be changes to the trading arrangements for the interconnectors but this is not envisaged to have any material implications.
- As a prudent System Operator, we have also carried out electricity adequacy and operability analysis on a scenario where there are no flows on the electricity interconnectors from EU exit day one.
- In this very unlikely scenario, there remains sufficient margin available to compensate for zero interconnector flows.
- We also have an operability strategy in place to manage this scenario and no actions in the market are currently required.

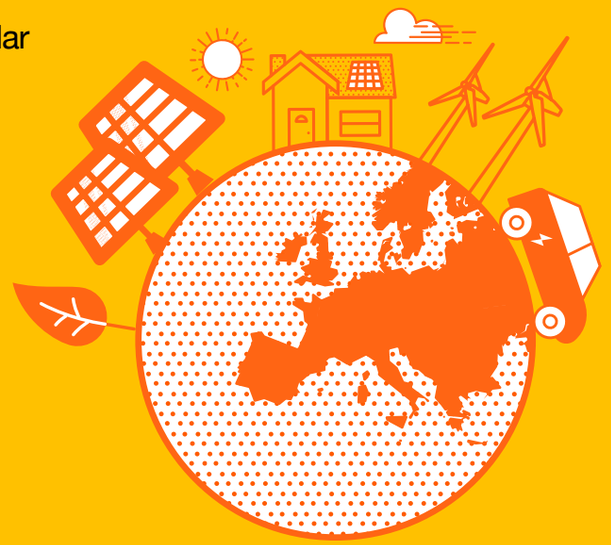
More information on trading electricity in a no-deal scenario can be found **here**.

Capacity Market suspension

Since the suspension of the Capacity Market on 15 November 2018, we have been working with the Department of Business, Energy and Industrial Strategy (BEIS) and the industry towards restoration of the Capacity Market.

We consider that the Capacity Market has met its core objective to ensure electricity security of supply at the lowest cost to consumers. As such, we believe that there is a need to continue the Capacity Market, and that this is the correct mechanism to promote long-term stable investment in capacity by providing a stable and reliable longer-term price signal.

We are confident that the Capacity Market will be restored and will evolve to continue to be a key pillar of the transition to a low-carbon energy future.



Glossary

Throughout this document, there are terms highlighted in purple that are explained in more detail here.

1-in-20 peak demand:
the level of demand that, in a long series of winters, with connected load held at levels appropriate to the winter in question, would be exceeded in one out of 20 winters, with each winter counted only once.

1-in-50 peak demand:
1-in-50 peak demand is the level of demand that, in a long series of winters, with connected load held at levels appropriate to the winter in question, would be exceeded in one out of 50 winters, with each winter counted only once.

750 MW export to Ireland:
We base this value on the average observed flow during peak-demand hour for each day of last winter.

Average cold spell (ACS):
ACS methodology takes into consideration people's changing behaviour due to the variability in weather, e.g. more heating demand when it is colder and the variability in weather dependent distributed generation e.g. wind generation. These two elements combined have a significant effect on peak electricity demand.

Balancing Mechanism:
is one of the tools used by National Grid ESO to balance electricity supply and demand close to real-time. Where National Grid ESO predicts that there will be a discrepancy between the amount of electricity produced and that which will be in demand during a certain time period, they may accept a 'bid' or 'offer' to either increase or decrease generation (or consumption).

The balancing mechanism is used to balance supply and demand in each half hour trading period of every day.

Balancing Mechanism (BM) reports:
are published on the Elexon website and provide operational data relating to the GB Electricity Balancing and Settlement arrangements.

Balancing Mechanism Units (BMU):
are used as units of trade within the Balancing Mechanism. Each BM Unit accounts for a collection of plant and/or apparatus, and is considered the smallest grouping that can be independently controlled.

Baseload electricity:
is either a market product for a volume of energy across the whole day (the full 24hrs) or a running pattern of being on all the time for power sources that are inflexible and operate continuously, like nuclear.

BBL:
A bi-directional gas pipeline between Balgzand in the Netherlands and Bacton in the UK. You can find out more at **www.bblcompany.com**

Beach supplies:
Gas produced offshore and brought onshore to the shore/beach gas terminal, but not yet part of the national transmission system (NTS) for gas.

beast from the east:
is a phrase used by the Met Office to describe cold and wintry conditions in the UK as a result of easterly winds from the near continent.

BEIS:
The government department for business, energy and industrial strategy.

Benefits for society as a whole:
The SO is committed to providing transparent, accurate information and insight. This is essential to the evolving challenge of system operability and the role of markets in delivering secure and efficient system operation. We provide all data and insights free of charge. It facilitates industry discussion, fosters innovation and improves decision-making across the industry, ultimately delivering benefits for consumers and society as a whole.

Black Start:
is the procedure used to restore power in the event of a total or partial shutdown of the national electricity transmission system.

Breakdown rates:
A calculated value to account for unexpected generator unit breakdowns, restrictions or losses. Forecast breakdown rates are applied to the operational data provided to the ESO by generators. They account for restrictions and unplanned generator breakdowns or losses close to real-time. Rates are based on how generators performed on average by fuel type during peak demand periods (7am to 7pm) over the last 3 winters.

BritNed:
BritNed Development Limited is a joint venture between Dutch TenneT and British National Grid that operates the electricity link between Great Britain and the Netherlands. It is a bi-directional interconnector with a capacity of 1,000 MW. You can find out more at **www.britned.com**

Clean dark spread:
the revenue that a coal-fired generation plant receives from selling electricity once fuel and carbon costs have been accounted for.

Glossary

Clean spark spread:
the revenue that a gas-fired generation plant receives from selling electricity once fuel and carbon costs have been accounted for.

Capacity Market (CM):
The Capacity Market is designed to ensure security of electricity supply. This is achieved by providing a payment for reliable sources of capacity, alongside their electricity revenues, ensuring they deliver energy when needed.

Cold day:
the demand forecast for the coldest day in an average (or seasonal normal) winter.

Constraints:
A constraint is where the capacity of the electricity network in a particular area is unable to manage the demand and supply of electricity in that area. This could be due to various factors such as a broken down network asset, or weather conditions leading to high supply of generation, for example.

Corrib:
is a gas field off the west coast of Ireland.

De-rated capacity:
is the capacity of generation reduced to best reflect what is expected to be available in real-time. The reduction is to account for unexpected outages or breakdowns and other restrictions to the generators which is based on historic performance.

De-rated margin for electricity:
is the sum of de-rated supply sources declared as being available during the time of peak demand plus support from interconnection, minus the expected demand at that time and basic reserve requirement. This can be presented as either an absolute GW value or a percentage of demand (demand plus reserve). The formula was revised in winter 17/18 to include distribution system demand, and in winter 18/19 to better account for interconnection. See our previous publications for further details (**https://www.nationalgrideso.com/insights/winter-review-and-consultation**).

Distribution networks (DNs):
carry electricity from the high voltage transmission grid to industrial, commercial and domestic users.

Distribution network operators (DNOs):
are responsible for the electricity distribution networks which carry electricity from the high voltage transmission grid to industrial, commercial and domestic users. There are 14 licenced DNOs in Britain and each is responsible for a specific regional distribution services area.

East West Interconnector (EWIC):
A 500 MW interconnector that links the electricity transmission systems of Ireland and Great Britain. You can find out more at **www.eirgridgroup.com/customer-and-industry/interconnection/**

ElecLink interconnector:
is a new HVDC 1,000 MW electricity interconnector which is being built to operate between France and Great Britain via the Channel Tunnel.

Electricity Market Reform (EMR):
is a government policy to incentivise investment in secure, low-carbon electricity, improve the security of Great Britain's electricity supply, and improve affordability for consumers.

Embedded generation:
Power generating stations/units that are not directly connected to the National Grid electricity transmission network for which we do not have metering data/information. They have the effect of reducing the electricity demand on the transmission system.

ENTSO-E:
European Network of transmission system operators for Electricity.

Equivalent firm capacity:
An assessment of the entire wind fleet's contribution to capacity adequacy. It represents how much of 100 per cent available conventional plant could theoretically replace the entire wind fleet and leave security of supply unchanged.

European Union's Emissions Trading System (EU ETS):
An EU-wide system for trading greenhouse gas emission allowances. The scheme covers more than 11,000 power stations and industrial plants in 31 countries.

Export:
Interconnectors flowing out of GB.

Glossary

Forward price:
is the predetermined delivery price for an underlying commodity, such as electricity or gas, as decided by the buyer and the seller of the forward contract, to be paid at a predetermined date in the future.

***Future Energy Scenarios* (*FES*):**
Our *FES* publication contains a range of credible pathways for the future of energy out to 2050. They form the starting point for all transmission network and investment planning, and are used to identify future operability challenges and potential solutions. You can find out more at **http://fes.nationalgrid.com/**

***Gas Ten Year Statement*:**
The *GTYS* is published annually to provide you, our customers and stakeholders, with a better understanding of how we intend to operate and plan for the gas national transmission system (NTS) over the next ten years.

Generation running order:
is the order we expect generation plant supplying electricity over the winter period to run based on the cost of producing energy. Power stations with lower production costs will tend to run more often.

Groningen field:
The Netherlands has two separate gas networks for gases of different qualities. The Groningen field produces gas with lower calorific value called L gas (or sometimes referred to as G gas). This is used for all residential heating in the Netherlands but is unsuitable for export to GB through BBL. Gas with a higher calorific value, or H gas, is produced from some Dutch fields and also imported from other countries. GB imports through BBL are all H gas.

Hunterston power station:
Hunterston B power station is a nuclear power station in North Ayrshire, Scotland.

Import:
Interconnectors flowing into GB.

Improved quality of service:
Improved service quality for our customers and stakeholders ultimately benefits the consumer as interactions in the value chains across the industry become more seamless, efficient and effective.

Improved safety and reliability:
As the energy landscape continues to decarbonise and transform, we operate a system with much more complex flows of energy and invest to make sure it remains safe and secure in the future.

Inertia:
System inertia is how resilient a system is to frequency change. System inertia will depend on what types of generation are connected to the system. Typically, generators with large moving parts have high inertia – because their moving parts continue to move even after they are switched off or turned down. In contrast, some types of generation that have no moving parts, such as solar panels, are classed as low inertia generation.

In-feed loss:
the level of power loss that the transmission system must be able to sustain without the system frequency falling below a defined level.

Interconnector flows:
in this section are based on typical commercial flows plus/minus a high/low sensitivity and historic breakdown rates, unlike those used in the 'winter view' which are based on flows under potential stress event conditions.

Interconnector (UK) Limited (IUK):
A bi-directional gas pipeline between Bacton in the UK and Zeebrugge in Belgium. You can find out more at **www.interconnector.com**

Interconnectors (gas):
Gas interconnectors connect gas transmission systems from other countries to the national transmission system (NTS) in England, Scotland and Wales. There are currently three gas interconnectors that connect to the NTS. These are:

- IUK interconnector to Belgium
- BBL to the Netherlands
- Moffat to the Republic of Ireland, Northern Ireland and the Isle of Man.

Interconnexion France–Angleterre (IFA):
The England–France Interconnector is a 2,000 MW link between the French and British transmission systems. Ownership is shared between National Grid and Réseau de Transport d'Electricité (RTE).

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. You can find out more at **www.grainlng.com**

Glossary

Load duration curves:
The average load duration curve is that curve which, in a long series of winters, with connected load held at the levels appropriate to the year in question, the average volume of demand, above any given threshold, is represented by the area under the curve and above the threshold. The 1-in-50 severe load duration curve is that curve which, in a long series of years, with connected load held at the levels appropriate to the year in question, would be such that the volume of demand above any given demand threshold (represented by the area under the curve and above the threshold) would be exceeded in one out of fifty years.

Load factors:
Load factors are an indication of how much a generation plant or technology type has output across the year, expressed as a percentage of maximum possible generation. These are calculated by dividing the total electricity output across the year by the maximum possible generation from each plant or technology type.

Loss of load expectation (LOLE):
Used to describe electricity security of supply. It is an approach based on probability and is measured in hours/year. It measures the risk, across the whole winter, of demand exceeding supply under normal operation. This does not mean there will be loss of supply for three hours per year. It gives an indication of the amount of time, across the whole winter, which the System Operator (SO) will need to call on balancing tools such as voltage reduction, maximum generation or emergency assistance from interconnectors. In most cases, loss of load would be managed without significant impact on end consumers.

Lower bills than would otherwise be the case
We lower consumers bills by efficiently and effectively balancing the electricity and gas systems, and facilitating markets worth over £35 billion per year. We make decisions that influence network development, wider wholesale market costs and capacity, which all form part of the consumer bill.

Margin (gas):
the difference between the level of demand and the supply that is available to meet it. In our gas stress tests, we consider the margin between potential supply and demand for a 1-in-20 peak day.

Margins Notice:
Issued if forecast gas demand for the day-ahead exceeds a pre-defined forecast of supply.

Medium-range storage (MRS):
These commercially operated sites have relatively short injection/withdrawal times. This means they can react quickly to demand, injecting when demand or prices are lower and withdrawing when they are higher.

Minimum demand:
is the lowest demand on the transmission system. This typically occurrs overnight.

Moyle:
A 500 MW bi-directional interconnector between Northern Ireland and Scotland. You can find out more at **www.mutual-energy.com**

N-1 test:
The N-1 assessment means that we, as 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.

Nemo Link:
The Nemo Link is an HVDC sub-sea link between GB and Belgium.

Net import/export:
The sum of total generation flowing via interconnectors either into or out of GB.

Net import flows:
Net interconnector import flows in this section are based on flows under potential stress event conditions. Interconnector flows in the ‘EU and connected markets’ section are based on typical commercial flows plus/minus a high/low sensitivity.

Non-beach supplies:
typically refers to gas from storage, liquefied natural gas (LNG) and gas imported through the interconnectors.

Non-daily metered (NDM):
A classification of customers where gas meters are read monthly or at longer intervals. These are typically residential, commercial or smaller industrial consumers.

Glossary

Non-storage supply (NSS):
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).

Normalised transmission demand:
is the demand seen on the transmission system, forecast using long-term trends and calculated with the effects of the weather and the day of the week removed as appropriate. This takes into account the power used by generating stations when producing electricity (the 'station load') and interconnector exports.

Normalised transmission peak demand:
is the peak demand seen on the transmission system, forecast using long-term trends and calculated with the effects of the weather and the day of the week removed as appropriate. This takes into account the power used by generating stations when producing electricity (the 'station load') and interconnector exports.

NTS shrinkage:
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), gas that is used in the running of the system e.g. compressor fuel.
- 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 of gas entering that network.

Operational Code 2 data (OC2 data):
Information provided to National Grid System Operator by generators. It includes their current generation availability and planned maintenance outages. You can access the latest OC2 data throughout the year on the BM reports website at **www.bmreports.com**

Operational surplus:
The difference between the level of demand (plus the reserve requirement) and generation expected to be available, modelled on a week-by-week basis. It includes both notified planned outages and assumed breakdown rates for each power station type.

Outage:
The annual planned maintenance period, which requires a complete shutdown, during which essential maintenance is carried out.

Peak:
The maximum requirement of a system at a given time, or the amount of energy required to supply customers at times when need is greatest. It can refer either to a given moment (e.g. a specific time of day) or to an average over a given period of time (e.g. a specific day or hour of the day).

Peaking plant:
Power plants that generally run only when there is a high demand for electricity, in order to balance the grid.

Pumped-storage:
a system in which electricity is generated during periods of high demand by the use of water that has been pumped into a reservoir at a higher altitude during periods of low demand.

Rate of Change of Frequency (RoCoF):
How quickly system frequency changes on the electricity network. Usually measured in Hertz per second. Some generators have a protection system that will disconnect it from the network if the Rate of Change of Frequency goes above a certain threshold.

Reactive power:
Reactive power describes the movement of energy across a network and is measured in MVAr. Different types of network assets and generators can generate or absorb reactive power. The flows of reactive power on a system affect voltage levels.

Reduce environmental damage:
As the SO, we are at the centre of the transition to a low-carbon system. We design markets that support new, low-carbon technologies and disruptive solutions to today's environmental challenges.

Replacement Reserve:
is a harmonised service across participating European TSOs for the provision of both an increase and decrease of active power.

Reserve requirement:
To manage system frequency and to respond to sudden changes in demand and supply, the System Operator maintains positive and negative reserve which is the capability to increase or decrease supply and demand. Reserve can be thought of as the requirement for a total amount of headroom (positive reserve) and foot room (negative reserve) provided across all generators synchronised to the system.

Seasonal normal demand:
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.

Glossary

Seasonal normal weather:
A set of weather conditions representing the average 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.

Technical capability:
is the capacity of connected plant expected to be generating in the market, based on the results of the Capacity Market auctions as well as a range of other sources of market intelligence, but not taking any account of potential breakdown or outage.

TNUoS demand charges:
Transmission Network Use of System charges recover the cost of installing and maintaining the transmission system in England, Wales, Scotland and Offshore. Generators are charged according to TEC (Transmission Entry Capacity). Suppliers are charged based on actual demand.

Transmission system demand (TSD):
Electricity demand that National Grid ESO, as the Electricity System Operator, sees at grid supply points, which are the connections to the distribution networks.

Transmission system operators
European transmission system operators (TSOs) for electricity are entities operating independently from the other electricity market players and are responsible for the bulk transmission of electric power on the main high voltage electric networks.

The Triad avoidance season:
runs from 1 November to the end of February each year.

Triad avoidance:
when demand side customers reduce the amount of energy they draw from the transmission network, either by switching to distribution generation sources, using on-site generation or reducing their energy consumption. We observe this behaviour as a reduction in transmission demand. This is sometimes referred to as customer demand management, but in this section we are considering customer behaviour that occurs close to anticipated Triad periods, usually to reduce exposure to peak time charges.

Triads:
the three half-hourly settlement periods with the highest electricity transmission system demand. Triads can occur in any half hour on any day between November and February. They must be separated from each other by at least ten days. Typically, they take place on weekdays around 4.30pm to 6pm.

UK Carbon Price Support (CPS) tax:
is the UK-only tax rate paid by electricity generators per tonne of CO_2 emitted, paid in addition to the EU ETS allowance price, as part of the Government's Carbon Price Floor (CPF) policy. The CPS rate is set at £18/tCO_2 and remains fixed until 2021.

UK Continental Shelf (UKCS):
Made up of the areas of the sea bed and subsoil of territorial sea over which the UK exercises sovereign rights of exploration and exploitation of natural resources.

Underlying peak demand:
demand varies from day to day, depending on the weather and the day of week. Underlying demand is a measure of how much demand there is once the effects of the weather, the day of the week and distributed generation, have been removed.

Uniform Network Code (UNC):
The Uniform Network Code (UNC) is the hub around which the competitive gas industry revolves, comprising a legal and contractual framework to supply and transport gas. It has a common set of rules which ensure that competition can be facilitated on level terms.

Units:
The gas and electricity industries normally use the conventions, units and metrics most applicable to the respective fuels. However, as whole system interactions increase, there is value in viewing the energy provided by both fuels through a single lens. This section therefore uses common units for gas and electricity to show a direct comparison for both fuels.

Very cold month:
Day 30 of the 1-in-20 load duration curve (LDC) from the 5 year forecast for gas year 19/20.

Very cold week:
Day 7 of the 1-in-20 load duration curve (LDC) from the 5 year forecast for gas year 19/20.

Very cold winter:
Day 60 of the 1-in-20 load duration curve (LDC) from the 5 year forecast for gas year 19/20.

Voltage:
Unlike system frequency, voltage varies across different locations on the network, depending on supply and demand for electricity, and the amount of reactive power in that area. Broadly, when electricity demand falls, reactive power increases and this increases the likelihood of a high voltage occurrence.

Glossary

Weather corrected demand (electricity):
The demand expected or outturned with the impact of the weather removed. A 30-year average of each relevant weather variable is constructed for each week of the year. This is then applied to linear regression models to calculate what the demand would have been with this standardised weather.

Weather corrected demand (gas):
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 composite weather variable and expected composite weather variable by a value that represents demand sensitivity to weather.

Western High Voltage (HVDC) link:
The Western Link uses DC technology to reinforce the existing UK transmission system and move electricity across the country in very large volumes between Hunterston in Scotland and Deeside in North Wales.

Wholesale electricity market:
The wholesale electricity market is where electricity is traded between generators and suppliers. This is different to the electricity retail market where the supplier sells directly to end consumers.

Figure/table glossary

Figure 2.1
Difference is due to efficiency of gas-fired generation.

Figure 2.2
These forecasts are normalised weather corrected demands.

This forecast demand represents a cold day with high gas demand for power.

This forecast demand represents a warm day with low gas demand for power.

Table 3.1
NDM: This sector is very sensitive to weather. Customers in this category are usually on non-daily metered (NDM) contracts. This means that their meters are read monthly, or at longer intervals. Residential demand is by far the biggest part of the NDM sector.

DM (excl. elec generation): Customers in this sector are those who are on daily metered (DM) contracts. This means that their meters are automatically read every day. They are typically industrial or commercial customers, but the sector excludes gas-fired generation plants because they are forecast separately. In industrial and commercial properties, gas is used to provide space heating, heat for processes, or used as a raw material. This sector is less sensitive to the effects of the weather than the non-daily metered sector.

Electricity generation: Electricity generation has some sensitivity to weather, but also depends on the hours of darkness. Gas-fired generation, as a proportion of total supply, varies with the amount of electricity from renewable sources. It is also dependent on the relative cost of generation at gas-fired and coal-fired power stations.

Ireland: GB has a gas interconnector link to Ireland (Moffat). This interconnector is only physically capable of flowing gas one way, out of GB and into Ireland. Gas exported to Ireland in this way is counted as part of overall GB demand.

Export to Europe: The GB gas market is connected to Belgium by the IUK interconnector and to the Netherlands via the BBL interconnector. Both of these interconnectors are capable of flowing gas in two directions, allowing for both import and export of gas. During the winter, gas is typically imported into GB from Europe. However, when gas is exported to Europe via these interconnectors it will be included in the total demand figure.

Storage injection: This is gas which is put ('injected') into a gas storage facility. There are several medium-range storage facilities connected to the high-pressure gas network. We anticipate that shippers will inject gas into, and withdraw gas from, these facilities many times over the winter. This is known as cycling. The injection is represented as part of total gas demand.

Figure 3.2
In this figure, we see demand reducing as the time periods increase but this is just a consequence of the way the severe condition is defined. A very cold week may be seven days below freezing, but a very cold month of the same severity would not include 30 days below freezing. A month of that type would be considered far more severe.

The longer the cold weather continues, the smaller the contribution storage can make to supply as stores of gas become depleted.

Figure 3.3
Peaks and troughs relate to weekends and public holidays.

Exports are typically dependent on the volumes of storage held in Europe and storage levels are currently higher than average. However, exports are still expected in October.

During the Christmas period, there are typically reductions in demand from domestic and industrial gas consumers, as well as a reduction in gas needed for electricity generation.

Figure 3.5
Booked import capacity for both IUK and BBL is currently much lower than the actual import capacity booked last winter.

Figure 3.6
Last winter, IUK flows picked up when BBL reached capacity during January and February.

Figure 3.7
At the beginning of last winter, the differential between UK and Asian prices reduced alongside high shipping costs. This resulted in more LNG being brought into Europe, driving competition in the market and making LNG an attractive option for supply in GB.

Asian prices increased making it a more attractive destination for LNG shippers and therefore redirecting deliveries from the UK.

Figure 3.8
Times when the margin notice would have been triggered under the new methodology.

Figure/table glossary

Figure 4.2
The ElecLink interconnector, which is expected to be commissioned this winter, is not included in these projections. However, it would increase the operational surplus if included.

46.4 GW
Normalised transmission peak demand.

w/c 13 January 2020 to have the lowest level of operational surplus (3.2 GW).

The ACS demand shown on this chart has no Triad avoidance applied to it.

Our analysis assumes a basic real-time reserve requirement of 1,500 MW for each week (as the Electricity System Operator we are required to carry operating reserve to regulate system frequency and respond to sudden changes in demand and supply).

All of our interconnector scenarios include the Nemo Link, which went live on 31 January 2019.

Table 4.3
The reduction for coal plants is likely to be due to the fact that some of the older coal plants have now been decommissioned, and coal plant is typically running less frequently.

Prior to last winter, biomass data was included with coal. Now that we have more historical data that is separate, we can see that breakdown rates for biomass plant are typically lower than for coal plant.

Figure 4.3
Winter minimum demand typically occurs at the first weekend after the clock change. It can also be over the Christmas period, most likely on Boxing Day, but this is typically driven by weather conditions during these periods.

Figure 4.8
EU Emission Trading System (EU ETS) and GB natural gas forward prices increased and pushed baseload front season price up.

EU ETS and GB natural gas forward prices increased again.

News about extra French nuclear plant outages due to potential welding problems pushed baseload front season price up.

The extension of Dungeness nuclear plants outage; EU Emission Trading prices increased.

Oil/Gas prices increase.

Market is relaxed.

Figure 4.9
The installed nuclear capacity in France is 63.1 GW

Figure 4.10
Tight system margin in French market due to lower temperatures and reduction in generation as a result of industrial strike.

Lower temperature in France pushed demand upward and industrial action reduced generation from nuclear plants.

Figure 4.12
GB market was short so imported via EWIC and Moyle.

GB weather issues: storm Gareth caused ice, snow and strong winds resulting in import flows.

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