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Russia-Ukraine gas transit talks: risks for all sides

The tripartite EU-Russia-Ukraine talks on post-2020 arrangements for the transit of Russian gas to Europe across Ukraine made progress in September, but appeared to reach stalemate in October. After the three sides met on 19 September, it was announced that Russia had accepted that transit would be subject to EU-aligned regulation; Naftogaz Ukrainy stated that a new transmission system operator (TSO) was on track to be certified by 31 December. This should, in principle, open the way for new arrangements, to replace the ten-year transit contract between Gazprom of Russia and Naftogaz Ukrainy of Ukraine that expires on that day. But the next round of talks, on 28 October, moved no further in that direction. Maroš Šefčovič, EU Energy Commissioner, declared "disappointment" at the lack of progress; Aleksandr Novak, Russian Energy Minister, stated that no agreement on transit could be made, except as part of a package that also resolved a series of outstanding legal disputes.[1]

On 30 October, the final regulatory obstacle to completion of the Nord Stream 2 pipeline was removed, when the Danish energy agency approved its route across the Danish continental shelf. The pipeline, which will boost non-Ukrainian transit capacity by 55 bcm/year, could now be completed by the year end, although it will only become operational in mid-2020 at the earliest. Ukrainian transit will in any case be needed, this winter and in future, although Gazprom will want to reduce it in proportion to the ramping-up of Nord Stream 2. (See *Box: what is changed by more rapid Nord Stream 2 construction?*) Nevertheless, the Danish decision – which, it was widely assumed in European political circles, would be delayed until next year – weakens the EC-Ukrainian bargaining stance, which has been based on securing large-volume gas flows through Ukraine for an extended period.

Given the length of time that long-term commercial contracts take to negotiate, it is improbable, but not impossible, that one will be signed to provide Ukrainian transit by 31 December. At this stage, perhaps only a meeting of the Russian and Ukrainian presidents, covering both gas issues and the military conflict in eastern Ukraine, might bring a breakthrough. However, even without a contract, there are various shorter-term arrangements that could be put in place. The acceptance by all sides of the principle of EU-type regulation makes this prospect more likely, although not assured. In this OIES Energy Insight,[2] we review the factors influencing the negotiations and the possible outcomes; the supply interruption that could result from failure to reach any deal, and its implications; and the medium-term (to 2025) outlook for transit via Ukraine and related issues.

[1] *Vedomosti*, 2019. 'Peregovory o prodlenii tranzit gaza cherez Ukrainu ne prinesli rezultata', 28 October; *Argus European Natural Gas*, 2019. 'Russia-Ukraine transit talks fail to yield progress', 28 October

[2] Russian gas transit to Europe, and the Russia-Ukraine disputes, have been covered in a series of publications by the OIES natural gas research programme, including most recently: Pirani, S., 2019. Russia-Ukraine transit talks: the risks to gas in Europe. *OIES Comment*, May 2019; Yafimava, K., 2019. Gas Directive amendment: implications for Nord Stream 2. *OIES Energy insight 49,* March 2019; and Pirani, S., 2019. Russian gas transit through Ukraine after 2019: the options. *OIES Energy Insight 41*, November 2018

Tatiana Mitrova, Simon Pirani & Jack Sharples

Factors influencing the negotiations

There are two sets of related factors that influence the negotiations. First, commercial issues concerning the character of the agreement between Gazprom as shipper and the new TSO in Ukraine; the constitution of that TSO and the regulatory regime; and other implications of the adoption of EU-style rules for the Ukrainian market. Second, political factors related to Russia's wider disputes with the EU and Ukraine, not only over gas but also over Crimea, the military conflict in eastern Ukraine and broader geopolitical issues. For many years, hopes that gas transit issues would be delinked from these wider problems have been disappointed. There is little sign of such delinking now.

The EC and Ukraine have both pressed, throughout the negotiations, for a long-term, large-volume contract (60 bcm/year, plus up to 30 bcm/year on a flexible basis, over ten years). Two types of arguments are advanced to support this stance. The first is geopolitical. Angela Merkel, German Chancellor, proposed in 2018 that European acceptance of Nord Stream 2 on one hand, and a guarantee of long-term transit through Ukraine on the other, could be part of a broader reset of European relations with Russia. Other, cruder geopolitical views can be heard, for instance that a long-term transit deal would strengthen Ukraine's hand in its broader conflict with Russia.[3] The second type of argument is that a long-term transit deal is vital to finance the maintenance and reconfiguration of Ukraine's very large pipeline network: this is dealt with below.

Here, the main point is that the essentially political proposal for a long-term large volume contract may hinder the negotiations, because once Nord Stream 2, Turkish Stream 2 and the onshore continuations of these pipelines are completed, Gazprom will not want or need anything like this capacity.

Little account seems to be taken on the EU side either of this commercial reality – or of the fact that, once it is considered, it becomes clear that a logical approach to the talks by Gazprom would be simply to allow a possible supply disruption to draw closer, in order to focus discussion on shorter-term and more flexible options. Moreover, Russian government and Gazprom analysts are conscious that the European market is oversupplied, and that, in the case of a deal being reached, the current high level of gas in storage will result in low winter prices for gas, and even lower summer prices. So there is also a commercial reason to keep the market in tension. This is especially true now, after the Danish decision, which has made it obvious that Nord Stream 2 will become available in a few months' time. In this situation, Russia is very likely to insist on short-term arrangements for Ukrainian transit, based on European regulation.

The Russian government's approach to the talks seems, no less than the EC's, designed to obstruct a successful outcome. It has insisted that any agreement is conditional upon a setting-aside of outstanding legal cases, principally: (i) the $2.56 billion compensation award made against Gazprom at the Stockholm Chamber of Commerce, arising from arbitration of several claims brought by Gazprom and Naftogaz Ukrainy against each other in respect of the previous transit and supply contracts; (ii) a $6.7 billion penalty imposed on Gazprom by the Ukrainian anti-monopoly committee for its alleged abuse of its position as a monopoly gas supplier; and (iii) an arbitration claim by Naftogaz, now estimated at $12 billion in total, for compensation for Gazprom's alleged failure to accept market-based gas tariffs in 2018-19.[4] The Russian side is pressing for an out-of-court settlement of these issues. But Naftogaz is unlikely to accept this, for political reasons: it would be seen as a retreat damaging to Ukraine's larger dispute with Russia. Far from considering that option, Naftogaz has intensified its efforts to arrest Gazprom property through international courts to recover the $2.56 billion award.[5]

[3] On Merkel/Russia discussions: *Deutsche Welle*, 2018. 'Merkel casts doubt on Nord Stream 2 gas pipeline', 10 April; *Argus FSU Energy*, 2018. 'Russia will consider 'economic' Ukrainian transit', 23 August

[4] *S&P Global/ Platts*, 2019. 'Gazprom CEO says all legal disputes must be resolved before Ukraine gas transit deal', 21 October; *S&P Global/ Platts*, 2019. 'Russia-Ukraine legal dispute intensifies with new $12 billion lawsuit', 5 November; *Vedomosti*, 2019. 'Rossiia otvetila na novyi isk 'Naftogaza Ukrainy'', 6 November

[5] *Vedomosti*, 2019. 'Peregovorii o prodlenii', op. cit. On Naftogaz's most recent court actions, see for example: Naftogaz Ukrainy, 2019. 'Amsterdam District Court approves Naftogaz's application', *Press Release*, 25 October. On the background, see: Pirani, S., 2018. After the Gazprom-Naftogaz arbitration: commerce still entangled in politics. *Oxford Energy Comment*, March 2018

Proposals have been mooted to structure a long-term deal so that the $2.56 billion is effectively paid in kind with gas supplies. Advocates of this "solution" may be unaware of the unhappy history of payment-in-kind in the Russian-Ukrainian gas trade and its potential for creating new frictions.

We suggest that these political factors militate against a timely agreement on post-2020 transit arrangements. If no deal is in place by 31 December, and a supply disruption follows, it will be because political factors have, not for the first time, outweighed commercial ones in the Russia-Ukraine gas relationship. If on the other hand a deal is reached, it will be because the commercial issues have been prioritised. In our view these are:

1. *Character of transit arrangements*. One possibility is that a long-term contract is signed, but with a great deal of flexibility, allowing Gazprom to use the Ukrainian pipeline network as a back-up for its other transit routes, once these are in place. Another possibility, more in keeping with EU-style regulation, would be for the Ukrainian TSO to auction capacity in the usual way, and for Gazprom to book what it required. Two sticking points would probably remain: (a) the tariff, which Naftogaz has insisted would have to cover amortisation costs of the pipeline system; and (b) the existing long-term booking by Gazprom of capacity at exit points from Ukraine, for instance in Slovakia, which Naftogaz insists breaches EU market principles, and which certainly prevents the operation of "virtual reverse flow" for the delivery of gas imports from the west to Ukraine.
2. *Possible resumption of direct Russian gas exports to Ukraine*. Another implication of the acceptance of EU-style regulation in Ukraine is that, on completion of interconnection agreements, Gazprom (the only company entitled by Russian law to export pipeline gas) could sell gas directly to Ukrainian customers. Andrei Kobolev, Naftogaz Ukrainy CEO, acknowledged and welcomed this possibility in October.[6] From Russia's point of view, the anti-monopoly committee's ruling against Gazprom may be seen as an obstruction to this.
3. *Unbundling and certification of the Ukrainian TSO*. This appears to have been removed as a potential major obstruction to a successful agreement, although the process may not be complete by 31 December. Differences between the Ukrainian government and Naftogaz over the form of the TSO have been resolved, an ISO model adopted, and work done on implementation. The election of the new Ukrainian parliament in June, and subsequent formation of a government supported by the Servant of the People party, which (unusually in Ukrainian parliamentary history) has a working majority, has facilitated this. Naftogaz's transportation assets have been placed in a subsidiary, Gas Transmission System Operator of Ukraine (GTSOU), which on 1 January will be transferred to another company, Main Pipelines of Ukraine, which is owned by the Ministry of Finance. GTSOU has made many of the preparations necessary to constitute itself as a TSO, and legislative changes required pushed through parliament. There is a potential problem in that, for political reasons not apparently related to Naftogaz unbundling, the work of the National Energy and Utilities Regulatory Commission was disrupted by resignations from its board. New appointments were made on 28 October, and a new chairman, Valerii Tarasiuk, elected on 4 November, which may resolve this problem.[7] Nevertheless, this, and the sheer tightness of the timetable, means that certification may not be completed by 31 December.
4. *Maintenance and future partial decommissioning of the pipeline system*. The EC and Ukraine insist that a long-term, large-volume agreement is essential to underpin the financing of future maintenance and reconfiguration of the system. Clearly though, there are other solutions to this

[6] *Novoe Vremya*, 2019. 'S 1-ogo ianvaria Gazprom mozhet nachat' postavliat' gaz dlia ukrainskikh potrebitelei', 9 October. https://nv.ua/biz/economics/gazprom-mozhet-vskore-nachat-postavlyat-gaz-dlya-ukrainskih-potrebiteley-kobolev-novosti-ukrainy-50047089.html

[7] *UNIAN*, 2019. 'Prezident vremenno naznachil 4 chlenov Natskommissii po tarifam', 29 October. https://www.unian.net/economics/energetics/10735338-prezident-vremenno-naznachil-chetyreh-chlenov-nackomissii-po-tarifam.html

problem at the political, rather than commercial level. There are many instances in many countries, in which large-scale decommissioning, for example of coal mines, oil fields and nuclear facilities have been undertaken with generous state and multilateral financial support. (The clean-up of Chernobyl is an obvious local example.) The pipeline system could surely qualify for similar non-commercial arrangements.

In conclusion, while these commercial issues are substantial, they could be resolved by 31 December or very soon afterwards, were they to be delinked from the political issues. Previous experience shows that this is far from certain to happen.

What is changed by the Danish decision on Nord Stream 2 construction?

Gazprom's strategy for reducing reliance on Ukrainian transit has centred on the construction of the Nord Stream 2 pipeline (55 bcm/year, raising total Nord Stream capacity to 110 bcm/year) and Turkish Stream (two strings of 15.5 bcm/year each, the first of which has been completed). Previous OIES publications have shown that Nord Stream 2, Turkish Stream 2, and their onshore continuations could only be fully operational by 2021-22 at the earliest. Even then, (with an additional 86 bcm/year of non-Ukrainian transit capacity) from a commercial standpoint Gazprom will want to maintain an option on some Ukrainian transit capacity, perhaps 15-30 bcm/year.[8]

The approval of the Nord Stream 2 route by Denmark means that the pipeline could be completed by the end of 2019. Several months would then be required to test it, fill it with linepack gas and make it ready for operation. The first string of Nord Stream 2 could be in operation by the late spring and the second at some point later in 2020. In this case, the 2021-22 timeframe for full operation of all the transit diversification pipelines will become more likely.

One caveat is that the European Commission can appeal against the Danish decision; this could cause a delay of up to several years in Nord Stream 2 construction. The Commission has one month from 30 October to lodge an appeal.

The other constraint on Nord Stream 2 becoming fully operational is that construction of the 51 bcm/year Eugal pipeline, running southward through Germany to the Czech Republic and carrying the gas to German and Central European markets, is not expected to be complete until 2021. One of Eugal's two strings (27.5 bcm/year) could be operational by early 2020. The full operation of both Eugal strings depends on completion of work in the Czech Republic to upgrade the transmission network to carry the gas on to the Baumgarten hub, and other destinations.

Without any intervention by the European Commission therefore, 27.5 bcm/year of gas that would otherwise transit Ukraine could be supplied to Europe via Nord Stream 2, in 2020. The remainder could be supplied by 2021.[9]

Implications of a supply interruption – Russia

The more rapid construction of Nord Stream 2, made possible by the Danish Energy Agency decision, means that any potential interruption of Russian gas supply to Europe will more likely be short term. The Russian authorities seem to be accepting this prospect as unpleasant, but not catastrophic.

Gazprom has been preparing for this outcome, pumping higher than normal volumes of gas into underground storage, sending warnings about potential transit problems to customers, and preparing to access additional spot and LNG supplies in the winter.

[8] See: Pirani, S., and Yafimava, K., 2016. Russian gas transit across Ukraine post-2019 – pipeline scenarios, gas flow consequences, and regulatory constraints. *OIES Paper NG 105*, February 2016

[9] Details on the Net4Gas website, here https://www.net4gas.cz/en/projects/capacity4gas-project/ and here https://www.net4gas.cz/en/projects/austrian-czech-interconnection/

Novatek has also proposed that, if needed, it can send uncontracted volumes of Yamal LNG Trains 3 and 4 to Gazprom's customers (Yamal LNG's Long Term Contracts will start only in the second quarter of 2020).

If there is a disruption it would be, of course, extremely damaging for the image of Russian gas in Europe, but the Russian authorities are still convinced that with coal and nuclear phase-out European customers have no other options than to keep buying cheap Russian gas. The problem of the overall image of gas as a fuel does not seem to be an important argument for them in this decision.

As for the inevitable disruption of gas supply to Ukraine in this case, the Russian authorities are not concerned. Moldova is different: there Russia could help to arrange reverse flows from Romania.

Implications of a supply interruption – Ukraine and Moldova

If the tripartite negotiations are not completed by 31 December, and gas supply to Europe via Ukraine is interrupted, Ukraine and Moldova are among the countries that will face the most serious security of supply issues.

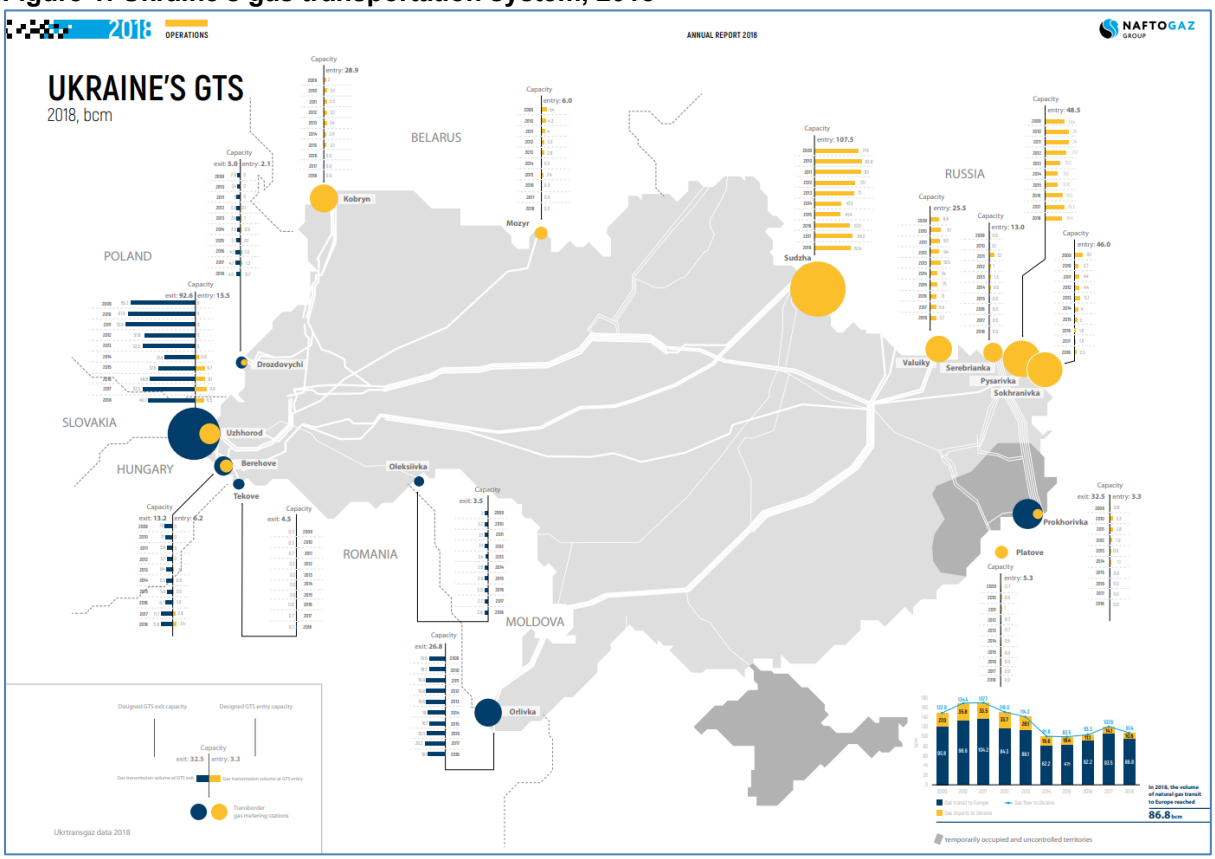
Ukraine had a total of 20.9 bcm of gas in storage on 9 October, and 21.75 bcm on 31 October, record levels for recent years – although in practice not all of this is available for distribution. In the event of a supply interruption, the main difficulty facing the government and Naftogaz will be to ensure that gas can be delivered from the storage facilities, mainly in the west, to the main centres of population in the centre, east and south of Ukraine. Naftogaz Ukrainy states that the security of supply arrangements in place will ensure uninterrupted supply to all consumers for at least two months from 1 January, even in the event of a cold winter.

Of the gas in Ukrainian storage on 9 October, 8.7 bcm belonged to Naftogaz Ukrainy and 4.7 bcm to non-Naftogaz traders: 13.4 bcm in total, more than one-third of Ukraine's total annual consumption. (A further 4.7 bcm of the gas in storage is cushion gas, and not therefore available for extraction; 2.32 bcm was held for foreign traders in a customs warehouse arrangement marketed by Naftogaz which, on extraction should be exported.)[10] In addition to the 13.4 bcm, Ukraine has its own production, and imports. Naftogaz states that it has contracted volumes for import from the west of 0.3 bcm for January, 0.28 bcm for February and 0.3 bcm for March. This amounts to an abundance of gas to deal with a supply interruption. Nevertheless, there may be challenges in moving it to customers in good order.

Gas flows through the Ukrainian transport system from east to west, via two main corridors: (1) from Sudzha on the north-east border, through which pass the main pipelines from Gazprom's producing area in Nadym-Pur-Taz, to Uzhgorod on the western border with Slovakia; (2) from Pysarivka and other smaller entry points on the eastern Ukrainian border, through south-eastern Ukraine, through Moldova (including a stretch through the Transdniestr enclave, which is not under the Moldovan government's control), back to Ukraine and on via Isaccea to Romania, where it links with the Trans Balkan pipeline. (See Figure 1 below.) In 2018, total transit via Ukraine to Europe was 86.8 bcm; 62.4 bcm of this entered Ukraine via Sudzha, 16.4 via Pysarivka and 8 bcm via smaller entry points.[11] Ukrainian production sites, the largest of which are in the Poltava and Kharkiv regions in eastern Ukraine, contribute gas to the Sudzha-Uzhgorod corridor.

[10] *Argus European Natural Gas*, 11 October 2019, p. 9, and 18 October 2019, p. 9
[11] Naftogaz Ukrainy, 2019. *Annual Report 2018*. p.76

Figure 1: Ukraine's gas transportation system, 2018



Source: Naftogaz Ukrainy Annual Report, 2018

When the system is operating normally, physical volumes from Russia are used to supply customers in the east; these may be replaced with Ukrainian gas to replenish transit flows destined for Europe. In 2009, when there was a supply interruption lasting two weeks, flow was reversed, to supply Ukrainian customers in the centre and east of the country from storage facilities in the west. Naftogaz Ukrainy states that preparations have been made for a similar reversal in 2020 if necessary, including the upgrading of two compressor stations in the Kyiv region.[12]

The security of supply situation for Moldova, and for southern areas of Ukraine supplied by the south-eastern pipeline route, is less clear cut. On an annual basis, Moldova's consumption is 2.5-3 bcm; the aggregate consumption of the four southern provinces of Ukraine that are largely supplied via the south-eastern pipeline (Odessa, Mykolayiv, Kherson and Zaporizhia) is around 5 bcm. Currently, Russian transit gas flows along this pipeline make it possible to maintain deliveries to Ukrainian customers by the swap method mentioned above. But from 1 January it is expected that, whether or not there is a supply interruption, these flows will be redirected via the Turkish Stream pipeline. Furthermore, volumes produced in Crimea that previously entered this part of the network have not done so since 2014.

The probable solution to these problems is to operate the pipeline in the reverse direction. There have been discussions between the Romanian, Moldovan and Ukrainian TSOs about reverse operation, to bring gas from and through Romania to Moldova and southern Ukraine. These discussions related to the cessation of Russian flows long term, rather than to a possible supply disruption. Naftogaz held a non-binding open season on capacity at the Isaccea interconnection point from 2020 to 2033-34 that

[12] Presentation by Iryna Mykhailenko, Naftogaz Trading, at the 5th Ukrainian Gas Forum, Kyiv, 9 October 2019; *Argus FSU Energy*, 2019. 'Ukraine prepares for gas from Romania', 22 August

was oversubscribed.[13] However, it is unclear whether, in the event of a supply interruption, sufficient gas could be brought to Isaccea. It is understood that if one of the three strings of the Trans Balkan line is operated in reverse, as has been discussed, only limited volumes – 1.5 bcm on an annualised basis – would be available for Romania from Bulgaria, and even these volumes are dependent on physical flows from Turkey to Bulgaria (see below p. 12), and on arrangements being put in place between the Turkish and Bulgarian TSOs. For the full 6 bcm/year capacity that could be available to be utilised, additional infrastructure investment would be required in both Bulgarian and Romania. Finally, it may also be possible for supplies from the northern areas of Ukraine to be diverted to the southern regions.

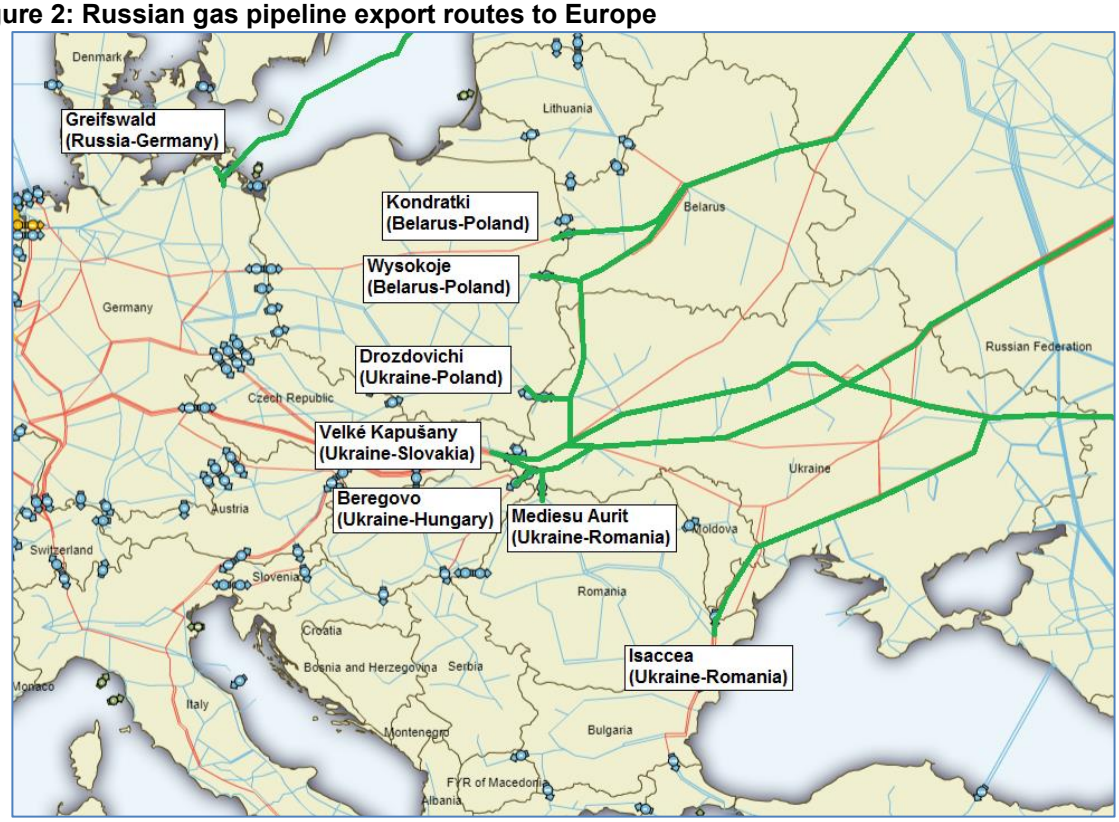
A new pipeline from Romania to Chisinau, the Moldovan capital, is under construction. Although slated for completion by the end of 2019, it is understood that it will be completed in mid-2020 at the earliest.[14]

Implications of a supply interruption – central and south-eastern Europe

To gain a clear understanding of the potential impact of an interruption in the transit of Russian gas via Ukraine on central and south eastern Europe, it is necessary to examine several key factors: (1) the daily capacities of pipeline interconnection points bringing Russian gas to Europe; (2) the physical flows and utilisation rates for those interconnection points at times of peak demand; (3) the amount of gas in storage and daily storage withdrawal capacities for countries that receive Russian gas via Ukraine; and (4) the patterns of storage withdrawals from those facilities at times of peak demand.

Russian gas is delivered to continental Europe via eight interconnection points, of which five are exit points for the Ukrainian transit system. These interconnection points are illustrated in the map below.

Figure 2: Russian gas pipeline export routes to Europe



Source: Map from IEA Gas Trade Flows in Europe, additions by the authors[15]

[13] Argus, 2019. *Recent Developments in the Ukrainian Gas and Power Markets (White Paper)*, October 2019
[14] Hydrocarbons Technology, 2019. *Ungheni-Chisinau natural gas pipeline*. https://www.hydrocarbons-technology.com/projects/ungheni-chisinau-natural-gas-pipeline/
[15] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/

In the north, from the Kondratki, Wysokoje, and Drozdovichi interconnection points, gas flows into the Polish market. From Kondratki gas flows across Poland and on to Germany at the Mallnow interconnection point, along the Yamal-Europe pipeline. As the map illustrates, Poland thus receives most of its Russian gas supplies via Belarus, rather than Ukraine. The limited volumes arriving in Poland via Ukraine are consumed in Poland, and not transited on further west.

In the south, at the Isaccea interconnection point, gas flows from Ukraine into Romania. From here, gas flows onwards to Bulgaria, and on from Bulgaria to Turkey, Greece, and North Macedonia. The main pipeline connecting Ukraine, Romania, Bulgaria, and Turkey is the Trans-Balkan pipeline. Romania also receives smaller volumes from Ukraine at the Mediesu Aurit interconnection point (also referred to as Tekovo in Ukraine). The lack of interconnections between Bulgaria and Serbia, and the limited interconnection between Romania and Hungary, means that gas flowing into south-east Europe via the Trans-Balkan line cannot flow north-west into central Europe.

At Beregovo (also referred to as Beregdaróc in Hungary), Russian gas transited via Ukraine flows into Hungary, and onwards to Croatia, Serbia, and Bosnia-Herzegovina. Small volumes also flow from Hungary to Romania, although Hungary receives virtually no gas in the reverse direction from Romania.

Finally, the main conduit for Russian gas transited via Ukraine to Europe is the Velké Kapušany (also referred to as Uzhgorod in Ukraine) interconnection on the Ukraine-Slovakia border. From Slovakia, Russian gas flows onwards to Austria, and on from Austria to Italy, Hungary, and Slovenia.

This brief analysis comprises five steps. The first is to measure the physical flows via these routes, which will be lost if there is an interruption in Ukrainian transit. Specifically, this refers to the daily average physical flows in January, February, and March in 2017, 2018, and 2019.

Secondly, by calculating the net imports of Russian gas delivered via Ukraine for Poland, Slovakia, Austria, Italy, Slovenia, Hungary, Croatia, Serbia, Romania, Bulgaria, North Macedonia, and Greece, it will be clear how much gas will be lost by each of these countries in the event of a transit interruption.

Thirdly, it is necessary to measure the amount of gas held in storage in each of these countries, the maximum daily withdrawal capacity, and the daily average storage withdrawals in each of these countries in January-March 2017-2019. The difference between the amount of gas usually withdrawn from storage for seasonal balancing and the maximum daily withdrawal capacity of the storage facilities is the amount of 'spare' storage withdrawal capacity that is likely to be available to compensate for the loss of supplies usually received via Ukraine. In a given country, if the 'spare' withdrawal capacity is greater than the net imports received via Ukraine, that country can cope with the loss of supplies via Ukraine for as long as storage stocks last.

Fourthly, it is necessary to consider the extent to which imports via other routes are able to compensate for the potential loss of supplies usually received via Ukraine. Finally, to calculate how long these countries may use storage stocks to compensate for the loss of supplies delivered via Ukraine, the minimum number of days that storage stocks will last is calculated, by dividing the amount held in storage by the maximum daily withdrawal capacity.

Table 1: Daily average flows in Q1 2017-2019 (mmcm/d)

	Jan-17	Feb-17	Mar-17	Jan-18	Feb-18	Mar-18	Jan-19	Feb-19	Mar-19
Greifswald	160.7	127.7	127.5	161.9	162.0	161.4	162.2	162.1	162.1
Kondratki	97.2	97.1	96.5	97.2	97.3	97.1	97.2	97.3	97.1
Wysokoje	9.4	11.1	8.0	9.5	0.0	14.2	6.4	6.5	6.5
Non-Ukraine	*267.3*	*235.9*	*232.0*	*268.6*	*259.3*	*272.7*	*265.8*	*265.9*	*265.7*
Drozdovichi	13.4	13.9	12.4	13.8	0.0	13.7	9.5	10.0	10.0
Uzhgorod	144.0	138.1	109.0	70.6	84.6	134.8	146.9	136.5	155.0
Beregovo	33.1	32.8	25.5	24.2	26.1	27.4	24.3	29.1	27.2
Isaccea + Mediesu Aurit	78.8	71.0	54.9	71.6	72.8	67.4	48.0	31.7	25.8
Ukraine	*269.3*	*255.8*	*201.8*	*180.2*	*183.5*	*243.3*	*228.7*	*207.3*	*218.0*
Total	**536.6**	**491.7**	**433.8**	**448.8**	**442.8**	**516.0**	**494.5**	**473.2**	**483.7**

Source: Data from IEA Gas Trade Flow in Europe[16]

The important points to note regarding Table 1 are firstly that the Nord Stream (Greifswald) and Yamal-Europe (Kondratki) pipelines are usually used at their full capacities of 162 and 97.5 mmcm/d, respectively. By contrast, the Ukrainian route (particularly Velké Kapušany/Uzhgorod) experiences much greater flexibility of usage. This means that the Nord Stream and Yamal-Europe pipelines cannot be loaded with additional volumes to compensate for the loss of flows through Ukraine. In any case, gas delivered via Nord Stream and Yamal-Europe is delivered onwards to Germany and north-western Europe, while supplies delivered via Ukraine are destined for central and south-eastern Europe.

Table 2: Net imports of Russian gas delivered via Ukraine in Q1 2017-2019 (mmcm/d)

	Jan-17	Feb-17	Mar-17	Jan-18	Feb-18	Mar-18	Jan-19	Feb-19	Mar-19
Austria	6.2	11.4	13.0	8.9	11.9	26.1	24.4	27.5	32.0
Bulgaria	11.4	9.5	7.9	8.0	9.5	8.6	9.4	8.5	7.4
Croatia	7.1	6.3	4.3	5.2	5.6	4.2	5.5	5.2	5.1
Greece	10.1	7.8	3.9	9.6	10.1	9.5	9.5	9.1	6.1
Hungary	29.2	30.4	24.1	15.7	12.6	16.2	17.6	22.0	22.7
Italy	101.0	72.4	50.3	54.0	94.6	87.1	89.3	66.8	87.9
North Macedonia	1.7	1.3	0.4	1.3	1.5	0.8	1.4	0.9	0.4
Poland	9.6	9.9	9.1	10.5	0.0	11.4	8.3	6.8	5.1
Romania	12.0	9.3	2.7	8.7	8.2	10.4	13.0	10.1	5.8
Serbia	9.5	8.8	6.5	8.8	9.1	7.8	9.2	10.3	6.8
Slovakia	-7.5	-3.0	-1.7	-9.0	-10.1	-2.1	1.8	4.9	8.6
Slovenia	9.4	8.0	6.3	4.4	5.1	4.6	4.9	4.6	3.9
Total	**199.7**	**172.1**	**126.8**	**126.1**	**158.1**	**184.6**	**194.3**	**176.7**	**191.8**

Source: Data from IEA Gas Trade Flow in Europe[17]

Table 2 highlights the yearly variation in net imports. This is partially driven by prevailing weather conditions, for example during the 'cold waves' that hit Europe in January 2017 and February-March

[16] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/
[17] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/

2018. Demand is also influenced by non-seasonal factors, such as the relative gas, coal, and CO_2 prices as the economic basis for thermal power generation (where gas and coal compete), and the levels of economic activity as a factor in industrial gas demand.

Due to the impact of prevailing weather conditions on gas demand, actual demand for Russian gas imports in the countries listed above in January 2020 cannot be predicted with certainty. Hence the value of considering flows in 2017, 2018, and 2019 as examples of varying weather-influenced gas demand. Furthermore, if there is an interruption in Ukrainian transit, European hubs are likely to see a surge in prices, which could dampen gas demand by encouraging switching from gas to coal for power generation. However, while the weather has an immediate impact on gas demand, the impact of prices on gas demand takes longer to filter through and would likely substantially impact gas demand only if the interruption lasted at least 1-2 weeks.

Two further points must be noted in relation to Table 2. Firstly, the negative numbers for Slovakia in 2017 and 2018 mean that the country exported more gas than it imported in those months. This is likely because Slovakia's large storage capacity is used to smooth out gas flows through central Europe. For example, Slovakia's storage capacity (c. 4 bcm) is larger than the storage capacities of Poland (3.2 bcm), Romania (3.0 bcm), and Czech Republic (3.3 bcm), despite Slovakia having lower domestic gas demand than these countries. Secondly, the figures for Slovakia include net imports received from the Czech Republic. This is because gas for domestic consumption in Slovakia is received via Ukraine, while net imports from the Czech Republic are delivered onwards to Ukraine as part of Ukraine's gas imports from the European market (along with physical imports from Hungary and Poland).

As noted earlier, 'spare' storage withdrawal capacity is the maximum daily withdrawal capacity minus the average daily storage withdrawals in a given month. This 'spare' storage withdrawal capacity therefore refers to withdrawal capacity that is likely to be available to compensate for the loss of supplies usually received via Ukraine, over and above usual seasonal storage withdrawals.

Table 3: Daily average spare storage withdrawal capacity (mmcm/d)

	Jan-17	Feb-17	Mar-17	Jan-18	Feb-18	Mar-18	Jan-19	Feb-19	Mar-19
Austria	38.3	51.2	79.1	51.1	42.1	62.8	59.8	82.9	111.1
Bulgaria	-0.3	0.1	1.5	-0.4	0.1	1.3	-0.4	0.0	1.4
Croatia	2.1	4.7	5.9	3.7	2.4	3.4	1.9	3.8	6.3
Greece	-	-	-	-	-	-	-	-	-
Hungary	52.0	69.6	79.1	56.0	47.1	58.3	47.8	62.4	74.6
Italy	154.0	186.4	251.7	175.4	172.9	223.2	175.4	181.4	250.4
North Macedonia	-	-	-	-	-	-	-	-	-
Poland	29.6	38.0	41.0	34.5	34.2	40.5	37.1	42.5	43.7
Romania	6.4	15.2	23.2	13.2	13.0	20.8	12.0	16.7	25.4
Serbia	-	-	-	-	-	-	-	-	-
Slovakia	20.0	31.0	39.0	19.8	18.5	28.5	21.2	31.4	46.8
Slovenia	-	-	-	-	-	-	-	-	-
Total	**302.1**	**396.2**	**520.5**	**353.3**	**330.3**	**438.8**	**354.8**	**421.1**	**559.7**

Source: Data from Gas Infrastructure Europe and IEA Gas Trade Flows in Europe, calculations by the author[18]
Note: Greece, North Macedonia, and Slovenia report no gas storage. Serbia has gas storage, which is used in its entirety on a seasonal basis, leaving no 'spare capacity' to compensate for the loss of supplies delivered via Ukraine.

[18] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/ and GIE, 2019. *Aggregated Gas Storage Inventory (AGSI+)*. https://agsi.gie.eu/#/

By subtracting the net imports via Ukraine (as given in Table 2) from the daily average spare storage withdrawal capacity (as given in Table 3), it is possible to calculate which countries could compensate for the loss of supplies usually delivered via Ukraine with gas withdrawn from storage, over and above the storage withdrawals that are used to balance seasonal changes in gas demand. The results of this calculation as presented in Table 4.

The regional total shows that the combined spare daily withdrawal capacity of all 12 countries listed in Table 4 (including the four that have no storage capacity but still receive net imports via Ukraine) is at least 100 mmcm/d greater than regional net imports via Ukraine. Even without the country with the largest storage withdrawal capacity in the region (Italy), total combined spare storage withdrawal capacity is still at least 50 mmcm/d greater than combined daily average net imports via Ukraine. Regarding individual countries, Austria, Hungary, Italy, Poland, Romania, and Slovakia have enough spare daily withdrawal capacity to compensate for the loss of net imports received via Ukraine, while Bulgaria, Croatia, Greece, North Macedonia, Serbia, and Slovenia do not.

Given that Gazprom is the main supplier of gas to Hungary, Serbia, and Croatia, and has coordinated the substantial additional injections into Hungarian storage to mitigate against the effects of an interruption in Ukrainian transit, it is reasonable to assume that gas from Hungarian storage could be used to meet the shortfalls in Serbia and Croatia. If this is the case, then Hungarian storage would still be sufficient to meet the needs of those three countries combined (see the bottom line of Table 4). Furthermore, given that Italy has plentiful storage and acts as a transit state for gas deliveries to Slovenia (whose gas demand is a fraction of that of Italy), it is also not unreasonable to expect that gas from Italian storage could be used to meet a shortfall in Slovenia.

Table 4: Daily average 'spare' storage withdrawal capacity minus daily average net imports via Ukraine (mmcm/d)

	Jan-17	Feb-17	Mar-17	Jan-18	Feb-18	Mar-18	Jan-19	Feb-19	Mar-19
Austria	32.0	39.8	66.1	42.2	30.3	36.7	35.4	55.3	79.1
Bulgaria	-11.7	-9.4	-6.5	-8.4	-9.3	-7.3	-9.8	-8.5	-6.0
Croatia	-5.0	-1.6	1.6	-1.5	-3.2	-0.9	-3.6	-1.4	1.2
Greece	-10.1	-7.8	-3.9	-9.6	-10.1	-9.5	-9.5	-9.1	-6.1
Hungary	22.8	39.2	55.0	40.2	34.5	42.2	30.2	40.4	51.9
Italy	53.0	113.9	201.5	121.3	78.3	136.2	86.0	114.6	162.5
North Macedonia	-1.7	-1.3	-0.4	-1.3	-1.5	-0.8	-1.4	-0.9	-0.4
Poland	20.0	28.0	31.9	24.0	34.2	29.1	28.9	35.7	38.6
Romania	-5.6	6.0	20.4	4.5	4.8	10.3	-1.0	6.6	19.5
Serbia	-9.5	-8.8	-6.5	-8.8	-9.1	-7.8	-9.2	-10.3	-6.8
Slovakia	27.5	34.0	40.7	28.8	28.6	30.6	19.3	26.5	38.2
Slovenia	-9.4	-8.0	-6.3	-4.4	-5.1	-4.6	-4.9	-4.6	-3.9
Regional total	**102.3**	**224.0**	**393.6**	**227.0**	**172.4**	**254.2**	**160.4**	**244.3**	**367.8**
Italy + Slovenia	43.6	105.9	195.2	117.0	73.1	131.6	81.2	110.0	158.6
Hungary, Serbia, Croatia	8.3	28.8	50.2	30.0	22.2	33.5	17.4	28.7	46.4

Source: Data from Gas Infrastructure Europe and IEA Gas Trade Flows in Europe, calculations by the author[19]

With Croatia and Serbia likely to benefit from Hungarian storage, and Slovenia potentially able to benefit from Italian storage, this leaves Bulgaria, Greece, and North Macedonia as particularly vulnerable to

[19] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/ and GIE, 2019. *Aggregated Gas Storage Inventory (AGSI+)*. https://agsi.gie.eu/#/

the impact of an interruption in gas transit via Ukraine. As Table 4 illustrates, the peak monthly shortfalls (i.e. the lowest figures for each of Q1-2017, Q1-2018, and Q1-2019) are 9.3-11.7 mmcm/d (Bulgaria), 9.5-10.1 mmcm/d (Greece), and 1.4-1.7 mmcm/d (North Macedonia). Taking a worst-case scenario approach, the shortfalls are thus assumed to be around 12 mmcm/d (Bulgaria), 10 mmcm/d (Greece), and 2 mmcm/d (North Macedonia).

These three countries receive their Russian gas via Ukraine using the Trans-Balkan Line pipeline noted earlier. Greece is the only one that also receives gas from other sources: Azeri gas via Turkey at the Kipi border interconnection point, and LNG via its Revithoussa regasification terminal. In Q1-2017, the combined spare capacity at Kipi and Revithoussa was 7.5-10.3 mmcm/d, rising to 12.3-15.4 mmcm/d in Q1-2018, and falling to 4.7-13.7 mmcm/d in Q1 2019. The low point of 4.7 mmcm/d was reached in January 2019. Thus, depending on weather conditions, Greece would likely be able to meet 50-100% of its shortfall through increased pipeline imports from Turkey and LNG imports.

For Bulgaria, the crucial development is the proposed reversal of the Trans-Balkan Line to flow from south to north, as part of the launch of the first line of Turkish Stream on 1 January 2020. This is dependent on the Bulgarian TSO, Bulgartransgaz, signing an agreement with the Turkish TSO, Botaş: to date, no such agreement has been announced. On 28 October, Bulgartransgaz announced a capacity auction to be held on 4 November for new entry capacity from Turkey to Bulgaria, with the new pipeline infrastructure to be launched on 1 January 2020.[20] However, as of 11 November, the results of that capacity auction have not yet been announced, although reports suggested that 288 GWh/d (26 mmcm/d) would be made available.[21] If this is correct, then flows of 26 mmcm/d into Bulgaria would be sufficient to meet the combined needs of Bulgaria, Greece, and North Macedonia.

Finally, while storage stocks (and related daily withdrawal capacities) appear to be sufficient to cover the shortfall if there is a Ukrainian transit interruption, with the potential launch of Turkish Stream and new capacity on the Turkey-Bulgaria border compensating where storage cannot, the length of time for which storage could compensate for the loss of Ukrainian transit remains a vital question.

In the eight countries for which storage data is available, all had stocks equal to 96-99% of their storage capacity on 1 November 2019. As late as 11 November, this figure was at least 97% for all countries except Slovakia (95%). If storage stocks are still at these levels on 1 January 2020, then the number of days for which those stocks would last if they were being drawn down at the maximum daily withdrawal capacity would be: Austria (86 days), Bulgaria (194), Croatia (86), Hungary (81), Italy (67), Poland (62), Romania (102), Slovakia (90).

However, it is unlikely that storage stocks would actually be drawn down at maximum daily capacity, given the amounts of 'spare storage withdrawal capacity minus net imports via Ukraine' highlighted in Table 4. Stocks are likely to be drawn upon as needed, rather than emptied at maximum daily capacity even when such volumes are not needed.

To calculate how long storage stocks are likely to last, it is possible to create hypothetical scenarios, each of which begins from the same starting point: actual storage stocks on 1 November 2019 (i.e. the 'high point' of European storage stocks). For each of the three scenarios (2017, 2018, and 2019), actual storage withdrawals in Q1 and net imports delivered via Ukraine in Q1 are subtracted from the starting storage stock, to calculate how much would be left in storage at the end of Q1, if the stocks available were drawn down to serve seasonal demand and to compensate for the loss of supplies usually delivered via Ukraine in line with the patterns seen in Q1 in 2017, 2018, and 2019.

Furthermore, the combined volumes of actual storage withdrawals and net imports received via Ukraine in March are used as the basis for calculating how many days those stocks would last beyond the end

[20] Bulgartransgaz, 2019. 'Other Market Information - Strandzha 2 (BG) / Malkoclar (TR) (Entry)'. *Press Release*, 28 October. https://bulgartransgaz.bg/en/news/other_market_information_strandzha_2_bg_malkoclar_tr_entry_-544-c31.html

[21] A. Sabadus, 2019. 'Turkey, Bulgaria offer spot capacity amid uncertain Ukraine transit'. *ICIS*, 1 November. https://www.icis.com/explore/resources/news/2019/11/01/10439054/turkey-bulgaria-offer-spot-capacity-amid-uncertain-ukraine-transit

of Q1, to illustrate how far into spring these countries could cope with the loss of Ukrainian supplies if the transit suspension extended beyond Q1.

For example, we start from the premise that Poland's gas stocks on 1 January 2020 are the same as on 1 November 2019. If Poland withdrew volumes from storage to meet seasonal demand at the same rate that it did in Q1-2017, and also drew on storage stocks to compensate for net gas imports equal to those it actually received via Ukraine in Q1-2017, it would have 3,723 mmcm left in storage at the end of Q1-2020. Furthermore, if the Polish stocks continued to be drawn down at the same rate as would have been necessary to serve seasonal demand and compensation for lost Ukrainian supplies in March 2017, then Poland's stocks would last for a further 52 days. Therefore, if a lengthy suspension of Ukrainian gas transit occurred in 2020, and Poland experienced gas demand similar to that experienced in 2017, Polish gas stocks would hypothetically be able to serve seasonal gas demand and substitute for imports usually received via Ukraine for 52 days beyond the end of Q1, or through to late May.

Table 5: Scenarios for longevity of storage stocks in case of a Ukrainian transit interruption

	Storage on 1 Nov 2019 (mmcm)	Amount left in storage at end of Q1 (mmcm)			No. of days of stocks left at end of Q1 at March withdrawal rate		
		Q1-2017	Q1-2018	Q1-2019	Q1-2017	Q1-2018	Q1-2019
Austria	8,475	3,723	2,859	4,666	113	46	234
Bulgaria	581	-514	-436	-418	-54	-42	-46
Croatia	514	-175	-188	-137	-40	-27	-29
Greece	-	-	-	-	-	-	-
Hungary	6,362	2,763	2,774	2,928	115	75	108
Italy	18,166	4,855	3,950	4,689	70	29	43
North Macedonia	-	-	-	-	-	-	-
Poland	3,180	984	1,194	1,681	52	54	136
Romania	2,953	972	937	1,101	113	50	116
Serbia	-	-	-	-	-	-	-
Slovakia	3,862	3,058	2,638	2,518	1,352	213	527
Slovenia	-	-	-	-	-	-	-
Regional total	**44,094**	**15,665**	**13,728**	**17,028**	**92**	**45**	**87**
Italy + Slovenia	18,166	4,146	3,528	4,290	60	26	40
Hungary, Serbia, Croatia	6,876	1,847	1,817	2,007	53	35	52

Source: Data from Gas Infrastructure Europe and IEA Gas Trade Flows in Europe, calculations by the author[22]

This exercise was performed for all the countries listed in Table 5, and for several years (thus including the cold spells in January 2017 and February-March 2018), with the additional hypothetical notion that Slovenia would be served by Italian storage stocks and that Serbia and Croatia would be able to draw on Hungarian gas stocks.

As noted earlier, the calculations above are based on the storage stocks on 1 January 2020 being the same as on 1 November 2019. This is because the winter of 2019-20 is so unusual, with companies filling storage to hedge against a possible supply disruption, and low hub prices across Europe signifying an unusually high level of supply relative to demand, even throughout the beginning of the winter heating season in October. Of all the countries listed in Table 5, only Austria and Poland withdrew

[22] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/ and GIE, 2019. *Aggregated Gas Storage Inventory (AGSI+)*. https://agsi.gie.eu/#/

more gas from storage than they injected into storage in October, and Austrian net storage injections in the first four days of November cancelled out the net withdrawals in October. Even by 9 November (the most recent data), storage inventories in Austria, Hungary, Romania, and Slovakia were higher than on 1 November, while Bulgaria, Croatia, Italy, and Poland had experienced only modest net withdrawals.

However, it is possible that net storage withdrawals could pick up throughout November and December. Therefore, the total net storage withdrawals for each of these countries in November and December 2016, 2017, and 2018 have been measured. These November-December net storage withdrawals were then subtracted from the hypothetical amount of gas left in storage at the end of Q1, based on the seasonal profiles for Q1-2017, Q1-2018, and Q1-2019. Table 5 is thus recreated with storage withdrawals for the preceding November-December impacting upon the results for Q1. The results of this revised analysis are presented in Table 6.

Table 6: Scenarios for longevity of storage stocks if storage withdrawals in the previous November-December are applied to each quarter

	Storage on 1 Nov 2019 (mmcm)	Amount left in storage at end of Q1 (mmcm)			No. of days of stocks left at end of Q1 at March withdrawal rate		
		Q1-2017	Q1-2018	Q1-2019	Q1-2017	Q1-2018	Q1-2019
Austria	8,475	1,077	764	3,586	33	12	180
Bulgaria	581	-598	-541	-524	-63	-52	-58
Croatia	514	-343	-286	-288	-79	-42	-60
Greece	-	-	-	-	-	-	-
Hungary	6,362	1,568	1,679	1,639	65	46	60
Italy	18,166	1,001	-339	688	14	-3	6
North Macedonia	-	-	-	-	-	-	-
Poland	3,180	262	550	860	14	25	69
Romania	2,953	346	324	232	40	17	24
Serbia	-	-	-	-	-	-	-
Slovakia	3,862	2,054	1,841	1,998	909	149	418
Slovenia	-	-	-	-	-	-	-
Regional total	**44,094**	**5,367**	**3,990**	**8,190**	**32**	**13**	**42**
Italy + Slovenia	18,166	292	-762	289	4	-6	3
Hungary, Serbia, Croatia	6,876	484	624	568	17	14	18

Source: Data from Gas Infrastructure Europe and IEA Gas Trade Flows in Europe, calculations by the author[23]

For example, starting from actual storage stocks on 1 November 2019, the volume of net storage withdrawals in Austria in November-December 2016 (2,646 mmcm) is subtracted to gain a hypothetical level of storage stocks on 1 January 2020. From this is further subtracted the actual storage withdrawals in Q1-2017 and the net imports received via Ukraine in Q1-2017. Because this scenario is based on storage withdrawals and net imports via Ukraine in winter 2016-17, the resultant figure of 1,077 mmcm is presented in the 'Q1-2017' column of Table 6.

This revised scenario shows that Austria, Hungary, Poland, Romania, and Slovakia would be able to cope through to the end of Q1 in a period of cold weather (such as that seen in February-March 2018)

[23] IEA, 2019. *Gas Trade Flows in Europe*. https://www.iea.org/gtf/ and GIE, 2019. *Aggregated Gas Storage Inventory (AGSI+)*. https://agsi.gie.eu/#/

However, Italy (sharing its storage with Slovenia) would struggle to both meet seasonal storage demand and compensate for the loss of imports normally received via Ukraine. Worse still, Bulgaria would barely reach the end of January.

By dividing the hypothetical amount of gas left in storage at the end of Q1 for each winter (2016-17, 2017-18, and 2018-19) by the combined daily average storage withdrawals and net imports received via Ukraine in march 2017, 2018, and 2019, the number of days those stocks would last from the end of Q1 onwards is also calculated. The result show that, in a cold winter (as experienced in Q1-2018), Austria, Hungary (sharing its storage with Croatia and Serbia), Poland, and Romania would struggle to reach the end of April without fully emptying their working gas storage volumes and starting to deplete their cushion gas, while Italy would struggle to get through Q1 and Bulgaria would struggle just to get through January.

As an additional caveat, the calculation for how many days the storage stocks would last beyond the end of Q1 is based upon the amount of gas left in storage divided by withdrawals in March. In reality, withdrawals in April, and through into May, are likely to be lower than in March, as the weather becomes milder. Therefore, stocks in Austria, Hungary, Poland, Romania, and Slovakia are expected to last slightly longer than as presented in Table 6 – on average, possibly to the end of April.

Furthermore, in a situation whereby storage stocks were being rapidly depleted, Poland would likely receive additional LNG imports, Italy would also receive additional LNG imports and additional pipeline imports via Switzerland, while Austria would likely receive additional imports from Germany, boosting the longevity of their storage withdrawals. If Austria were to increase its net imports from Germany, it is possible that some of these volumes would be delivered onwards to Hungary at Mosonmagyarovar on the Austria-Hungary border. Thus, Hungarian storage (even if being used to support Serbia and Croatia) would last longer. With these extra supplies, in Austria, Hungary, Italy, and Poland could see their storage stocks stretching into early/mid-May. For Romania, respite would only come if the reversal of the Trans-Balkan pipeline to supply Bulgaria via Turkey, enabled such supplies to also reach Romania, as part of an effort to supply Moldova (as discussed on pages 6-7 above).

To conclude, if storage stocks remain virtually full (as they were at the beginning of November 2019), the countries discussed above would be able to use storage withdrawals to both meet their regular seasonal storage withdrawal demand and compensate for the loss of imports usually received via Ukraine, probably through to early/mid-May, depending on weather-related demand. However, their ability to do this would be impaired if substantial storage withdrawals take place in November and December 2019, leading to lower storage stocks on 1 January 2020. In that more pessimistic scenario, the countries above would still be able to cope through Q1-2020 but would start to run short in mid-April, unless additional LNG and cross-border pipeline flows combined with gas demand in April-May that is lower than March enabled the drawdown of storage stocks to be stretched into early/mid-May. Therefore, the key factors affecting the outcome are actual storage levels on 1 January 2020 (influenced by storage withdrawals in November and December 2019), and weather-related gas demand throughout the first 4-5 months of 2020.

A reflection on gas prices

A key element in drawing gas into central and south-eastern Europe in the case of a Ukrainian transit disruption would be the “ripple effect” of hub prices in different countries. The countries affected most directly (such as Slovakia, Hungary, and Austria) would see their hub prices surge. The differential from neighbouring hubs would motivate cross-border trade movements, for example from the Czech Virtual Trading Point (VTP) to the Slovak VTP, or from NCG (Germany) to the Austrian VTP, and onwards to the Hungarian MGP hub. To the north and west, gas is likely to be drawn from Gaspool to NCG in Germany, and from Germany and France into Switzerland for onward delivery to Italy. As gas is drawn to central Europe from north-western Europe, hub prices in north-western Europe would be expected to rise, attracting LNG cargoes (to Dunkerque, Zeebrugge, and Gate Rotterdam) to supplement the pipeline supplies from Russia (via Nord Stream and Yamal-Europe) and Norway that would likely be operating at full capacity.

In effect, an interruption to Ukrainian gas transit in January 2020 would firstly test the daily operative capacities of storage facilities in the region. A longer disruption would further test the functioning of the cross-border European gas market, in terms of hub prices providing incentives and infrastructure providing the physical ability to bring gas where it is most needed. The data presented here suggests that the European market could indeed cope with such a disruption, with the combination of storage, LNG supplies, and cross-border trade movements ensuring that, even in a period of colder-than-usual weather, each of the markets discussed here would remain supplied through to April, if not early May.

Of course, it is possible that there will not be an interruption in Ukrainian transit, or that such a disruption may only last a few weeks before a new agreement is reached. In that case, Europe is likely to end the summer with a substantial amount of gas in storage, especially if Q1-2020 brings mild weather, given the historically high levels of storage across Europe. Of the 19 countries whose storage data is reported by the Gas Infrastructure Storage Europe Aggregated Gas Storage Inventory (AGSI+), only Latvia (72%) had storage that was less than 95% full as of 9 November 2019.[24]

The result of no transit interruption is therefore likely to be relatively low hub prices in Europe in the spring of 2020, and even lower prices in summer 2020. The dynamic of the European summer gas market in 2019 saw pipeline supplies being consumed and LNG supplies effectively being injected into storage. Our colleague Mike Fulwood recently argued that, if European storage is still relatively full at the start of summer 2020, plentiful LNG supplies on the global market could cause a substantial oversupply, and very low European hub prices. Such a situation would be exacerbated by a mild winter in the northern hemisphere in 2019-20 (thus reducing gas demand in North America, Europe, and the major Asian LNG markets), subdued LNG demand in South America and the Middle East, a slowdown in growth in demand in the emerging Asian LNG markets, and the continuation of current levels of pipeline supplies into Europe. Moving into Q3-2020, if storage is once again completely full LNG supplies coming into Europe (in line with Europe's role as the 'balancing market' for global LNG) would have nowhere to go, putting further downward pressure on prices. The potential for such a "perfect storm" led Fulwood to ask: "Could we see $2 (per MMBtu) gas in Europe in 2020?"[25] Given that we saw the TTF day-ahead price fall to a low of $2.41/MMBtu (EUR 7.50/MWh) on an oversupplied market with relatively full storage on 3 September 2019, that question is far from unreasonable.

Medium-term outlook and conclusions

Any supply interruption in January 2020 would itself provide an additional impetus to the negotiating parties to reach an agreement. For this reason, we expect that any such interruption would last weeks, rather than months. Arrangements for transit, whether made with or without such an interruption, will either be long-term and very flexible, or much shorter term.

One significant consequence of a supply interruption would be that, on the European political level, further doubts would be raised about the role of gas in the energy mix. Arguments against reliance on gas would be strengthened. With the newly-elected European Commission due to oversee the drafting of a new decarbonisation package, Brussels may opt further to reduce the role of gas in the energy transition.

As for the transit of Russian gas to European markets, the role of Ukraine will be significantly reduced, if not in 2021-22, then shortly thereafter. Gazprom will seek arrangements under which its own pipelines, including Nord Stream 2 and Turkish Stream 2, are used as baseload, and Ukraine becomes the route of last resort. The Ukrainian transportation network will require downsizing, probably with the maintenance and upgrading of the Sudzha-Uzhgorod route, the reversal of the south-eastern route, and the decommissioning of other capacity. Whether such a major decommissioning project can be financed solely by the new Ukrainian TSO must be open to doubt.

[24] GIE, 2019. *Aggregated Gas Storage Inventory (AGSI+)*. https://agsi.gie.eu/#/

[25] Fulwood, F., 2019. Could we see $2 (per MMBtu) gas in Europe in 2020? *Oxford Energy Comment*, October 2019. https://www.oxfordenergy.org/publications/could-we-see-2-gas-in-europe-in-2020/

The other important function of the Ukrainian transport system will be to underpin the continuing development of the Ukrainian gas market and its integration with the European market. Ukraine now consumes about 20 bcm/year of its own gas and 10-15 bcm/year of imports, all currently delivered at the western borders. One outcome of the current changes may well be a resumption of direct imports from Russia: these are very unlikely to be on a long-term contract basis as they were prior to 2015, but sales into a traded market. One issue for Gazprom is whether it intends to make such sales at all, especially given the potential for gas bought at entry points on the Russia-Ukraine border to be resold by other parties at Ukraine's western border.