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SEE ENERGY BRIEF

Monthly Analysis

The Growing Importance of Gas Infrastructure
in SE Europe



Introduction

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

The main purpose of this Monthly Analysis is to describe latest gas infrastructure developments and consequent changes to gas supply flows, and to assess how flows might further change as planned infrastructure is built over the next few years. The central question is whether, as a result of these improvements, the SEE region can eventually have a non-Russian gas supply future. The conclusion is that sufficient capacity is almost in place to import and distribute enough alternative volumes to replace Russian imports – assuming of course that this alternative supply is available and at competitive prices.

Gas Demand and Supply in SE Europe

SE Europe, as defined by IENE (see Map 1), contains 7 EU member states¹ and several members of the Energy Community², bound by its Treaty to incorporate EU energy directives and regulatory standards. Even though Turkey is not, strictly speaking, part of the region, it has become important in IENE's analysis as a transit country for the Southern Gas Corridor - it feeds gas into the TANAP-TAP system and has for some years exported small gas volumes to Greece through a pipeline connection (Komotini – Karacabey).

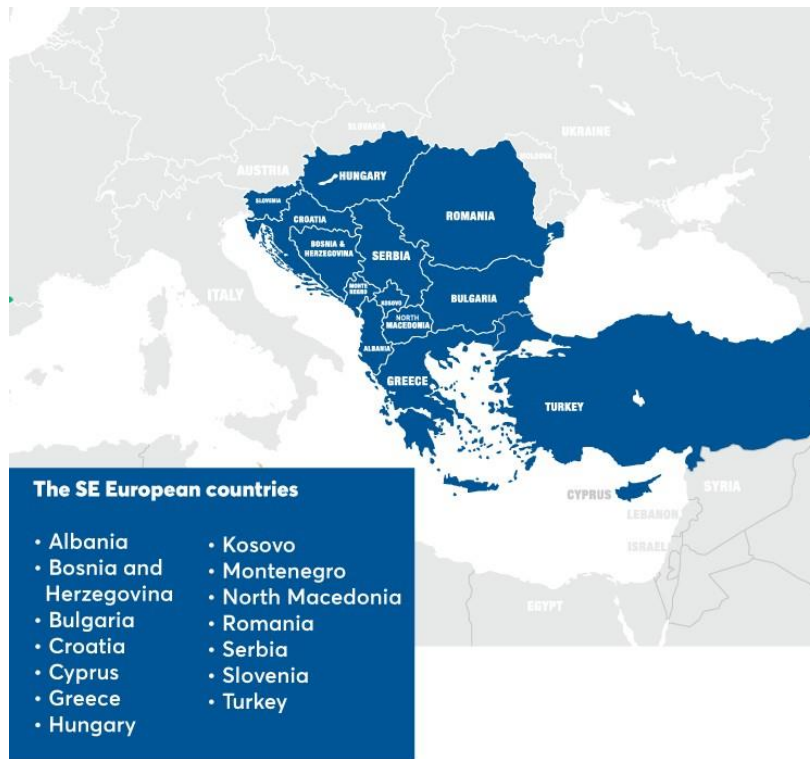
The regional gas markets are immature compared with the northwest European gas markets, which were rapidly liberalising. Gas consumption in the region has been resilient through the pandemic period. It dipped in 2019, but then grew in both 2020 and 2021. It is worth mentioning that the total SE European gas consumption, including Turkey, accounted for 24% of total EU-27 gas consumption in 2021, based on Eurostat's data. With the 7 EU member states in SE Europe alone accounting for 9% of total EU-27 gas consumption in 2021, it comes down to basically five EU countries driving consumption in the region – Romania (12.1 bcm in 2021), Hungary (11.3 bcm in 2021), Greece (6.4 bcm in 2021), Bulgaria (3.4 bcm in

¹ The SEE EU member states include Bulgaria, Croatia, Cyprus, Greece, Hungary, Romania and Slovenia.

² The Energy Community is an international organisation which brings together the European Union and its neighbours to create an integrated pan-European energy market. The organisation was founded by the Treaty establishing the Energy Community signed in October 2005 in Athens, Greece, in force since July 2006. The key objective of the Energy Community is to extend the EU internal energy market rules and principles to countries in SE Europe, the Black Sea region and beyond on the basis of a legally binding framework. The Energy Community has nine Contracting Parties - Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Georgia, Moldova, Montenegro, Serbia and Ukraine.

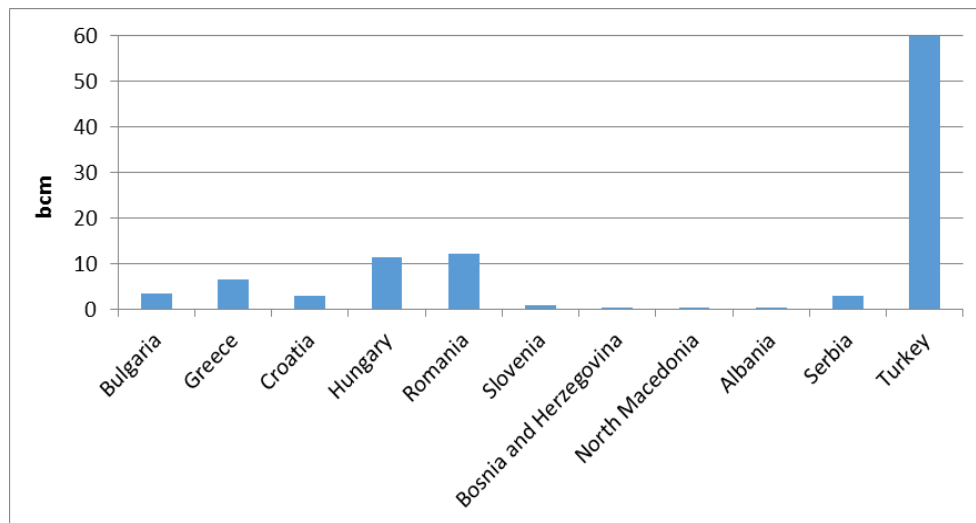
2021) and Croatia (2.9 bcm in 2021), as shown in Figure 1.

Map 1: The SE European Region as Defined by IENE



Source: IENE

Figure 1: Gas Consumption in SE Europe, 2021

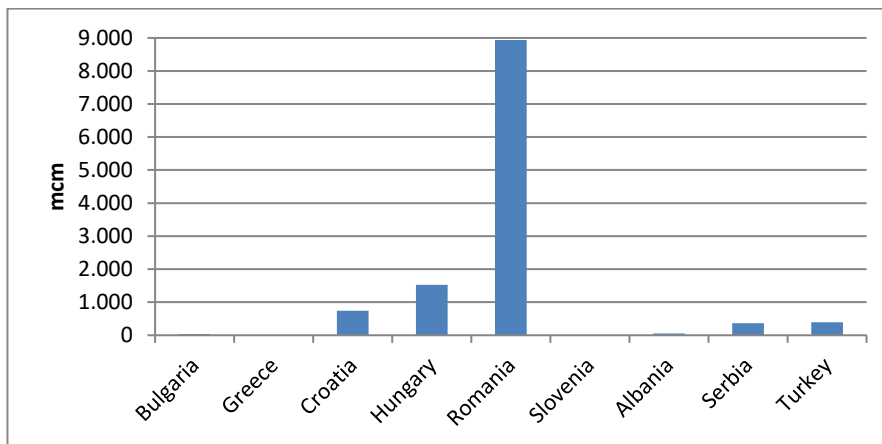


Note: Cyprus, Montenegro and Kosovo do not consume natural gas.

Sources: Eurostat, IENE

Gas production in SE Europe is very low and only Romania (8.9 bcm in 2021), Hungary (1.5 bcm in 2021) and Croatia (746 mcm in 2021) contribute substantial volumes to the region, as shown in Figure 2.

Figure 2: Gas Production in SE Europe, 2021



Note: Bosnia and Herzegovina, Cyprus, Montenegro, North Macedonia and Kosovo do not produce gas.

Sources: Eurostat, IENE

Gas Infrastructure in SE Europe

Another main feature of SEE gas markets has been the lack of gas interconnections among them, as analysed in IENE’s major study, the “SE Europe Energy Outlook 2021/2022” (1). Much had been talked about linking up these largely “island” markets, but very little had been achieved before 2019-2020. Whether this was due to policy failures at national and EU level, or the fault of local TSOs with limited technical capability serving relatively small markets not having sufficient financial resources, is debateable.

However, the SE European region with respect to gas is currently under transformation. A number of gas interconnections have already been built (e.g. Interconnectors Hungary-Romania, Croatia-Hungary, Bulgaria-Romania, Greece-Bulgaria, Turk Stream and the TANAP-TAP system), while several new ones are under construction or planned, including the East Med gas pipeline. Similarly, there is a number of operational FSRUs in the region, such as the Croatia LNG and Dordyol and Etki LNG in Turkey, and planned ones or under construction, especially in Albania, Montenegro, Turkey, Cyprus and Greece, as well as several plans for the expansion or construction of underground gas storage facilities.

Underground Gas Storage (UGS) Facilities

More specifically, there are underground gas storage facilities in 4 countries – Romania, Bulgaria, Croatia and Hungary. Bulgaria’s storage is the Chiren UGS with a capacity of 0.5 bcm, which is planned to double to around 1 bcm in order to provide additional storage for Bulgaria and a storage service for the broader region. Greece has no storage, but there are plans for the South Kavala project for 0.7 bcm. Both the Chiren

expansion and South Kavala construction are included in the latest 5th Projects of Common Interest (PCI) list³. Romania has a much larger gas market and a larger storage system with some expansion planned. The current capacities and planned expansions are shown in Table 1.

Table 1: Technical Working Gas Volumes (TWh) of UGS in SE Europe

Countries	Number/Site	Operational	Planned	Total Future
Bulgaria	Chiren	5.8	4.8	10.6
Croatia	Okoli	5.2	0.3	5.5
Romania	6	33	12.5	45.5
Greece	South Kavala	0	3.9	3.9
Hungary	5	69.6	0	69.6
Serbia	Banatski Dvor	4.5	0	4.5
Turkey	3	35	43.2	78.2

Sources: GIE, IENE

Gas Interconnections

Between 2019 and 2021, several gas infrastructure projects have been completed. Turk Stream came on-stream at the start of 2020, diverting all Trans Balkan Pipeline gas flowing south. TAP came on-stream at the very end of 2020, introducing Caspian gas into the supply mix. Croatia LNG (Krk FSRU) began operations at the start of 2021. Moreover, the Revithoussa LNG terminal in Greece increased its throughput, supporting exports to Bulgaria and other neighboring countries and providing comfort to 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. **(2)**

In Romania, the BRUA⁴ 1 expansion of the domestic gas system was completed in late 2020. Gas Interconnector Greece-Bulgaria is now in operation (from October 2022), and the Alexandroupolis FSRU looks highly likely for the end of 2023. The interconnector Bulgaria-Serbia is only now gathering steam and might be ready by 2024.

The North Macedonia-Greece Interconnector is a planned gas pipeline that will supply gas from Greece to North Macedonia, providing direct connection to Greece’s national gas system and hence the existing Revithoussa LNG Terminal. Furthermore, this gas interconnection will allow gas from Azerbaijan, and possibly provide transit to Serbia. The project has received grants from the EU’s technical assistance fund CONNECTA and the Western Balkan Investment Framework, as well as a €25 million loan from the European Investment Bank. The European Bank for Reconstruction and Development is also considering financing it. As of 2021, the pipeline was scheduled for completion in 2024; however, the project has still not yet reached financial

³ 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

⁴ The BRUA pipeline is a natural gas pipeline which is part of the future Bulgaria, Romania, Hungary and Austria gas interconnector.

close or begun construction. **(3)**

On pipelines, there are several projects across the SEE region, but typically these are more in the form of expansions rather than new builds. Romania has BRUA 2, which will expand the interconnector capacity with Hungary to 4.4 bcm, and this is on the EU Commission’s November 2021 5th PCI list. But for pipelines in the medium-term, much will depend on whether and how many of the numerous FSRU projects currently under consideration will proceed. If some of the FSRUs, as described below, do come on-stream, then potential onshore pipeline bottlenecks will need to be resolved. Also, into the short and medium term, there are likely Black Sea upstream developments to bring to market, such as Turkey, which is preparing to take its first delivery from a large natural gas discovery in the Black Sea as President Recep Tayyip Erdoğan seeks to burnish his credentials just ahead of the May 14 presidential election. **(4)**

Table 2: Major Gas Interconnections in SE Europe

Countries	Capacity (bcm)	Status
Interconnector Hungary-Croatia	5.5-7.5	In operation
Interconnector Slovenia-Croatia	5.0	Planned
Interconnector Croatia-Serbia	7.0	Planned
Interconnector Croatia-BiH	1.5	Planned
Interconnector Romania-Hungary	1.75	In operation
Interconnector Serbia-Hungary	6.0-10.0	In operation
Interconnector Serbia-BiH	1.2	Planned
Interconnector Albania-Kosovo	1.5-2.0	Planned
Interconnector Serbia-North Macedonia	1.6	Planned
Interconnector Greece-Bulgaria	3.0-5.0	In operation
Interconnector Turkey-Greece-Italy	11.0	In operation
Interconnector Greece-North Macedonia	1.5-3.0	Planned
Interconnector Bulgaria-North Macedonia	-	Planned
Interconnector Bulgaria-Romania	1.5	In operation
Interconnector Bulgaria-Serbia	1.8	Under construction
Ionian Adriatic Pipeline	5.0	Planned
TANAP-TAP system	TANAP: 16.0 TAP: 10.0	In operation
Trans Balkan Pipeline	Initially: Up to 27.0 Currently: 1.0-2.0	Idle
Turk Stream	31.5	In operation
East Med Pipeline	10.0-20.0	Planned

Sources: GIE, IENE

Furthermore, Edison plans to take the final investment decision on a proposed pipeline to deliver East Mediterranean gas to European markets by the end of 2023, the Italian project developer told Reuters. The East Med-Poseidon pipeline, which would initially connect several gas fields offshore Israel and Cyprus to Italy and have an annual capacity of 10 bcm of gas, could be ready by 2027, Edison said. The project, supported by Israel, Cyprus and Greece, would guarantee alternative supplies for Europe, which is weaning itself off of Russian piped gas. In addition, it would better connect Cyprus to its EU partners. For these

reasons, the European Commission is interested to partly fund the project, whose cost is estimated at around €6 billion. (5)

Italy's Edison, a subsidiary of France's EDF and Greece's DEPA International Projects are promoting the project through their joint venture IGI Poseidon. Last year, they received independent positive assessments over the feasibility of the pipeline, which would be 2,000 km long, with at least 800 km offshore. The pipeline would be initially fed by Israeli gas fields already in production and others under development and at a later stage from Cyprus's fields. In Israel these include Leviathan, Tamar and also the Tanin & Karish fields that have additional reserves to be developed. These fields produce around 28 bcm a year, with about a third exported to Egypt and Jordan. Production is expected to climb in the coming years as current projects are expanded and new discoveries are brought online including those from Cyprus (Aphrodite, Glavkos, Zeus, Cronos).

LNG Terminals and FSRUs

As already analysed, several FSRU 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 FSRUs have been reported in Greece, Albania, Croatia, Cyprus and Turkey. Some of these plans are very recent and are clearly a reaction to the Russia-Ukraine war.

Concerning Croatia LNG expansion, the country's Prime Minister Andrej Plenkovic announced in June 2022 a plan to more than double the size of the facility at Krk. It is understood that the Croatian TSO Plinacro is currently working on pipeline expansion options to Slovenia and Hungary, as well as to Bosnia and Herzegovina.

Apart from the Alexandroupolis FSRU, a second one, known as Thrace FSRU, is now developing located in the Thracian Sea, offshore Alexandroupolis, as Gastrade, promoter of both projects, has already announced. In addition, Dioriga Gas, a unit of Greek refiner Motor Oil, aims to start construction of an FSRU facility off Agioi Theodori, near Athens, within 2023. It will have a storage capacity of up to 210,000 cubic metres of gas which will be either regasified and exported through Greece's gas grid or sold as LNG via vessels and trucks. (6)

Moreover, Elpedison, a joint venture by Italy's Edison and Helleniq Energy, wants to build an FSRU off the northern city of Thessaloniki, Greece's second largest, by 2025. Also, Mediterranean Gas plans to build an FSRU off the port of Volos, in central Greece. It has invited LNG producers, traders, large-scale consumers, industrial users and marine and shipping companies to submit non-binding interest in booking capacity by December 19, 2022. The facility, which will have an annual regasification capacity of 5.2 billion cubic metres, will carry gas to North Macedonia, Bulgaria, Serbia, Romania, Albania, Italy and the rest of Europe.

In March 2021, Exceleerate Energy, ExxonMobil and the Ministry of Infrastructure and Energy of Albania signed a Memorandum of Understanding (MoU) in order to conduct a feasibility study for the potential development of an LNG project in the Port of Vlora in Southern Albania. Under the MoU, Exceleerate's study explored the potential of an integrated LNG-to-power solution that includes developing an LNG import terminal, converting and/or expanding the existing Vlora thermal power plant, and establishing small-scale LNG distribution to Albania and the surrounding West Balkans region. Exceleerate's CEO announced in May 2022 that the company would move its FSRU Excelsior from Israel to Albania at the end of 2022, with commercial regasification operations expected to begin at Vlore in the second quarter of 2023. (7)

In October 2022, Exceleerate announced that the Excelsior FSRU would be deployed instead to Germany, following the signing of a five-year charter contract with the German government. Currently, there are no indications of alternative vessel arrangements having been made for the Port of Vlora project. As of June 2022, Albania had already begun discussing new energy agreements with neighbouring countries, including Kosovo, Montenegro, North Macedonia and even Bulgaria.

In February 2023, Montenegro's Minister of Finance Damjanović and representatives of the US State Department discussed the possibility of building an LNG terminal in the Port of Bar and agreed on concrete steps towards realisation of the idea. They also talked about the potential involvement of American companies in the Bar project. Damjanović expressed Montenegro's readiness to move forward with the task, with the support of American development agencies. In 2021, Singapore-based project developer LNG Alliance partnered up with Montenegro's state-owned power firm EPCG to look into LNG and power projects and a dedicated LNG import terminal in the Port of Bar. In May 2022, it completed pre-feasibility studies for the terminal and signed an MoU with the Port of Bar for further advanced studies. The Bar LNG terminal is expected to serve Montenegro but also Bosnia and Herzegovina, Kosovo, Serbia, Albania and even the southern region of Hungary. Table 3 summarises the existing, under construction and planned LNG terminals/FSRUs in SE Europe.

Regarding Cyprus, the 137,000 m³ LNG carrier Galea is being converted at Cosco Shipping Heavy Industry in Shanghai into an FSRU named Etyfa Prometheas and is expected to be located at Vasilikos port. The FSRU will be moored alongside a purpose-built jetty and regasified LNG will be sent to a gas-fired power plant and to the country's gas grid, currently under development. The Natural Gas Infrastructure Company (ETYFA) previously expected to launch the LNG import project for power generation in the summer 2022. However, it seems that delays related to the Covid-19 pandemic affected the timeline of the project. Recent local media reports suggest that the contractors first expected to complete the project worth some €315 million in July 2023 and then moved the date to October 2023 (8). Moreover, Turkey now operates four LNG terminals, while an FSRU in northwestern Turkey's Gulf of Saros is under construction near the southern area of Bulgaria where Turkey and Bulgaria's gas grids connect. (9)

Table 3: Existing, Under Construction and Planned LNG Terminals/FSRUs in SE Europe

	Country	Terminal or Phase Name	Start-up Year	Nameplate Receiving Capacity (MTPA)	Owners	Concept
Existing	Turkey	Marmara Ereğlisi	1994	5.9	Botas (100%)	Onshore
		Aliaga Izmir LNG	2006	4.4	EgeGaz (100%)	Onshore
		Dortyol - MOL FSRU Challenger	2018	4.1	Botas (100%)	FSRU
		Etki LNG terminal - Turquoise	2019	7.5	Terminal: Etki Liman (100%), FSRU: Kolin Construction (100%)	FSRU
	Greece	Revithoussa	1999	4.6	DESFA (100%)	Onshore
	Croatia	Krk LNG	2021	1.9	Terminal: HEP (85%), Plinacro (15%), FSRU: Golar (100%)	FSRU
Under Construction	Greece	Alexandroupolis FSRU	2023	4.0	Copelouzos Group (20%), GasLog Cyprus Investments (20%), DEPA Commercial (20%), Bulgartransgaz (20%), DESFA (20%)	FSRU
	Cyprus	Vasilikos FSRU	2023	0.6	DEFA (100%)	FSRU
	Turkey	Gulf of Saros FSRU	2023	5.6	Botas (100%)	FSRU
Planned	Greece	Thrace FSRU	2025	4.4	Copelouzos Group (20%), GasLog Cyprus Investments (20%), DEPA Commercial (20%), Bulgartransgaz (20%), DESFA (20%)	FSRU
		Dioriga Gas FSRU	2023	1.9	Motor Oil (100%)	FSRU
		Thessaloniki FSRU	2025	3.8	Helleniq Energy (50%), Edison (50%)	FSRU
		Argo FSRU	2025	3.8	ExxonMobil LNG and Mediterranean Gas	FSRU
	Albania	Port of Vlora FSRU	2023	-	Excelerate Energy, ExxonMobil, and the Ministry of Infrastructure and Energy of the Republic of Albania	FSRU
	Montenegro	Port of Bar	2023	0.4-1.2	LNG Alliance, EPCG	Onshore

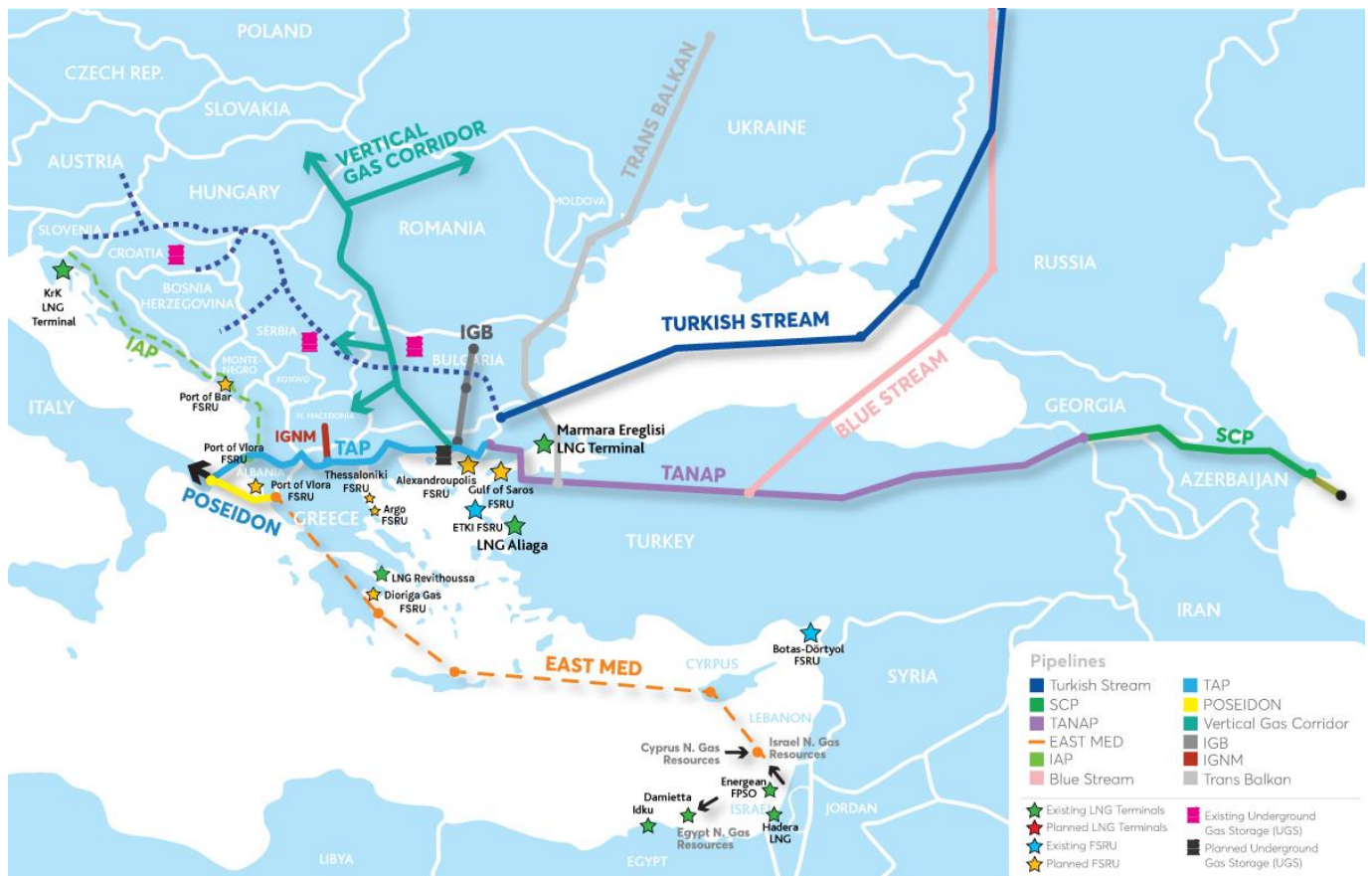
Sources: IGU, IENE

The Expanded South Corridor

In view of several new gas infrastructure projects under development in the SE European region, a redefinition of the Southern Gas Corridor is necessary by mapping all new potential gas supply sources and routes. Therefore, the concept of an Expanded South Corridor is introduced and defined as such to include all major gas trunk pipelines, LNG regasification terminals and underground gas storage facilities, which will ensure that gas is fed into the system with some of them being re-directed towards the main European gas markets. This Expanded South Corridor, with its multiple gas entry points and linked underground gas storage and LNG facilities, already provides, and will provide further, the necessary background for the

operation of regional gas trading hub(s).

Map 2: The Expanded South Corridor



Note: The TANAP, TAP, IGB and Turk Stream have been completed, while BRUA is still under construction. The IAP, the IGI Poseidon in connection with East Med pipeline and the Vertical Corridor and the IGSM are still in the study phase. Blue Stream and Trans Balkan are existing pipelines.

Source: IENE

Seen in a broader perspective, the construction and operation of huge gas infrastructure projects, such as TurkStream and the East Med, inevitably carries a heavy political concomitant burden as the rearrangement and reshuffling of gas flows causes ripple effects at various levels. Furthermore, they alter the energy security architecture and redistribute income from gas sales and transit fees. Judging from experience so far in the European scene, we see that in most cases energy security, at both the demand and supply end, prevails over all other considerations. In the case of SE Europe, the energy security dimension of major gas infrastructure works is even more pronounced.

Discussion

This Monthly Analysis focused on the recent developments in the SE European 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 and of upstream potential. Greece is emerging as a regional LNG hub, with strong links to Turkey; thus, enhancing regional cooperation. These developments will help secure the operation of each country's gas hubs.

Pulling all these elements together, it seems that if the gas supply is there, SE Europe will be in a very good position to replace its Russian volumes. From a supply perspective, more LNG and a little more gas from the Southern Gas Corridor is expected over 2022-2024. Between 2025 and 2028, regional upstream comes into play, with Romania as a frontrunner. The Expanded South Corridor is of great importance to the region, providing real diversification, particularly if expanded in the future, and helping Western Balkan countries to diversify away from Russian gas as well as reduce their dependence on coal/lignite.

Despite abundant transmission and import capacity, SE Europe remains poorly connected because of numerous regulatory bottlenecks, including lack of interconnection agreements, delays in implementing congestion management mechanisms or failure to implement the use-it-or-lose-it principle. Lack of cooperation and coordination among TSOs largely caused by legal ambiguities at the interface between EU member states and Energy Community Contracting Parties, regulatory instability and unpredictability as well as political manoeuvring remain the most important barriers to regional gas market integration.

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