


February 2022



Quarterly Gas Review: Impact of Conflict in Ukraine and the Short-Term Gas Markets

Introduction

The European gas market, as well as the global gas market, is in a high state of uncertainty regarding the potential impact of any possible conflict in Ukraine. In this latest OIES Quarterly Gas Review, we focus on the implications of a potential military invasion of Ukraine by Russia. In the second part we focus, as usual, on short-term gas pricing developments, discussing the roller coaster ride in wholesale gas prices and what the forward curves look like given the heightened uncertainty regarding pipeline flows from Russia into Europe. The second part also analyzes the underlying European supply-demand balance, including the rapid depletion of storage.

If you would like to discuss any of these issues further then please contact Mike Fulwood (mike.fulwood@oxfordenergy.org), Katja Yafimava (katja.yafimava@oxfordenergy.org) or Jack Sharples (jack.sharples@oxfordenergy.org).

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1. The impact of conflict in Ukraine on the European gas market

The uncertainty over the prospect of an escalation of hostilities in or against Ukraine by Russia has already started to impact gas prices in Europe and globally. Undoubtedly, any invasion with the prospect of resistance by Ukraine and heavy sanctions from the West on Russia would spook the markets and likely force prices even higher given the uncertainties surrounding gas flows.

Beyond the price spikes that would accompany the outbreak of military conflict, there has been considerable public debate over whether such a conflict would also lead to a partial curtailment, or even complete cessation, of gas flows from Russia to Europe. The potential reasons for such a curtailment or complete shut-off vary from European sanctions prohibiting the purchase of Russian gas, Russia curtailing or ceasing supplies to Europe as a response to European sanctions that target Russia's financial sector, or damage to vital pipeline infrastructure during the course of the conflict.

The purpose of this section of the Quarterly Gas Review is not to assess the likelihood of military conflict, but firstly to assess the probability of a partial curtailment or complete shut-off, secondly to explore the possible sources of alternative supplies, and thirdly to estimate the impact of such a curtailment or shut-off on the European gas balance.

1.1. How important are Russian supplies to the European gas market?

In the past three years, gas consumption in Europe¹ fluctuated between a peak of 488 Bcm (2019) and a low of 471 Bcm (2020), before recovering to 480 Bcm in 2021. Declining gas production in Europe is rendering the market increasingly import-dependent, with imports accounting for approximately 85 per cent of total supply between 2019 and 2021.

Russia is the largest source of imports to the European gas market. Russian pipeline supplies accounted for 35 per cent of total European supply² in 2019 (179 Bcm), although that figure fell to 32 per cent in 2020 (146 Bcm) and 31 per cent in 2021 (142 Bcm). In addition, LNG from Russia added 18-20 Bcm per year of supply to the European market, equivalent to 4 per cent of total supply in that period.

Turkey is also a major pipeline gas export market for Russia, and a transit country for the delivery of Russian gas to South-Eastern Europe. Turkish gas demand rose from 47 Bcm (2019) and 50 Bcm (2020) to 62 Bcm (2021), while the country remains dependent on imports to meet at least 95 per cent of that demand. Russia is the largest supplier to that market, providing 15 Bcm and 16 Bcm in 2019 and 2020, respectively, and 27 Bcm in 2021.³ Russia exported virtually no LNG to Turkey during this period.

Therefore, if we broaden our definition of Europe to include Turkey, Russian pipeline supplies provided 36 per cent of demand in 2019 and 31 per cent in 2020 and 2021. When Russia's LNG exports to Europe are included, the share of Russian supply in wider European supply rises to 40 per cent in 2019 and 35 per cent in 2020 and 2021.

1.2. How is Russian pipeline gas delivered to Europe?

There are four main routes for Russian pipeline gas into Europe – Nord Stream 1 via the Baltic Sea to Germany, the Yamal-Europe pipeline to Germany via Belarus and Poland, the various Ukraine routes to Slovakia, Hungary, Romania and Poland, and the pipelines to Turkey (Blue Stream and Turk Stream), with onward connections to Bulgaria, Serbia, and Hungary. In addition, there are pipelines for direct deliveries to the Baltic states and Finland.⁴ The Nord Stream 2 pipeline (which is now physically

¹ 'Europe' is defined as the EU-27, UK, and non-EU Balkans. Turkey is excluded. This excludes storage injections and withdrawals

² Defined production plus net imports. This excludes storage injections and withdrawals

³ Data from Argus (subscription required)

⁴ Gas is also delivered via Lithuania for onward transmission to the Russian enclave of Kaliningrad

complete but not yet operational), runs in parallel with Nord Stream 1, although the starting point in Russia (Ust-Luga) is just to the south of the starting point for Nord Stream 1 (Vyborg).

Figure 1.1: Russian gas export routes to Europe



Source: OIES

To provide an estimation of the relative importance of these routes, in 2021, Russia delivered 58.1 Bcm via Nord Stream 1, 26.5 Bcm via the Yamal-Europe pipeline, 37.5 Bcm via Ukraine, 12.1 Bcm via Turkish Stream to the EU member states of South-Eastern Europe, and 4.3 Bcm directly to the Baltic states and Finland (plus another 2 Bcm or so for Kaliningrad). A residual 3.7 Bcm was delivered to Poland via Belarus. In addition, all of Russia's 26.5 Bcm deliveries to Turkey were made via the Blue Stream and Turkish Stream pipelines. The key point is that deliveries via Ukraine accounted for 22 per cent of the 168.7 Bcm that Russia delivered to the wider European market (including Turkey) in 2021. When Turkey is excluded, the share of deliveries via Ukraine to Europe rises to 26 per cent.

1.3. How might Russian gas supplies to Europe be curtailed or cut off entirely?

1.3.1. Would Russia cut off supplies to Europe?

If the situation escalated into military conflict, to which Europe responded with sanctions targeting Russia's financial sector, and the Russian government then responded by ordering the partial or complete curtailment of Russian gas supplies to Europe (in breach of Gazprom's long-term contractual commitments to some or all of its European counterparties) for a period of several weeks or months, this would have economic consequences for both the Russian government and Gazprom. While, as argued below, this seems unlikely, it is important to understand the consequences.

In the period January-November 2021, tax on the production and export of oil and natural gas provided around 36 per cent of Russia's federal budget revenues.⁵ Most of this was from the production and export of oil and gas condensate with the tax on the production and export of natural gas accounting for some 18 per cent of the total,⁶ or 6.3 per cent of Russian federal budget revenues in that period.

The Russian taxation of oil is heavily weighted towards taxation of production rather than exports. Regarding natural gas, the opposite is true, with export duty accounting for 65 per cent of Russian gas tax revenues in January-November 2021, with tax on production accounting for 35 per cent. The loss of government tax revenues would effectively be 'double-counted' because a curtailment of exports (and export duties) would lead to lower production (and lower revenues from tax on production).

Aside from the impact on Russian government revenues, Gazprom itself would be hit hard by a curtailment of exports to Europe, given the wide disparity between Gazprom's revenues from its exports and its revenues from domestic sales. Despite the low gas prices in Europe in 2020, Gazprom's revenues from sales to Europe were twice its revenues from sales in Russia, while in 2019 its European export sales revenues had been 2.5 times its domestic sales revenues. This was despite the fact that in 2019 and 2020 Gazprom's sales volumes to the two markets (Europe and Russia) were similar, and that its exports are subject to a 30 per cent export duty.⁷ According to Gazprom's latest financial results (for Q1-3 2021), even when the export duty is subtracted, Gazprom's revenues from exports beyond the former Soviet Union accounted for 70 per cent of its total sales revenues and revenues from domestic sales accounted for just over 20 per cent. Put differently, in Q1-3 2021, Gazprom's sales revenues (net of export duty) were 3.3 times higher than its domestic sales revenues. Therefore, Gazprom is significantly more dependent on its sales revenues from exports to Europe than the Russian government is dependent on the tax revenues from those gas exports.

As discussed in the regular analytical section of the Quarterly Gas Review, Gazprom is already pursuing a commercial strategy of not selling volumes on the spot market, and only supplying Europe with volumes nominated by its counterparties under long-term contracts. If the Russian government were to go a step further, and order the curtailment of supplies to an extent that meant Gazprom was not meeting its long-term contractual commitments, or if it were to take the most radical step of cutting off Russian gas supplies to Europe completely, the impact on Gazprom and the Russian government would not be limited to the short-term loss of sales and tax revenues, but Gazprom's reputation as a reliable supplier would also be ruined. During the recent months of high prices in Europe, Gazprom has publicly stated that if European buyers want more Russian gas, they should sign more long-term contracts. However, if a partial or complete curtailment of Russian pipeline supplies to Europe resulted in a breach of existing long-term contracts, it would destroy trust in those contracts and make it almost impossible

⁵ Ministry of Finance of the Russian Federation. (2021). *Ежемесячная информация об исполнении федерального бюджета*. (Updated 27 December 2021). https://minfin.gov.ru/ru/statistics/fedbud/execute/?id_65=80042-yezehemesyachnaya_informatsiya_ob_ispolnenii_federalnogo_byudzheta_dannyye_s_1_yanvaryaya_2011_g

⁶ https://minfin.gov.ru/ru/statistics/fedbud/oil/?id_65=122094-svedeniya_o_formirovanii_i_ispolzovanii_dopolnitelnykh_neftegazovykh_dokhodov_federalnogo_byudzheta_v_2018-2022_godu

⁷ Gazprom. (2021). *Annual Report 2020*, 121-124. <https://www.gazprom.com/ru/posts/13/041777/gazprom-annual-report-2020-en.pdf>

for Gazprom to convince its European counterparties to sign new long-term gas supply contracts. On balance it does not seem likely that Gazprom or the Russian government would curtail supplies to Europe in the event of an escalation of hostilities in or against Ukraine, including in the event of a full-scale invasion, given the short- and long-term costs of such a move. However, European prices would surge on the fear that such a move would remain possible, given the unpredictability of any subsequent escalation in sanctions and counter-sanctions between Russia and Europe that could accompany such a military conflict.

1.3.2. Might European buyers be forced, through sanctions, to stop buying Russian gas?

While European sanctions would be applied to a whole range of activities, the likelihood of sanctions being applied to gas purchases from Russia under long-term contracts is extremely low. Cutting supply via all the routes, other than those to and via Turkey and the Baltics would remove pipeline imports equivalent to 26 per cent of total European supply in 2021⁸ – assuming that there would be no reason for Turkey to stop flows – and would likely send the market into turmoil and hit European economies. At a time of huge uncertainty, and with already high gas prices, this would sharply increase prices, with possible destruction of demand. Such sanctions would also require unanimity in the EU at least but there are already emerging splits with Germany, at the time of writing, opting for diplomatic routes. Other central and eastern Europe countries are also heavily dependent on imports of gas from Russia. On balance, therefore, this seems a very unlikely route for Europe to take, and an unnecessary self-inflicted wound.

1.3.3. Might other sanctions imposed on Russia interfere with the gas market?

Indirectly, it is possible that other sanctions could impact the gas market. There has been talk in the media of potentially the West limiting Russia's access to the SWIFT payments system making it very difficult for Gazprom to receive payments for gas under its contracts. If Gazprom could not receive payments for gas it has supplied, the risk of curtailed flows from Russia would be significantly increased. However, it is reported that Germany, again, is reluctant to support any limitation on Russia's access to the SWIFT payments system. This also, therefore, seems an unlikely reason for gas flows to be curtailed.

1.3.4. Would transit countries between Russia and Europe curtail flows?

The two main non-EU transit countries, excluding Turkey, are Belarus and Ukraine. Belarus seems unlikely to do anything to curtail flows (independently of approval from Russia, although threats have been made in the past). In any case, the flows on the Yamal-Europe route are currently at very low levels. The pipeline has a capacity of 97 MMcm/d on the Belarus-Poland border. In December 2021, flows into Poland dropped to 26 MMcm/d, and then fell to zero on 6 January and remained at that level until 28 January (most recent daily data). Flows of Russian gas from Belarus into Poland via a smaller interconnection fell from 13.4 MMcm/d in December 2021 to 4.5 MMcm/d in January 2022.⁹

The Ukrainian government is unlikely to prevent the transit of gas through the country for fear it would impact its supporters in Europe at a time of war. However, it is clearly possible that pipeline flows could get interrupted if there was any damage to pipelines, compressor stations and/or control rooms because of the conflict. Depending on the extent of any invasion or incursion, there is a distinct possibility of some disruption to infrastructure. A small-scale incursion into Eastern Ukraine, which is already partly controlled by Russian supporters, may not impact the main pipelines which do not go through that region. However, a wider invasion, possibly moving on Kiev, would significantly increase the possibility of damage to pipeline infrastructure and curtailment of flows. The complete cessation of flows via Ukraine would remove, at current flow rate, some 36 MMcm/d from the European market (the daily average flow from Ukraine to Poland, Slovakia, Hungary, and Romania for the first three weeks of January 2022).¹⁰

⁸ Data sourced from ENTSOG Transparency Platform, <https://transparency.entsog.eu/#/map>

⁹ Data sourced from ENTSOG Transparency Platform, <https://transparency.entsog.eu/#/map>

¹⁰ Data sourced from ENTSOG Transparency Platform, <https://transparency.entsog.eu/#/map>

1.3.5. Nord Stream 2 approval

While there have been no suggestions to date of imposing sanctions in respect of Russian gas supplies to Europe, there have been suggestions of sanctions impacting new Russian export capacity, namely Nord Stream 2, a new Russian pipeline to Germany under the Baltic Sea. This newly built pipeline is already filled with gas but is not allowed to start flows until its operator is certified as compliant with EU law by the German regulatory authority, the BundesNetzAgentur (BNetzA). The certification request from Nord Stream 2 AG (NS2 AG), a Swiss-registered company, was accepted on 8 September 2021. However, the certification process was suspended by BNetzA on 16 November 2021, on the grounds that only a German-registered company could be certified as an operator.¹¹ While the suspension itself was carried out on technical/procedural grounds – as NS2 AG would need some time to establish the required new subsidiary – its timing appears to have been political, reflecting complex domestic and international dynamics, namely the change of government in Germany and the unfolding Ukraine crisis. On 26 January 2022, Nord Stream 2 AG announced that the new German subsidiary, Gas for Europe GmbH, has been established.¹² Once BNetzA is ‘able to check whether the documentation resubmitted by the subsidiary, as the new applicant, is complete’, it will be able to resume the certification process and is obliged to issue a draft certification decision within six months after the suspension has been lifted. This timeline is consistent with the announcement made by BNetzA in December 2021 that a decision on certification would not be made until the second half of 2022.¹³ At the time of writing the certification process remains suspended.

There is no doubt that should the Ukrainian security situation deteriorate to the extent of a full-scale Russian military invasion, the US will not hesitate to apply sanctions in respect of Nord Stream 2. New sanctions legislation to that effect is currently under development. In this case, it would be extremely difficult politically for the EU – and for Germany – not to join the US in doing so and, at the very least, the certification of the Nord Stream 2 operator is likely to remain suspended and the pipeline to remain idle. What happens after that would depend on the length and severity of any conflict. In the event of a full-scale military invasion, and in the absence of any negotiated peace deal, the approval process for Nord Stream 2 would likely remain suspended. This raises the prospect of litigation, by multiple parties, directly or indirectly involved with Nord Stream 2, in respect of damages associated with it not becoming operational.

In the event of more limited hostilities, which fall short of a full-scale invasion, the situation is more uncertain. It is possible that while refusing to join the US sanctions in respect of Nord Stream 2, Germany – under pressure from the EU as well as from the Greens coalition partner within the government – may try to keep the certification process suspended for some time, thus preventing the pipeline from becoming operational. However, it would be impossible for BNetzA to do so for more than a few months without it becoming obvious that certification is suspended on grounds other than legal and regulatory, thus making itself liable to legal action. This is especially true as Nord Stream 2 AG has already established its Germany subsidiary – a key condition for lifting suspension – although further steps still need to be made. Therefore, BNetzA is likely to proceed with certification, subject to Gas for Europe GmbH’s compliance with the EU law, enabling Nord Stream 2 to start flowing gas before winter 2022/23. While the EU may want to stop Nord Stream 2 – under pressure from the US as well as from several EU Member States – it does not, on legal and regulatory grounds, have the power of blocking BNetzA’s certification decision and can only issue a (non-binding) opinion. Once certified by BNetzA, Nord Stream 2 could start flowing gas, whereas the EU and Member States would be able to contest BNetzA certification decision in courts, but not necessarily stop the gas flowing.

¹¹ For details, see Yafimava, K and Fulwood, M. (2021). ‘German regulator’s decision to suspend certification of Nord Stream AG: F.A.Q.’, OIES Energy Comment, November

¹² Nord Stream 2 press release, 26 January 2022.

¹³ Inverardi, M. and Steitz, C. (2021). ‘Nord Stream 2 won’t go live in first half of 2022, German regulator warns’. *Reuters*, 16 December. <https://www.reuters.com/business/energy/german-regulator-says-nord-stream-2-launch-not-expected-h1-2022-2021-12-16/>

1.4. Could Europe replace any lost supplies from Russia?

The main alternative for lost supplies would be the global LNG market, additional withdrawals from storage and potentially additional pipeline imports from North Africa, Iran and Azerbaijan.

It has been well documented that storage in Europe is already at very low levels. On 25 January 2022, total storage stocks in the EU-27 and UK combined stood at 42.7 Bcm (41 per cent of capacity). These are the lowest stocks on 25 January since 2011, while the average stocks held on that date in the previous five years (2017-2021) were 58.2 Bcm.¹⁴ As discussed elsewhere in the Quarterly Gas Review, Europe's situation is more precarious than usual in terms of storage providing a buffer to cover demand surges during the winter.

Between 5 January and 25 January (most recent data), European storage withdrawals were running at around 630 MMcm/d. At the present rate of withdrawal, current stocks would be sufficient to last 67 days, until the first week of April. However, storage withdrawal rates are likely to slow down significantly towards the end of winter, as the weather becomes warmer. In the immediate short-term, there is scope for much higher daily withdrawals, given that the nameplate daily withdrawal capacity of European storage as a whole is around 1,800 MMcm/d.

In the period 1-28 January 2022, flows via Nord Stream 1 averaged 153 MMcm/d, which is below the full capacity of 165 MMcm/d (the level recorded in December 2021). Flows via the Yamal-Europe pipeline have been zero since 6 January, and flows into Poland from Belarus have averaged 4.5 MMcm/d since 8 January (down from 13 MMcm/d in December 2021). Finally, as noted earlier, flows via Ukraine have averaged 36 MMcm/d in January so far. Therefore, Russian flows to Europe via the main routes (excluding transit via Turkey and direct deliveries to Finland and the Baltic states) in January have generally been around 195 MMcm/d.

Technically, these flows could be replaced by ramping up daily storage withdrawals by 33 per cent, from 600 MMcm/d to 800 MMcm/d. However, at that rate, European storage stocks would be empty by mid-March (beware the Ides of March!), and the daily withdrawal capacity would drop as those stocks began to run close to empty, due to declining pressure in the facilities.

There also appears to be little upside potential in pipeline supply from the three major non-Russian sources of pipelines supplies to Europe: Norway, North Africa (Algeria & Libya), and Azerbaijan.

Pipeline supplies from Norway appear to be running at full capacity, reaching 390 MMcm/d in December 2021 – the highest since November 2017. Supplies from Norway are delivered to Germany, the Netherlands, Belgium, France, and the UK. These markets also receive Russian gas via Nord Stream 1 and Belarus (Yamal-Europe pipeline), but are not dependent on transit via Ukraine for any of those deliveries.

Pipeline imports from North Africa are largely to Southern Europe and were already running at high levels last year. Total imports from North Africa to Spain and Italy in 2021 reached 37.7 Bcm, which is slightly higher than in 2017 and 2018, and significantly higher than 2019 (26.7 Bcm) and 2020 (25.1 Bcm). If anything, those supplies are now slightly constrained by the cessation of transit via Morocco for deliveries from Algeria to Spain since 1 November 2021, although this has been offset with higher Algerian supplies to Italy.

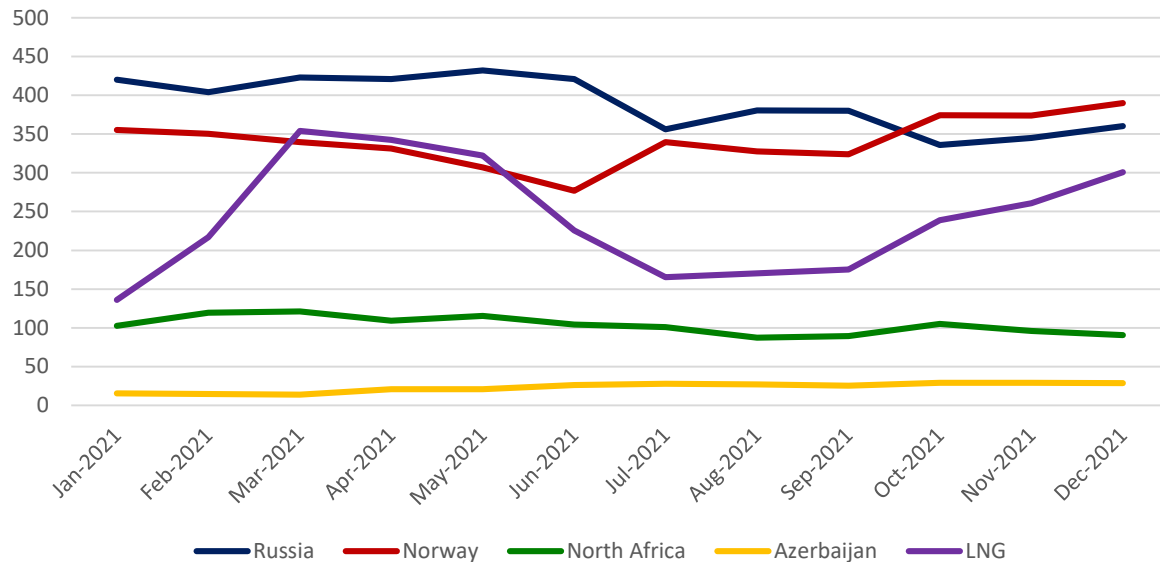
Pipeline supplies from Azerbaijan to Greece and Italy via Turkey and the Trans-Adriatic Pipeline (TAP) are already effectively running at full capacity of 27-29 MMcm/d in October, November, and December 2021. Therefore, any additional Azeri production would most likely be consumed in Turkey, along with any potential additional supplies from Iran.

In the event of a partial or complete curtailment of Russian pipeline supplies to Europe, LNG rather than non-Russian pipeline supplies would be called upon for additional supply. LNG imports into Europe (excluding Turkey) have already risen sharply in the last few months as some of the supply constraints in 2021 began to unwind and demand growth from Asia and elsewhere in the world eased. Monthly net

¹⁴ Data from Gas Infrastructure Europe. (2022). *Aggregated Gas Storage Inventory*. <https://aqsi.gie.eu/#/>

imports of 165-175 MMcm/d in July-September 2021 rose to 301 MMcm/d in December 2021 – far higher than the imports of 215 MMcm/d in December 2020, but below the imports of 353 MMcm/d in December 2019. Net imports in January 2022 (as of 29 January) are already at a record 12,009 MMcm (414 MMcm/d), which far surpasses the previous record of 10,955 MMcm (353 MMcm/d).¹⁵

Figure 1.2: European imports by supplier (monthly average MMcm/d)



Source: Data from ENTSOG Transparency Platform and Kpler LNG Platform

The scope for even greater European LNG imports is limited by the fact that the LNG export terminals seem to be currently running at or very close to full available capacity. If that is the case then any additional flows to Europe would require diversion of flows from other markets. European prices are already significantly higher than Asian prices and have been instrumental in attracting cargoes to Europe in the last few months. Qatar have reportedly been approached by the US to provide more cargoes to Europe, but they are pretty much producing at maximum and cargoes would have to be diverted from Asia.

Finally, there is no significant potential upside to European gas production in the short-term. Dutch gas production consistently averaged around 0.9 Bcm per month (30 MMcm/d) between August and December 2021. In early January, the Dutch Ministry of Economy announced that it could raise the Groningen production cap from 3.9 Bcm to 7.6 Bcm for the gas year 2021-22 in order to secure supplies, although a final decision is not expected until April.¹⁶ The move would add 3.7 Bcm to European supply spread over the course of several months, perhaps equivalent to around 1 Bcm per month (around 32 MMcm/d).

UK production has already rebounded from its mid-2021 maintenance, while maintenance at the Tyra offshore platform in Denmark remains ongoing and is not expected to be complete until mid-2023. In any case, the resumption of production in Denmark will only add a small amount of supply (around 2 Bcm/a) to the European market. Production in the rest of Europe as a whole continues to decline, and if the prices of recent months have not been sufficient to generate additional production, then this is a sign that the other European producers simply have no more to give.

Overall, it seems that there is only very limited potential additional supply available from either European gas producers or non-Russian pipeline suppliers. In that context, any partial or complete curtailment of Russian pipeline supplies to Europe would have to be compensated for by higher storage withdrawals and LNG imports even greater than the record levels seen in January. The caveats here are that

¹⁵ Data from Kpler LNG platform (subscription required)

¹⁶ Krümpelmann, S. (2022). 'Groningen 2021-22 gas output estimate almost doubled'. *Argus*, 7 January. <https://www.argusmedia.com/en/news/2289553-groningen-202122-gas-output-estimate-almost-doubled>

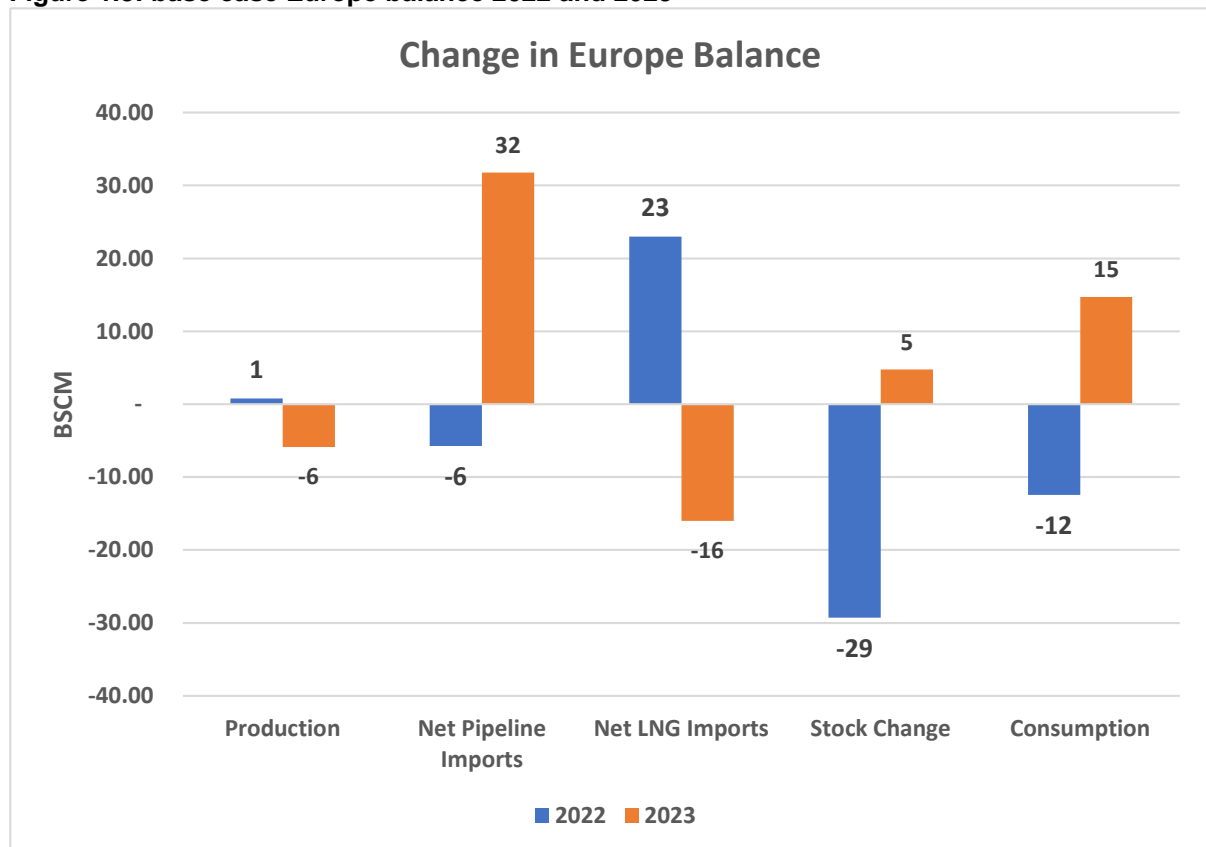
additional storage withdrawals raise the risk of stocks being completely depleted before the end of winter, especially if European demand encounters a weather-related surge, as occurred in February-March 2018, while demand for even greater LNG imports could run up against limited availability of cargoes on the global market, especially if the additional demand occurred during a cold spell in North-East Asia that resulted in a surge in LNG demand in that region.

Given those conclusions, we now turn our attention to modelling the European gas balance under different scenarios of Russian supply.

1.5. Possible scenarios on Russian flows to Europe

Using NexantECA's World Gas Model we have looked at some possible scenarios for Russian flows to Europe. The base or reference case is that there is no war, with Nord Stream 2 coming on in the middle of this year at some 30 to 40 per cent of capacity and flows on the Yamal-Europe route return to some 65 per cent of capacity. This would mean an increase in pipeline imports from Russia this year, compared to 2021, but not enough to offset the likely decline in imports from North Africa and Iran in particular. Gas production in Europe may be similar to the 2021 level but demand lower, particularly in Turkey where demand rose strongly last year due to a weather-related shortfall in hydroelectricity generation. LNG imports would rise significantly on the back of rising global LNG supply and slower demand growth in Asia and South America, to enable a partial refilling of storage in Europe. The stock change of minus 29 Bcm in Figure 1.3 represents a net injection of gas into storage in 2022 of 9 Bcm compared to a net withdrawal in 2021 of 20 Bcm – a turnaround of 29 Bcm. In respect of gas prices, TTF averaged some \$13.50 per MMBtu in 2021 and the model projection is for a similar level in 2022 – note this is significantly below the current forward curve which is already pricing in the possibility of some Ukraine disruption as well as lower flows from Russia than our base case suggests. In 2023 in the base case, net pipeline imports rebound with much higher Russian flows as Nord Stream 2 flows. Demand also rebounds but LNG imports drop back year on year, following the 2022 rise.

Figure 1.3: base case Europe balance 2022 and 2023



Source: OIES

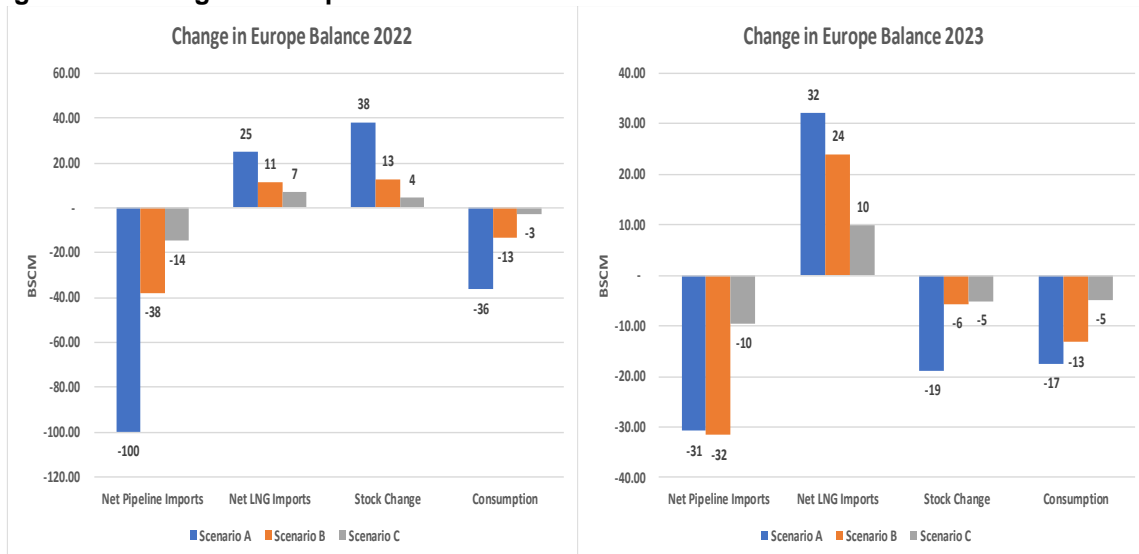
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In the event of a full-scale Russian invasion of Ukraine, three alternative scenarios are considered for the rest of 2022 before 2023 reverts to the base case, but with no Nord Stream 2.

- **Scenario A:** All flows along Nord Stream 1, Yamal-Europe, and all routes via Ukraine are halted in the next few weeks. Russia exports to the Baltics and direct routes to Turkey are maintained, including those into Southeast Europe. Nord Stream 2 does not start up.
- **Scenario B:** All flows through Ukraine are halted, Nord Stream 1 operates at full capacity, and the Yamal-Europe route only runs at about one third of its capacity – broadly similar to its Q4 2021 rate of flow. Russia exports to the Baltics and also the direct Turkey routes are maintained. Nord Stream 2 does not start up.
- **Scenario C:** As for scenario B with all flows through Ukraine halted and Nord Stream 1 at full capacity, but Yamal-Europe also runs at full capacity to accept diversions of volumes from the Ukraine route.

Figure 1.4 shows the change in the Europe balance for 2022 and 2023 compared to the base case of no full-scale invasion and no flow curtailments.

Figure 1.4: change in Europe balance v base case



Source: OIES

Scenario A in 2022 has a very large reduction in net pipeline imports – from Russia – and as a consequence, Europe pulls in more LNG imports, withdraws a lot more gas from storage (effectively leaving storage in Europe largely empty through the year) and leads to a steep reduction in demand – in effect demand destruction in power and industry. Despite the return to gas flows from Russia (albeit without Nord Stream 2) in 2023 there are considerable knock-on effects from 2022. In the base case, pipeline imports were projected to increase significantly in 2023 but that does not materialise without Nord Stream 2. With the need to replenish storage stocks, LNG imports increase relative to the base case while demand is again restricted (effectively not rebounding from the 2022 decline).

Scenario B in 2022 has a more muted response. Pipeline imports are reduced but the full flows on Nord Stream 1 limit the reduction. As a result, the need to import more LNG, withdraw more from storage and reduce demand is more limited. In 2023 the knock-on effects are also muted, although pipeline imports are still much lower than the base case as the Yamal-Europe route remains restricted. More LNG imports are still needed, but not as big a storage rebuild as withdrawals in 2022 were reduced, and the fall in demand is also more limited.

Scenario C, in contrast, exhibits much smaller differences from the base case in 2022 and 2023. This reflects the fact that Yamal-Europe flows at full capacity as flows are diverted from the Ukraine routes.

Slightly lower pipeline imports are offset by more LNG with little change in storage movements and demand.

The reductions in pipeline imports into Europe are in part offset in the three scenarios by increasing LNG imports. Figure 1.5 shows the change in total and regional imports between the base case and the three scenarios.

Figure 1.5: change in LNG imports v base case



Source: OIES

The first point to note is that there is little scope for increasing the amount of LNG available on the global market in 2022 – maybe only 3 Bcm can be done. There is a bit more scope in 2023 as more LNG supply comes on. The increase in European LNG imports, therefore, almost all comes from diversions from other countries. In 2022, the modelling suggests that most of the diversions come from China and smaller amounts from India, Pakistan and Bangladesh. In 2023 the diversions to Europe are more widely spread. With the curtailment of flows from Russia, an increase in spot prices globally is not unexpected. Figure 1.6 shows the change in Henry Hub, Japan spot and TTF prices in 2022 and 2023 compared to the base case.

Figure 1.6: change in spot prices v base case



Source: OIES

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The average TTF price in 2021 was some \$13.50 per MMBtu and the average Japan spot price some \$16 per MMBtu. As noted earlier the base case price for 2022 for TTF was similar to the 2021 level and for Japan spot slightly lower at some \$14. In scenario A, prices rise sharply in 2022 by around 40 per cent for TTF and 20 per cent for Japan spot. The price rises for the other scenarios are a bit smaller and quite muted for scenario C. For 2023 the difference in prices compared to the base case are even greater. This reflects largely that in the base case 2023 prices decline significantly compared to 2022 but remain higher in the scenarios. In scenario A, for example, the 2023 and 2022 prices are at broadly the same level on average at \$16 to \$17 per MMBtu for both Japan spot and TTF, compared with significant falls in the base case.

1.6. Conclusions

The global gas markets are being unnerved by the possibility of a full scale or partial military invasion of Ukraine by Russia. The current forward curve for TTF,¹⁷ at the time of writing, has an average price of \$28 per MMBtu for the rest of 2022, seemingly pricing in potentially significant disruption to gas flows from Russia into Europe. Even with an invasion by Russia it is unclear whether this would result in any disruption of flows from Russia. On balance, it is unlikely that Russia would curtail flows along Nord Stream 1, Yamal-Europe, and the Ukrainian routes simply as a result of sanctions imposed by the West. Additionally, it is also unlikely that Europe would apply sanctions on energy imports from Russia, especially gas, as that would be likely to severely damage Europe's economies, especially in central and eastern Europe. In respect of Nord Stream 2, a full-scale military invasion would almost certainly lead to the cancellation of the project on political grounds (potentially followed by litigation over damages). Should the Ukrainian security situation remain tense but short of a full-scale invasion, the process of approving Nord Stream 2 is likely to go ahead. As there is a limited scope for significant delays on legal and regulatory grounds, it is still possible that Nord Stream 2 could be flowing gas before next winter.

A curtailment of flows might be more likely if the sanctions imposed on Russia include a ban on use of the SWIFT international payments system, since if Russia isn't getting paid for its hydrocarbon exports it would be unlikely to deliver them, and claim the halt in physical flows as a *force majeure*. A more realistic scenario might be that the Ukrainian gas infrastructure was damaged in any conflict and with no ability to repair it in the middle of a conflict, thereby shutting down flows.

OIES has run three different scenarios in respect of the curtailment of flows from Russia. A complete shutdown of Nord Stream 1, Yamal-Europe and the Ukraine routes has devastating consequences for the European gas market with knock-on effects around the world. The 100 Bcm or so of lost imports cannot be replaced with additional production in Europe or pipeline and LNG imports from elsewhere as the capacity does not exist. LNG can, to some extent, be diverted from Asia especially but this is limited. Storage in Europe can be run down but this only provides a few weeks respite at most and then storage is unable to be refilled because of lack of supply, leaving the European market facing a disastrous winter in 2022/23 with industry and power plants shutting down, as European gas prices rise well above 2021 levels.

A slightly less dramatic scenario would be that the Ukraine routes are closed off and, if the loss of gas is limited to the 40 Bcm or so along those routes, then the curtailment of demand and the depletion of storage as well as the diversions of LNG are more muted. A third scenario would be that the reduction in flows via Ukraine is partly offset by increasing flows along Yamal-Europe, which could replace a substantial proportion of the Ukraine losses, since currently flows along Yamal-Europe are very low. If this occurred and Russia co-operated in diverting the flows then the potential diversions of LNG, withdrawals from storage and reduction in gas demand would be quite small.

This is far from a rosy scenario, however, since the current low Russian flows along the three corridors (excluding flows via Turkish Stream) are some 193.5 MMcm/d, which is significantly below the level seen as recently as December 2021 (302.8 MMcm/d), and far below the level seen twelve months ago, in January 2021 (377.2 MMcm/d). If this continues, even in the absence of any possible conflict in

¹⁷ As of 28 January 2022

Ukraine, next winter in Europe is looking significantly worse than this winter, with storage levels by October 2022 well below 2021 levels, which were already below normal storage levels for that time of year.

The European gas buyers and governments appear to be doing little or nothing to alleviate the current gas supply situation. The US Government is reportedly talking to US LNG producers and other LNG exporters in an attempt to get them to send more LNG to Europe, which can only be done through diversions. A key question for European gas buyers and governments is why they are not nominating more – up to the daily contract quantities (DCQs) – on the existing contracts with Gazprom. OIES estimates that the DCQs on the contracts along those routes (excluding the routes to and via Turkey) are over 300 MMcm/d, compared to the 231 MMcm/d currently flowing to Gazprom's European counterparties via Nord Stream 1 (153 MMcm/d), Yamal-Europe (zero plus 4.5 MMcm/d via a smaller Belarus-Poland interconnection), Ukraine (36 MMcm/d), Turkish Stream (34 MMcm/d to South-Eastern Europe, excluding Turkey), and directly to Finland and the Baltic states (3.1 MMcm/d).

One possible answer to this question is that, in January at least, if the contracts are priced on the monthly (month ahead) contract then the January TTF price was some \$37 per MMBtu, while the day-ahead price has been much lower averaging \$28 and as low as \$25. It makes sense, therefore, for buyers to buy day-ahead gas or even take gas out of storage rather than nominate under the long-term contract. That situation is changing, however. The February price may be around \$28, while the day-ahead price is now around \$30 so the incentives have changed. Moreover, in the current circumstances, with potentially higher prices in the future, it would make sense – certainly collectively – for the European buyers to nominate higher volumes on their contracts with Gazprom. The very act of doing so, and increasing flows, could take the pressure off storage and also bring prices down.

As a general conclusion, there has been much public debate over the potential impact of a full-scale Russian invasion of Ukraine on the European gas market. Our analysis has demonstrated that the European market is already very tight, with the only significant potential upsides for supply being additional LNG imports (which are already at record levels), additional storage withdrawals (which could later impact the ability of the European market to cope with an intense spell of cold weather before the end of winter), or Russia itself (while Gazprom is holding back from the spot market and currently has spare capacity on its routes to Europe via both Belarus and Ukraine). In this context, uncertainty over Russia's military intentions and market fears of potential for supply disruption are already placing upward pressure on prices in a market where the fundamentals have driven prices to high levels in any case. If the geopolitical context worsens and any of our three scenarios come to pass, they will make a challenging market situation even tighter, with price surges to new record highs the inevitable outcome.

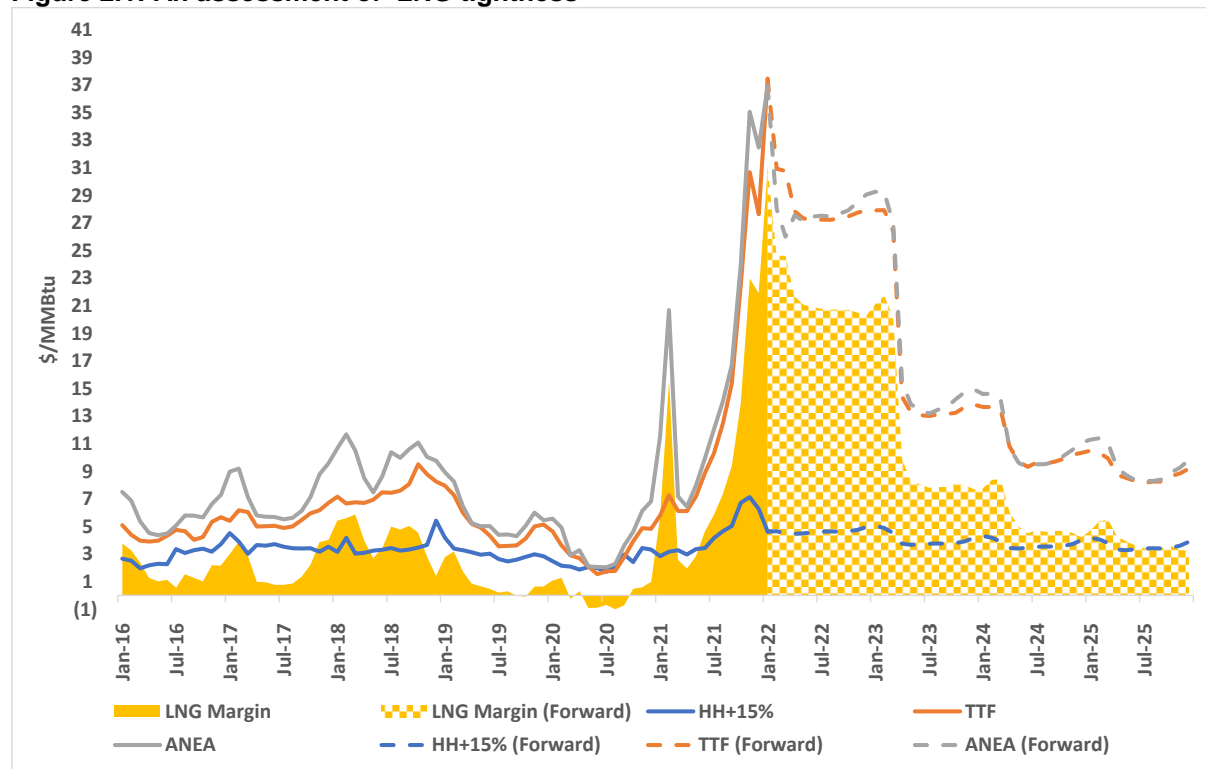
2. Price analysis

In this second section of the quarterly, we include our regular review of some key pricing trends for global LNG, Europe, and Asia.

2.1 LNG tightness

Firstly, we consider our ‘LNG tightness’ analysis, as an indicator of how profitable existing export projects are, and whether there is a need for new FIDs to meet demand in the global market. Figure 2.1 is based on data from Argus Media and shows the prices for TTF in the Netherlands, the ANEA spot price in Asia and the Henry Hub price in the US. It then calculates the highest netback from Europe or Asia to the US Gulf Coast plants based on the respective shipping costs. Deducting Henry Hub plus 15 per cent from the highest netback gives the LNG Margin, which provides an indication of whether developers in the US can expect to recover the fixed cost of liquefaction. A margin in excess of \$3/MMBtu (the fixed liquefaction cost in the traditional Cheniere contract) – as it was in 2018 - would provide an obvious incentive for new projects while a margin well below this suggests a more oversupplied market.

Figure 2.1: An assessment of ‘LNG tightness’



Source: OIES, based on data from Argus Media. Forward curve at 25 January 2022

The negative margins back in 2020, when the COVID-19 pandemic caused lockdowns in Asia and Europe leading to economic decline and a fall in energy demand, seem a distant memory now. Between 150 and 200 cargoes were shut in, which started to impact the market during the summer months. The picture changed dramatically as the impact of the pandemic started to ease and economic recovery brought higher demand and increased prices, pushing the margin back into positive territory in Q3. At the end of 2020 and in early 2021, the very cold weather and a dramatic rise in prices in Asia (see Figure 1.1) pushed the margin briefly to an extremely high level. The price spike in Asia was discussed in an earlier OIES Comment.¹⁸

¹⁸ Fulwood, M. (2021). ‘Asia LNG Price Spike: Perfect Storm or Structural Failure?’ *OIES Comment*, 17 February <https://www.oxfordenergy.org/publications/asia-lng-price-spike-perfect-storm-or-structural-failure/>

Prices fell back quickly after the Asian spike, but the continuing tightness of the global supply demand balance led to firm prices throughout the summer. In August, however, prices started to rise dramatically in both Europe and Asia, seeming to incorporate a large 'fear' premium, pricing in another cold winter. There were also reports of some short covering by LNG traders in Asia supporting the price, and some traders having large short open positions on TTF which resulted in significant margin calls.¹⁹ These short positions needed to be covered by buying on the physical or futures markets, providing short term price support.

In December, the price volatility increased with prices moving as much as 10 per cent up and down in a day on little more than good or bad news and windy or non-windy days in Europe. The support to prices in the last couple of months has come from significantly reduced flows along the Yamal Europe pipeline from Russia. For the market as a whole, the lower Russian flows have been offset by much higher LNG imports, reaching record levels in December – a record that is likely to be broken in January. In the absence of the lower flows from Russia, the higher LNG imports may well have brought prices down significantly. The current issues surrounding Ukraine and Russia, as discussed in the first part of the review, are also impacting the forward curve.

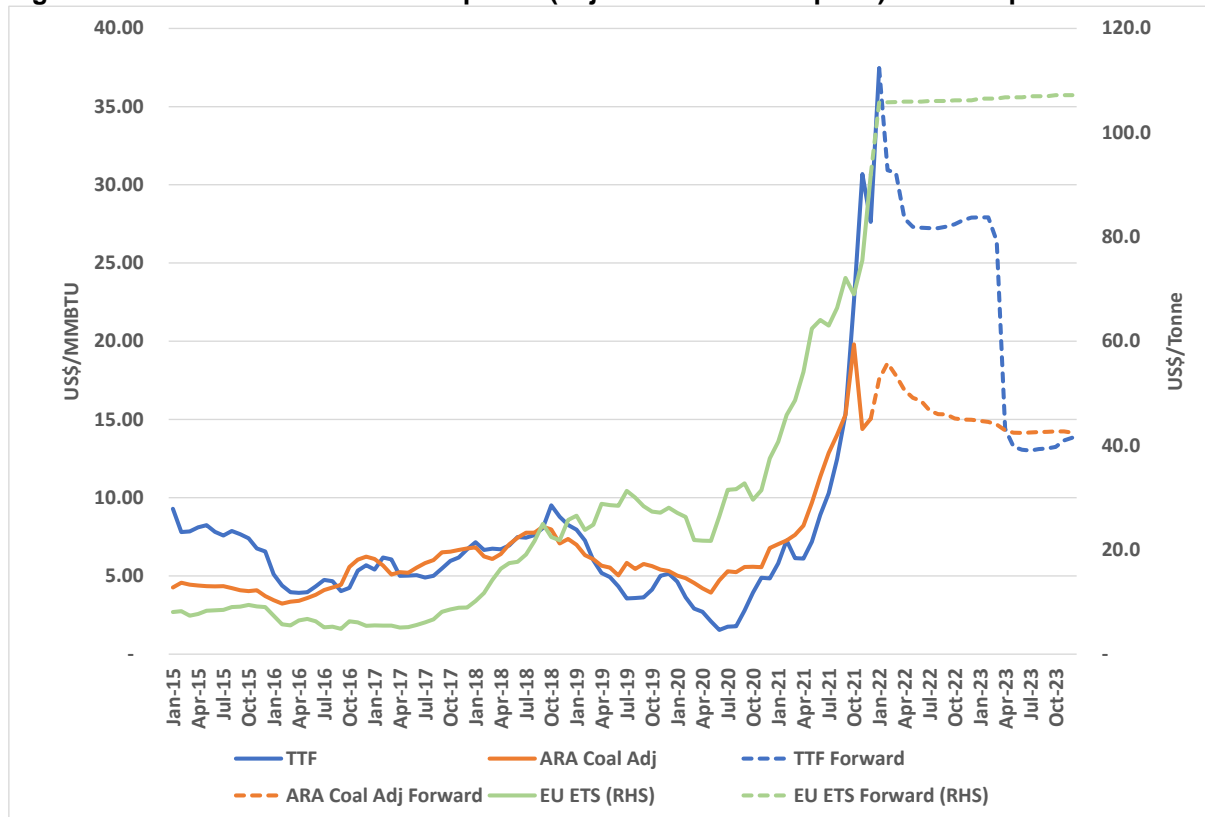
The forward LNG margin, therefore, is now well over \$20/MMBtu, through to early 2023, and doesn't get down to less than \$5 until 2025. Clearly, current margins provide an incentive for new FIDs but much lower margins might not. However, it is not just the margin which will be needed for FIDs to be forthcoming. Even if the economics look good, most new LNG developments will still require the backing of long-term contracts and it is not clear that, even with the current very high spot prices, the big Asian buyers are necessarily queuing up to enter into new contracts.

2.2 Carbon prices and inter-fuel competition in Europe

The rising European prices reflecting the tight global supply demand balance, might have been expected to lead to a loss of competitiveness for gas in the power market. Figure 2.2 compares TTF prices with the coal and carbon prices. The coal price (ARA – Amsterdam, Rotterdam, and Antwerp) is adjusted for the relative efficiency of gas power plants to coal power plants and the relatively higher carbon costs of coal.

¹⁹ Payne, J. and Zhdannikov, D. (2021). 'Commodity traders face big margin calls as gas prices soar'. Nasdaq, 4 October. <https://www.nasdaq.com/articles/exclusive-commodity-traders-face-big-margin-calls-as-gas-prices-soar-2021-10-04-0>

Figure 2.2: TTF and Rotterdam coal prices (adjusted for carbon price) and ETS prices

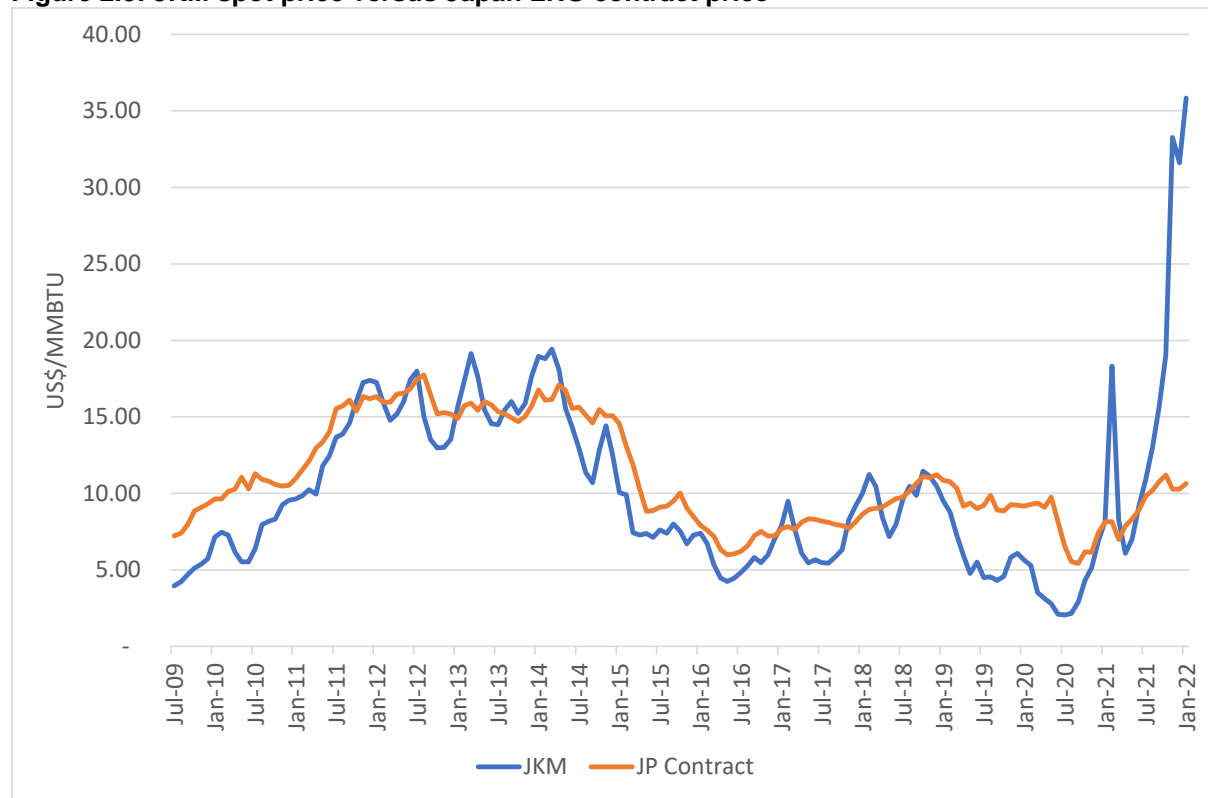


Source: Argus Media, ICE. Forward curve at 25 January 2022

2.3 JKM spot price versus LNG contract price in Asia

The relationship between contract and spot prices in Asia continues to be of significant interest. As we have noted at various times, customers tend to seek changes in the formation of prices when their impact causes them to suffer very substantial financial losses. This certainly occurred in Europe when spot and contract prices diverged and customers began to demand a move away from oil-linked pricing to hub-based prices, catalyzed by new EU rules on market liberalization.

Figure 2.3: JKM spot price versus Japan LNG contract price



Source: Platts and Argus data, OIES analysis

In early 2019, there was a decisive break between the oil-linked contract price and the JKM spot price, as Figure 2.3 shows. Contract prices came down in early 2020 as oil prices had fallen a few months before. The prices began to converge towards the end of 2020 before we saw the big jump in the JKM spot price in February. The rise in spot prices through 2021 saw JKM jump back well above oil-indexed contract prices. Japanese buyers in Q4 used the high spot prices as a reason to resell unneeded oil-indexed cargoes to buyers in China.

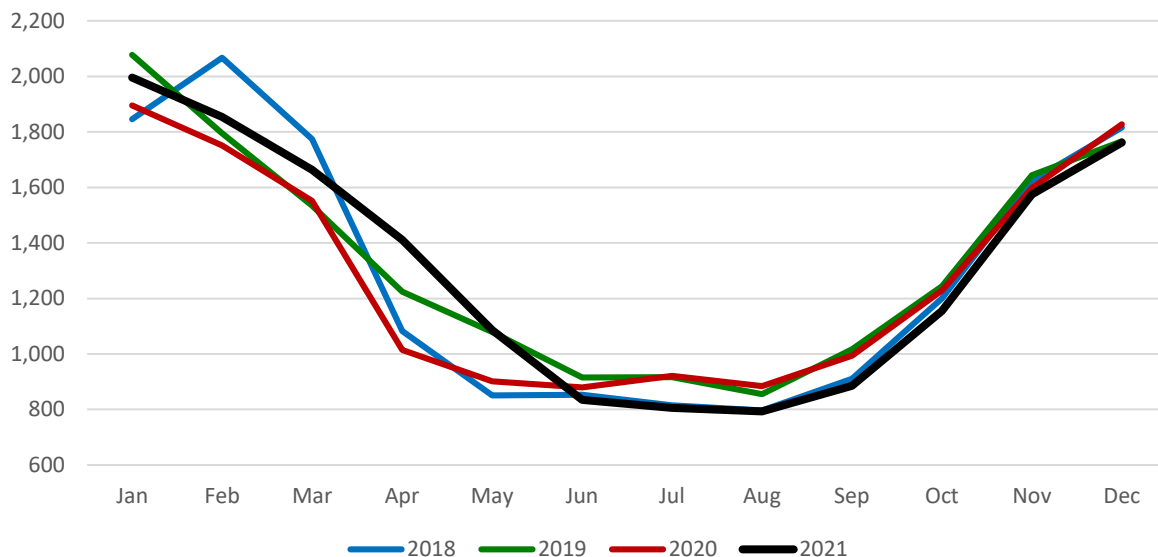
When spot prices were well below contract prices, there was discussion as to whether there would be a real challenge to oil-indexed contracts, if the trend persisted. However, with spot prices well above contract prices, this discussion seems to have stalled. It may take a return to a more balanced spot market and much lower prices for this debate to be renewed.

2.4 The European supply-demand balance

For 2021 as a whole, implied European gas consumption (production plus net imports and net storage withdrawals) totalled 480 Bcm. This was a 10 Bcm increase on 2020, but still not a recovery to 2019 levels (488 Bcm). For comparison, consumption in 2019 was boosted by a supply-long global market and relatively low prices, and consumption in 2020 was curtailed by the first wave of the COVID-19 pandemic. Comparison with total implied consumption in 2017 (488 Bcm) and 2018 (474 Bcm) finds the figure for 2021 roughly halfway between the two, so very much within the boundaries of ‘normal’.

Within the annual figure, there is significant monthly variation. In the first five months of the year, European gas demand was relatively robust compared to previous years, as illustrated in Figure 2.4. However, from June onwards, demand was dampened by rising prices that reached exceptionally high levels in the fourth quarter. This primarily affected gas demand in the industrial sector, and to a lesser extent power generation later in the year when the rise in gas prices outstripped the rise in coal and carbon prices. However, other sectors saw sustained demand, for example the commercial and residential heating sector, and in the power generation sector earlier in the year, when gas was not only still competitive relative to coal and carbon, but also necessitated by slumps in wind power generation and nuclear outages.

Figure 2.4: Supply to the European market (monthly average MMcm/d)



Source: Data from ENTSOG, Gas Infrastructure Europe, and Kpler

A certain ‘vicious cycle’ was created: price increases may have been caused by constraints on supply, but although some demand was curtailed by higher prices, other sources of demand were inelastic and therefore not curtailed by the higher prices. It was this dynamic that saw monthly implied gas consumption between June and December an average of just over 2 per cent lower than in the same period in 2018, but crucially, not fall any further.

In this context of relatively inelastic demand reaching a point where it could not fall much further, supply constraints were the principal cause of the increase in prices in 2021. This is visible when the supply is broken down by source and compared to previous years, as in Figure 2.5.

Specifically, European gas production continued its decline. While UK production in mid-2021 was impacted by maintenance that had been delayed from mid-2020, the ongoing decline in EU-27 production saw the decline in Dutch production matched by a decline in production in the remaining 26 EU member states. Only in Denmark, where maintenance work at the Tyra offshore platform will continue until 2023, is there a planned increase in production in the next two years. This suggests that European production in 2022 will be even lower than in 2021.

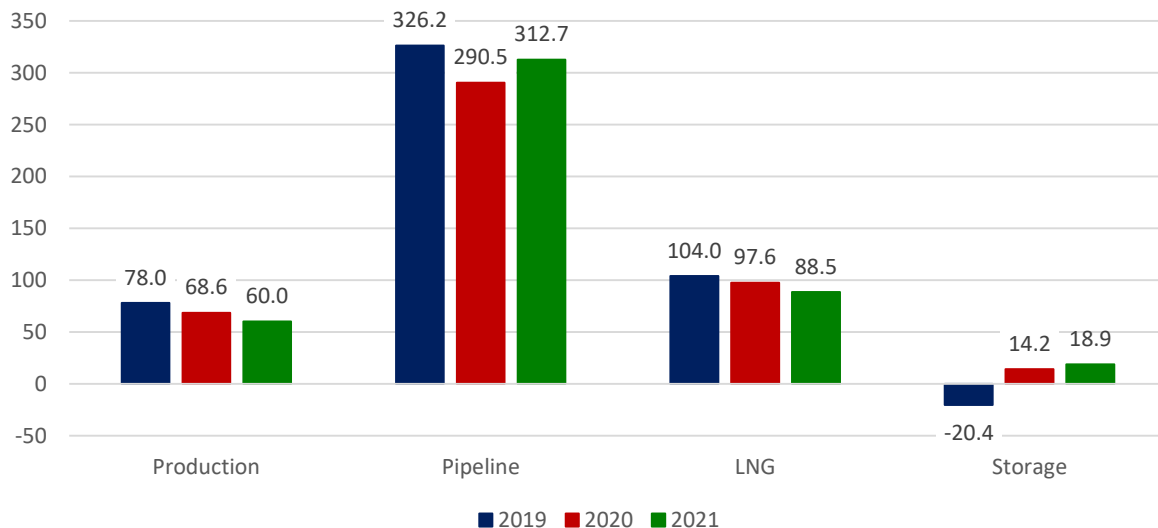
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For the year as a whole, pipeline imports rebounded from their slump in 2020, but did not return to 2019 levels. This was despite pipeline imports from Norway and Algeria rebounding and exceeding 2019 levels, and new supply from Azerbaijan reaching Greece and Italy via the Trans-Anatolian Pipeline (TANAP) and onwards via the Trans-Adriatic Pipeline (TAP). The reason for the limited year-on-year rebound in pipeline imports was a modest year-on-year decline in physical flows from Russia, which pushed those pipeline imports 36 Bcm (20 per cent) below their 2019 level.

European LNG imports fell by 11 Bcm year-on-year in 2021, placing them 15.5 Bcm lower than in 2019. The peak of 2019 was something of an outlier, with significant oversupply on the global market finding its way to Europe, which acted as the balancing element of that global market. Much of the additional LNG supply effectively ended up being injected into European storage, with Europe seeing a net storage injection of just over 20 Bcm over the course of the calendar year. The year-on-year decline in European LNG imports in 2020 was the result of constrained demand, rather than supply. With the European market saturated and prices at records lows in the summer of 2021, a significant number of export cargoes were shut in, most notably in the United States. Finally, the year-on-year decline in 2021 was the result of a much tighter global LNG market, with the growth in global demand outstripping the growth in global supply. In January and February, LNG cargoes were pulled away to Asia by cold weather and higher prices. After a surge in European LNG imports between March and May, cargoes were again pulled away to Asia between July and September. It was only when European prices rose dramatically from late September onwards that European LNG imports grew again in Q4, particularly in December.

Finally, in the context of production, pipeline and LNG imports all being lower than in the last pre-COVID year (2019), it was left to storage to balance the market. In the supply-long year of 2019, net storage injections took 20 Bcm off the market. In the tight market of 2021, net storage withdrawals added almost 19 Bcm to the market, most notably through stronger-than-usual withdrawals in Q1 and slower-than-usual injections in Q2.

Figure 2.5: Annual supply to the European market 2019-2021 (Bcm)



Source: Data from ENTSOG, Gas Infrastructure Europe, and Kpler

Turning our attention to Q4 in particular, the decline in production and pipeline imports compared to previous years mirrored the trends for 2021 as a whole, while LNG imports rebounded from 2020 levels but did not reach the volume recorded in Q4-2019. The net storage withdrawal of around 19 Bcm was similar to both Q4-2020 (21 Bcm) and Q4-2017 (20 Bcm), and notably higher than in Q4-2018 (around 13 Bcm) and Q4-2019 (just under 8 Bcm). However, as a point of comparison for Q4-2021, the limited storage withdrawal in Q4-2019 was an outlier, due to a combination of mild weather and, more pertinently, fears of a possible transit disruption related to the expiry of the Russia-Ukraine long-term transit contract on 31 December 2019. A supply-long market allowed those with storage stocks to leave

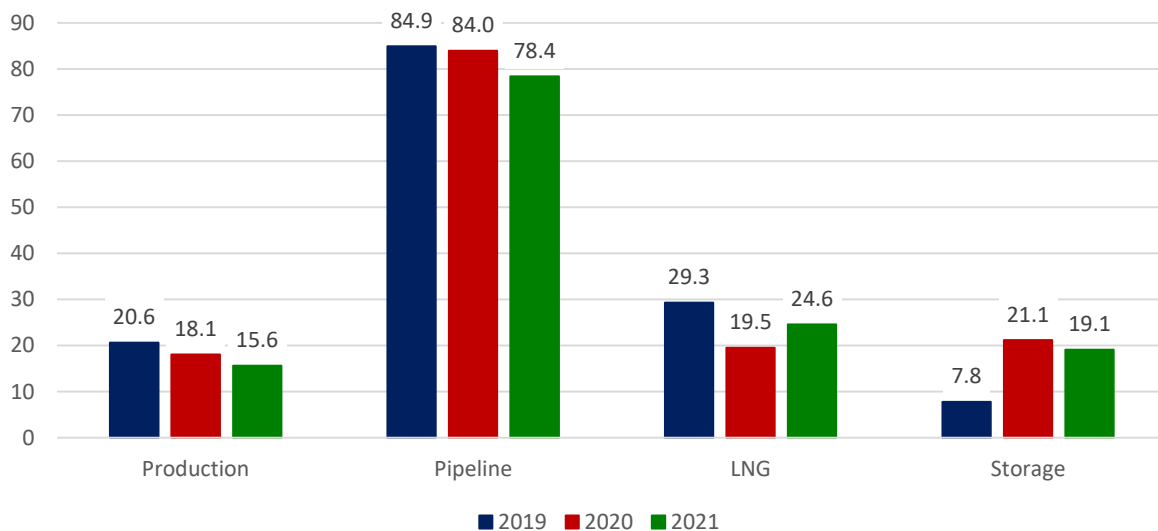
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them untouched in Q4-2019, as a hedge against potential supply disruption. Overall, the production level in Q4-2021 was to be expected, and the volume of net storage withdrawal in Q4-2021 can be considered 'normal'.

While the year-on-year decline in European gas production in Q4-2021 was expected, the substantial decline in pipeline imports was perhaps not. In Q1-3, total European pipeline imports (234 Bcm) were around 28 Bcm higher than in 2020 (206 Bcm) and just 7 Bcm lower than in the same period in 2019. However, total pipeline imports in Q4-2021 were 5.5 Bcm lower than in Q4-2020, and 6.5 Bcm lower than in Q4-2019. In other words, the year-on-year growth of the first three quarters turned sharply to year-on-year decline, while the shortfall relative to Q4-2019 was equal in magnitude to the shortfall accumulated over the first three quarters of the year.

In terms of pipeline imports by supplier, the non-Russian supply in Q4-2021 grew by 5 Bcm year-on-year, and by just over 7 Bcm compared to Q4-2019. This included increases from Norway and Azerbaijan, and a slight decline in imports from North Africa, with the latter caused by the cessation of transit of Algerian gas to Spain via Morocco from 1 November. By contrast, pipeline imports from Russia in Q4-2021 were down by 10.5 Bcm compared to Q4-2020, and down by 13.7 Bcm compared to Q4-2019. This decline in Russian flows included a 6.2 Bcm year-on-year decline in volumes delivered via Ukraine and 6.1 Bcm year-on-year decline in flows to Poland and Germany via the Yamal-Europe pipeline, which was slightly offset by a 1.8 Bcm year-on-year increase in quarterly flows to South-Eastern Europe via the Turkish Stream pipeline.

Figure 2.6: Supply to the European market in Q4, 2019-2021 (Bcm)



Source: Data from ENTSOG, Gas Infrastructure Europe, and Kpler

In our last Quarterly Gas Review, we noted the speculation that Gazprom could increase its physical flows to Europe once it had completed its domestic storage injections in Russia. Gazprom did indeed meet its domestic storage target by 1 November, as intended, and continued to make domestic storage injections until 8 November. However, Gazprom's physical deliveries to Europe grew by 9 MMcm/d in November compared to October, and although they grew again in December, the daily average for that month (360 MMcm/d) was still below the volume Gazprom delivered to Europe in August and September (380 MMcm/d). This contraction in Russian pipeline supplies in Q4-2021 played a decisive role in tightening the European market, and the associated price increase.

The reason behind the shortfall is threefold. Firstly, not only did Gazprom not replenish its downstream European storage stocks during the summer, it did not do so in November, once it had completed its domestic storage injections. Secondly, having dramatically reduced its spot gas sales earlier in the year (most notably via its Electronic Sales Platform, or ESP), Gazprom then completely halted its ESP sales

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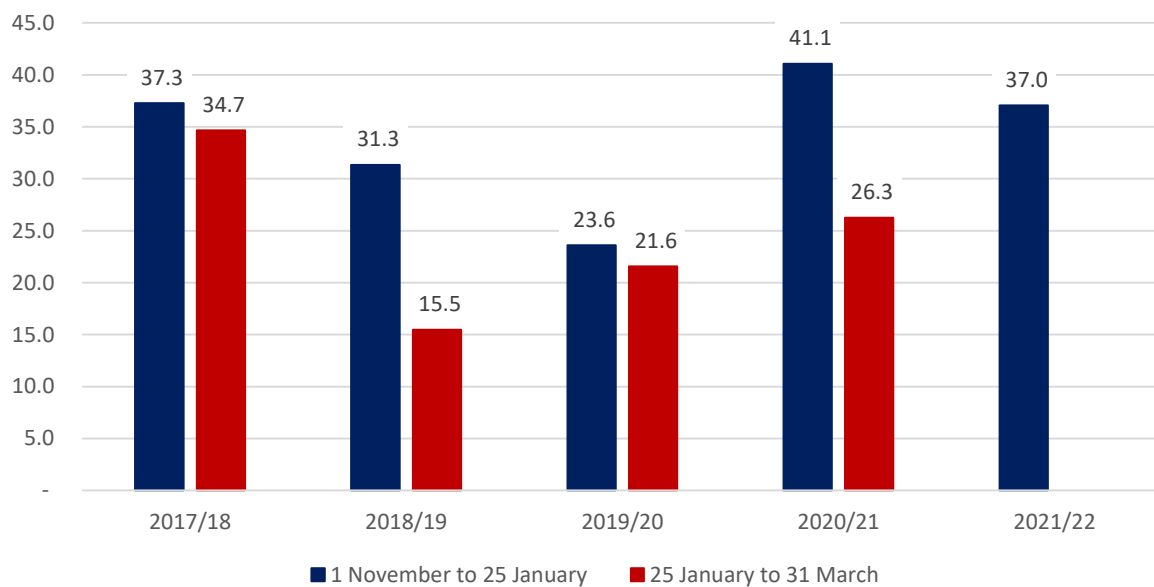
on 13 October. Finally, reports have emerged that Gazprom’s European counterparties with long-term contracts (whose prices are indexed to European hubs) did not nominate the maximum volumes to which they were entitled, due to the prevailing high prices.

A consequence of the high prices in Europe from October onwards was to increase the attractiveness of the European market to LNG suppliers. As a result, European LNG imports in Q4-2021 (24.5 Bcm) increased by 5 Bcm year-on-year, but were still 5 Bcm lower than in the supply-long, relatively low-price Q4-2019. The increase continued into January, which set a new record for European LNG imports.

2.5 European gas storage

In the previous Quarterly Gas Review, we noted that Europe had begun the winter with around 20 Bcm lower than in October 2019 and 2020, and around 10 Bcm lower than in October 2017 and 2018. In four of the previous five years, European storage stocks peaked between 20 and 30 October, with the exception being 2020, when stocks peaked on 11 October. Therefore, to gain an understanding of how rapidly Europe has drawn down its storage stocks during the current winter compared to the previous four winters, it is useful to consider the volume withdrawn from storage between 1 November and 25 January (the latest available data). As Figure 2.7 illustrates, withdrawals in the first half of the current winter have been relatively brisk, albeit smaller in volume than in the same period in winter 2020/21.

Figure 2.7: European net storage withdrawal from 1 November to 25 January (Bcm)



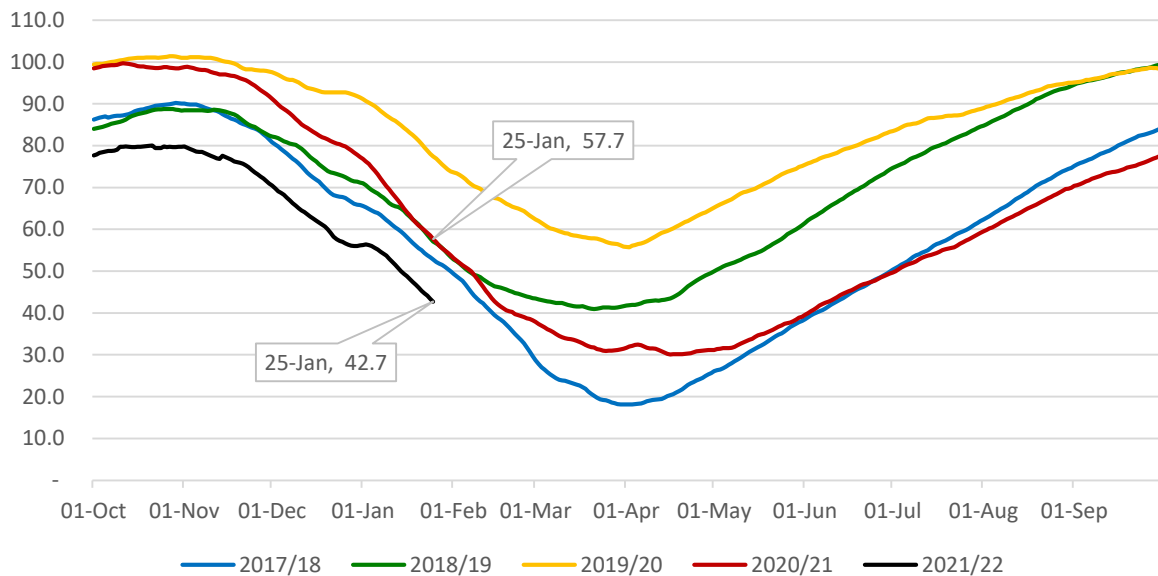
Source: Gas Infrastructure Europe Aggregated Gas Storage Inventory (AGSI+)

While the pace of withdrawals in Q4-2021 and January 2022 were not exceptional, they must be contextualised by the absolute volume in storage, as illustrated in Figure 2.8. The concern is whether Europe has enough in storage to last the rest of winter. As demonstrated in Figure 2.7, European net storage withdrawals between 25 January and the nominal end of winter (31 March) have varied widely in recent years, from the substantial withdrawals that accompanied the particularly cold weather in February-March 2018 to the much smaller withdrawals associated with much milder weather in Q1-2019 and Q1-2020. The average for the past four winters has been around 25 Bcm.

If Europe experiences a winter similar to the average of the previous four years, net storage withdrawals of 25 Bcm between 25 January and 31 March would leave European storage stocks at 17.7 Bcm – slightly lower than European stocks on 31 March 2018 (18.1 Bcm). If Europe has a mild February and March, with limited withdrawals similar to February-March 2019, Europe could end the winter with around 27 Bcm in storage – several Bcm less than the 31.5 Bcm Europe had in storage on 31 March

2021. Worryingly, if Europe experiences a spell of sustained cold weather and strong withdrawals similar to those in February-March 2018, Europe would be left with just 8 Bcm in storage.

Figure 2.8: Stocks held in European storage (Bcm)



Source: Gas Infrastructure Europe Aggregated Gas Storage Inventory (AGSI+)

Even if Europe avoids the worst-case scenario, it is still more than likely to end the winter with storage stocks lower than at the end of winter 2020/21, and thus require even larger summer net injections to bring stocks back to even the level of October 2021 for the start of winter 2022/23. This will provide upside pressure to European gas prices through the summer of 2022. If that scenario does come to pass, the impact will be felt beyond the summer of 2022, as net injections would be unlikely to significantly exceed those of summer 2021, meaning that Europe would again start the winter with significantly smaller storage stocks than it had in 2017-2020. That, in turn, would provide further upside pressure to prices in winter 2022/23.

In storage terms, Europe is at the mid-point of a process that provides a mirror image of the period 2019-2021. In 2019, a mild start to the year meant that storage on 31 March was much higher than twelve months earlier. In the summer that followed, oversupply on the European market led to the accumulation of storage stocks that effectively filled storage capacity by October 2019. Those stocks were not significantly drawn down in winter 2019/20 (at least partly due to Ukrainian transit concerns in Q4-2019 and mild weather in Q1-2020). This was followed by major oversupply during the first wave of the COVID-19 pandemic, and storage once again absorbed the excess and October 2020 saw storage facilities at full capacity. The storage overhang that had accumulated since the spring of 2019 was only cleared by the cold weather of Q1-2021 and the need for European storage withdrawals to offset the loss of LNG cargoes to Asia.

Two years of storage stock accumulation in 2019-2020 was unwound in the space of several months, but the pendulum then swung sharply in the opposite direction. Slower injections in summer 2021 meant that Europe began winter 2021/22 with stocks lower than usual. It now appears that Europe will end that winter with very low stocks, and will struggle to replenish them in summer 2022. The likely consequence will be another tight winter in 2022/23. Two gas storage 'feast years' in 2019 and 2020, the two 'famine years' of mid-2021 to mid-2023 will likely be ended by a more plentiful global LNG market and a looser supply-demand balance in Europe, with the accompanying lower prices, that will facilitate the replenishment of storage stocks back to the start-of-winter levels of 2017/18 and 2018/19. In storage terms at least, the European market is still 'a long way from normal'.

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