

Assessment of the impact of Ukraine invasion on gas supply

The invasion of Ukraine by Russia in February of this year has led to a heightened focus in Europe on gas supply and energy security. As a result, there has been increased volatility in the price of wholesale gas, which has been rising rapidly since the middle of 2021, resulting in historical highs across Europe in 2022. Russian gas supply to Europe has decreased significantly since the invasion, equating to just 20% of the 2020 gas year average up to end-August 2022.

A number of measures have been announced in recent months to combat the risk of gas supply shortages in Europe this winter. These include a voluntary reduction in gas demand of 15% for all EU countries¹ between August 2022 and March 2023 and a target for European natural gas storage sites² to be 80% full on 1st November to help mitigate the effect of any supply challenges. In light of the introduction of these targets, most EU states have implemented measures to reduce gas demand this winter and the EU collectively reached the 1st November target to fill natural gas storage sites by 80% ahead of time; as of the start of October natural gas storage was just over 89% full across the EU.

To compensate for the drop in Russian gas supply between January and August 2022, Liquefied Natural Gas (LNG) imports to Europe have increased significantly, from 50 bscm for this same period last year to 90 bscm by 31st August 2022. Over half of these imports in 2022 have been to North-West European countries, double the volume of the previous year, with many import facilities operating at capacity during the summer months.

National Grid gas winter outlook 2022/23

National Grid is the gas Transmission System Operator (TSO) for Great Britain (GB). Given that more than 70% of gas in Ireland is imported from Scotland via Moffat, Gas Networks Ireland look to National Grid's Gas Winter Outlook to inform our outlook for the winter ahead.

There is no forecasted change to the supply quantities available to GB, and hence to Ireland, for winter 22/23 compared to the previous year. Hence, the outlook for ROI indicates sufficient gas supply sources and network capacity to meet the anticipated demand projections over the coming winter period. Supplies from the UK Continental Shelf (UKCS) and from Norway are expected to be the main sources of supply to GB, with forecasted flows similar to the previous winter, with LNG, GB gas storage and interconnection with Europe providing flexible supplies to meet demand.

National Grid project LNG imports to be higher this winter than previous years, compensating for expected lower interconnector imports from the Netherlands and Belgium. The amount of gas in GB storage at the start of winter 2022/23 is at the high end of the five-year average for this time of year.

Should a supply deficit occur, National Grid expect that there will be an increase in storage withdrawal and LNG deliveries, in conjunction with a reduction in any continental Europe exports. Should a deficit still exist, these actions would then be followed by a requirement for continental Europe imports and maximising storage withdrawal.

Over the past five winters, imports from continental Europe have contributed an average of around 6% of total GB supply.

While some uncertainty exists around the supply of natural gas to continental Europe this winter, particularly as regards Russian gas supply and LNG imports, there are several reasons which support the import of gas to GB. To date, in spite of volatile and high gas prices, the market throughout Europe has continued to function, with gas flowing in the direction of where the price is highest. There is a strong correlation between price differential and interconnector flows. In addition, the market is preparing for both imports to and exports from GB this winter with import and export capacity currently being booked on the interconnectors with Europe.

The margin between forecast peak supply capacity and demand for winter 2022/23 is 122 mscm/d, an increase of 18 mscm/d compared to winter 2021/22. This indicates an expected increase in the capability of supply to meet demand on the peak day for the winter ahead driven largely by a reduction in forecast peak day demand compared to last winter. Expected reductions in domestic and industrial demand in response to higher gas prices are expected to be only partially offset by higher demand for gas for power generation on the peak day.

Under N-1 conditions, i.e. an event resulting in the loss of the single largest piece of National Transmission System (NTS) infrastructure, the supply margin at peak demand is 50 mscm/d. Again, this is a forecasted increase in the ability of supply to meet demand compared to winter 2021/22 on a peak day even with the largest supply source in GB unavailable.

While National Grid identify the need for gas imports from Europe on a cold day in winter, there is scope to instead increase gas supply from other sources, e.g. from Norway or the UKCS. However, given the more flexible nature of the gas interconnectors, imports from the Netherlands and Belgium are seen as the more likely supply source in the situation where markets across Europe are operating as expected.

¹ Ireland received an exemption on the mandatory 15% gas demand reduction target for winter 2022/23 because it is not directly connected to the European gas grid

² Ireland doesn't currently have a dedicated gas storage facility

Supply and demand overview

This Winter Outlook report sets out Gas Networks Ireland's analysis and view of the adequacy of the gas network for the coming winter. The gas supply position is dependent on both the supply of gas and on the system's ability to transport gas to the end user.

The Corrib gas field, following commencement of production in December 2015 and a subsequent period operating at full capacity, reached a production plateau at the beginning of 2018. A steady decline in production has been observed at Corrib since January 2018, in line with supply profile projections as provided by the operators of the Corrib gas field. Corrib operated at a level of c. 43% of historic maximum production capacity when averaged over winter 2021/22.

Given the decline in indigenous gas supply from Corrib, imports from GB through the Moffat Entry Point continue to be the dominant supply source and provide the balance of gas supply after Corrib and biomethane

Historic 2021/22 gas supplies

In 2021/22 indigenous gas supply sources (i.e. Corrib and biomethane) met 27% of **ROI annual gas demand**. Imports from GB through the Moffat Entry Point accounted for the balance of 73%.

Indigenous gas supply sources met 21% of **annual Gas Networks Ireland system demand** while Imports from GB through the Moffat Entry Point accounted for the balance of 79%.

Indigenous sources accounted for 19% of the ROI gas supply sources that met the 2021/22 **ROI peak day gas demand**, with Moffat contributing the balance of 81%.

Moffat and indigenous supply sources accounted for 85% and 15% respectively of **Gas Networks Ireland system peak day gas demand in 2021/22**.

Forecast 2022/23 gas supplies

The Corrib gas field is expected to meet approximately 19% of **ROI annual gas demand** in 2022/23. Having reached a production plateau in early 2018, Corrib is anticipated to be flowing at up to c. 37% of its historic maximum daily capacity over the coming winter period. The Gross Calorific Value of Corrib gas is consistently 37.7 MJ/scm. Corrib and biomethane are the two remaining indigenous gas supply sources. Biomethane injection to the gas grid currently provides low levels of supply to the network. Biomethane is expected to grow to a larger share of indigenous supply in the near future with new, higher targets being announced in 2022 as part of the RePowerEU plan for 2030.

Gas supplies from GB via the Moffat Entry Point are expected to account for 81% of **ROI annual gas demand in 2022/23**, with indigenous supplies contributing towards 19% of demand.

Indigenous supplies and Moffat are anticipated to account for 15% and 85% respectively of **annual Gas Networks Ireland system demand** in 2022/23.

In the case of a **1-in-50³ winter peak day**, indigenous supplies are anticipated to account for 13% of **ROI gas demand**, with Moffat contributing 87%.

Indigenous supplies and Moffat are anticipated to account for 9% and 91% respectively of the **Gas Networks Ireland system demand** in the event of a **1-in-50 winter peak day**.

Figure 1: actual 2021/22 supplies

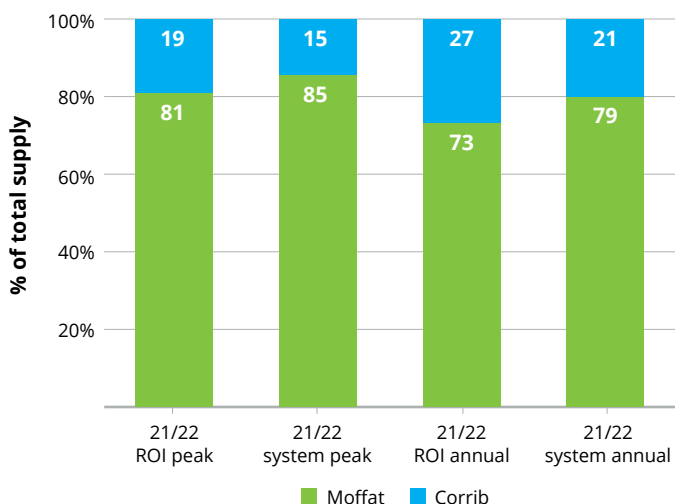
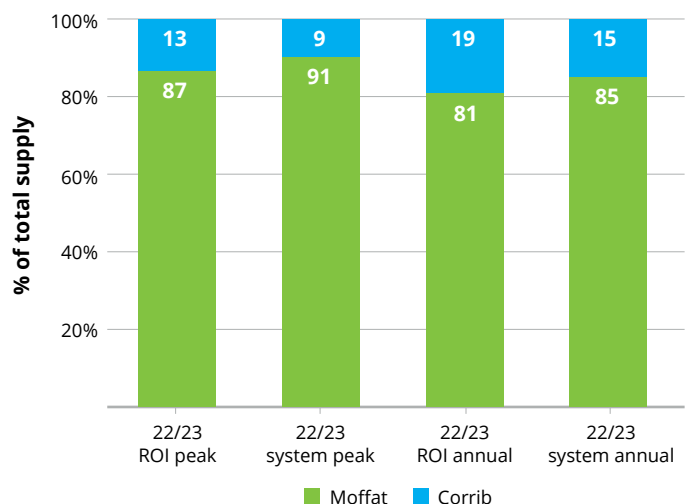


Figure 2: forecast 2022/23 supplies





Historic winter 2021/22 supply and demand

In winter 2021/22, 28% of ROI gas demand was met by indigenous supply sources while imports from Moffat accounted for the remaining 72%.

Indigenous supply sources accounted for 21% of Gas Networks Ireland winter 2021/22 demand while Moffat provided the balance of supply of 79%.

The winter period 2021/22 saw a decrease in Residential sector gas demand of -6.5% compared to the previous winter. The winter period 2021/22 was warmer than the previous winter period based on a Degree Day (DD) comparison. Hence, the weather corrected Residential gas demand for winter 2021/22 showed a decrease of -1.4% when compared to the previous winter period.

In the Industrial and Commercial sector, gas demand decreased by -7.7% below the previous winter period. This decrease can be, in part, attributed to the relatively high gas prices in winter 2021/22; on average gas prices were four times higher in winter 2021/22 vs. 2020/21.

In the Power Generation sector, gas demand was down -5.6% on the previous winter; this is in contrast to a marginal (0.2%) increase observed the previous winter. The decrease in gas demand for power generation can also be attributed to the high gas prices observed over the period; coal- and oil-fired generators rose in the merit order, resulting in them displacing some gas-fired generation. Wind powered generation for winter 2021/22 reduced by -4.4% in comparison to the previous winter, while the installed all-island wind generation capacity increased in the interim period⁴ suggesting that average wind speeds were lower in winter 2021/22 than the previous winter.

The Gas Networks Ireland transmission system continues to supply gas to flexible gas-fired power generation on the Single Electricity Market (SEM). Gas contributed an average of 38.4% of Ireland's power generation fuel mix during the winter 2021/22 period. Over gas year 2020/21, gas accounted

for 47% of the fuel mix; gas typically contributes a higher portion of the fuel mix during the summer months due to the likelihood of lower wind generation compared to the winter. On days of low wind, gas has contributed to almost 87% of the generation fuel mix.

Gas demand for transport increased by 18% in winter 21/22 vs. the previous year, equating to a demand of 11GWh in winter 21/22. This growth is in line with the increased roll-out of CNG refuelling stations in Ireland.

Overall, ROI gas demand for winter 2021/22 was -6.4% lower than the previous winter period.

The ROI peak day gas demand for winter 2021/22 occurred on the 24th January 2022 with a peak day demand of 21.5 mscm/d. The average temperature on the 24th January 2022 was 4.5 °C. On this peak day, Power Generation accounted for 62% of demand with Industrial and Commercial accounting for 21% and Residential accounting for 17%. Gas-fired power generation accounted for 59% of the SEM fuel mix on this day, with wind generation accounting for 16%. It is notable that wind generation was not particularly low on the peak day. However, electricity interconnectors operated as net exporters of electricity to GB, which when combined with comparatively high electricity demand in ROI, drove very high demand for gas-fired power generation.

14th January 2022 was the peak day for Gas Networks Ireland system demand. Total Gas Networks Ireland system throughput on the peak day was 28.4 mscm/d. This figure includes flows to ROI, NI and IOM of 21.5 mscm/d, 6.4 mscm/d and 0.5 mscm/d respectively.

The coldest day in winter 2021/22 occurred on the 4th January 2022, with an average temperature of 1.75 °C; the equivalent day in 2020/21 occurred on the 9th January 2021, with an average temperature of -1.35 °C.

Forecast winter 2022/23 supply and demand

Table 1 presents the 1-in-50 and average peak day system demand forecasts for 2022/23. The Winter Outlook projections take into account the sharp increase in fuel prices that has occurred in the previous year.

Gas supply forecasts for winter 2022/23 indicate that for a 1-in-50 peak day, Moffat flows would be at c. 89% of its current technical capacity⁵. An average winter peak day would require 74% of the available capacity at Moffat to meet Gas Networks Ireland system demand.

Table 1: projected gas demand for winter 2022/23

| | 1-in-50 winter peak day (mscm/d) | Average winter peak day (mscm/d) | Annual 2022/23 total (bcm) | Winter ⁶ 2022/23 total (bcm) |
|--|-------------------------------------|-------------------------------------|-------------------------------|--|
| ROI demand | 24.4 | 21.4 | 5.7 | 3.0 |
| Gas Networks Ireland system demand ⁷ | 34.6 | 29.2 | 7.4 | 3.9 |
| Corrib supply | 3.4 | 3.3 | 1.1 | 0.7 |
| Biomethane supply | 0.01 | 0.01 | <0.01 | <0.01 |
| Gas Networks Ireland system Moffat supply | 31.2 | 25.9 | 6.3 | 3.2 |
| ROI Moffat supply | 21.0 | 18.1 | 4.6 | 2.3 |

In order to stress the peak day gas demand requirement, Gas Networks Ireland carried out a sensitivity analysis on the forecast peak day gas demands for winter 2022/23 to incorporate three notional scenarios. These scenarios investigate the impact of other thermal generators being on outage on the 1-in-50 peak day, namely the coal/oil-fired generators at Moneypoint and the oil-fired generators at Tarbert.

- Sensitivity 1: outage at Moneypoint (1 unit out of service) on the peak day;
- Sensitivity 2: outage at Moneypoint (all 3 units out of service) on the peak day;
- Sensitivity 3: outage at Tarbert (all 4 units out of service) on the peak day.

All three sensitivity scenarios resulted in an increase in gas demand in the Power Generation sector in comparison to the base case. Table 2 below quantifies the increase in gas demand in each sensitivity for both ROI and Gas Networks Ireland system gas demands.

Table 2: Increase in gas demand vs. base case for each sensitivity

| | Increase vs. base case ROI 1-in-50 peak day demand | Increase vs. base case Gas Networks Ireland 1-in-50 peak day demand |
|--|---|---|
| Sensitivity 1 (1 MP unit out of service) | 2.5% | 1.8% |
| Sensitivity 2 (All 3 MP units out of service) | 5.8% | 4.1% |
| Sensitivity 3 (All Tarbert units out of service) | 3.0% | 2.1% |

The increased gas demand in all sensitivity scenarios remain within the capacity of the Moffat Entry Point and of the Gas Networks Ireland system capacity in the event of a 1-in-50 winter peak day.

⁵ Moffat Entry Point has a technical capacity of 35 mscm/d

⁶ Winter total refers to the aggregate forecast demand / supply for the period between 1st of October 2022 and 31st of March 2023

⁷ The Gas Networks Ireland system demand refers to the total demand transported through the Gas Networks Ireland system, i.e. the combined demands for ROI, Northern Ireland (NI) and Isle of Man (IOM)

Operational challenges for winter 2022/23

Gas Network Ireland's operational challenges for winter 2022/23 remain consistent with those of 2021/22, with the additional challenges of gas price volatility and uncertainty in the wider energy market prompted by the Russian invasion of Ukraine. Ideally Gas Networks Ireland strives to maintain flat, steady flow profiles at each of the Entry Points where possible and to minimise variations in network pressures. Network configuration and physical limitations coupled with late nomination/re-nomination behaviour can prevent this from always being the case. Within-day variation in network pressures is expected to continue as a result of volatility in supply and demand patterns.

Shipper actions that aid Gas Networks Ireland in this regard include:

- ensuring D-1 nominations/re-nominations are accurate;
- avoiding large within day imbalances where possible;
- providing re-nominations in a timely and accurate manner in compliance with contractual arrangements and;
- operating in accordance with the flow nomination information provided to the Transmission System Operator (TSO).

In addition to the occurrence of 1-in-50 winter peak day demands, there are several other factors which need to be considered regarding system flexibility:

- within-day pressure volatility at Moffat on the GB National Transmission System (NTS) impacts on compressor station operations. The frequency and magnitude of such volatility has increased in recent years, as a result of a change in demand/supply patterns in the GB NTS. In particular, due to the reduction in gas flows from Europe so far in 2022, GB has been exporting significant amounts of gas to

Europe via the interconnector at Bacton. Much of GB's gas, including Norwegian gas and LNG, makes landfall in the North of GB, e.g. in Scotland, at St. Fergus. This gas must be transported south to Bacton and to meet demand in the densely populated south of England. This can cause high inlet pressures at Moffat.

- gas with a lower Gross Calorific Value (GCV) at Moffat means higher volumes are required to meet downstream energy requirements;
- current technical capacity of Moffat (35 mscm/d) is based on a GCV of 39.5 MJ/scm and;
- the average GCV at Moffat over the Winter 2021/22 was c. 39.5 MJ/m³, ranging between 38.6 MJ/scm and 40.2 MJ/scm⁸.

Commercial arrangements

Gas Networks Ireland monitors transmission system imbalances as a result of shipper balancing activities on a daily basis. Ongoing increased liquidity on the Marex Spectron Trading Platform allows Gas Networks Ireland to trade out system wide imbalances in an efficient manner. As a result of the Russia/Ukraine conflict, and resulting significant price volatility, it remains imperative that balancing actions are kept to a minimum and, to support this, Gas Networks Ireland continues to encourage shippers to maintain balanced positions.

Increased volatility and high prices in the gas market, following the invasion of Russia by Ukraine and consequently the reduction in gas supply to Europe from Russia, and the associated 3.5% of the System Average Price that is levied as a penalty against the Shippers for imbalances, appear to be serving as an incentive to Shippers to appropriately balance their portfolios.

8 Validated by actual GCV observations at the Moffat Entry Point

