The Potential Impact on the UK of a Disruption in Russian Gas Supplies to Europe

Introduction

The geopolitical tensions between Russia and Europe over the build-up of Russian troops on the Ukrainian border have generated concerns over the extent of Europe's reliance on Russian natural gas. There are fears that the supply of Russian gas to Europe could be disrupted, although for the reasons discussed below, we consider this eventuality unlikely. The purpose of this paper is to examine the possible consequences for the UK if such a disruption in Russian supplies to Europe were to occur.

We begin by considering the potential triggers for a disruption in Russian pipeline gas supplies to Europe, in order to highlight the different levels of disruption that could be associated with different triggers. In the second section, we examine the level of UK dependency on Russian gas, and place this dependency in the context of broader European dependence on Russian gas. In the third section, we analyse the potential impacts on the UK of such a disruption. Here we find that while the UK would be unlikely to face a physical shortage of supplies, the ‘ripple effect’ of price increases at hubs in continental Europe would be quickly replicated on the UK trading hub, the National Balancing Point (NBP).

In the fourth section, we consider the existing legal/regulatory frameworks for cooperation with regard to security of supply. While the position of the UK relative to neighbouring states remains uncertain with regard to post-Brexit agreements on the application of the solidarity provisions of the EU Security of Supply Regulation, pricing dynamics between the UK and neighbouring continental European markets would be sufficient to cause gas supplies to move from one market to another, albeit with the potential for some infrastructure bottlenecks. In the fifth (and final) section, we examine the potential impact of price increases on UK gas demand. This is particularly pertinent given that the large share of the domestic sector in total UK gas demand – where gas is used for space heating by 80 per cent of UK households – means that the UK is at its most vulnerable to supply shortages or price spikes during the winter. As a consequence, UK concern over the potential for an interruption to Russian gas supplies to Europe – and its impact on the UK in particular – will be especially heightened at present, and will remain so until the end of winter and the arrival of warmer weather.

What could be the triggers for disruption?

There are three potential reasons for a disruption in Russian gas supplies to Europe, each of which carries different implications for the potential extent of curtailment of Russian gas supplies to Europe. All three are predicated on Russia launching a military invasion of Ukraine.
The first is the possibility of European and American sanctions against Russian gas exports (similar to those imposed on Iranian oil exports). At present such sanctions against the purchase of Russian gas appear unlikely, with the sanctions currently threatened focusing on Russia’s financial sector. A notable exception is the Nord Stream 2 pipeline. The pipeline is now complete, with both of the parallel lines filled with technical gas by the end of December 2021, meaning that it is technically ready to flow. However, the pipeline cannot begin operations until the operating company, Gas for Europe (a newly-created subsidiary of the pipeline project company, Nord Stream 2 AG), has received certification from the German regulator, the BundesNetzAgentur (BNetzA), to act as a pipeline system operator. In December 2021, the BNetzA stated that it would not make a decision on Nord Stream 2 in the first half of 2022. However, in late January 2022, the German Foreign Minister, Annalena Baerbock, told the German parliament that Western allies were working on a strong package of sanctions that included Nord Stream 2.

A second possibility is the Russian government responding to Western sanctions by suspending the sale of Russian gas to Europe, forcing Gazprom to breach its long-term contracts with its European counterparties. Speaking anonymously to Politico on 31 January, one EU official stated, “as we are preparing for sanctions, we are also preparing for countersanctions, looking very closely at the energy sector.” This scenario also appears unlikely: while revenues from gas production and exports to Europe accounted for just over 6 per cent of Russian federal budget revenues in 2021, exports beyond the former Soviet Union accounted for 70 per cent of Gazprom’s sales revenues in Q1-3 2021 (latest available data). This would suggest an economic cost to Gazprom far beyond the economic cost to the Russian federal budget. However, if the Russian government were to suspend natural gas exports to Europe in this way, not only would its reputation as a gas supplier be in tatters, but European buyers of all Russian hydrocarbons would doubt the reliability of such supplies and begin to seek alternatives. Given the large share of Russia in European gas imports, such a displacement of Russian supplies in total European imports would take years, if it could even be achieved at all. Therefore, the impact of a major disruption in gas supplies to Europe would be to undermine the role of gas in the European energy mix in general, and potentially threaten its future even beyond the long-term decline in European gas demand forecast as part of a broader energy transition.

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A third possibility is for the eruption of military conflict in Ukraine to cause damage to one of the gas pipelines that cross Ukraine to bring Russian gas to Europe. The two major pipelines that enter Ukraine from Russia at Sokhranovka and Sudzha are located to the north of the areas currently controlled by separatists, and so would only face possible damage if the zone of conflict expanded.

While the first scenario would suggest that all Russian gas flows to Europe remain as normal but that Nord Stream 2 is effectively cancelled, the second scenario would entail a complete cessation of Russian gas flows to Europe (both via pipelines and in the form of LNG), and the third scenario would imply localised disruption only to the flow of Russian gas via Ukraine. These scenarios, and the possible impact of a partial or complete curtailment of Russian gas supplies on the European market were analysed in the January 2022 edition of the OIES Quarterly Gas Review. Here it is sufficient to note that we consider it unlikely that a physical curtailment of Russian pipeline supplies to Europe would occur even in the event of a military conflict in Ukraine. At the same time, the uncertainties generated by such a conflict would have an immediate impact on European prices, due to concerns over the possible escalation of both the conflict, and the possibility that gas supplies could be affected. Indeed, we consider that uncertainties over the geopolitical situation are contributing to the current high gas prices in Europe, in addition to the fundamental physical market tightness.

How dependent are Europe and the UK on Russian gas?

In 2021, imports provided 87 per cent of the gas supply to Europe (the EU plus UK), while European production only provided 13 per cent of supply. In short, Europe is heavily import-dependent. Russia was the largest external supplier, with pipeline deliveries from Russia accounting for 31 per cent of total European supply and Russian LNG deliveries accounting for a further 4 per cent. Therefore, natural gas produced in Russia accounted for 35 per cent of all the gas supplied to the European market in that year. Generally speaking, it is the EU member states in North-Eastern Europe, Central Europe, and South-Eastern Europe that have the greatest dependence on Russia and the EU member states furthest west that have the lowest levels of dependency on Russia to meet their gas import needs.

Between 2017 and 2021, UK gas demand was generally stable at 80 bcm per year, with the exception of 2020, when demand declined to 76 bcm.

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12 Gas supply is defined as production plus pipeline and LNG imports. Storage injections and withdrawals are not included in this calculation.
14 Kpler, 2022. LNG Platform. [https://lng.kpler.com/map/search](https://lng.kpler.com/map/search) [subscription required]
15 Gross production plus net imports and stock change
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Figure 2: Norwegian export pipeline system

Source: Norwegian Petroleum Directorate (NPD) 20


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In 2017, the combination of UK production and pipeline imports from Norway accounted for 97 per cent of UK gas consumption. By 2021, that figure had fallen to 81 per cent, while the ongoing decline in UK gas production was offset by higher LNG imports at the UK’s three main import terminals: Isle of Grain, Dragon, and South Hook.²⁵

The Isle of Grain terminal in South-Eastern England was launched in 2005, and is wholly-owned by the UK pipeline system operator, National Grid. It has the capacity to import up to 14.3 million tonnes per year (mtpa) of LNG, the equivalent of 19.5 billion cubic metres of natural gas (almost one quarter of UK gas demand). It also has storage tanks capable of holding 1 million cubic metres (mmcm) of LNG, the equivalent of 615 mmcm of natural gas. Since its launch, the maximum volume imported into Isle of Grain in a calendar year was 5.8 mt (2011), while imports in 2021 totalled 4.3 mt.²⁶ Import capacity at Isle of Grain is held under long-term capacity contracts by Centrica, TotalEnergies, Sonatrach, E.ON, and Pavilion Energy.²⁷

The South Hook and Dragon LNG terminals are both located in the port of Milford Haven, in South-West Wales, and both were launched in 2009. The South Hook terminal is owned by Qatar Energy (67.5 per cent), ExxonMobil (24.15 per cent), and TotalEnergies (8.35 per cent).²⁸ The primary capacity at South Hook is owned by South Hook Gas Company Ltd, whose shareholders are Qatar Petroleum (70 per cent) and ExxonMobil (30 per cent).²⁹ The terminal has an annual import capacity of 15.4 mtpa (equivalent to 21 bcm per year of natural gas), and the capacity to store 775,000 m³ of LNG, equivalent to 476 mmcm of natural gas. The peak annual import into South Hook was achieved in 2011 (10.6 mt), while imports in 2021 totalled 5.24 mt (just over half the terminal capacity).

The Dragon LNG terminal is owned by Shell (50 per cent) and Ancala LNG (50 per cent), the latter being an investor focused on mid-market size infrastructure assets. The import capacity of the terminal is 5.6 mtpa, equivalent to 7.6 bcm per year of natural gas. That capacity is held by Shell (50 per cent) and Petronas (50 per cent).³⁰ The storage tanks at Dragon LNG can hold 320,000 m³ of LNG,

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25 Access regimes to all three UK’s LNG terminals are analysed in Yafimava (2020), ‘Finding a home’ for global LNG in Europe: understanding the complexity of access rules for EU import terminals, OIES, January.
equivalent to 197 mmcm of natural gas. Peak annual imports reached 2.42 mt (in 2020), while imports in 2021 totalled 1.83 mt (around one-third of the terminal’s annual capacity).

Therefore, total UK LNG import capacity on an annual basis is 35.36 mtpa, or 2.9416 mtpa per month. Between January 2017 and January 2022, total LNG imports at these three terminals exceeded 66 per cent of their monthly import capacity only twice: in December 2019 (69 per cent) and January 2022 (81 per cent).\(^3\)

*Figure 4: UK LNG imports (million tonnes) and imports as a share of nominal import capacity*

Between January 2017 and January 2022, total LNG imports at these three terminals exceeded 66 per cent of their monthly import capacity only twice: in December 2019 (69 per cent) and January 2022 (81 per cent).\(^3\)

There are several reasons why the UK LNG import terminals do not regularly operate closer to full capacity on a monthly basis. Firstly, UK gas supply is predominantly based on UK production and pipeline imports from Norway, leaving LNG imports as ‘third choice’, and unlikely to increase in volume to displace UK and Norwegian supplies on a regular basis until those sources of supply begin to dwindle. Secondly, the UK lacks gas storage capacity relative to overall demand. Europe as a whole (EU plus UK) has roughly 105 bcm of gas storage capacity, which equates to 22 per cent of annual consumption. By contrast, the UK has just 0.9 bcm of gas storage relative to around 80 bcm of annual demand. Instead of importing substantial amounts of LNG in the summer and placing it into storage for the winter, the UK relies on swing in UK production and Norwegian pipeline supplies, ‘topped up’ with fluctuating monthly LNG imports. Finally, UK gas production had already peaked when these LNG terminals were launched, with the long-term view that as UK gas production declines and the UK becomes more import-dependent, LNG supplies will be needed to fill the gap. The experience of the last several years suggests that the UK would normally have substantial capacity to increase LNG imports in a time of need. However, if imports continue at the rate seen in January 2022, the spare import capacity will be relatively limited for the short-term future.

Finally, the UK is physically connected to the continental European market by two interconnector pipelines under the English Channel: The Interconnector from Bacton (UK) to Zeebrugge (Belgium), and the Bacton-Balgzand Link (BBL) from Bacton (UK) to Balgzand (Netherlands). The Interconnector between the UK and Belgium has 25.5 bcm of bi-directional technical capacity, equivalent to 70 mcm/d.\(^3\) Since 1 January 2017, the largest daily volume exported from the UK to Belgium was 59 mcm, on 31 December 2021.\(^3\) The BBL has 45 mcm/d (16.4 bcma) of capacity from the

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31 Kpler, 2022. LNG Platform. [https://lng.kpler.com/map/search](https://lng.kpler.com/map/search) [subscription required]
Netherlands to the UK and 15 mmcm/d (5.5 bcma) of reverse flow capacity from the UK to the Netherlands. The BBL most recently operated at full capacity from the UK to the Netherlands on 30 and 31 December 2021. However, over the past several years the interconnections between the UK and Belgium/Netherlands have usually shipped gas from the UK to Belgium/Netherlands in the summer and to the UK in the winter. By doing so, they take advantage of the UK being supply-long in the summer due to its own production and pipeline imports from Norway, and the UK effectively making use of continental gas storage stocks in the winter, in the absence of such seasonal gas storage in the UK. This seasonality of flows on the Interconnector and BBL are illustrated in Figure 5, below. Here it should be noted that the unusual pattern of net exports from the UK to Belgium and the Netherlands is strongly influenced by the benchmark trading hub in North-Western continental Europe (the TTF) being at a premium to the UK National Balancing Point (NBP), so the additional LNG volumes imported into the UK were being shipped onwards to the continent.

As the annual figures in Figure 1 show, net annual trade between the UK and continental Europe is far below the combined annual capacity of the Interconnector and BBL. However, the value of these pipelines is in short-term and seasonal balancing with flows in both directions. For example, in 2021, the Interconnector shipped approximately 1.8 bcm from the UK to Belgium, and 1.8 bcm from Belgium to the UK, while the BBL shipped 2.4 bcm from the Netherlands to the UK and 0.9 bcm from the UK to the Netherlands.

**Figure 5: Flows on the Interconnector and BBL (million cubic metres per day)**

![Graph showing flows on the Interconnector and BBL](source)

Source: ENTSOG Transparency Platform. Note: Positive values indicate UK imports and negative values indicate exports from the UK to continental Europe.

Overall, UK dependence on Russian gas supplies is limited. The UK has no direct pipeline connection to Russia, and imports of LNG from Russia rose from virtually zero in 2017 to 2.4 mt (equivalent to 3.25 bcm) in 2021, meaning that Russian LNG accounted for 4 per cent of total UK gas supply in 2021. However, any disruption in Russian pipeline gas deliveries to the European market would almost inevitably cause prices on European trading hubs to surge. This surge would affect the dynamics of pipeline movements both between the UK and Norway and between the UK and continental Europe, while simultaneously influencing the dynamic of LNG imports into Europe.

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37 Kpler, 2022. LNG Platform. [https://lng.kpler.com/map/search](https://lng.kpler.com/map/search) [subscription required]
How would the UK be impacted by a disruption in Russian gas supplies to Europe?

As we discussed in the most recent OIES Quarterly Gas Review, any disruption to Russian pipeline gas supplies to Europe would almost certainly cause day-ahead and front-month hub prices in continental Europe to rise substantially. We concluded that across 2022 as a whole, pipeline imports would be lower than in 2021 (due to loss of Russian supply and the inability of other pipeline suppliers to increase their exports to Europe beyond current volumes), LNG imports would rise (with cargoes being attracted by higher prices), and storage stocks would be drawn down more rapidly in late winter and replenished to a lesser extent in summer 2022, meaning that Europe would potentially start winter 2022/23 with less gas in storage than at the start of winter 2021/22.

From a UK perspective, the first impact would be that prices on continental European hubs would rise more rapidly than those on the NBP. This would lead to traders buying gas on the NBP, exporting it from the UK to continental Europe via the Interconnector and BBL, and then re-selling those volumes on European hubs. If UK gas demand remained constant, this drawing away of supplies would tighten the UK market and cause prices on the NBP to rise, until they reached approximate parity with hub prices in continental Europe, and the commercial motivation to move gas from the UK to the European continent subsided.

At the same time, producers of gas at offshore fields in Norway that sell their gas into the spot market, and have optionality between selling to the UK and selling to continental Europe (with delivery via one of the five pipelines connecting Norway with France, Belgium, the Netherlands, and Germany noted earlier), could shift those sales to continental Europe for as long as continental European prices remained at a premium to those on the NBP.

The physical limitation to this movement of gas away from the UK to continental Europe would be the physical capacities of the Interconnector and BBL on the one hand, and the physical capacities of the pipelines bringing Norwegian gas to continental Europe on the other. As noted earlier, the Interconnector and BBL reached full capacity for the shipment of gas from the UK to Belgium/Netherlands on 31 December 2021. However, in the second half of January 2022, the movements were generally 2-5 mcm/d of imports to the UK via the BBL and similar volumes moving between the UK and Belgium, with a change in direction every few days.

In terms of Norwegian pipeline deliveries to continental Europe, there is currently little spare capacity to increase such deliveries. The Franpipe (to France) and Zeepipe (to Belgium), have been operating at full capacity since mid-December 2021. The three pipelines (Norpipe, Europipe I, and Europipe II) that supply Germany and the Netherlands operated at almost their combined full capacity in January 2022. The capacities of these pipelines are given in the table below.

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Figure 6: Capacities of pipelines bringing Norwegian gas to continental Europe

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>Million cubic metres per day (mmcm/d)</th>
<th>Billion cubic metres per annum (bcma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Franpipe to Dunkerque (France)</td>
<td>54.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Zeepipe to Zeebrugge (Belgium)</td>
<td>42.2</td>
<td>15.4</td>
</tr>
<tr>
<td>Norpipe to Emden (Germany)</td>
<td>44.4</td>
<td>16.2</td>
</tr>
<tr>
<td>Europipe I to Dornum (Germany)</td>
<td>45.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Europipe II to Dornum (Germany)</td>
<td>71.2</td>
<td>26.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>258.3</strong></td>
<td><strong>94.3</strong></td>
</tr>
</tbody>
</table>

Source: Gassco. Note that these numbers are in standard cubic metres.

If this situation were to remain as it stands (at the beginning of February 2022), additional supplies to North-Western continental Europe would not be possible from Norway by pipeline, but only directly to the LNG terminals in France, Belgium, and the Netherlands, or to LNG terminals in the UK for regasification and re-export via the Interconnector and BBL.

Figure 7: Combined net LNG Imports to Dunkerque, Zeebrugge, and Gate Rotterdam (million tonnes per month)

Source: Data from Kpler LNG Platform

The Dunkerque LNG import terminal has an annual import capacity of 9.6 mtpa of LNG, which equates to 0.8 mt of LNG per month. The Zeebrugge LNG import terminal has an annual import capacity of 6.6 mtpa of LNG, equivalent to 0.55 mt of LNG per month. Finally, the GATE Rotterdam LNG import terminal has an annual import capacity of 8.8 mtpa of LNG, equivalent to 0.73 mt of LNG per month. Together, these three import terminals have a combined nameplate import capacity of 25 mt of LNG per year, or 2.08 mt of LNG per month. In fact, the record for monthly imports into these three terminals

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40 Kpler, 2022. LNG Platform: https://lng.kpler.com/map/search [subscription required]
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per month, or just over 27 mmcm/d). The send-out of 105 mmcm/d relative to the send-out capacity of 147 mmcm/d left around 42 mmcm/d of spare send-out capacity (around 1.3 bcm per month, equivalent to 15.6 bcm per year).43

Secondly, the capacity to deliver that imported LNG (along with pipeline gas imported from Norway) onward to continental Europe could be constrained if the Interconnector and BBL were already operating at full capacity from the UK to Belgium and the Netherlands, as they were at the end of December 2021. As noted earlier, this was an unusual situation given that these two pipelines usually bring gas from continental Europe to the UK during the winter. The reason is market tightness in North-Western Europe, due to lower Russian flows to the region (particularly on the Yamal-Europe pipeline via Belarus and Poland). This is partly due to Gazprom not offering volumes to the European spot market and partly due to European counterparties possibly not nominating their full contractual volumes and instead seeking volumes from storage or the prompt spot market, due to a price difference between prompt hub prices and the hub-indexed prices in Gazprom’s long-term contracts. As a result, the TTF day-ahead price maintained a slight premium over the NBP day-ahead price in December 2021 and January 2022. That differential was at its widest in the period 29-31 December,44 which caused gas to flow from the UK to continental Europe via the Interconnector and BBL. This situation – of the market of North-Western continental Europe being tighter than the UK market, leading to a TTF premium over NBP – is likely to persist as long as Russian physical flows to the region remain lower than usual. In this regard, January 2022 could be seen as a small-scale example of how flows might look in the event of a curtailment in Russian physical flows to North-Western Europe, with the UK importing more LNG than it needs and then re-exporting those volumes to Belgium and the Netherlands via the Interconnector and BBL pipelines.

Finally, the increase in LNG imports into the UK – either for domestic consumption or re-export – would only be possible if there were supplies available on the global LNG market. This would be influenced by both the global supply-demand balance, and the impact of higher prices attracting cargoes from the spot market to other European import terminals. For example, if a localised disruption in Russian gas supplies to Europe via Ukraine impacted deliveries of Russian gas to northern Italy, prices on the Italian hub (Punto di Scambio Virtuale, or PSV) would surge to attract LNG cargoes to Italy. If the disruption was broader and affected Russian deliveries via non-Ukrainian routes as well, attempts to attract LNG cargoes to the UK for regasification and re-export to the continent would face competition from LNG terminals across Europe. More dramatically, if such a scenario was to occur during a cold spell in Asia, European LNG buyers would face stiff competition for cargoes, perhaps even leading to a bidding war. In such a dramatic context – the substantial curtailment of all Russian pipeline gas flows to Europe at the same time that strong LNG demand in North-East Asia limited the availability of LNG for Europe – the result would surely be the limitation of European gas consumption outside protected sectors (such as households and hospitals), and the sharing of gas across borders.

Existing legal/regulatory frameworks: security of supply cooperation provisions

The EU Security of Supply Regulation

When the UK was an EU Member State it was bound by the 2017 EU Security of Supply Regulation – a legal instrument aimed at safeguarding ‘the security of gas supply in the Union by ensuring the proper and continuous functioning of the internal market’ in natural gas, by allowing for ‘exceptional measures to be implemented when the market can no longer deliver the gas supplies required, including solidarity measures of a last resort’.45 The UK was part of the two North Sea regional groups: one, associated with a loss of Norwegian supply (which also included Belgium, Denmark, Germany, Ireland, Spain,

43 For a more detailed discussion of LNG import capacity, please see the Appendix to this paper
44 Pricing data from Argus (subscription required)
45 Article 1.
France, Italy, Luxembourg, Netherlands, Portugal, and Sweden), and another, associated with a loss of UK supply (which also included Belgium, Germany, Ireland, Luxembourg, and Netherlands). These groups served as the basis for risk associated cooperation in line with preventive and emergency plans, with the latter to be activated in a crisis.

The Regulation introduced the solidarity measure under which a Member State, which is directly connected to a Member State that has requested the application of such measure, is obliged to: ‘take the necessary measures to ensure that the gas supply to customers other than solidarity protected customers in its territory is reduced or does not continue to the extent necessary and for as long as the gas supply to solidarity protected customers in the requesting Member State is not satisfied’. In other words, the Regulation obliged a Member State to reduce supplies to its own non-household customers to enable supplies to (mostly) household customers of another Member State, which requested the solidarity measure. This suggests that the UK, being directly connected (via interconnectors) to three EU Member States – Ireland, Belgium, and the Netherlands – would be obliged to apply the solidarity measure to all of them, should they request it. Conversely, all three of these countries would be obliged to provide supplies to the UK, should it make such a request (not relevant for Ireland, which receives a significant share of its gas supply from the UK both directly and via transit).

As the UK has left the EU, it is no longer bound by the Security of Supply Regulation, which means that the UK is not obliged to supply these Member States and vice versa. The Regulation stipulates that ‘a Member State shall also provide the solidarity measure to another Member State to which it is connected via a third country unless flows are restricted through the third country’, which suggests that the EU is still obliged to provide these measures to Ireland but only insofar as the UK does not restrict transit flows through its territory. There is a provision for the Gas Coordination Group (consisting of representatives of the Member States, ACER, ENTSOG, the industry, and customers, chaired by the European Commission) to coordinate between the EU and third countries in an emergency, but it has no binding effect on the latter.

Solidarity can be requested by a Member State in a crisis, with the highest level of crisis (emergency) being defined as a situation ‘where there is exceptionally high gas demand, significant disruption of gas supply or other significant deterioration of the gas supply situation and all relevant market-based measures have been implemented but the gas supply is insufficient to meet the remaining gas demand’. This suggests that the solidarity measure can only be requested in a physical gas shortage situation i.e., when supplies for protected customers are not available at any price.

UK-EU Trade and Cooperation Agreement

The post-Brexit UK position on cooperation on security of electricity and gas supply is unclear with the Trade and Cooperation Agreement stating:

‘The Parties shall cooperate with respect to the security of supply of electricity and gas... The Parties shall immediately inform each other in the event of an actual disruption or other crisis, in view of possible coordinated mitigation and restoration measures...’

‘Each Party shall establish... plans’, containing ‘the measures needed to prepare for, and mitigate the impact of, an electricity or natural gas crisis...’ Such measures must ‘not significantly distort trade
between the Parties... In the event of a crisis, the Parties shall only activate non-market-based measures as a last resort.\textsuperscript{52}

As the TCA refers to ‘possible’ coordinated mitigation and restoration measures, this suggests that both the UK and the EU have discretion as to what extent to coordinate their actions in the event of a crisis. On behalf of the EU, such coordination would be managed by the Gas Coordination Group.

**Post-Brexit UK-EU cooperation on security of supply: not mandatory and subject to goodwill**

From these rather general statements it might be concluded that the provisions in Security of Gas Supply Regulation are such that cooperation, even in the event of emergency when solidarity provisions would be applied across the EU, is not compulsory between the EU and the UK in either direction. The Trade and Cooperation Agreement does not bridge that gap; solidarity is for the EU Member States only. While there are no concrete commitments or obligations, all the necessary understanding is there because the UK was subject to all the requirements until recently and there were, and still are, close links between National Grid, ENTSOG, Ofgem,\textsuperscript{53} and EU regulators, but cooperation will depend on goodwill on both sides. Given the existing LNG and pipeline gas flows around the UK — with the import of pipeline gas from Norway (not an EU Member State but bound by the acquis\textsuperscript{54} through the European Economic Community) — and export and transit to Ireland (an EU Member State), it seems likely that, in the event of an emergency, cooperation would prevail. Should the UK attempt to restrict flows of available LNG to continental European EU member states this could create serious political and regulatory tensions which would be difficult to resolve. However, given the UK government’s insistence on only activating non-market measures as a last resort, it would be logical to expect prices to determine flows between the UK and its neighbours, in the manner outlined earlier.

**Implications of price increases for UK gas demand**

If a disruption to Russian gas supplies to Europe were to occur, especially before the end of the present winter, the result would be price spikes across Europe. The UK would face price spikes similar to those in other European markets, despite the UK not being directly dependent on Russian pipeline gas supplies. A sharp increase in wholesale UK gas prices — beyond the already high level seen at present — would have dramatic implications for multiple sectors. Natural gas is widely used in the UK, for power generation (particularly to balance out variable renewable power generation), for space heating in the residential and commercial sectors, and in heavy industry.

In the event of a major price spike, industrial demand would be the first to be curtailed, as higher prices could render operations loss-making and factories could temporarily cease work. Thereafter, the UK would face a problem of demand inelasticity. Due to a lack of alternatives, gas consumers would be forced to continue using gas despite high prices. This is especially true of household gas consumers, given that four in every five UK households use gas for space heating. The retail gas prices paid by such consumers are protected from the most dramatic fluctuations in wholesale prices by a ‘price cap’, which regulates retail tariffs in relation to wholesale prices. In the latter part of 2021, the gap between this price cap and skyrocketing wholesale market prices led multiple retail companies to bankruptcy.


\textsuperscript{53} The Office of Gas and Electricity Markets (Ofgem) is the government regulator for the electricity and downstream natural gas markets in the United Kingdom

\textsuperscript{54} “The EU’s ‘acquis’ is the body of common rights and obligations that are binding on all EU countries, as EU Members”. European Union, 2022. EUR-Lex (Access to European Law). https://eur-lex.europa.eu/summary/glossary/acquis.html
The UK government raised the price cap on 1 October 2021, in line with the regular revision that takes place every six months.

As of 2 February 2022, the latest rise in the energy price cap has been announced by the UK regulator, Ofgem, and it shows a rise of some 54 percent for the period 1 April to 30 September 2022, compared to the period 1 October 2021 to 31 March 2022. The rise in the wholesale gas price element of the calculation was some 115 percent, from 60 pence per therm to 130 pence per therm. The wholesale gas price element of 130 pence per therm is calculated on the forward curves for the period April 2022 to March 2023, as quoted between August 2021 to January 2022. The next price cap will be set on the forward curves for the period October 2022 to September 2023, as quoted between February 2022 and August 2022. The latest quote (2 February 2022) for that period averages some 148 pence per therm. If maintained then this would be a rise of some 14 percent, leading to a small further rise in the energy price cap from October this year. Clearly wholesale gas prices could rise further, especially with the uncertainty over a conflict in Ukraine, but equally if any conflict doesn’t transpire and gas supply, especially from Russia, increases, wholesale gas prices could fall significantly.

A final point to note regarding UK gas demand is that, due to the significant share of domestic gas use (for space heating, hot water, and cooking) in total UK gas demand, such total demand is strongly seasonal. For example, between 2017 and 2021, the average share of domestic gas consumption in total UK gas demand in Q1 was 47 per cent. But for Q3, that average figure was 18 per cent. Therefore, the UK is at its most vulnerable to any physical supply shortages or price spikes during the colder winter months, and especially in Q1. For this reason, concerns over geopolitical tensions in Eastern Europe and potential impacts on Russian gas supplies to Europe, and by extension the impact on the UK, will be especially heightened from now until the end of winter, but could ease slightly from April onwards.

Figure 9: UK quarterly gas demand by sector (million cubic metres)

Source: UK Government statistics

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Conclusion

This paper began by setting out possible triggers for a disruption in Russian pipeline gas supplies to Europe, and several possible scenarios for such disruption, ranging from the effective cancellation of Nord Stream 2 through a curtailment of Russian supplies via Ukraine, to a complete cessation of Russian supplies to Europe. A key point is that the outbreak of a military conflict in Ukraine is highly likely to bring a surge in European gas prices, due to concerns over the unpredictability of a possible escalation of hostilities that could impact gas flows in Europe.

A second key point of this paper is that while the UK is seemingly removed from concerns over Russian supplies in a physical sense, with UK supply being split between domestic production, Norwegian pipeline supply, and LNG imports, any disruption to Russian supplies to the European market will generate a severe price spike that will filter through to the UK market. In physical flow terms, higher prices in continental Europe would draw gas away from the UK through the Interconnector and BBL. To the extent that LNG cargoes are available on the global market, capacity is available at UK LNG import terminals, and capacity is available on the Interconnector and BBL pipelines, the UK would become a ‘land bridge’ to North-Western Europe, regasifying LNG cargoes and re-exporting them. This could make the task of physical balancing on the UK transmission system more challenging, and could increase the volatility of wholesale prices on the UK market accordingly. As noted earlier, the surge in UK LNG imports and net exports to Belgium and the Netherlands (via the Interconnector and BBL pipelines) in January 2022 could serve as a foretaste of what could happen to regional flows in the event of a sustained curtailment in physical flows of Russian pipeline gas to North-Western Europe.

In terms of the movement of gas from one country to another during a supply disruption, the existing legal arrangements between the UK and its neighbours (who are EU member states) are such that, even in the event of emergency when solidarity provisions would be applied across the EU, cooperation between the EU and the UK is not compulsory for either party. Nonetheless, it seems likely that, in the event of an emergency, cooperation would prevail, and non-market measures (such as enforced restrictions on consumption in non-protected sectors to allow exports to neighbouring states in need) would only be applied as a last resort. It is highly likely that, absent government intervention to prevent the free flow of gas, pricing signals would draw gas from one market area to another.

Finally, time is of the essence. UK gas demand is strongly seasonal, yet the UK lacks seasonal storage facilities. Rather, the UK relies on swings in its own production and fluctuations in imports to meet the peaks of its winter demand. Therefore, the tightening of the market due to a disruption in Russian supplies to Europe would produce far greater challenges if it were to occur before the end of winter (late March/early April, depending on the weather). With that in mind, governments, market participants, and analysts will continue to monitor the situation on Ukraine’s borders with Russia and Belarus, while the tensions generated by the threat of conflict are contributing to the current volatility and high level of European wholesale prices.

While the tight supply-demand balance since October 2021 has driven prices to high levels, the lack of ‘room for manoeuvre’ in such a tight market is causing increased volatility. Any indication of a shift in the supply-demand balance (such as weather reports, production outages, or geopolitical tensions) is causing a price reaction. For example, between 29 December 2021 and 12 January 2022, the TTF front-month price fell from 97 Euros per Megawatt hour (EUR/MWh) to 65 EUR/MWh, rebounded to 97 EUR/MWh and then fell back to 75 EUR/MWh. For comparison, from May 2017 to May 2021, the TTF front-month price did not surpass 30 EUR/MWh. In other words, the difference between the highest and lowest TTF front-month prices in a two-week period between the end of December 2021 and mid-January 2022 was greater than the absolute highest price recorded in the four-year period between May 2017 and May 2021. If a military conflict does lead to a disruption of Russian supplies to Europe, the UK might not face a physical shortage, but the impact on wholesale (and by extension, retail) gas prices will be substantial, and due to its impact on the power generation, commercial and residential heating, and industrial sectors will contribute to inflationary pressures at a time when the UK is already facing challenging economic circumstances.
Appendix: LNG Import Capacity in the UK and North-Western Europe

The capacity of LNG import terminals depends on several elements. Firstly, the number of jetties and the size of vessels that can be accommodated at each jetty. For example, Isle of Grain and South Hook each have two jetties, while Dragon LNG has one. Isle of Grain and South Hook can accommodate vessels up to 266,000 m³ in capacity, while Dragon LNG can accommodate vessels up to 217,000 m³ in capacity. The time it takes for an LNG carrier to dock, discharge its cargo, and then leave the terminal is also a factor.

Isle of Grain reports that it offers over 200 berthing slots per year.56 According to data from Kpler, the record number of cargoes received at the Isle of Grain in a calendar month was 15 in December 2019, followed by 11 in January 2022, and 10 in November 2019. In annual terms, 2019 saw 65 cargoes discharged, ahead of 57 in 2020 and 56 in 2021. January 2022 also saw a record number of cargoes arrive at South Hook (16), ahead of the previous record (12) that was achieved in May 2019, May 2020, and March 2021. In annual terms, South Hook received a record 79 cargoes in 2020, ahead of 2019 (74 cargoes), and 2021 (58 cargoes). January 2022 also saw a joint-record number of cargoes arrive at Dragon LNG (7), the same as in March 2020. In annual terms, Dragon LNG received 35 cargoes in 2020, higher than in 2019 (27) and 2021 (25). Overall, the three UK LNG import terminals received a combined 34 cargoes in January 2022, more than the previous record, 31 in December 2019. In annual terms, the UK received 166 LNG cargoes in 2019, 171 in 2020, and 139 in 2021.

A second element is the capacity of the terminal to store LNG. At Isle of Grain, the storage capacity is 1 million cubic metres of LNG (equivalent to 615 million cubic metres of natural gas when regasified). At South Hook, the capacity is 775,000 m³ of LNG and at Dragon the capacity is 320,000 m³ of LNG. When the storage tank is full, gas must be regasified and injected into the pipeline system before more LNG import cargoes can be accommodated.

A third element is the rate at which the terminal can regasify the LNG and inject it into the national transmission system. At Isle of Grain, that rate is reported by Grain LNG as 645 GWh/d (approximately 59.5 Smmcm/d), although this is reported as 699 GWh/d (64.5 Smmcm/d) by ENTSOG and 67.1 Smmcm/d by Gas Infrastructure Europe (GIE). At South Hook, the daily send-out capacity reported by GIE is 61.8 Smmcm/d and at Dragon LNG it is reported by GIE as 28.9 Smmcm/d. That gives a combined 90.7 Smmcm/d of send-out at two terminals at the port of Milford Haven. The combined capacity of these two terminals combined is reported by ENTSOG as 949 GWh/d, or 87.4 mmcm/d. This suggests that total send-out capacity from the three terminals is 1,594 GWh/d, or 146.9 Smmcm/d, according to ENTSOG.

Finally, the nominal annual import capacity is usually lower than the annualised sum of the daily send-out capacity, even when these two values are reported by the same entity. For example, Gas Infrastructure Europe reports that Isle of Grain has a nominal import capacity of 19.5 bcm per year, and a daily send-out capacity of 2.65 mmcm per hour (63.6 mmcm/d). If that daily send-out capacity were maintained every day for 365 days, it would total 23.2 bcm – notably higher than the nominal annual import capacity. This is because LNG terminals are not expected to operate at full send-out capacity every day. LNG cargoes are offloaded from tankers, placed into storage tanks, and then withdrawn from the storage tanks and regasified for injections into the pipeline system over the course of several days.

For Figure 4 and Figure 7, and the discussion of LNG imports into the three UK LNG import terminals and the three terminals in North-Western continental Europe (Dunkerque, Zeebrugge, and Gate Rotterdam), this paper refers to the monthly LNG imports and nominal annual LNG import capacity (divided equally by 12 calendar months) reported by the Kpler LNG platform.

For comparison, the nominal annual import capacity for Isle of Grain, South Hook, and Dragon LNG combined reported by Kpler equate to 139 (standard) mmcm/d. This is the same nominal import capacity reported by Gas Infrastructure Europe, which states the combined send-out capacity of the three terminals as 158 Smmcm/d. ENTSOG report the daily send-out capacity as 147.5 Smmcm/d. According to Kpler, the record daily LNG importation into the UK occurred on 19 April 2019, when 261 mmcm of natural gas equivalent was offloaded at the three LNG import terminals. However, the record for daily send-out into the National Grid transmission system occurred on 5 December 2019, when 141 mmcm was injected into the pipeline system at the three terminals.

To conclude, the capacity of an LNG import terminal is very much a ‘moveable feast’. In terms of receiving cargoes, the monthly record (set in January 2022) at Isle of Grain and South Hook is a cargo every two days, and at Dragon LNG it is a cargo every four days. The LNG storage tanks at these terminals are being constantly drawn down as LNG is regasified, and topped up with fresh LNG cargoes. The monthly record send-out for the three terminals combined (also set in January 2022) saw send-out equivalent to 67 per cent of the monthly send-out capacity. While the rate of capacity utilisation (that is, volume of UK LNG imports in January 2022 relative to import capacity and, by extension, the volume of spare capacity to increase those imports from their present level) is difficult to define, it is clear that UK LNG imports in January 2022 were at a sustained high level and that the spare capacity to increase those imports further is less than is usually the case, even in mid-winter.