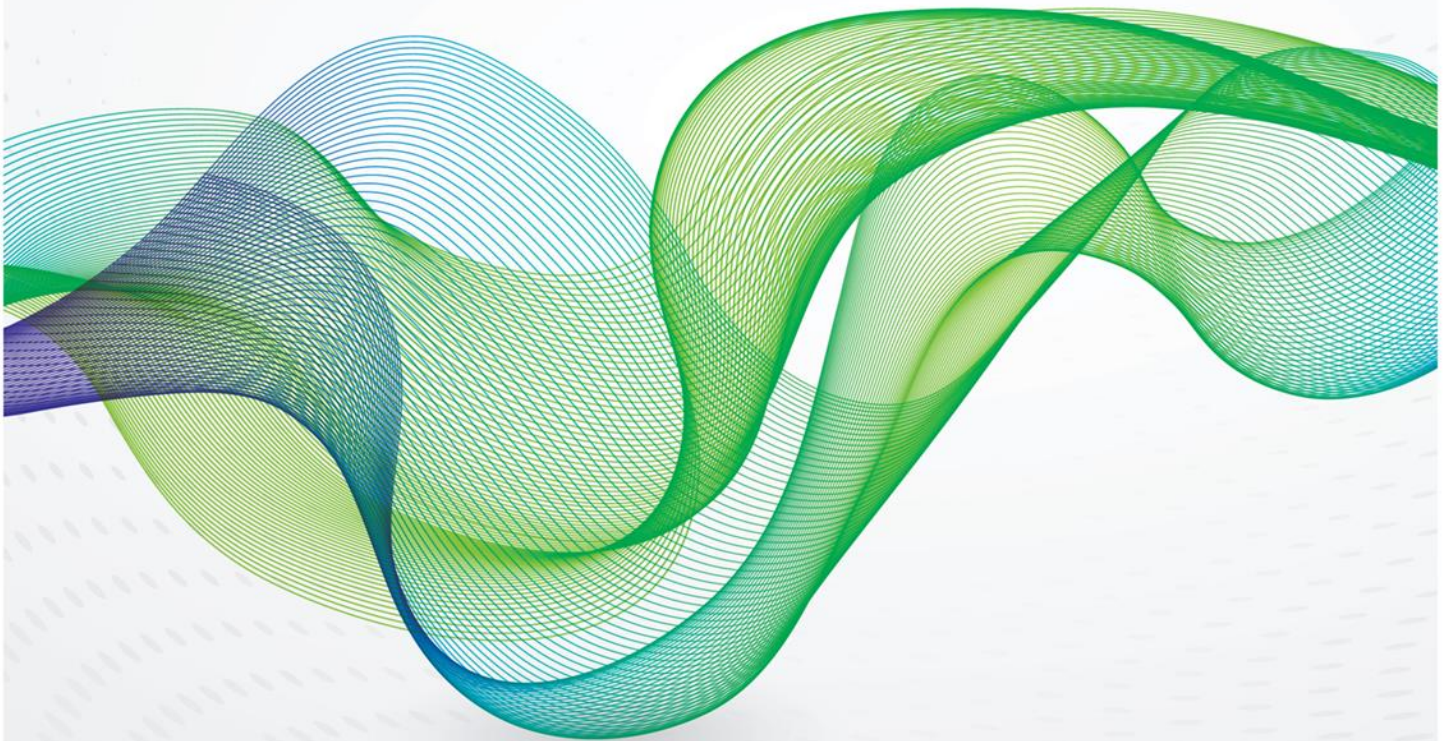


December 2022

South East Europe gas markets – reconfiguring supply flows and replacing Russian gas





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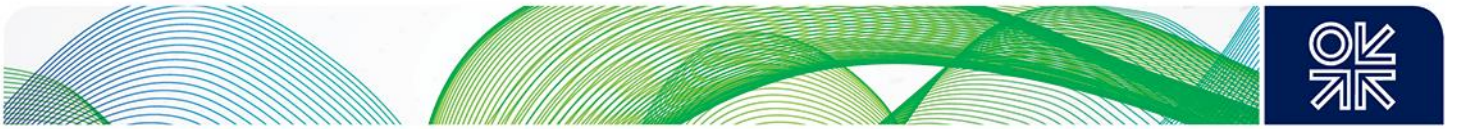
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ISBN 978-1-78467-212-6



Acknowledgements

I would like to thank several OIES colleagues for help: Michal Meidan, Jack Sharples, Mike Fulwood, Anouk Honoré, Patrick Heather and John Elkins all provided patient assistance and critique. Within the gas industry, BP's Zeyno Elbasi is very well informed on Turkey and the Southern Corridor markets.



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Even before the Russia-Ukraine war started in February 2022, countries within this region were transforming their gas supply arrangements, moving from being relatively isolated markets to becoming well interconnected, from being largely supplied by Russian imports to having a diverse supply portfolio.¹ The war and the EU's target of removing Russian oil and gas from its supply portfolio before 2030 has given this process more impetus, although much of the change we see today results from moves started several years ago.

The main purpose of this paper is to describe infrastructure developments and consequent changes to gas supply flows, and to assess how flows might further change as planned infrastructure is completed over the next 5 years. The central question is whether, as a result of these improvements, the region can have a non-Russian gas supply future. The conclusion is that sufficient capacity is almost in place to import and distribute enough alternative volume to replace the Russian imports – assuming of course that this other supply is available and at an acceptable price.

This paper looks at current demand levels and recent Russia import volumes, the interconnectors and other pipelines which have been commissioned recently, and the prospects of planned pipeline and LNG regas projects being built. Another dimension is the upstream. The Black Sea is a very immature province, but there are projects, notably offshore Romania and Turkey, which could make a profound difference to the supply mix. Contributions from Romania's Neptun Deep and Turkey's Sakarya projects are assessed below.

I. Introduction – regional overview of the SE European gas market

Over the last 3-4 years there have been significant changes to sources of gas supply and gas flow patterns as new infrastructure has come on-stream and regulatory changes applied to allow reverse flows. The region was already no longer 'Russia's market' even before February 2022. In the prior 2-3 years it had demonstrated real supply diversity, importing and distributing regasified LNG and Caspian (Southern Gas Corridor) gas internally.² Connectivity with other suppliers, and interconnectivity within the region, have improved immeasurably, and will continue to do so as other projects are developed over the next 4-5 years.

The discussion in this paper centres on the region's 5 EU member states (Romania, Bulgaria, Greece, Croatia, Slovenia) which together form its economic heart. They, and the region, matter because:

- Much-improved interconnectivity and infrastructure generally (and there is more to come) is creating a new LNG market, with Greece at its centre.
- The region is within touching distance of being able to replace its Russian gas imports.
- It is a transit region (TAP and Turk Stream) for gas moving deeper into the EU.
- It has growing links with Turkey: Turkey is not only a participant in the Southern Gas Corridor but also could be a source of LNG or pipeline gas being shipped into the region.
- The upstream Black Sea is close to becoming a supply source.

¹ SE Europe is defined as 5 EU Member States - Romania, Bulgaria, Greece, Croatia, Slovenia - and the Energy Community members Serbia, Montenegro, Bosnia & Herzegovina, Rep of N Macedonia, Kosovo, Albania. It excludes Turkey and Hungary, although both these countries are included in some sections of the paper because of their real or potential influence on the region. Moldova is excluded because the relationship between Moldova and Transnistria is complex and data is not comprehensive. However, brief comments on Moldova are made in Section II (c) below.

² *Southern Gas Corridor* is the linked system of pipelines – South Caucasus Pipeline line through Azerbaijan & Georgia, TANAP in Turkey and TAP through Greece and Albania to Italy which transport Shah Deniz Caspian gas from Azerbaijan to markets in Turkey, Greece, Italy and also Bulgaria.



- All this will have implications for price determination in the region and could support a hub.

Most of the conclusions of the paper relate to the following factors: the emergence of Greece as an import centre; the potential resilience to Russian gas withdrawal; linkages with Turkey; price discovery. These factors set it up well for a post-Russian gas supply future, and also for a net-zero future. This latter point will be the subject of a later paper. The region has a significant volume of coal (lignite) in its energy mix. In 2021 it produced 22% of the EU's lignite. Serbia, Bulgaria Romania, Greece, Bosnia & Herzegovina are all large producers, and to-date it is Greece which has been the region's leader in removing lignite. Greek production has fallen by two-thirds, from 36 million tonnes in 2018 to 12 million tonnes in 2021.³ Displacing lignite has to be a priority, and gas seems to be the preferred first step for doing this in a region so far slow in building renewables capacity.

a) SE Europe market characteristics

A 2019 OIES paper on SE Europe set out the case for looking closely at SE Europe.⁴ In terms of economic size and gas demand, the region is small: in aggregate it produces just 5% of the EU's GDP and has 5% of EU gas demand. The challenge was - why SE Europe? The answer is that it has an importance beyond these numbers. It contains 5 EU member states and several members of the Energy Community, bound by its Treaty to incorporate EU energy directives and regulatory standards. The whole region is, therefore, party to EU energy rules, regulatory and policy requirements. Further, nearly 90% of the region's total 26-27 bcma gas demand is in the EU-5. If there is to be some sort of EU gas supply sharing or joint purchasing scheme or arrangement during and after the current supply crisis, then SE Europe through its 5 Member States will need to be included.

Another main feature of these markets has been the lack of physical interconnectivity between them. Much had been talked about linking up these largely 'island' markets, but very little had been achieved before 2019-20. Whether this was due to policy failure at the national and EU level, or small TSOs serving relatively small markets not having sufficient financial resources, is debateable. The 2019 paper argued that the region was about to be transformed: interconnectors were being built (eg Greece-Bulgaria ICGB); a new gas corridor from the Caspian was being constructed; improvements to renovate domestic systems (eg BRUA in Romania) were happening. Also, the region now has a transit function now, with TAP gas going to Italy and Turk Stream gas to Hungary. Lastly, there is the Black Sea upstream potential.

b) Market evolution

In general terms, and at the risk of an over-simplified hindsight view of history, these markets have gone through three stages, and a fourth is now starting. This progression has not been to a regular beat, but frequently slow, frustrating and sometimes fractious. Summarising these evolutionary stages:

Stage 1: 1980s-2010 - market creation; Russia as the dominant supplier

With the exception of Romania, supply is dominated by imports from Russia as gas penetrates the region's energy mix. The Trans Balkan Pipeline was built in stages during the 1980s to bring Russian gas southwards via Ukraine to Romania, Bulgaria, Greece, Rep of N Macedonia and Turkey. Ultimately it had 25 Bcma capacity in 3 lines through Romania, and at peak in the late 2010s the system was carrying around 20 bcma of Russian gas, about half of which transited the region as it moved on to Turkey. There was just one LNG terminal – Greece's Revithoussa built in 2000 brought in small volumes of LNG which stayed in Greece. There was no interconnectivity between countries; gas could not move between the region's markets.

³ Euracoal Market Report, quarterly market reports and 2021 production map at <https://public.euracoal.eu/download/Public-Archive/Library/Charts-Maps/Coal-in-Europe/EURACOAL-Coal-in-Europe-2021-01.pdf>

⁴ Julian Bowden, SE Europe gas markets: towards integration, OIES gas paper NG150, October 2019



Stage 2: 2010-2018 – growing security & diversity of supply concerns; talk but little action

There was growing awareness of the risks of lack of interconnectivity and supply concentration, especially in the aftermath of the 2009 supply crisis caused by the breakdown of the Russia-Ukraine gas relationship. Markets were also immature compared with NW Europe markets, which were rapidly liberalising. During the 2009 gas crisis, Bulgaria in particular had faced major supply problems. Many interconnector project ideas were floated, but very few made progress. Hungary-Romania was built in 2010, Croatia-Hungary in 2011 and Bulgaria-Romania in 2016, but these were all small capacity and had very low utilisation rates. Perhaps frustrated by the lack of progress, at the end of 2014 the EU Commission launched its CESEC initiative, targeting 9 projects for priority completion.⁵

Stage 3: 2019-2022 – transformation

This stage marks a real change. Two major import and transit projects were commissioned. First, Turk Stream came on-stream in January 2020, and by diverting all Russian volumes away from the Trans Balkan Pipeline virtually overnight, it left that big system immediately empty and potentially available for other gas. To a small extent there has now been some reverse flow in it, for instance with Romania receiving its small amounts of Russian gas via Turk Stream and Bulgaria. Secondly, TAP was commissioned in December 2020, bringing Azerbaijan's gas into SE Europe & Italy through the now completed Southern Gas Corridor.

On LNG, utilisation levels at Revithoussa rose significantly from 2019 as Greece and Bulgaria arranged reverse flows. Greece exported the first regasified LNG to Bulgaria in 2019 (0.7 bcm, about one-quarter of Bulgaria's demand), thereby breaking Russia's supply monopoly in Bulgaria. Elsewhere, the region's second LNG terminal on Croatia's Krk island came on-stream in January 2021.

In a landmark development, the long-awaited Greece-Bulgaria interconnector ICGB started to flow gas on 1st October 2022. Construction finished in July 2022, and commercial flows are now ramping-up in this first-phase 3 bcma capacity development, with Azeri gas and LNG moving northwards.

Upstream, production from Black Sea Oil and Gas (BSOG) Midia field offshore Romania began in June 2022, but it remains to be seen whether Turkey's giant Sakarya discovery of August 2020 will stimulate more exploration in the Black Sea generally.

Lastly, even though Turkey is not part of the region, it has become important during Stage 3 as a transit country for Southern Corridor gas - it feeds gas into TAP and has for some years exported some gas volumes to Greece through a small pipeline connection. The emptying of the Trans Balkan system now gives Turkey a physical connection to Bulgaria from this line in reverse flow. To-date it has not been used: Botas says a formal interconnection agreement is required. Nevertheless, a test flow was made in June 2022, allegedly with regasified US LNG, and Bulgaria's tenders for LNG in 4Q2022 gave both Greece and Turkey as delivery point options for the gas.⁶

Stage 4: 2023-2027 – Russian volumes shrink

In February 2022 Russia invaded Ukraine, and Gazprom cut gas supplies to Bulgaria in April over the payment in roubles issue. The infrastructure developments above have given SE Europe a good platform to replace Russian gas imports volumes over the next 2-3 years (in line with EU policy of removing Russian gas before 2030) with a mix of LNG and pipeline gas, and also the confidence to do more. Several other LNG terminal projects have been announced recently – four in Greece, one in Albania and the further expansion of Croatia LNG. One or two of these should happen by 2025. The

⁵ CESEC – Central Europe and Southern Europe Energy Connectivity. See Julian Bowden, SE Europe gas markets; towards integration, OIES gas paper NG150, October 2019, pp 20-23 for a description of CESEC, its priority projects and its effectiveness.

⁶ Platts European Gas Daily 24th June 2022 & 23rd September 2022



frontrunner is Alexandroupolis in northern Greece: its 2023 start-up date looks realistic and it will probably accelerate the expansion of the ICGB pipeline to 5 bcma and the construction of the Bulgaria-Serbia interconnector. Upstream, the spotlight is on whether Romania's Neptun Deep partners will take FID soon so that the field can deliver first gas by 2027.⁷ The result of all this is that Russian volumes could be fully displaced over the next 5 years.

The summary above does not include what has *not* happened on gas infrastructure and market building projects. The list would be long and includes gasification of the West Balkans, building IAP (Ionian Adriatic Pipeline), development of a pricing hub, slow pace of the Romanian offshore. Analysing what make projects work, or equally not work, is beyond the scope of this paper. Clearly more is needed than political support. While a compelling supply/demand and commercial story is essential, what is also critical is a powerful lead-promoter who can pull together a mixture of leadership, finance, and political cover. Many projects clearly have not managed to tick sufficient boxes.

II. SE Europe gas demand & storage

a) Demand

Demand in the region has been resilient through the pandemic period. It dipped in 2019, but then grew in both 2020 and 2021. There are two things to note. First, in a European context, total SE Europe demand is small – 5% of total European demand and the EU-5 in SE Europe alone account for just 6% of total EU demand. Secondly, most of the region's demand is concentrated in these EU-5 – they accounted for 90% of SE Europe's demand of 29.6 bcm in 2021. With demand in Slovenia just 1 bcma, it comes down to basically four countries driving demand in the region – Romania (12.1 bcm in 2021⁸), Greece (6.1 bcm in 2021), Bulgaria (3.4 bcm in 2021) and Croatia (3 bcm in 2020).

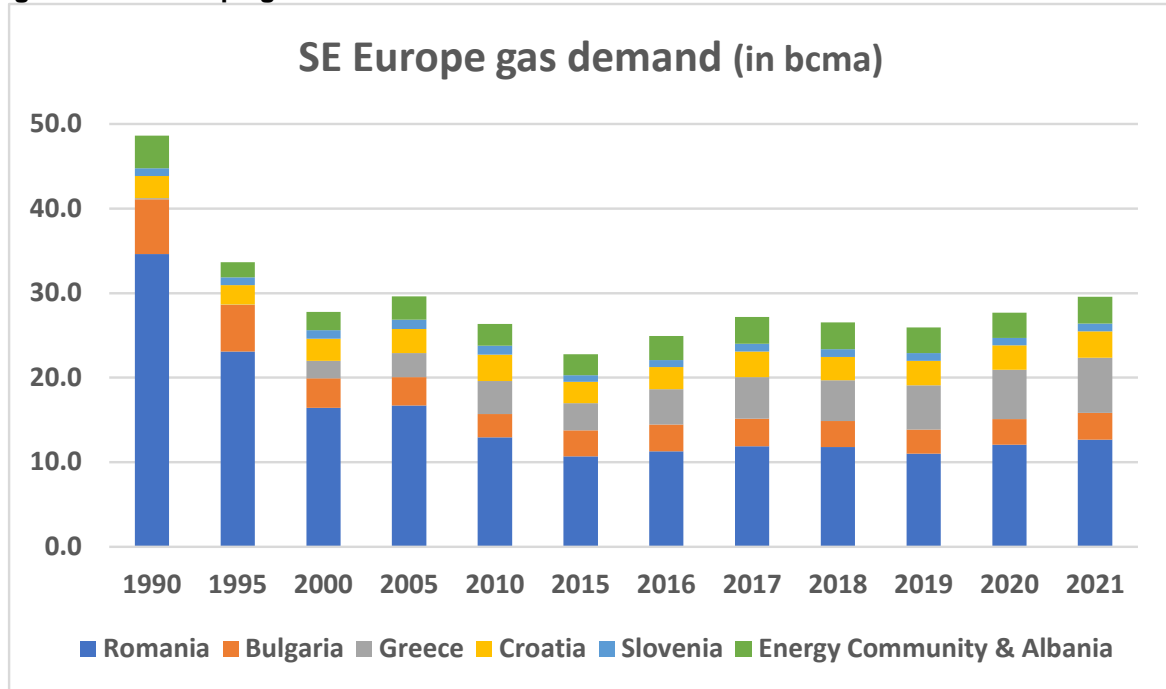
In general terms, over the last 20 years apart from a drop in 2015-16, demand has been flat in the 26-30 bcma range. In 2021, total demand in the region was 29.6 bcm, an increase of 7% in the year, and taking demand back to a level not seen since 2005.

⁷ All these projects are discussed in some detail below.

⁸ Romania National Institute of Statistics. Monthly Industry Bulletin, Table 18 for monthly gas balance at https://insse.ro/cms/sites/default/files/field/publicatii/buletin_statistic_de_industrie_nr02_2019.pdf Greece quarterly s/d and import statistics from DESFA press releases at <https://www.desfa.gr/en/press-center/press-releases>. Bulgaria monthly gas s/d data from National Statistical Institute at <https://nsi.bg/en/content/766/statistical-data>



Figure 1: SE Europe gas demand 1990-2021



Sources: national statistical agencies of Romania and Bulgaria, Desfa for Greece

Taking the main consuming countries individually:

Romania is the region’s major market. Demand fell sharply in the 1990s in the post-Soviet era contraction, and industrial activity in particular suffered. Since around 2010 it has stabilised around 11-12 bcma, and in 2021 was up 2% to 12.1 bcm.

Bulgaria is a substantially smaller market, where demand has been around 3 bcma for 20 years now, dropping below 3 bcma in 2008-11 during the financial crisis. In 2021 demand was up 13% to 3.4 bcm.

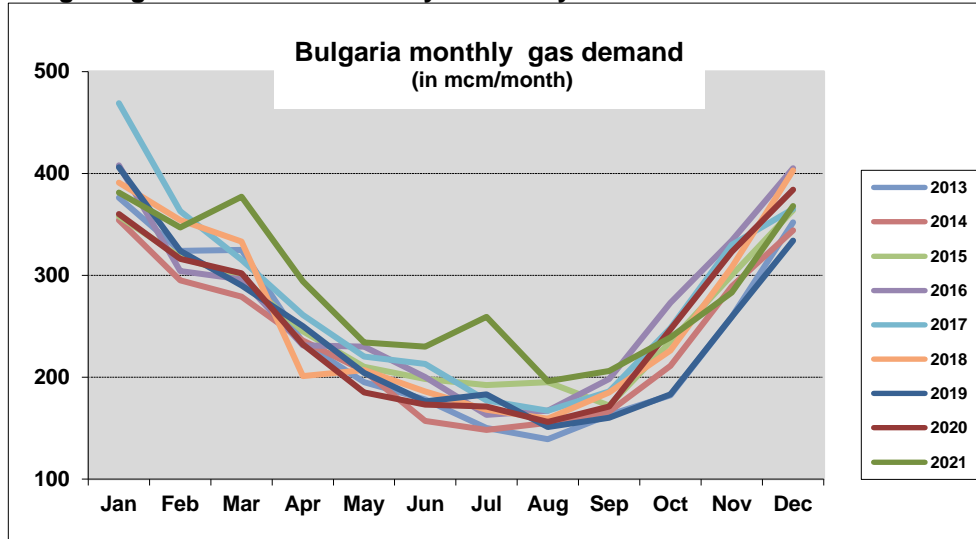
Greece has been the region’s dynamic gas market with demand on a rising trajectory since 2016, and up strongly in 2021 by 11% to just over 6 bcm. The main engine of growth has been the power sector, and in particular the reduction of lignite use. It is the region’s leader in reducing lignite production.

b) SE Europe Storage

Demand in the region is highly seasonal, which makes the general European concern about storage levels going into winter 2022/23 certainly applicable to SE Europe also. Charts below illustrate demand seasonality from two of the region’s markets (Bulgaria & Romania), and also show storage levels at end-September for 2022 and recent years.

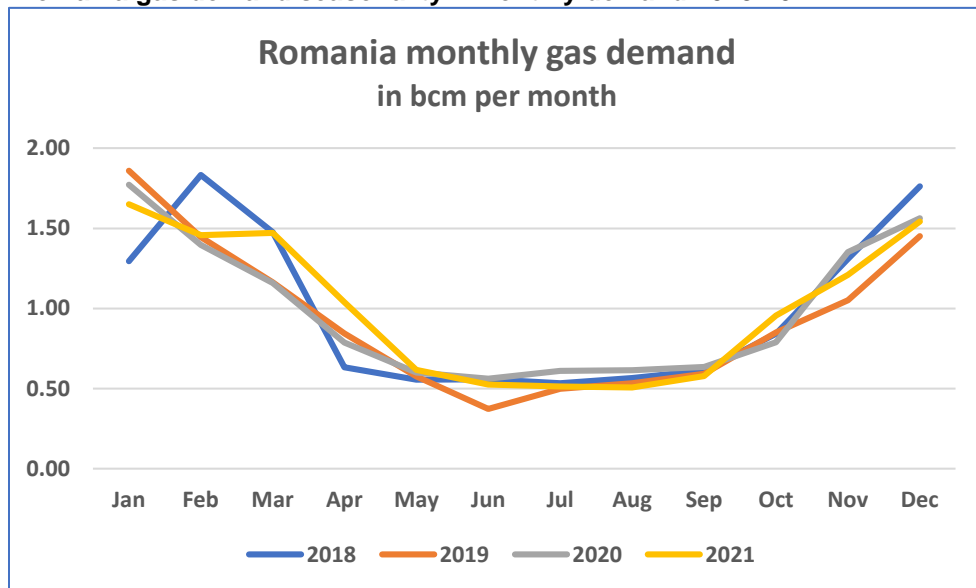


Figure 2: Bulgaria gas demand seasonality – monthly demand 2013-2021



source: Bulgaria National Statistical Institute, monthly energy statistics at <http://www.nsi.bg/en/content/5024/production-and-deliveries-natural-gas>

Figure 3: Romania gas demand seasonality – monthly demand 2018-2021



Source: Romania National Institute of Statistics, monthly Buletin statistic de industrie, table 18, at https://insse.ro/cms/sites/default/files/field/publicatii/buletin_statistic_de_industrie_nr05_2022.pdf

There is underground storage in 3 countries – Romania, Bulgaria and Croatia, as well as Hungary. Bulgaria’s storage is the 0.5 bcm (5.8 TWh) capacity facility at Chiren. Capacity is planned to double to around 1 bcm to provide additional storage for Bulgaria and a storage service for the broader region.⁹

⁹ See Bulgartransgaz Ten-Year Network Development Plan (TYNDP) 2022-2031, page 34

Greece has no storage, but there are plans for the South Kavala project for 0.7 bcm.¹⁰ Both the Chiren expansion and South Kavala construction are included in the latest 5th Projects of Common Interest (PCI) list.¹¹ Romania is a much larger gas market, and has a larger storage system with some expansion planned. Current capacities and planned expansions are tabulated below.

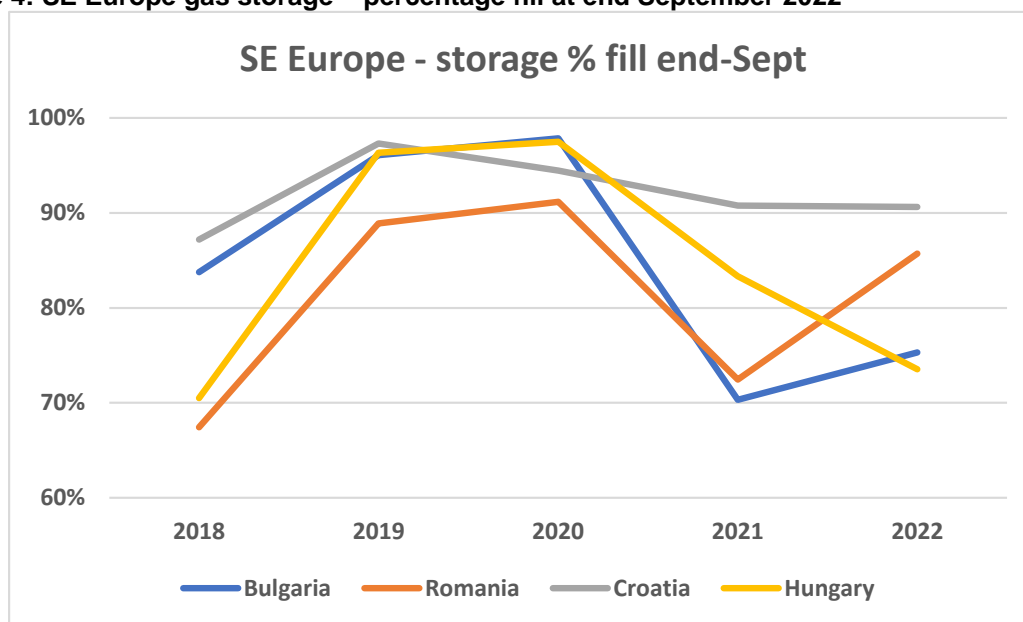
Table 1: SE Europe underground storage – existing & planned capacity

SE Europe - technical working gas volumes of underground storage facilities in TWh				
	site	operational	planned	future total
Bulgaria	Chiren	5.8	4.8	10.6
Croatia	Okoli	5.2	0.29	5.5
Romania	6 sites	33	12.5	45.5
Greece	S Kavala	0	3.9	3.9
Hungary	5 sites	69.6	0	69.6

source: GIE (Gas Infrastructure Europe) storage map, 2021 edition

There are deep concerns about how Europe in general will manage its gas balance in the 2022/23 winter, and storage levels are closely monitored. In Bulgaria and Romania, storage levels are now (end-September) higher than in 2021, but lower than in 2019 and 2020. Hungarian levels remain below those of recent years.¹²

Figure 4: SE Europe gas storage – percentage fill at end September 2022



¹⁰ For update see Desfa Management report to Board of Directors 2021, page 41, at <https://www.desfa.gr/userfiles/financialreports/Management%20Report%202021.pdf>

¹¹ Projects 6.20.2 & 6.20.3 of the 5th PCI list, November 2021 at https://ec.europa.eu/energy/sites/default/files/fifth_pci_list_19_november_2021_annex.pdf

¹² Storage data taken from GIE data at <https://agsi.gie.eu>

c) Moldova

Inclusion or exclusion of Moldova is problematic because of its complex politics and relatively poor energy data. Here it is excluded because it is a small and divided country with deep local geopolitical issues, and tackling it properly would really justify a dedicated note. How would Transnistria get supplied in the event of a major and prolonged supply disruption? Including Transnistria, the gas market has been flat at around 3.0 bcma over 2015-20, and is supplied basically by Russia.¹³ Excluding Transnistria, Moldova consumed 1.2 bcm in 2021.¹⁴ In October 2020 a 150 km 1.5 bcma capacity pipeline was built from Romania to Chisinau but whether any gas has been supplied through it is unclear. Interestingly, Greece's Institute of Energy for SE Europe IENE in its comprehensive 1300-page *SE Europe Energy Outlook 2021/2022* treated Moldova not as a core SE Europe country but as a country peripheral to SE Europe.¹⁵

Table 2: Moldova gas demand 2018-2021

Moldova gas demand (in Bcm)			
2018	2019	2020	2021
1.13	1.06	1.08	1.23

source: Moldova in Figures 2022, footnote 14

III. Russia gas supply into SE Europe

a) Volumes & market share

Russia has a long history of gas supply into the region, where (apart from Romania with its century-old history as a gas producer) it was a primary facilitator in putting gas into the energy mix. Gas mostly came through the Trans Balkan Pipeline, a system built and expanded from the 1980s to bring gas via Ukraine to Romania, Bulgaria, Greece, Rep of North Macedonia and Turkey. Russian gas for Serbia and Bosnia came through Hungary and this flow as well as Russian gas for Hungary has also now been diverted into Turk Stream.

Russian gas exports into the region over the last 7 years and Russia's overall market share are tabulated below. The last complete set of export data is for 2020. Total regional demand then was 27.7 Bcm, and Russian's market share was 38%, higher than its share of the EU market. In some earlier years, its market share was substantially higher – over 50% in 2017-8 for instance. The reduced current level reflects competition from LNG and the start-up of the Southern Gas Corridor (that is gas from TAP).

¹³ Gazprom in Figures 2015-19 page 82 and 2016-20 edition page 86.

¹⁴ Moldova in Figures, statistical pocket book 2022, National Bureau of statistics of Rep of Moldova, page 21 for energy data

¹⁵ Institute of Energy for SE Europe IENE, South East Europe Energy Outlook 2021/2022, Athens, December 2021

Table 3: Russian gas exports to SE Europe by country 2015-2020

Russian gas exports to SE Europe (in bcm)							
	2015	2016	2017	2018	2019	2020	2021
Bulgaria	3.1	3.2	3.3	3.2	2.4	2.3	2.9
Greece	2.0	2.7	2.9	3.3	2.5	3.1	3.3
Romania	0.3	1.7	1.4	1.5	1.1	1.0	3.0
Slovenia	0.5	0.5	0.6	0.5	0.3	0.4	
Croatia	0.6	0.8	2.8	2.8	2.8	1.8	
Serbia	1.9	1.9	2.2	2.2	2.2	1.4	
Bosnia	0.2	0.2	0.2	0.2	0.2	0.2	
Rep N Macedonia	0.1	0.2	0.3	0.2	0.2	0.3	
Turkey	27.0	24.8	29.0	24.0	15.4	16.4	26.3
Hungary	6.0	5.7	7	7.3	10.5	8.6	
Total SE Europe	8.7	11.2	13.7	13.9	11.7	10.5	
Total SE Europe + Hungary	14.7	16.9	20.7	21.2	22.2	19.1	
Total above incl Turkey	41.7	41.7	49.7	45.2	37.6	35.5	
Moldova	2.9	3.0	2.7	3.0	2.9	3.1	

source: Gazprom in Figures 2015-19 p 82 & 2016-2020, p 86
2021 is taken directly or estimated from national statistics

SE Europe gas demand & Russian market share						
	2015	2016	2017	2018	2019	2020
SE Europe total demand (bcm)	22.8	24.9	27.2	26.5	25.9	27.7
Russia supply (bcm)	8.7	11.2	13.7	13.9	11.7	10.5
Russia market share	38%	45%	50%	52%	45%	38%

A reasonable assumption would be to set the target for replacing Russian volumes in SE Europe at 10-11 bcma. If Hungary is included, then clearly the volume required would be much higher.

b) SE European energy diplomacy

There have been two fairly rapid responses to the Russia-Ukraine crisis: one diplomatic one, the other to support consumers. Following the outbreak of hostilities, nothing changed in the region until 27th April 2022 when Gazprom suspended its gas supplies to Poland and Bulgaria, followed by Finland on 21st May, in all cases for failure to agree revised contract terms for payment in roubles.

While all countries and the EU itself have been very active in talking to suppliers about potential supply increases, in this region Bulgaria has been notably busy. For Bulgaria the cut was serious because of its high dependency on Russian supply, although not as serious as it would have been before LNG deliveries via Greece became clearly possible from 2019. Nevertheless, then Prime Minister Kiril Petkov immediately embarked on a period of intense energy diplomacy. On 5th May he hosted a regional energy forum in Sofia, attended by delegates from Greece, Romania, Serbia, Rep of North Macedonia, Azerbaijan, Turkey, Ukraine and the European Commission, where the agenda was the obvious one of regional gas supplies. On 6th May, he had a separate meeting with the Azeri Energy



Minister Parviz Shahbazov.¹⁶ On 9th May he was in Washington.¹⁷ Prior to this, speaking about Bulgaria’s domestic arrangements he’d been reported noting probably correctly that “IGB together with the LNG project near Alexandroupolis, gives us the opportunity for full (supply) diversification”.¹⁸ On 21st July Petkov met Azeri President Ilham Aliyev in Baku, where the agenda included a request for additional gas over the 1 bcma of Shah Deniz 2 gas already contracted.¹⁹

The EU Commission has been active too. For instance, Petkov’s Baku meeting was preceded earlier that week by a meeting in Baku between EU Commission President Ursula von der Leyen, Energy Commissioner Kadri Simson and Azeri President Aliyev and Energy Minister Parviz Shahbazov. The concluding statement included an MOU to almost double the volume of Azeri gas to the EU from the current 12 bcm to 20 bcma by 2027 through an expanded Southern Gas Corridor.²⁰ Market reaction to this so far has been sceptical because it is not at all clear where the extra 8 bcm will come from as there are no new upstream projects under development in Azerbaijan to provide this kind of volume and on this timescale.

c) Affordability

How will demand be affected by the very high gas prices in 2022? Bad enough for the wealthier parts of the EU, it will be a much heavier burden on the poorer SE Europe region, where SE Europe’s five EU Member States’ average GDP per capita in 2020 was just 64% that of the EU-28 average. If the Energy Community members are included, the SE European region’s GDP per capita was 55% of the EU-28.

With gas at exceptionally high prices (€200 MWh was breached end-July 2022), early evidence confirms that a demand reaction is happening and is accelerating. The table below summarises demand data from the countries which report fairly early. Demand has been down by between 10-13% in the first six months, with virtually all the reduction in the second quarter.²¹

Table 4: SE Europe gas demand fall in 2022 – first-half data

2022 demand response (in bcm)			
	1H2021	1H2022	
Greece	2.92	2.62	-10%
Bulgaria	1.86	1.64	-12%
Romania	6.76	5.86	-13%

In most EU countries support mechanisms have been put in place to assist consumers. In SE Europe, in Greece, for example, Energy Minister Kostas Skrekas said in September that “The government will continue to implement policies that shield consumers from the extremely adverse impact of the energy war Russia has waged on Europe” while announcing a further 1.1 billion euros for electricity subsidies on top of a 9 billion programme already committed.²²

¹⁶ <https://nova.bg/news/view/2022/05/06/367961/prime-minister-petkov-confers-with-azeri-energy-minister-shahbazov/>

¹⁷ <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/09/statement-by-nsc-spokesperson-adrienne-watson-on-national-security-advisor-jake-sullivans-meeting-with-bulgarian-prime-minister-kiril-petkov/>

¹⁸ Platts European Gas Daily 6th May 2022

¹⁹ <https://bta.bg/en/news/bulgaria/300209-outgoing-pm-petkov-to-visit-azerbaijan-on-july-21-and-22> and <https://www.azemews.az/nation/197063.html> has photos of the meeting

²⁰ https://ec.europa.eu/neighbourhood-enlargement/news/statement-president-von-der-leyen-azerbaijani-president-aliyev-2022-07-18_en

²¹ Greece from Desfa press release <https://www.desfa.gr/en/press-center/press-releases/stoixeia-desfa-gia-thn-katanalwsh-fysikoy-aerioy-to-a-ejamhno-toy-2022> Romania from Buletin statistic de industrie, #7 2022 Table 18 at https://insse.ro/cms/sites/default/files/field/publicatii/buletin_statistic_de_industrie_nr05_2022.pdf

Bulgaria from monthly gas demand in <https://nsi.bg/en/766/statistical-data>

²² <https://www.euronews.com/2022/09/22/greece-energy-subsidies>



IV. Upstream

Following the Russian invasion of Ukraine, there is intense focus at both the national and EU level on seeking ways of procuring alternative supply. To-date though, EU efforts seem to have been focused more on external suppliers like Azerbaijan, Algeria and Norway, with visits by highest level delegations typically securing an MOU (see above for the von der Leyen visit to Azerbaijan in July 2022 as an example). Curiously, encouraging domestic EU production seems to have been relatively overlooked.

Several countries in the region produce small amounts of gas, but volumes typically cover only a small part of their national demand. The exception is Romania, which has over a century-long history as a gas producer and currently can cover around 75% of its demand. But its production is in slow decline, in 2021 output of 8.9 bcm met 74% of demand. Of note, with the exit of UK from the EU, Romania is now the second largest gas producer in the EU after the Netherlands. Serbia produces just under 0.5 bcma, covering 20% of its demand. Croatia has both on-shore and off-shore production, but the offshore in particular is on a decline trend. Total output was 2 bcm in 2012, falling to 0.8 bcm in 2020 (decline of 10% pa), which met well under 30% of its 3 bcm demand that year.

Although it is not within the SE Europe region, Turkey's upstream is included here. Any domestic production, especially if it is big enough to exceed incremental demand in this 4th largest European market which is extremely import dependent, has the potential to release gas otherwise destined for Turkey to go to other markets. While this could be in the form of LNG, Turkey also has pipeline connections into SE Europe.

There is exploration elsewhere in the Black Sea other than in Romania and Turkey. Long-standing small production from offshore Crimea is excluded here as it is not relevant to the European balance and is now "off-limits", but there is on-going exploration offshore Bulgaria and Georgia. This is not addressed here, as even if successful it would have no impact on the regional or European balance until beyond the medium-term.

a) Romania

Romania is the EU's second largest gas producer after the Netherlands. In 1990 output was touching 30 bcm, but it fell sharply over the next 10 years to 14 bcm by 2000. The on-shore is now unlikely to contain any surprises. There have been some discoveries in recent years, but these have served really just to moderate the decline trajectory. Romania's output has fallen slowly at 3% pa over recent years, from 10.3 bcm in 2018 to 8.9 bcm in 2021.

Production is heavily concentrated. Two companies dominate the Romanian upstream - Romgaz and OMV Petrom. In 2021, Romgaz contributed 5 bcm (57%) and OMV Petrom 3.7 bcm (42%) of total output.

A solution to a potentially growing gas deficit seems to be development of the offshore, with the Neptun Deep project likely to be the supply gamechanger for both Romania and the region, as it could transform Romania from small net importer to small net exporter. Despite some shows over several years of drilling, nothing substantial was found until the Domino-1 well in the Neptun block found gas in 2012.²³

The country's supply/demand problem is recognised by the Romanian Government and gas industry. The two charts below come from consecutive TSO Transgaz Ten-Year Network Development Plans (TYNDP). Both show a continued erosion of the Romgaz and OMV Petrom base production. Neptun Deep would make a big difference on two counts. Its potential 5-6 bcma output moves Romania from small deficit to small surplus while on its short plateau (which in reality would probably be extended once production has started) and given the projected flat demand outlook. Secondly, it would doubtless

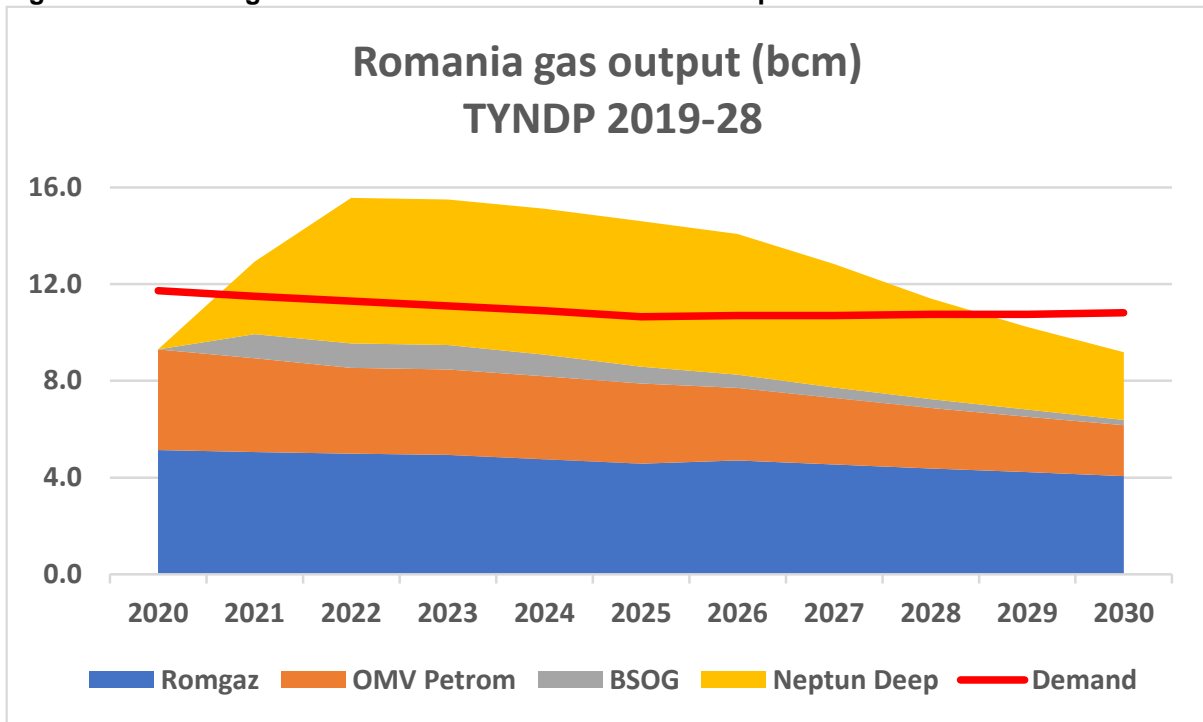
²³ <https://www.offshore-technology.com/projects/neptun-deep-gas-field-project-black-sea/>



stimulate further exploration efforts in both the Romanian and Bulgarian offshore, and also probably shorten development times because infrastructure built for Neptun would still be in place.

The problem is that Neptun Deep has yet to receive FID, and the two charts below show how the projected start-up date has regularly been pushed back.²⁴ When the next TYNDP is released, it will be pushed back again. OMV Petrom is now talking about a 2027-28 start-up on the basis of FID in 2023.

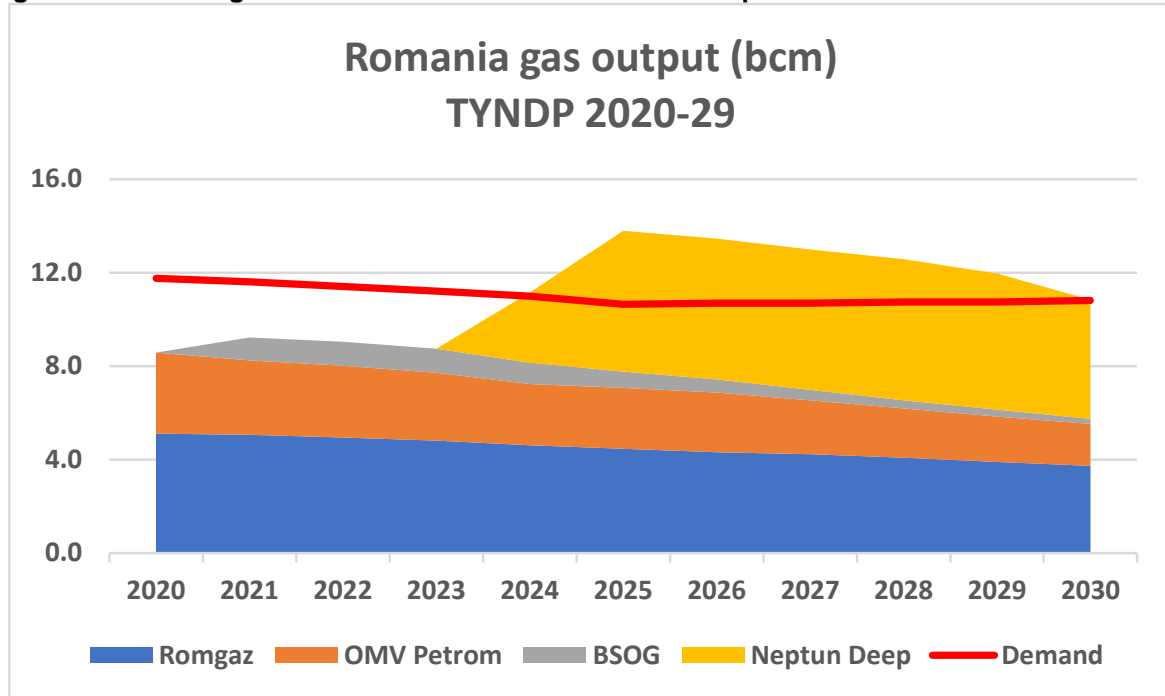
Figure 5: Romania gas balance in Ten-Year Network Development Plan 2019-2028



²⁴ Transgaz Ten-Year Network Development Plans – Planul de dezvoltare sistemului national de transport gaze naturale 2019-2028 and 2020-2029.



Figure 6: Romania gas balance in Ten-Year Network Development Plan 2020-2029



i) BSOG – Midia project on-stream June 2022

Black Sea Oil & Gas (BSOG) announced that production from its Midia project started on 15th June 2022, and that it hopes to produce 0.5 bcm in 2022, reaching a plateau 1 bcma in 2023. The Midia project consists of 2 fields, Ana and Doina, about 120 kms offshore in about 70 metres water depth, discovered in 2007 and 1995 respectively. Projected capex is reported as \$400 million, and FID was taken in 2019. There is 1 subsea well on Doina, 4 platform wells on Ana, and a 126 km pipeline to shore to a gas treatment plant. BSOG’s CEO Mark Beacom commented in the press release for first gas that “It has been a long and challenging journey to finally reach this significant milestone for the country. A number of firsts were achieved in Romania, all during the global pandemic and, more recently, conflict in Ukraine that threatened to impact Black Sea operations”.²⁵

Both the TYNDPs above had Midia on-stream in 2021, but the business and political climate unsurprisingly led to delays. While it makes a welcome contribution to the supply position - 1 bcma meets 8% of Romania’s demand - its importance lies more outside the supply/demand balance as an example of Black Sea project feasibility. Upstream companies have had a general complaint that the terms available to the offshore are not attractive and have deterred investment. Neptun Deep partners had long argued that a new offshore law would be required for its FID to be taken. The new offshore law was passed in May 2022 and features an improved tax regime and dropping the obligation to sell some production on the controlled part of the domestic market. The Neptun Deep partners are now studying its details.

²⁵ <https://www.blackseaog.com/black-sea-oil-gas-delivers-first-gas-from-the-mgd-project/>



ii) Neptun Deep – no FID yet

Despite some shows over many years, nothing commercial was discovered until the Domino-1 well in the Neptun block found gas in 2012.²⁶ Neptun Deep has had a fairly long history. In 2008 OMV Petrom and ExxonMobil formed a JV to explore the block, and the Domino-1 exploration well found gas. The JV then spent around \$1.5 bn over 2008-16 on further extensive exploration and appraisal work including eight exploration and appraisal wells and two 3D seismic programmes.²⁷

The reservoir is in water depths varying between 100 and 1700 metres. The reserve base is variously estimated at 50-84 bcm, usually at the higher end, although in the past the OMV-Petrom CEO Christina Verchere has been reported as saying it has recoverable reserves of 50 bcm.²⁸ The Transgaz TYNDP (above) assumes plateau output at around 6 bcma.

Production of around 6 bcma, with a fairly flat demand outlook, would flip Romania from being a small importer to small exporter. However, FID has not been taken. Delay has been caused not only by partners' (OMV Petrom & Exxon) complaints about Romania's offshore law being unattractive, but also by the major disruption caused by Exxon's departure.

In 2020, Exxon announced its intention to exit. While the main reason cited was the Romania 2018 offshore law, there was a perhaps an element of portfolio clean-up. From an Exxon perspective Neptun Deep might have looked to be a non-core asset. Romgaz emerged as the frontrunner replacement, and in March 2022 the Romgaz Board endorsed a share purchase agreement to acquire the ExxonMobil shares.²⁹ The purchase price is \$1.06 bn, and the share sale & purchase agreement was signed on 3rd May 2022.³⁰ The project operator will be OMV Petrom. Meanwhile, with FID being pushed back while the sale by Exxon was being completed, there was substantial pressure on the Romania Government to amend the offshore law, the whole process echoing Mark Beacom's comment above about a long and challenging journey.

Bringing all this together, at an OMV press conference in March 2022, OMV CEO Alfred Stern said "The Neptun Deep asset in the Black Sea represents a unique opportunity for Romania and Europe to become less dependent on imports. OMV Petrom will be the operator of the block with Romgaz as a partner. Depending on a new offshore law in Romania, we expect final investment decision to be taken in 2023, with first gas in 2027".³¹

Does the delay in FID reflect that there is still nervousness inside OMV and OMV Petrom about making the commitment, or just very understandable caution? In an interview in June, OMV Petrom's CEO Christina Verchere said "Neptune Deep looks to address energy security, energy transition and economic development for Romania and is the central piece of our strategy to a lower carbon future. We are committed to invest up to 2 billion euros in this project, out of a total of 11-billion-euro investment plan to transform our company to meet both environmental targets and the energy needs of Romania. In the upcoming period, we will analyze the final content of the Offshore Law and its impact on the Neptune Deep project. In any project of such scale, the final investment decision considers a series of economic, fiscal and market factors. The economic viability of the investment depends on key factors and on their stability for the duration of the project."³² But, unlike Alfred Stern three months earlier, she

²⁶ <https://www.offshore-technology.com/projects/neptun-deep-gas-field-project-black-sea/>

²⁷ <https://www.omvpetrom.com/en/our-business/exploration-and-production/neptun-deep>

²⁸ <https://www.romania-insider.com/omv-netptun-deep-offshore-law-dec-2021>

²⁹ <https://www.romgaz.ro/en/press-release-romgaz-neptun-deep-project-straight-line>

³⁰ Romgaz 1Q 2022 Results presentation, slides 7 & 15, at https://www.romgaz.ro/sites/default/files/2022-05/Romgaz%20Presentation%20Q1%202022%20-%20en_0.pdf

³¹ <https://seenews.com/news/omv-to-make-final-investment-decision-on-romanian-offshore-gas-project-in-2023-ceo-777253>

³² <https://www.energynomics.ro/en/christina-verchere-omv-petrom-already-started-the-journey-to-the-future-of-energy/>



did not give any mention of a possible timeline for FID or first gas. On the other hand, Romgaz itself has talked about first production late 2026-early 2027.³³

iii) Other offshore Romania

In 2015 Lukoil (87.8%) and Romgaz (12.2%) announced that the Lira-1 well had discovered gas on the Trident block, with reserves estimated at 30 bcm. In 2020 Lukoil announced its intention to exit. In 2021 Romgaz was involved in seismic reprocessing work, and in September 2021 a 5-year extension for resource evaluation was granted.³⁴ It would seem likely that development of Trident would be more as a satellite of either Midia or Neptun, and therefore its progress would be dependent on developments in those adjacent blocks.³⁵

b) Turkey Black Sea - Sakarya

Romania's seemingly dilatory approach contrasts with the unbelievable speed of the development of Turkey's Sakarya field. Since the discovery of the at least 540 bcm field in 2020, and despite general scepticism that development would take years and require international oil company partners, there is now a serious likelihood that first production will begin as planned in the second half of 2023, for reasons described below.

Turkey is a major consumer with insignificant domestic production, leaving it very vulnerable to the increasing cost burden of imports in a weakening economy and exchange rate. Domestic production in 2021 was just 0.4 bcm in a total market of almost 59 bcm, meeting well under 1% of supply. Demand has shown continuous and impressive growth, 13% per annum over the 20 years 1990-2010 or 9% per annum over the 30 years 1990-2020, and in 2021 demand soared further to 58.7 bcm, making it firmly the 4th largest market in Europe after Germany, UK and Italy.

While virtually all of this volume was imported, Turkey's one advantage over many other markets both large and small is that it has substantial diversity of supply and diversity of pricing. Pipeline supply from Russia, Iran and Azerbaijan is mostly oil indexed, LNG is mostly spot. In 2020 LNG accounted for 15.1 bcm of total imports of 48 bcm, or over 30% of its total supplies. In 2021, LNG's share fell back to 24% share of imports, but the volume in a rising market was similar at 14 bcm.³⁶

The missing piece has always been a significant domestic supply contribution. Exploration campaigns in the Eastern Mediterranean provoked crises with Cyprus and Greece caused by disputes over ownership of the reserves and have not met with success. On the other hand, the Black Sea has turned up the major Sakarya field.

Many companies over many years have explored the Turkish Black Sea without commercial success. Then in August 2020 TPAO's drill ship the *Fatih* drilling the Tuna-1 well found significant gas. Tuna-1 was drilled in water depth of 2100 metres, and at 2400 metres found reserves estimated at 320 Bcm. Further drilling of Tuna-1 then found a second deeper reservoir at 2700 metres, and reserves estimates were raised to 405 bcm.³⁷

³³ Romgaz press release 23rd March 2022 at <https://www.romgaz.ro/sites/default/files/2022-03/Comunicat%20de%20Pres%20-%20Proiectul%20Neptun%20Deep%20-%20In%20linie%20dreapta%20EN.pdf>

³⁴ Romgaz presentation pack on 2021 results, April 2022 slide 14 at <https://www.romgaz.ro/sites/default/files/2022-04/Romgaz%20Presentation%202021%20-%20en.pdf>

³⁵ Globuc review of Black Sea projects 3rd Oct 2019, at <https://globuc.com/blackseaoilgas/offshore-projects-in-the-black-sea/>

³⁶ Imports data from Regulator EPDK's monthly market report at <https://www.epdk.gov.tr/Detay/Icerik/3-0-95/dogal-qazaylik-sektor-raporu>

³⁷ TPAO press release 17th Oct 2020 at <https://www.tpa.gov.tr/file/2010/press-release-tuna-1-discovery-17-10-2020-3825f8b0ef03ee93.pdf> See also TPAO annual report 2020, page 23, for drill ship *Fatih* performance, at



With yet further drilling, by end-2021 estimated total reserves for Sakarya were raised to 540 bcm, including 135 bcm found by the Amasra-1 well in North Sakarya.³⁸ By now TPAO had 2 other ships operating, the *Kanuni* and *Yavuz*, and had a fourth drillship on order.³⁹ As far as we are aware, the reserves have not been certified by an independent international certification company.

Production planning is built around a 2-phase fast development. TPAO has announced a first phase of 3-4 bcma (10 million cm/day) from 6-10 wells, with untreated gas flowing through a 16" pipe to landfall at Filyos for processing. First gas is scheduled for 2023, in time to coincide with the Republic's centenary celebrations.⁴⁰ Phase 2, again subsea, would take total Sakarya output to 40 million cm/day from 30-40 wells, ie around 14-15 bcma by 2027-28. For context, this latter number would represent about 25% of Turkey's current demand. Gas quality is believed to be lean and low sulphur, so complex processing will not be necessary.

There was widespread scepticism about TPAOs capability to deliver a major project and to a very aggressive first gas timetable in a new province with 2000 metres water depth. It was assumed that an IOC would be needed as partner, yet at this early stage has been no talk of any desire to seek partnerships.

Instead, TPAO has contracted in world-leading service providers. In September – November 2021, three major contracts were concluded:

- Schlumberger had worked with TPAO on its Eastern Mediterranean drilling, and in October 2021, it and Subsea 7 won the EPCI (engineering, procurement, construction & installation) contract for Sakarya.
- Saipem won the pipelay contract in November 2021. Pipe was contracted from Tenaris, with the first batch of 16" pipe delivered in March 2022⁴¹. (Another pipeline will be required for Phase 2, and 24" is being talked about). In June 2022, preparations for laying the 170 km pipeline linking the field to the Filyos landing point started, with Saipem's Castor 10 on station and the deep-sea Casterone about to enter the Black Sea.⁴² Casterone has since entered the Black Sea in early July.
- In November 2021 Wood Group was appointed the integrated project manager.

1Q 2023 for first gas⁴³ always look implausibly fast. With these international service companies contracted, however, first gas late in the second half of 2023 looks entirely possible. On 13th June 2022 on the occasion of first ceremonial pipelay, Energy Minister Fatih Donmez claimed that Sakarya will be the world's fastest offshore project from discovery to first gas.⁴⁴ Zohr offshore Egypt at two years was quicker, but for gas in a new province rather than an incremental project, his claim and applause for a major development at pace was still justified. Donmez said in late September that the main pipeline was on schedule for an end-September 2022 completion.⁴⁵ He has since said in November 2022 that

<https://www.tpa.gov.tr/file/2108/tpao-2020-annual-reports-544611f8f11b4976.pdf> . See also Offshore technology article 26th October 2021 at <https://www.offshore-technology.com/projects/sakarya-gas-field-development-black-sea-turkey/>

³⁸ TPAO press release 4th June 2021 at <https://www.tpa.gov.tr/file/2201/20210604-tp-amasra-1-discovery-eng-66361e0331ced70c.pdf>

³⁹ Platts European gas daily, 29th November 2021

⁴⁰ Platts European gas Daily 10th March 2021

⁴¹ https://www.tenaris.com/en/newsroom/news-listing/line-pipes-for-sakarya-gas-field-project--00631669122?hss_channel=lcp-166327

⁴² <https://www.offshore-mag.com/field-development/article/14214002/saipem-wins-transportation-and-installation-work-for-sakarya-janszio-gas-projects-offshore-turkey-australia>

⁴³ <https://www.aa.com.tr/en/energy/energy-projects/turkey-to-use-first-gas-from-black-sea-in-q1-2023/31881>

⁴⁴ <https://ocean-energyresources.com/2022/06/14/turkiye-starts-laying-underwater-pipes-for-black-sea-gas-project/>

⁴⁵ Platts European Gas Daily 20th September 2022



pipeline was then 97% complete, 9 of the 10 planned production wells had been drilled and that first gas was now expected in March 2023.⁴⁶

c) Other Black Sea & East Med

Offshore Crimea there is production, but this is not part of the European equation for obvious reasons. There is exploration, or exploration interest, offshore Bulgaria and Georgia. However, neither of these could produce gas until beyond the medium term: it is mentioned here for completeness but is not relevant for the SE European or larger European gas balances. **Bulgaria's** main prospect is Han Asparuh, in which OMV Petrom has a 42.8% share alongside Total (57.1% and operatorship). In April 2022, Han Asparuh received another 2-year extension.⁴⁷ Offshore Georgia is also attracting some interest, and OMV Petrom is involved here too.⁴⁸

The idea of **Eastern Mediterranean pipeline exports** seems to keep moving between doable and not doable, and with Russia-Ukraine and the EU's search for alternative gas it is being revived again. In June 2022 the EU Commission President Ursula von der Leyen was in Israel and talked about the 10 bcm EastMed pipeline.⁴⁹ Technically difficult, with €6 billion plus capex, it is promoted by a JV between DEPA and Edison.

In summary, what is planned by the DEPA - Edison JV is a 1900 km pipeline (1350 offshore, 559 km onshore) from the Cyprus and Israeli offshore gas fields to Greece via Crete, and then via the planned 970 km Poseidon pipeline to continue to southern Italy. Pipe diameters vary between 24", 26" and 42", with Phase 1 capacity of 10 bcm. Supporting this, an Intergovernmental Agreement between Cyprus, Greece, Israel and Italy was made late in 2018.⁵⁰ The project is on the EU's 5th and most recent end-2021 PCI list.⁵¹

Overall, given the size and technical complexity of the pipeline (deep water, compression needs) together with synchronising with the East Mediterranean upstream, it is highly unlikely that an East Med pipeline gas to Europe could figure in the next 5-6 years.

V. SE Europe regional gas flows

It is obvious that changing flows are closely linked to new infrastructure, although that is not always the case, as Europe is seeing now from the Russia-Ukraine war. This section looks at low changes, while Section VI considers the reasons behind the changes. They are both then linked in Section VII, which attempts to bring everything together to address the question of whether Russian gas can be replaced.

Key infrastructure events have occurred in a short time-frame in 2019-2021:

- Turk Stream came on-stream at the start of 2020, diverting all Trans Balkan Pipeline gas flowing south. One concern with this was the impact on TSO revenues in transit countries Romania and Bulgaria.
- TAP came on-stream at the very end of 2020, introducing Caspian gas into the supply mix.

⁴⁶ Platts European Gas Daily, 17th November 2022

⁴⁷ <https://seenews.com/news/totalenergies-omv-petrom-units-get-extension-of-bulgarian-oil-gas-exploration-permit-780886>

⁴⁸ OMV Petrom annual report 2020, page 28

⁴⁹ Platts European Gas Daily 14th June 2022

⁵⁰ <https://www.depa.gr/international-infrastructures/?lang=en>

⁵¹ 5th PCI list at C(2021) 8409 Final 19th November 2021 at

https://ec.europa.eu/energy/sites/default/files/fifth_pci_list_19_november_2021_annex.pdf



- Croatia LNG (Krk FSRU) began operations at the start of 2021.
- Revithoussa increased its throughput, mainly reflecting Bulgarian imports of LNG from the international market but also Greece's own rising demand. Bulgaria's imports of gas from non-Russian sources started well before its April 2022 Russian cut-off, and before it started receiving its Shah Deniz Stage 2 gas.

Summarising and drawing together points made above, over the last 3 years countries in the region have seen:

- Greece exporting LNG to Bulgaria from 2019
- Greece importing Azeri gas from TAP
- Bulgaria importing regasified LNG via Greece, and importing Azeri gas from TAP (and since October 2022 from the ICGB interconnector)
- Romania importing Russian Turk Stream gas via Bulgaria
- Romania now a small net exporter of gas to Hungary
- Serbia receiving its Russian gas from Bulgaria (via Turk Stream) instead of Hungary.

Some of these flow movements are explored in greater detail below.

a) Bulgaria & Greece

Bulgaria provides a very good example of how flows have changed over 2019-2022. Bulgarian exports (or rather transit) of Russian gas to Greece and Rep of N Macedonia were transferred seamlessly when Turk Stream started up: overnight the gas moved into Bulgaria from Turkey rather than from Romania. Increased volumes to Greece were more a reflection of Greece demand increasing sharply rather than any flow change.

Table 5: Bulgaria's gas exports 2019-2021 by country

Bulgaria gas exports in bcm				
	2019	2020	2021	reasons for flow change
Greece	2.2	2.8	3.1	Greek demand up
Rep of North Macedonia	0.3	0.3	0.4	
Serbia		0.0	2.6	Turk Stream start-up Jan 2020
Romania		0.2	2.8	Turk Stream & Trans Balkan reversal
Turkey	4.3	0.1	0.0	Turk Stream and Trans Balkan not used for north-south flow
Total exports	6.9	3.3	8.9	

source: Bulgartransgaz Consolidated Annual Activity Reports, 2020 page 15 & 2021 page 16

Greece gas exports to Bulgaria in bcm			
	2019	2020	2021
Greece exports to Bul	0.68	0.63	0.66

source: DESFA end-year gas balance reports, at <https://www.desfa.gr/en/press-center/press-releases/stoixeia-desfa-gia-thn-katanalwsh-fysikoy-aerioy-to-2021>

Total flows through Bulgaria were 6.9 bcm in 2019, and halved in 2020. Then as Russian gas to Romanian and Serbia was transferred to Turk Stream, gas moving through Bulgaria rose again. Serbia became a Bulgarian export destination, getting its gas via Turk Stream instead of via Hungary.

Romania's imports from Russia came via Bulgaria instead of Ukraine, and deliveries of Russian gas to Turkey on the Trans Balkan route stopped completely.

For **Greece** two things happened in this period. First, gas exports started to Bulgaria: from nothing to 0.6 – 0.7 bcma in 2019-2021, accounting for about one-quarter of Bulgarian demand. Secondly, TAP operations ramped-up in 2021, and Azeri gas through TAP in 2021 accounted for 17.5% of Greece's imports. (For the Greece gas balance and gas supply sources, see Appendix 3)

One concern was how these flow changes might affect TSO revenues. In the event, Bulgartransgaz seems to have come out of it well, Romania's Transgaz poorly. Transit revenue was always relatively more important for Bulgartransgaz than for Transgaz. Transgaz operates a domestic system supplying 12 bcma, four-times the 3 bcma domestic demand that Bulgartransgaz supplies. Domestic activity was (and is) always likely to be more important for Transgaz. Also, when the Trans Balkan Pipeline system was operating, the gas only moved some 190 km across Romania, whereas distances covered by transit streams handled by Bulgartransgaz to Greece, Rep of N Macedonia and Turkey were much greater. For Bulgartransgaz transit revenues accounted for around 60% of its total revenues. From its services provided to Turk Stream this percentage has been more than preserved and revenues actually increased appreciably. Contrast this with Transgaz, where total revenues have fallen. Specifically transit revenues have fallen from 20% of its total in 2017 to just 5% now. But one reflection from the accounts is that these TSOs, and especially Bulgartransgaz, have an incentive to utilise the Trans Balkan system as much as is reasonably possible.

Table 6: TSO revenues 2017-2021 – Bulgartransgaz & Transgaz Romania

Bulgartransgaz revenues						
in millions \$ (at average annual exchange rate)						
	2017	2018	2019	2020	2021	2021 sector %
Transit activity	\$119.5	\$122.4	\$128.6	\$158.7	\$208.9	59%
Domestic market	\$40.7	\$51.1	\$49.2	\$42.7	\$68.8	19%
Other (storage, balancing etc)	\$48.8	\$51.5	\$27.1	\$28.5	\$75.4	21%
Net sales revenue (in \$ million)	\$209.0	\$225.0	\$204.9	\$230.0	\$353.1	
source: Bulgartransgaz Consolidated Activity Reports 2000 & 2002 op cit						
Transgaz (Romania) revenues						
in millions \$ (at average annual exchange rate)						
	2017	2018	2019	2020	2021	2021 sector %
Transit activity	\$85.6	\$79.6	\$76.9	\$28.8	\$16.7	5%
Domestic market	\$343.8	\$289.3	\$279.9	\$290.1	\$270.4	85%
Other (storage, balancing etc)	\$12.5	\$25.9	\$13.1	\$18.5	\$29.8	9%
Net sales revenue (in \$ million)	\$442.0	\$394.8	\$369.9	\$337.4	\$316.9	
source: Transgaz Consolidated Report to the Board of Administration, various years exchange rates to US \$ for lev / lei taken from Central Bank published rates in both countries						

b) Hungary

Hungary is not regarded here as part of SE Europe: in a gas sense historically it has been much more plumbed into the Central European systems. However, there have been 3 changes which have now brought it into the SE Europe orbit. First, Hungary now gets its Russian gas via Turk Stream. Secondly, it has been recently importing gas from Croatia, and thirdly, its interconnector with Romania is now bi-directional and plans are to expand it. In this respect Hungary is a very good example of markets coming together through interconnectivity.



Hungary is an 11 bcma market – the same size as Romania. It has some domestic production (2.2 bcm in 2020) and the remainder is imported from various directions. It is very well connected with its neighbours. In the past, main import flows were from Ukraine and then Austria, and main export flows were to Ukraine and the transit flow of Russian gas to Serbia. The table in Appendix 2 shows its connection points and associated gas movements.

Turk Stream has transformed the patterns radically. The 2021 flow numbers shown in Appendix 2 do not reflect the stark changes, but the 2022 numbers certainly will as the Turk Stream flows have built up.

Opposite is a real-time snapshot based on a map on the home page of the Hungarian TSO FGSZ of Hungary showing flows at all the entry/exit points. Taking just 2 days in August and October and annualising the data, there is a consistent pattern emerging. The only constant with the past is flows coming in from Austria. Everything else has changed. The main import flow is now from Serbia (ie Turk Stream). Other gas is now entering from Croatia, corresponding with increased utilisation at Croatia LNG, and also from Romania. Flows from Ukraine have ceased.

from:	1st Aug	6th Oct
Austria	2.9	3.1
Croatia	1.3	1.1
Serbia	6.1	5.5
Romania	1.5	0.5
Total	11.8	10.2

source:
FGSZ website homepage, at <https://fgsz.hu/en>

Assessing the impact on Hungary, the conclusion is probably positive. Hungary has been handed an exchange of Ukraine transit risk for Turk Stream transit risk, which in both cases is probably low. Given it can now receive gas from Croatia, is interconnected with Slovakia, and that the interconnector with Romania is now bi-directional and plans are to expand it to bring in Black Sea gas (once that comes on-stream), Hungary looks to be in a reasonable position. In return, SE Europe has in effect linked with Central Europe, which should promote liquidity for regional price determination.

VI. Infrastructure: new and planned

As commented before, the market in SE Europe (with the exception of Romania) developed on the back of imported gas and as a series of 'island markets', poorly interconnected and with no recognised gas pricing point. Most of the gas was imported on oil-indexed long-term contracts, and a main transportation system was the Trans Balkan Pipeline, bringing in Russian gas via Ukraine.

Increasingly in the 2000s onwards, interconnector projects were defined and designed, but a feature of the period was that very few of these were built. The small 1.75 bcma Hungary-Romania interconnector was built in 2010, and the Hungary-Croatia interconnector in 2011. The Bulgaria-Romania interconnector built in 2016 was short (25 km), small (1.5 bcma), and modest capex (€24 mn).

Against a context of an EU looking to create a competitive and transparent gas market and design a regulatory system to do this, it was long recognised that within the EU, Poland & the Baltics and SE Europe were behind the curve. For SE Europe, market concentration and lack of interconnectivity presented high barriers. A long list of interconnector projects and projects to upgrade domestic pipeline systems emerged from around 2010, but apart from the few examples already mentioned, which marked a beginning, nothing was done.

Perhaps reflecting a frustration with progress, the European Commission set up the **CESEC** initiative in 2014 (Central & Southern Europe Energy Connectivity), and it started to work in 2015.⁵² Nine priority

⁵² Julian Bowden SE Europe gas markets: towards integration, OIES paper NG150, October 2019



projects were identified, including interconnectors such as IGB, LNG regas terminals (eg Croatia Krk) and reinforcement and expansion of domestic gas systems (particularly in Romania).

Seven years on, is it possible to evaluate the CESEC work; has it delivered on its plan, did it mobilise resources and get things built? The answer is probably no. The infrastructure completed in the last few years already had some level of support and momentum. Croatia LNG has been built, in Romania the BRUA 1 expansion of the domestic gas system has been completed. ICBG is now operating (from October 2022), and a second Greek LNG terminal (Alexandroupolis) looks highly likely for 2023. All this would probably have happened without CESEC. The interconnector Bulgaria – Serbia IBS is only now gathering steam, and might be ready by 2024. However, what CESEC undoubtedly generated over this period was that intangible ingredient of great importance – bring people together. It provided a formal forum in Brussels for the region’s TSOs, regulators, Energy Ministries, some companies and the Commission to meet and report, and in that respect it played a very positive role. It comes back to the question posed at the end of Section 1 - what does it take to design and deliver a project in any sensible time frame?

Figure 7: Southern corridor infrastructure



a) New infrastructure 2019-2022

The intention here is to explore some recent projects in more detail, in particular TAP, Croatia LNG and Turk Stream.



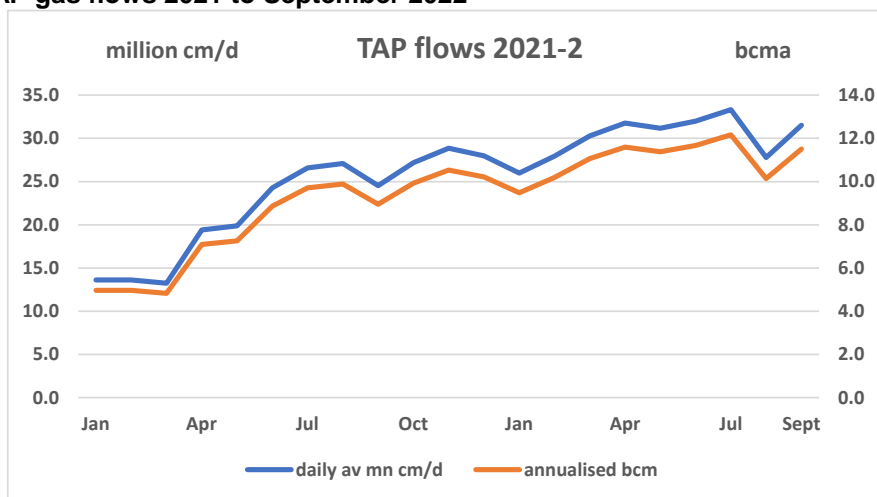
i) TAP

The 878 kms long Trans Adriatic Pipeline TAP started commercial gas flows in December 2020.⁵³ The chart below shows the steady and fairly rapid build up to full initial capacity of 10 bcma and flows through to end-September 2022. In fact, present throughput (June-September 2022) has been around an annualised figure of 12 bcma.⁵⁴ This must therefore include some spot gas from Azerbaijan. The Shah Deniz Stage 1 contract to Turkey of 6.6 bcma, which expired in April 2021, had not by that date been renewed. Negotiations continued through the summer, and eventually in August 2021 it was partially renewed in the form of a 3-year contract.⁵⁵ Non-renewal of a gas contract is unusual, and suspicions remain that Azerbaijan needed to retain access to at least some of the SD1 gas for meeting its own domestic gas demand requirements, and therefore it pushed to hold volumes back.

TAP expansion plans are based around two compressors needed to raise throughputs to ultimate capacity of 20 bcma. One compressor would be required in Greece, the other in Albania. In a joint statement by TAP and the Italian and Greek TSOs SNAM SRG & DESFA on the incremental capacity process, the plan is a first binding phase in November 2022 and, eventually, a second binding phase in 2023.⁵⁶

One intriguing possibility from the flow pattern changes already seen, and planned infrastructure construction in the region, is that TAP might assume a role as a regional pipeline as well as being the final segment of the long-distance Southern Gas Corridor. This comes from two interesting drivers: the Alexandroupolis FSRU project in Greece (very high probability) and Albania LNG (medium probability) will both need take-away capacity; Algerian short-haul LNG deliveries to Greece also probably look sub-commercial now that there is a pipeline alternative option to Greece. For reference, Greece imported 0.47 bcm LNG from Algeria in 2021.

Figure 8: TAP gas flows 2021 to September 2022



⁵³ <https://www.tap-ag.com/infrastructure-operation/history-timeline#period-12977>

⁵⁴ Data here and in graph below taken from daily flows on the ENSOG transparency platform at <https://transparency.entsog.eu/#/map>

⁵⁵ See Gulmira Rzeyeva, Turkey's supply-demand balance and renewal of its LTCs, OIES Insight 113, April 2022, page 11.

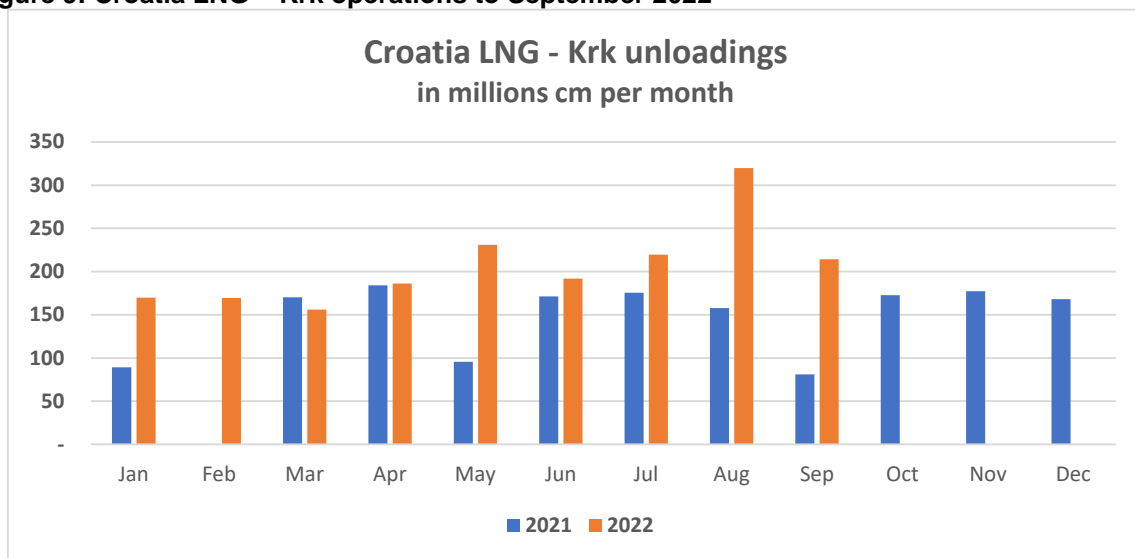
⁵⁶ <https://www.tap-ag.com/shippers/market-tests>



ii) Croatia LNG

The FSRU terminal at Krk came into operation at the beginning of 2021. Technical capacity is 2.9 bcma, approximately the same as Croatia's gas demand.⁵⁷ In its first year it handled 1.6 bcm, and volumes are rising: in the first nine months of 2022 it took in 1.8 bcm, giving well over 80% capacity utilisation.⁵⁸ Some of this gas is flowing through to Hungary. Expansion plans to more than double capacity have begun to be considered recently, which include not only the terminal but also interconnector capacity to Hungary and Slovenia and potentially southwards to Bosnia & Herzegovina. In June 2022, Prime Minister Andrej Plenkovic was reported as saying "We are going to increase its current capacity from 2.9 Bcm to 6.1 Bcm, going far beyond the needs of our industry and households, so as to play a regional role."⁵⁹

Figure 9: Croatia LNG – Krk operations to September 2022



iii) Turk Stream

Turk Stream consists of two parallel pipelines, running 930 kms across the Black Sea at depths over 2000 metres from the Russian Black Sea coast direct to NW Turkey. Capacity of each line is given with curious precision at 15.75 bcma. Construction was impressively rapid; the Allseas pipelay vessel *Pioneering Spirit* did the job in about 15 months, sometimes laying 5 km per day and on one day a world record of over 6 kms.⁶⁰

Line 1 then connects directly into the Botas system for Turkey, and Line 2 takes gas to the Turkey-Bulgaria border. This latter allows Russian gas which came to Bulgaria, Romania, Greece and Rep of N Macedonia to be diverted from the Trans Balkan Pipeline System: this happened seamlessly at the start of January 2020. Further work during 2020 in Bulgaria and Serbia (a new connection to the Hungarian border through Serbia) then allowed Russia flows previously via Ukraine for Hungary and Serbia to be transferred into Line 2. Hungary is now importing no gas from Ukraine. In 2021, reported flow through Line 2 was 11.6 bcm, which feels roughly right from an aggregation of what all the countries previously supplied from the Trans Balkan system would have been importing from Russia last year.⁶¹

⁵⁷ <https://lng.hr/en/about-terminal/>

⁵⁸ Throughput data from Kpler LNG Platform (subscription required)

⁵⁹ Platts European Gas Daily 12th August 2022

⁶⁰ <https://turkstream.info/project/technology/>

⁶¹ Platts European Gas Daily, 6th May 2022



One area of uncertainty is what would happen to Turk Stream in the event of a cessation of EU gas imports from Russia, for whatever reason. One scenario could be that flows will continue: Turkey is not in the EU and has a deep energy relationship with Russia, Bulgaria has not received Russian gas since April 2022 (although there has been talk about a resumption), Serbia is not in the EU although it is Energy Community, and Hungary is the most pro-Russian member state in the EU. Another scenario is that the gas could all be diverted into Turkey, and then it would re-emerge re-branded as a Botas export, with Botas saying (perhaps correctly) that the molecules are all LNG. Whichever the case, gas through Line 2 looks likely to continue to flow into SE Europe and Hungary, at least for the remainder of 2022.

iv) Revithoussa LNG regas terminal

The first LNG regas facility in the region was Revithoussa, 45 km west of Athens, completed in 1999 and commissioned in 2000. Nominal capacity was 5 bcma but after a third storage tank was completed at end-2018 it increased to almost 7 bcma.⁶² All this can be utilised, in the sense that capacity at the entry point to the Greek transmission system at Agia Triada from the terminal is also around 7 bcma..⁶³ DESFA's plan to add a floating storage tank in late 2022 or early 2023 have now been realised – it started operations in early November.⁶⁴

Charts below show the volume of LNG coming into Revithoussa since 2014, the number of LNG carriers discharging, and then for more recent years, the country supplying the LNG. As the right-hand chart shows, volumes climbed significantly in 2019 and 2020 to around 2.7 bcm, falling back in 2021, and on present trends in the first 9 months of 2022 they are on-track to exceed the 2020 level of 2.8 bcm. In incremental terms, over the period 2014-2020 Greek demand rose by 2.7 bcm, and incremental LNG supply into Revithoussa accounted for 55% of this.

The main supplier of LNG in the last 2.5 years has been the US. Short-haul suppliers – Algeria and Egypt – also figure constantly in the supply mix, while Qatar has featured strongly but is currently (in 2022) absent.

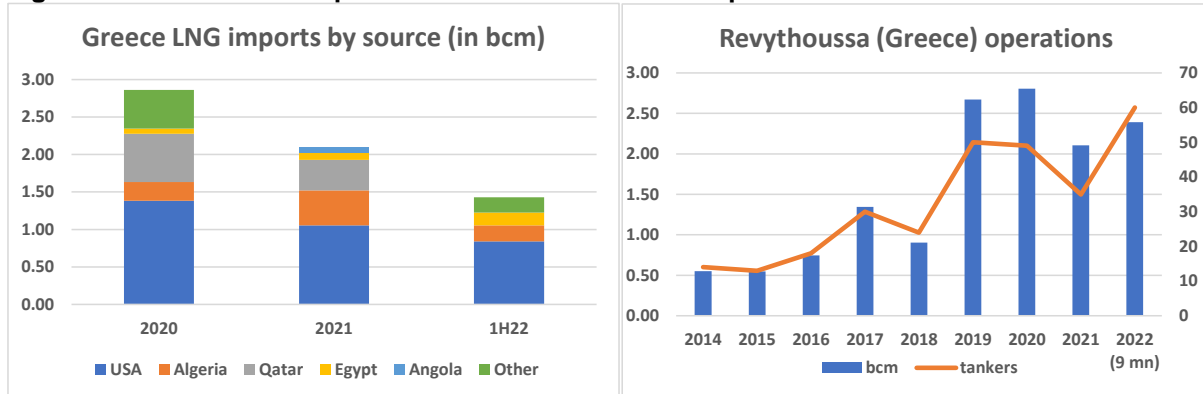
⁶² GIIGNL (Groupe International des Importeurs de Gaz Naturel Liquefie) Annual Report 2022, page 62, and 2018 report for the original nominal capacity

⁶³ <https://www.desfa.gr/userfiles/pdflist/DDRA/NNGS-Operation-Report-for-Year-2021-EN.pdf> page 10

⁶⁴ <https://www.novinite.com/articles/215222/30-of-all-Liquefied-Gas-supplies-to-Greece-are-for-Bulgaria> and <https://www.ekathimerini.com/economy/1184128/gaslog-picked-for-revithoussa-lng-fsu/> May 2022, and https://www.gem.wiki/Revithoussa_LNG_Terminal . On the new FSU start-up, see Platts European Gas Daily 8th November 2022.



Figure 10: Greece LNG imports & Revithoussa terminal operations



b) Infrastructure completing in 2022-23

Projects below have either just completed (ICGB) or appear to have a high probability of completing during 2023.

i) ICGB Greece-Bulgaria Interconnector

On 8th July 2022 ICGB announced the completion of the construction phase of the interconnector between Greece and Bulgaria. The PMs of both countries, together with their Energy Ministers, the Azeri Energy Minister and EU officials celebrated the event at the gas metering station near Komotini. Also in July it was certified as an independent transmission operator and almost finished its line-fill. ⁶⁵ On 1st October it started commercial operations, and at the inauguration in Sofia the EU Commission President Ursula von der Leyen said “This pipeline is a game changer. It’s a game changer for Bulgaria and for Europe’s energy security. And it means freedom. It means freedom from dependency on Russian gas.”⁶⁶

It has taken a long-time to build the 182 km 32” pipeline, initial capacity 3 bcma and expandable with compression to 5 bcm. FID was taken in 2015, it has been on the EU’s PCI lists, and was also a CESEC priority project. Developed by ICGB AD, a company established in 2011 to design, build and operate the pipeline, it is a JV between Bulgaria Energy Holding and Greece’s IGI Poseidon. DEPA and Edison in turn each have 50% in IGI Poseidon.⁶⁷

Of the 3 Bcma initial capacity, 1.57 bcma has been booked according to ICGB head Teodora Georgieva. This would include the 1 bcma Shah Deniz 2 gas contract for Bulgaria. The remaining capacity will be offered on 2 capacity trading platforms, Prisma and RBP.⁶⁸

Given the Bulgarian problem with Russian gas supply being stopped since April 2022, it is possible to see the initial capacity being filled quickly with a combination of regasified LNG from Revithoussa, from Alexandroupolis when it comes on-stream in late 2023, and perhaps some small spot volumes from the Southern Corridor. It is also realistic to see its expansion being requested in the near future if the uncertainties on Russian supply continue. Indeed, in a recent interview with Azerbaijan’s Trend, Georgieva said two interesting things. Firstly, she could see expansion happening in 2023-4 to combine

⁶⁵ <https://www.icgb.eu/the-construction-phase-of-the-greece-bulgaria-interconnector-is-completed>

⁶⁶ Euractiv 1st Oct 2022 at <https://www.euractiv.com/section/energy/news/in-sofia-von-der-leyen-hails-new-gas-interconnector-bringing-freedom-from-russia/>

⁶⁷ For detail on the company and the project, see <https://www.depa.gr/international-infrastructures/?lang=en> and also the ICGB website at <https://www.icgb.eu/home>

⁶⁸ Interview with Georgieva in Azerbaijan’s Trend, reported in Platts European Gas Daily 25th July 2022



with Alexandroupolis LNG coming on-stream. Secondly, she emphasised that when ICGB began over 10 years ago, the market context was just Greece and Bulgaria. Today, however, the market has evolved into both a broader regional setting and ICGB is looking at a very different supply/demand and geopolitical environment. In other words, 3 bcma is now looking a bit on the small side.

ii) Bulgaria-Serbia Interconnector IBS

This project seemed stalled, perhaps because of confusion around whether it would be necessary when Turk Stream was completed; would this not be a duplication if there is adequate third-party access to Turk Stream? It was conceived some years ago, was included on the CESEC priority list in 2015, and is on the 5th PCI list agreed in Nov 2021 (project 6.8.3), and recently it has been gaining momentum. Essentially it is a short 170 km link from Bulgaria to Nis (about the same length as ICGB, 62 kms in Bulgaria and 108 kms in Serbia) of 1.8 bcma capacity. Note, this capacity is in the range of the level recent Russian exports to Serbia.

At a regional energy minister's meeting in Sofia on 5th May 2022, Serbia's deputy PM and Minister of Mining and Energy, Prof Zorana Mihajlovic, commented that its completion will allow Serbia to access LNG from Greece and gas from Azerbaijan, and that construction by September 2023 is the target. A 140 million lev (\$85 mn) contract has been signed between Bulgartransgaz and DZZD International Gas for its construction.⁶⁹

iii) Alexandroupolis LNG

Greece's second LNG terminal will be the FSRU at Alexandroupolis in northern Greece. Founding shareholder was Gastrade, but in a series of buy-ins it now includes TSOs DESFA and Bulgartransgaz, DEPA and Gaslog. Each of these 5 holds a 20% interest. Gaslog will be converting one of its fleet (*Gaslog Chelsea*) to be the FSRU. FID was taken in January 2022.⁷⁰ FSRU capacity is 5.5 bcma and is scheduled to be operational by the end of 2023.

Commenting on its participation, DESFA summarised strategic points which would probably all be shared by all other shareholders. It wrote "The strategic importance of the Alexandroupolis FSRU is significant as it:

- Constitutes a key outlet for the supply of the Greek and the SE European Market;
- Contributes to the country's security of supply, liquidity and efficiency;
- Strengthens Greece's strategic role in SE Europe;
- Promotes competition among gas suppliers and supports the creation of a transaction hub in the wider region of Southeastern Europe, leading to lower prices that will benefit all final consumers
- Works in harmony and complementarity with other regional gas projects e.g. ICGB, TAP.

The FSRU will be connected to the National Natural Gas Transmission System of Greece with a 28 km long pipeline, through which the LNG will be sent into Greece, Bulgaria and the wider region. In this regard, DESFA has signed an Advanced Reservation of Capacity Agreement (ARCA) contract with

⁶⁹ https://www.mre.gov.rs/en/aktuelnosti/saopstenja/mihajlovic-gas-interconnection-bulgaria-most-important-project_and_https://bulgartransgaz.bg/en/news/bulgartransgaz-ead-i-dzzd-interneshanal-gaz-shte-podpishat-dogovor-za-izgrazhdane-na-mezhdusistemnata-gazova-vrazka-balgariya-sarbiya-710.html

⁷⁰ <https://www.gastrade.gr/en/2022/01/28/gastrade-adopts-the-final-investment-decision-for-the-alexandroupolis-independent-natural-gas-system-ings/>



Gastrade for the construction of the connection of the FSRU with the NNGS, which will include the construction of a metering station. The FSRU is expected to be operational by 2023.”⁷¹

With this list of shareholders, FID taken, a ship nominated for conversion, political cover, the timetable looks credible. An important signpost now will be when the ship goes to the Keppel yard in Singapore for conversion. Assuming long-lead items were ordered at much the same time as FID and will be available when the ship reaches the yard, the actual conversion should take 6-9 months.

iv) Turkey

In principle, with Trans Balkan Pipeline now empty, there is a system available for flowing gas from Turkey into SE Europe independently from Turk Stream. At an energy trading conference in mid-June 2022, Sefa Furkan Gul of Enerjisa Uretim⁷² commented that with its surplus LNG import capacity, Turkey could potentially export 10 bcma to SE Europe, and that all that was missing in order to do this is an interconnection agreement between Turkey and Bulgaria.⁷³

However, even without this agreement it seems that a flow has already happened. There are 2 interconnection points between Turkey and Bulgaria. One is the new Strandzha-2-Malkoçar, which Gazprom has fully booked for taking Turk Stream gas into SE Europe (Bulgaria, Serbia and Hungary, and from Bulgaria into Greece and Rep of N Macedonia). The other is the Trans Balkan Line original Strandzha-Malkoçlar crossing point for Russian gas transiting Romania and Bulgaria for Turkey, and now capable of reverse flow. Between 1st-10th June 2022, what was called a “test flow” of US LNG for Bulgaria was landed at Marmara Ereğlisi and exported by Epias to Bulgaria.⁷⁴ Volumes exported were reported at 9 million cm/day during early June.⁷⁵ The significance of this is that there is now a realistic possibility of Turkey becoming a material factor in supply into SE Europe far beyond its role as a landing and transit facility for Turk Stream and the Southern Gas Corridor.

c) Infrastructure plans medium-term to 2027

On pipelines, there are several projects across the region, but typically these are more in the nature of expansions rather than new builds. Romania has BRUA 2 which would do several things, including expanding the interconnector capacity with Hungary to 4.4 bcma, and this is on the EU Commission’s November 2021 5th PCI list (project number 6.24.4).⁷⁶ But for pipelines in the medium-term, much will depend on whether and how many of the numerous LNG regas terminal projects proceed. Clearly, if some of the LNG regas projects below do come on-stream, then potential on-shore pipeline bottlenecks will need to be resolved. Also into the medium-term, there are likely Black Sea upstream developments to bring to market.

Several LNG regas projects are in early stages of definition, but until they are further advanced they must remain potential rather than firm. A number of expansions and new regas terminals have been reported in Greece, Albania and Croatia. Some of these plans are very recent and are clearly a reaction to Russia-Ukraine.

⁷¹ Desfa Management Report to the Board of Directors 2021, page 41 at <https://www.desfa.gr/userfiles/financialreports/Management%20Report%202021.pdf>

⁷² <https://www.enerjisaeeurope.com>

⁷³ Reported in Platts European Gas Daily, 16th June 2022

⁷⁴ <https://nova.bg/news/view/2022/06/06/371416/първият-танкер-с-американски-природен-газ-се-разтоварва-на-пристанище-в-турция/>

⁷⁵ Reported in Platts European Gas Daily 25th July 2022

⁷⁶ See Transgaz presentation pack for its 1Q2022 Interim Financial Statements, especially slides 23-25, at <https://www.transgaz.ro/sites/default/files/users/user360/Presentation%20of%20the%20Financial%20statements%201Q2022.pdf>



Taking these in no particular order:

i) Croatia LNG expansion In June 2022 Prime Minister Andrej Plenkovic announced a plan to more than double the size of the facility at Krk during an EU ‘Three Seas Initiative’ summit in Riga.⁷⁷ It is understood that the Croatian TSO Plinacro is currently working on pipeline expansion options to Slovenia and Hungary, as well as to Bosnia & Herzegovina.

ii) Alexandroupolis II A second FSRU has been proposed.⁷⁸

iii) Motor Oil (Dioriga Gas) Corinth is looking at a 2.6 bcma capacity FSRU, with a 2023 start-up.⁷⁹

iv) Thessaloniki LNG – Elpedison In April 2022 Elpedison announced plans for an FSRU offshore the Thessaloniki area, 7 bcma capacity with a 2025 start-up target. In mid-April 2022 it applied to energy regulator RAE for an independent natural gas system licence. An anchor customer for this would be the Elpedison power plants in Thessaloniki.⁸⁰

v) Albania LNG In March Exceletrate & Exxon signed an MOU with the Albanian Ministry of Infrastructure & Energy to do a feasibility study for an LNG project, anchored around an LNG-to-power project at Vlore.⁸¹ The study was to be completed by 3Q2021 and start-up was thought to be possible as early as 2023.⁸² Matters then seemed to go quiet. Then very recently in July 2022, Exceletrate and Bulgarian gas distributor Overgas signed an MOU for regasified LNG from Vlore for up to 1 bcma for 10 years.⁸³

VII. Replacing Russia gas - conclusions

The discussion above has looked at recent developments in the SE Europe regional gas market. It is a story of new infrastructure, gas flow changes, repositioning of pipelines (Trans Balkan reversal, TAP as potential regional pipeline), infrastructure expansions, upstream potential, Greece as the regional LNG centre, links with Turkey, regional cooperation.

More infrastructure is almost certainly going to come on-stream in 2023. Alexandroupolis LNG looks to be bankable for late 2023. Then there are several LNG regas projects as 2024 approaches, and Turkey’s Sakarya starting production. Beyond that there is Romania’s Neptun Deep. On the Southern Corridor, the EU’s recent MOU of July 2022 with Azerbaijan on major expansion of the corridor, doubling its capacity to enable 20 bcma exports to the EU by 2027 was more impressive for what it didn’t say.⁸⁴ It said nothing about where supply might come from, whether it might come from accelerated development of other Azeri gas fields, or facilitating the export of Turkmen gas, either from a rapid build of a small Trans Caspian pipeline or an expansion of the Turkmenistan-Iran-Azerbaijan 1-2 bcma swap

⁷⁷ Platts European Gas Daily, 21st June 2022

⁷⁸ <https://www.upstreamonline.com/lng/new-lng-import-project-flagged-for-greece/2-1-1177927>

⁷⁹ <https://www.upstreamonline.com/lng/greece-lng-import-project-edges-closer-after-key-deal-signed/2-1-1027536> and <https://www.offshore-energy.biz/desfa-and-dioriga-gas-sign-deal-on-greek-fsru/> and https://dioriga.gr/wp-content/uploads/2021/10/Eol-Notice_REPORT_DIORIGA-GAS.pdf on a market test.

⁸⁰ <https://www.elpedison.gr/en/news-room/press-releases-announcements/read-news/?nid=136&pg=> and https://www.gem.wiki/Thessaloniki_FSRU_Terminal

⁸¹ Exxon Mobil press release at <https://www.exxonmobilng.com/en/about-us/trending-topics/mou-signed-with-the-government-of-albania-and-exceletrate-energy>

⁸² <https://exceletrateenergy.com/news/exceletrate-energy-exxonmobil-and-the-republic-of-albania-agree-to-lng-terminal-study/>

⁸³ <https://exceletrateenergy.com/news/exceletrate-energy-signs-gas-sales-mou-with-bulgarias-overgas/> dated 18th July 2022

⁸⁴ https://ec.europa.eu/neighbourhood-enlargement/news/eu-and-azerbaijan-enhance-bilateral-relations-including-energy-cooperation-2022-07-18_en



which started in Jan 2022. Failure to consider a more complete picture of supply *plus* transportation will probably prove to be a constraint on delivering this MOU.

Pulling all these elements together, the table overleaf presents one scenario of how much gas SE Europe could pull in and distribute. This is not a forecast. It says nothing about supply availability or gas affordability. The evidence suggests strongly, however, that if the supply is there, SE Europe will be in a very good position to replace its Russian volumes.⁸⁵

From a supply perspective, the short-term 2022-4 seems to involve more LNG and a little more from the Southern Gas Corridor. Into the medium-term 2025-28 the region's upstream comes into play. Primarily this means Romania, but the Turkey upstream is included here because although Sakarya gas almost certainly goes into Turkey, that could free-up imports to go somewhere else, all depending of course on Turkey's own demand progression.

With more interconnectivity, an individual country's supply position becomes secondary to the region's supply position. Overall, the numbers in this scenario indicate that SE Europe is well placed to replace Russian volumes (with the usual caveats on supply availability and affordability). In fact, the numbers suggest far more cover than the 10 bcm 'target' requires, and that there could be surplus capacity to cover Hungarian requirements also.

The scenario above is judgemental, but based around evidence from the discussion in this paper Revithoussa utilisation can be raised, Alexandroupolis LNG looks a banker, one of the several other LNG regas projects should happen, there should be some small expansion of the Southern Gas Corridor. The conclusion is that replacing Russian volumes of around 10 bcm in 2022 would be hard, but in 2023 it looks easier and by 2024 complete. Including Hungary in the equations makes this more difficult, but for Hungary it is hard to envisage no gas moving through Turk Stream.

If all these things happen, then

- There will be pricing and hub evolution implications. Already the Greek and Bulgarian infant hubs seem to be gaining some credibility.
- Greece emerges as the LNG gateway for the region.
- The stronger sense of region should position it better for the net zero campaign, where the first priority must be the removal of lignite from SE Europe's energy mix.

⁸⁵ Nor does it say anything about tariffs and costs of supply. The assumption here is that as import volumes and interconnection capacity increase, then the region's TSOs will have increasing scope to net-off gas movements. In other words costs of transportation has a strong dynamic, but at present they remain hard to calculate as so much depends on circumstances and other developments. For a detailed review of current transport costs, then the very recent Energy Community Secretariat's *SEEGas report – regional transmission routes* of Sept 2022 is available at <https://www.energy-community.org/news/Energy-Community-News/2022/09/30.html>



Table 7: SE Europe incremental import capacity 2022-2028

SE Europe incremental import capacity & upstream - additions 2022-2028									
	Short-term			2025	Medium-term			Total 2022-28	description
	2022	2023	2024		2026	2027	2028		
LNG regas & pipeline									
Revythoussa	2.0							2.0	33% utilised in 2021
Revithoussa floating storage	0.5	0.5						1.0	FSU operational Nov 2022
Alexandroupolis FSRU		1.0	3.0					4.0	on stream 2H 2023. Capacity 5.5 bcma
Croatia LNG (Krk)	0.75							0.8	60% utilised in 2021
Croatia LNG (Krk) expansion				1.0	1.0			2.0	
One of the 4 Greece LNG projects + Albania LNG happens				2.0	2.0			4.0	5 more LNG projects promoted, 1 happens
Turkey LNG direct or via Turk Stream into SEE		1.0						1.0	Interconnection agreement with Bulgaria tba
TAP & SGC	1.0	1.0						2.0	SD2 ramp-up, SD1 spot sales
IGB operational 1st Oct 2022	<i>does not bring more supply into region, but expands reach of LNG. 3 bcm 1st phase, 5 bcm ultimate capacity</i>								
IBS operational end-2023	<i>does not bring more supply into region, but expands reach of LNG. 1.8 bcm capacity</i>								
Black Sea upstream									
Romania BSOG	0.5	0.5						1.0	on-stream June 2022
Romania Neptun Deep						2.0	3.0	5.0	FID in 2023; first gas 2027
Total incremental capacity for SEE									
	4.8	4.0	3.0	3.0	3.0	2.0	3.0	22.8	
Romania base upstream decline	0.4	0.4	0.4	0.4	0.4	0.4	0.4	2.8	
Turkey Black Sea									
Sakarya		1.0	2.5			5.0	5.0	13.5	First gas 2H 2023. Phase II gas from 2027

Appendix 1 – SE Europe macro-economic & gas balance snapshot 2020

The table below presents a snapshot for 2020 of several high-level indicators for SE Europe: population, GDP per capita, electricity demand, gas production & demand, gas supply dependency on Russia. The EU on an EU-28 basis is also shown for comparisons. The data has been assembled from a variety of sources, international (mainly IEA) and from national statistical agencies. Sometimes these sources can give slightly different numbers: the intention here is to paint a picture and give an impression of size and scale, and not to reconcile different data sources.

SE Europe - macro-economic & energy snapshot 2020									
		Population (millions)	GDP per cap \$ year 2015, ppp	Electricity demand per capita (kwh)	Gas % in total energy	Gas demand (bcm)	Gas output (bcm)	Imports from Russia (bcm)	% supply from Russia
EU	Romania	19.4	\$27,000	2700	30%	11.8	9.0	1.0	8%
	Bulgaria	7.0	\$21,700	5000	14%	3.0	0.1	2.3	77%
	Greece	10.7	\$28,100	4800	25%	5.5	0	3.1	57%
	Croatia	4.1	\$26,900	4000	31%	3.0	0.9	1.8	60%
	Slovenia	2.1	\$36,400	7000	12%	0.9	0	0.4	46%
	Total / average	43.2	\$26,900	3900		24.2	9.9	8.6	36%
Energy Community	Albania	2.9	\$13,400	2400	2%	0			
	Serbia	7.0	\$17,500	4800	13%	2.5	0.4	1.4	56%
	Montenegro	0.6	\$19,300	4800		0			
	Kosovo	1.8	\$11,300	3100		0			
	Rep of North Macedonia	2.1	\$15,300	3200	11%	0.3		0.3	100%
	Bosnia & Herzegovina	3.3	\$14,200	3500	3%	0.2		0.2	100%
	Total / average	17.6	\$15,400	3800		3.0	0.4	1.9	63%
	Total SE Europe	60.8	\$23,600	3900		27.2	10.4	10.5	39%
Total EU-28	515.7	\$41,900	5700	25%	461.2	88.1	152.1	33%	
Total SEE 5 in EU as % of EU-28	8%	64%	6%		5%	11%	6%		

sources: IEA, World Energy Balances - indicators; BP Statistical Review of World Energy 2021; national stats energy balances

Appendix 2 – Hungary gas balance & gas flows through entry/exit points

Tables below show the recent Hungarian gas balance and imports, exports and transit flows by entry / exit point. On supply / demand, main points are:

- Demand increased 6% to 11.1 bcm in 2021
- Domestic production continued to decline. The fall over 2000-2020 was a gentle 1% pa from 2.7 bcm to 2.2 bcm, but the decline in 2021 was a steeper 11% fall on 2020.
- A draw-down in storage volumes over the year, which is reflected in the storage chart in Section II (b) above.

On import and exit flows main points are:

- Big reduction in flows in from Ukraine, and a reduced transit flow
- Impact of Turk Stream start-up with no more transit of gas through to Serbia
- Impact of Croatia LNG start-up (much lower exports to Croatia. 2022 data will show higher imports from Croatia).

Hungary gas balance (in bcm)		
	2020	2021
opening stocks in pipeline	0.1	0.1
domestic production	2.2	2.0
imports	12.2	8.4
transit	1.5	0.1
storage withdrawal	3.1	4.3
Total supply	19.1	14.8
Domestic market	11.1	11.7
exports	4.3	0.9
transit	1.5	0.1
storage injection	2.1	2.0
closing stocks in pipeline	0.1	0.1
Total demand	19.1	14.8
Domestic consumption	10.4	11.1

source: FGSZ, Data of the Hungarian natural gas system, 2021 edition, page 28
https://fgsz.hu/file/documents/2/2267/mekh_statistikai_kiadvany_foldgaz_a4.pdf

Hungary - gas imports and exports (in bcm)				
	2018	2019	2020	2021
Imports				
Bregdaroc (Ukraine, GTSO)	9.5	12.8	5.0	5.9
Bregdaroc (transit)	2.2	2.0	1.5	0.1
Mosonmagyaróvár (Austria, Gas Connect Austria)	3.2	4.5	4.5	1.3
Csanádpalota (Romania, Transgaz))	0.03	0.0	0.1	0.7
Balassagyarmat (Slovakia, Eustream)	0.01	1.3	2.6	0.0
Dravaszerdahely (Croatia, Plinacro)				
Kiskundorozsma (Serbia, Turk Stream)				0.4
total imports	14.9	20.7	13.7	8.4
Exports				
Dravaszerdahely (Croatia, Plinacro)	1.3	4.4	1.5	0.4
Csanádpalota (Romania, Transgaz))	0.2	1.6	1.1	0.1
Kiskundorozsma (Serbia, Srbija)	0.2	0.4	0.7	0.1
Kiskundorozsma (transit)	2.2	2.0	1.5	0.1
Bregdaroc (Ukraine, GTSO)	3.4	3.6	0.9	0.0
Balassagyarmat (Slovakia, EUstream)	0.0	0.0	0.0	0.2
total exports	7.2	12.0	5.8	1.0

FGSZ, Data of the Hungarian natural gas system, 2021 edition, page 49

Appendix 3 – Greece gas balance 2019-2021

The table below details Greece's gas balance over the last 3 years. Gas imports are disaggregated into entry points from Russia, Turkey (at Kipoi and from TAP) and LNG into Revithoussa. Exports to Bulgaria are also shown. Demand is separated into the 3 main demand sectors, where the power sector has been the main engine of gas demand growth. Main points are:

- Demand growth to 6.1 bcm in 2021, with virtually all incremental demand over the last 3 years being from the power sector as Greece began to substitute out lignite.
- On the supply side, while more LNG has been imported, much of this has then gone to Bulgaria. In effect, incremental demand in 2021 has been from supply by Southern Corridor gas via TAP.

Greece gas balance (in TWh & Bcm)						
	2019		2020		2021	
Gas imports						
Sidirokastro (Russia)	25.7	40%	31.9	45%	35.4	46%
Agia Triada (LNG)	31.0	48%	32.6	46%	24.7	32%
Nea Mesimvria (TAP)	0.0	0%	0.0	0%	13.6	18%
Kipoi (Turkey)	8.1	13%	6.1	9%	4.0	5%
Total imports	64.8	100%	70.6	100%	77.7	100%
	Twh	Bcm	Twh	Bcm	Twh	Bcm
Exports (to Bulgaria)	7.7	0.67	7.3	0.63	7.6	0.66
Demand						
by sector	Twh	Bcm	Twh	Bcm	Twh	Bcm
electricity	37.5	3.2	41.0	3.6	48.0	4.2
distribution	11.1	1.0	11.7	1.0	13.1	1.1
industry	8.8	0.8	10.3	0.9	8.8	0.8
Total demand	57.4	4.9	63.0	5.5	69.9	6.1
source: DESFA quarterly gas balance press release, op cit						