



# Master Plan of Energy Networks for the Adriatic-Ionian Region

## Study 2 –

### INTEGRATED NATURAL GAS CORRIDORS AND MARKET FOR GREEN ADRIATIC-IONIAN REGION

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# 1 Flagship project – overall goal and expected impact

Energy Networks Sub-Group of EUSAIR Pillar 2 – Connecting the Region identified three Flagship Projects for embedding in the frameworks of 2021-2027 European cooperation and cohesion funds, one of which is **the Integrated natural gas corridors and market for a green Adriatic-Ionian Region**. EUSAIR's Pillar 2 flagship projects would support legislative alignment, enforce monitoring, data collection, and simulate modelling in transport networks for strategic project development to improve transport and energy connectivity in the Western Balkans and to the rest of Europe.

This study provides description of the EUSAIR Flagship project on Integrated natural gas corridors and market for a green Adriatic-Ionian Region and their impact in the scenarios developed by the Master Plan on Energy Networks, thus this study is the integral part of the Master Plan.

The objective, as stated in the flagship description, is that this project responds to the needs of the EU Policy Objective n. 2 and n. 3 for a greener and low-carbon and more connected Europe, so the goal is at expanding and interconnecting national gas systems promoting security of gas supplies while exploiting opportunities for gas storage and counterflows towards an efficient gas trading hub.

It is generally assumed that the natural gas is the fuel for the energy transition given its low carbon content and a key driver for power generation. Thus, the natural gas networks and pipelines have been a main topic in the countries' energy agenda. Natural gas production and demand are relatively low in the non-EU EUSAIR countries. Albania, Montenegro and Bosnia and Herzegovina are not connected to the European gas pipeline network, while Macedonian gas system is connected to EU via Bulgaria. Only Serbia produces any significant amount of gas. Some countries have developed gas networks and the region is heavily dependent on Russian gas supply. The share of imported gas in total gas consumption will increase in forthcoming years.

These facts indicate the need for better inclusion of the EUSAIR countries in European flows and the natural gas market, and better connection of the gas transport system with neighboring systems countries, as well as with new supply projects.

Taking into account the war in Ukraine and its exploited gas transport system, the largest gas consuming countries in Europe are trying to reduce dependence of Russian gas and to ensure the stability of gas supply. However, Europe has put big efforts to reduce dependence on Russian gas which has important implications to the non-EU EUSAIR countries.

Main challenge is to ensure significant decrease of dependence on Russian gas in the EUSAIR region, providing diversity of supply of natural gas, providing security of supply of natural gas, introducing renewable energy sources in the region, reducing CO<sub>2</sub> emissions in the region, and facilitating economic development. The development of new gas pipelines, gas storage and LNG regasification terminals, as well as the creation of new interconnections as larger corridors, UPP terminals or domestic production led to larger markets or areas that are not yet supplied with gas can contribute to tackle these challenges. Although the EUSAIR countries are working to expand renewable energy and have set targets under the Energy Community framework, they are also pursuing the expansion or introduction of gas supply in parallel.

Here follows the short description of the existing and planned gas pipelines and LNG regassification units by country as well as their impact in the mid-term scenarios. Maps for each country has been sourced by the European Network of Transmission System Operators for Gas, ENTSO-G 2022, Energy Community, National TSO and NECPs.

## 2 Proposed actions and projects

### 2.1 Transbalkan Gas Ring

The Transbalkan Gas Ring is a cluster of projects consisting of new gas pipelines, upgrading and counterflows through the Balkan region. It refers to TSG2 Priority action of construction and establishment of an integrated natural gas infrastructure and well-functioning gas market and in particular to the following sub-actions:

- a) Diversification of natural gas sources, infrastructures and routes to promote security of natural gas supply and competitiveness
- b) Development of interconnections, counterflows and natural gas storage along a regional perspective.

Key EUSAIR countries involved are Bosnia and Herzegovina, Croatia, Serbia and Slovenia.

#### 2.1.a Gas Interconnector Serbia-Bulgaria

The Interconnector Bulgaria-Serbia (IBS) aims at the construction of a gas pipeline, ensuring bi-directional interconnection of the gas transmission networks of the Republic of Bulgaria and the Republic of Serbia. It is the priority project of the Central and South Eastern Europe energy connectivity (CESEC) Initiative and is recognized as an EU Project of Common Interest (PCI) included in the 5<sup>th</sup> PCI list published by the EC in November 2021. Its European Network of Transmission System Operators for Gas 202 TYDNDP code is TRA-F-137 and its Energy Community PECI code Gas\_09.

The gas pipeline will have a length of 170 km from the town of Novi Iskar, Bulgaria (62 km in Bulgaria), to the city of Niš, Serbia (108 km in Serbia) and a planned transmission capacity of 1.8 bcm/y with reverse flow capability. The project is necessary to enable Serbia to diversify gas supplies and reduce import dependence on Russian gas.

Promoters are: Public Enterprise Srbijagas and Bulgartransgaz EAD, Ministers of Energy of Bulgaria and Serbia.

The pipeline will provide a new supply route from Bulgaria to Serbia, as well as to other parts of the South-East European region, enabling access to liquefied natural gas (LNG) from Greece, Azeri gas from the Southern Gas Corridor, and gas from Black Sea offshore production.[https://www.gem.wiki/Bulgaria-Serbia Interconnector Gas Pipeline - cite\\_note-source1-1](https://www.gem.wiki/Bulgaria-Serbia_Interconnector_Gas_Pipeline_-_cite_note-source1-1)

The IBS is part of a broader process of diversification of gas supplies and a stepping stone for further enhancement of energy security in the region.

The construction of Serbia's 109-kilometer section started in January 2022 and is planned to be completed by the end of 2023. It will cost EUR 85.5 million and will be paid for with a EUR 25 million loan from the European Investment Bank (EIB), a EUR 49.6 million grant from the European Union IPA Fund with the remaining EUR 11 million coming from the Serbian state budget and Srbijagas funds. The interconnection will secure an 80% increase in the amount of gas provided to Serbia.

On February 1, 2023, construction work began on the project's 62-km Bulgarian section and the completion date is envisaged by the end of 2023. In 2020, Bulgaria was awarded a EUR 27.6 million grant under the Connecting Europe Facility (CEF) for construction works. In February 2023, Netherlands-based bank ING confirmed a EUR 49 million state-guaranteed loan with Bulgartransgaz for the project.



Figure 1. Gas interconnector Serbia-Bulgaria

Source: Energy Community

**2.1.b North Interconnection BA-HR Gas Pipeline Project Slobodnica (HR) - Brod (BA) - Zenica (BA)**

For the North interconnection on the route Slobodnica - Brod - Zenica, it is planned to connect the gas transmission systems of Croatia and Bosnia and Herzegovina. The pipeline goes from Slavonski Brod (Slobodnica) in Croatia, it will cross the Sava river to Bosanski Brod in Bosnia and Herzegovina with further extension to Zenica. The section Slobodnica - Brod is 5.1 km long, and the section Brod - Zenica is 140 km long. The proposed interconnection would have the capacity of **1.3 bcm/y**. The project will be H2 ready.

Project will integrate BA with Croatian and other neighbouring gas markets. Pipeline will be bidirectional and together with "South Interconnection BA-HR" creates a part of Energy Community Gas Ring. The main goal is to diversify the routes and sources for gas supply of Bosnia and Herzegovina. Gas will arrive from Croatia transport system, Croatian UGS and Croatian LNG terminal, IAP, interconnection point Croatia-Hungary and Baumgarten via Slovenia

The project completion is planned in 2026.

### **2.1.c Western Interconnection Gas Pipeline BA-HR (Licka Jesenica-Trzac-Bosanska Krupa with branches to Bihac and Velika Kladusa)**

Project will connect Bosnia and Herzegovina with Croatian gas transmission system and will enable gasification of part of Una-Sana Canton on the west side of BA. The aim of the project is to assess the feasibility of providing gas supply to the Una-Sana Canton in BA from the Croatian gas transmission system. It will be from the Lička Jesenica gas transmission node in Croatia via Lika to the HR/BiH border and from there to Bosanska Krupa with branches to Bihać and Velika Kladuša in Una-Sana Canton. The extension of the gas transmission in Croatia to the border with BiH will allow additional gasification in the part of Croatia along the pipeline route. The project will be H2 ready.

Project is on the Energy Community PECEI PMI 2020 List and is included in ENTSOE TYNDP 2022.

The project completion is planned in 2026.

### **2.1.d Gas Southern Gas Interconnection Pipeline BA - HR (Split-Zagvozd-Posusje-Novi Travnik with a Main Branch to Mostar)**

The southern interconnection of the gas transmission systems of Croatia and Bosnia and Herzegovina, promoted by BH Gas and Plinacro, on the route Zagvozd - Imotski - Posušje - Tomislavgrad - Zenica with the branch to Mostar, is of the strategic importance for the security of supply of Bosnia and Herzegovina, since this country currently depends on only one entrance into the gas transmission system (from Serbia via The Republika Srpska).

Croatian sections of the southern interconnection Croatia - Bosnia and Herzegovina include the section Dugopolje (Split) - Zagvozd with a total length of 52 km, and the section Zagvozd - Imotski - border of Croatia and Bosnia and Herzegovina with a total length of 22 km, while on the Bosnian and Herzegovinian side the total length of the route is **169 km**. The interconnection capacity is up to **1.5 bcm/y**.

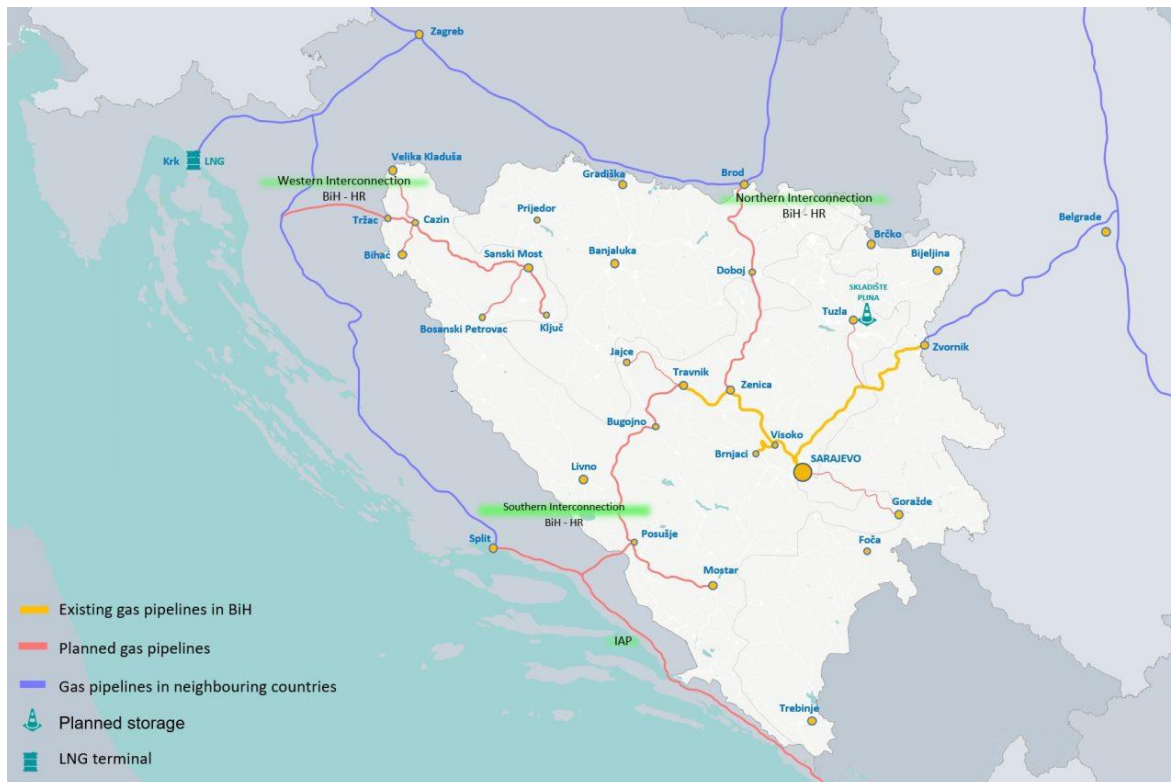
The Split-Zagvozd section was planned to be constructed as a part of the Ionian Adriatic Pipeline (IAP), but independently on the IAP construction, Plinacro already applied for a construction permit for the Zagvozd – Split pipeline.

The project ensures diversification of routes and sources of supply (through the LNG terminal on the island of Krk, the future Ionian-Adriatic Pipeline and other supply routes that go through Croatia and further gasification of BiH, which will result in the increased transit of natural gas through Croatia.

The gas pipeline is planned to be bi-directional and H2 ready.

Work on the project is expected to start in 2023 and the pipeline should be put into operation by the end of 2024.

The project also received support from the Energy Community, as it was included on the 2018 and 2020 lists of Projects of Mutual Interest (PMI). The North, West and South Interconnection routes are shown below:



**Figure 2. New Interconnections in Bosnia and Herzegovina**

*Source: BH gas*

### 2.1.e Interconnector Serbia-Croatia

The interconnection of Croatia and Serbia is planned on the route Slobodnica - Sotin - Bačko Novo Selo. The main goal of the project is to connect the Serbian and Croatian transmission systems in order to ensure market integration, diversification of gas supply sources and increase security of supply in both countries. It will also provide Serbia with the access to the Croatian LNG terminal.

The first phase of the project would be the construction of the Negoslavci - Sotin - Bačko Novo Selo gas pipeline (15 km) and Osijek - Vukovar (30 km) gas pipeline.

Project is on the Energy Community PECE PMI 2020 List and is included in ENTSOE TYNDP 2022. Project promoters are Public Enterprise Srbijagas Novi Sad (Serbia) and Plinacro D.o.o (Croatia).

Covering Croatia and Serbia, connecting the Croatian gas transmission system to the Serbian gas transmission system Slobodnica - Sotin (Croatia) - Bačko Novo Selo (Serbia). First phase would be Negoslavci-Sotin-Bačko Novo Selo plus the pipeline Osijek-Vukovar. It will be new interconnection, new entry point and transmission route for the needs of Serbia; it will be SoS and diversification of supply route for Serbia. It will enable Serbia access to Croatian UGS, LNG and enable supply of gas from Austria, Slovenia and Italy by the Croatian gas transmission system. Project will be H2 ready.

The construction is planned to start in 2025 and end in 2030. Commissioning is foreseen in 2027 until 2030.

Overall capacity is 479,960 GWh/d.



**Figure 3. Interconnector Serbia-Croatia**

*Source: Energy Community*

### **2.1.f Interconnection Croatia/Slovenia (Lučko - Zabok - Rogatec)**

New pipeline which will upgrade the existing interconnection Croatia/Slovenia. Along with the existing interconnection Karlovac-Lučko-Zabok-Rogatec, a new gas pipeline system has been planned which would significantly increase the capacity of the interconnection of the Croatian and the Slovenian gas transmission systems in this direction. Considering almost all existing and new supply directions in the surrounding region and the Croatian storage potentials this opens significant transit potentials in both directions. The current capacity is limited; the section from Lučko to Rogatec up to 1.5 bcm/y. Increasing capacity by 5 bcm opens the possibility for importing more gas from the Baumgarten.

The project will be hydrogen ready.

The source of gas can be:

1. Direction HR to SLO: LNG on the island of Krk, IAP and Russian gas from Hungary
2. Direction SLO to HR: Russian gas via Austria, Northern African gas via Italy

Project will enhance utilization of the LNG evacuation pipeline by increasing capacity of the interconnection Croatia/Slovenia.

In addition, the source of the gas is going to be the gas from the Krk LNG as well as from the Ionian – Adriatic Pipeline toward Slovenia and the neighbouring countries. In this case the current pipeline capacity would not be sufficient; therefore, it is envisaged to be increased. By doubling the pipeline, it is possible to use both the existing and future Croatian UGSs.

## Upgrade of Rogatec interconnection between Slovenian and Croatian gas systems (M1A/1 Interconnection Rogatec)

The upgrading of the interconnection point between Slovenian and Croatian gas systems at Rogatec (Slovenia) is a part of the PCI: 6.26.1 Cluster Croatia – Slovenia at Rogatec.

The PCI aims at construction of a new pipeline of a capacity up to 5 bcm/y in both directions: Luko - Zabok (HR), DN700 with 36 km length and Zabok - Rogatec (SI) DN700 with 34 km length. Including:

- **Upgrade of Compressor station Kidrievno (SI)**, 2nd phase for higher operational pressure in the existing M1/1 and M2/1 pipelines, higher flow and bidirectional operation. The project aims to assure additional necessary compressor power (30 MW) for the PCI 6.26 Cluster Croatia - Slovenia at Rogatec.
- Adjustment to operating parameters of the transmission system of the Croatian TSO, increasing the transmission capacity and enabling bidirectional operation. The project consists of a pipeline with a length of 3.8 km and a diameter of DN800. The expected bidirectional incremental capacity brought by the project at IP Rogatec (SI/HR) is 162 GWh/d.

Commissioning of the projects is expected in 2026.



Figure 4. Interconnection Croatia Slovenia

### 2.1.g Interconnector Greece-Bulgaria (IGB Project)

The IGB pipeline is **182 km long** (of which 31 km in Greece and 151 km in Bulgaria), and runs vertically from South to North between Komotini (where it connects to the TAP pipeline) and Stara Zagora in Bulgaria, interconnecting the Greek natural gas system with the Bulgarian one. The IGB project is part of the European Commission's Projects of Common Interest (PCI 5<sup>th</sup> List n. 6.8.1) and is included in the list of priority projects for Central and South Eastern Europe Gas Connectivity (CESEC).

The technical capacity is **3 bcm/y** with an option for increasing the transmission capacity to up to **5 bcm/y**, if there is market interest in such expansion. This can be achieved through the construction of a compressor station in Komotini, Greece, where the gas pipeline connects to the Greek gas transmission network and to the Trans-Adriatic Gas Pipeline (TAP), giving Bulgaria direct access to the Southern Gas Corridor. This would also allow for reverse flow.

The project provides opportunities and creates synergy with other important projects in the region - the LNG terminal in Alexandroupolis near Komotini, Greece; EastMed to directly link the resources from the Eastern Mediterranean with Greece via Cyprus and Crete, as well as LNG from Israel, Egypt.

IGB is of strategic importance for the realization of the Vertical Gas Corridor, supported by the EC, which interconnects the networks of Bulgaria, Greece, Romania and Hungary. The project will contribute to the development of the Bulgarian side's concept for the realization of Balkan Gas Hub.

Together with the Poseidon and EastMed projects, this pipeline is part of an infrastructure system promoted by IGI Poseidon (a 50:50 joint venture by Edison and Depa) that contributes to the expansion of the "Southern Corridor" of natural gas and to the diversification of routes and sources of supply for Europe.

The IGB was put into operation on October 1, 2022.



Figure 5. Interconnection Croatia Slovenia

Source: IGB website

## 2.2 Ionian-Adriatic Gas Pipeline (IAP)

### 2.2.a IAP

The IAP project has been based on the idea of connecting the existing gas transmission system of Croatia via Montenegro and Albania with the TAP gas transmission system (Trans Adriatic Pipeline). The total length of the gas pipeline from Split to the Albanian city of Fieri equals 511 km. On the territory of Croatia, the construction of four sections and a compressor station in Dugopolje has been planned. The mentioned sections are: Split – Zagvozd (52 km), Zagvozd – Ploče (50 km), Ploče – Dubrovnik (103 km) and Dubrovnik – Prevlaka – Dobreč (MN) in the length of 47 km.

The gas pipeline capacity of 5 bcm/y has been planned for natural gas supply of Albania (1 bcm/y), Montenegro (0.5 bcm/y), Bosnia and Herzegovina (1 bcm/y) and Croatia (2.5 bcm/y).

The implementation of this project will enable the gasification of Montenegro and Albania, as well as the southern part of Croatia and Bosnia and Herzegovina.

The implementation of the entire IAP project provides opening of the new energy corridor for the region of CEE/SEE and Western Balkans within the Southern Gas Corridor (SGC), for the purpose of establishing a new natural gas supply route from the Middle East, Caspian region and East Mediterranean. The IAP will have a bidirectional gas flow and it will be fully compatible with the LNG terminal on the island of Krk.

The main IAP advantages:

- Gasification of Albania, Montenegro, southern part of Croatia and Bosnia and Herzegovina
- Security of supply and a diversification of the supply for the entire region
- Market integration

The project is planned to be completed in 2025



Figure 6. IAP

Source: Energy Community website

### 2.2.b Trans-Anatolian Gas Pipeline (TAP)

TAP is a natural gas interconnector, transporting the energy produced in the Azerbaijani sector of the Caspian Sea, travelling the vast territories of Georgia, Turkey, crossing into Europe at the Greek/Turkish border, with 550 km in the Greek territory, 215 km through Albania, going into the Adriatic Sea for 105 km and finally resurfacing in Melendugno, in the south of Italy to connect to the Italian natural gas grid.

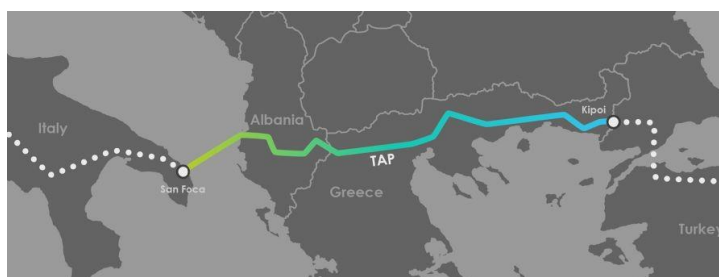
TAP capacity is of 10 bcm/y with the project to double it to reach just over 20 bcm/y.

The TAP expansion project, promoted by ENTSP-G (n. TRA-A-810) is primarily driven by potential increases of the technical capacity at IPs along the TAP pipeline route. If infrastructure upgrades necessary for the expansion project are realised by the interconnected TSOs, then additional natural gas flows from the Greek-Turkish border will reach the markets of Greece, Albania and Italy. Hence,

this expansion project is conducted in close coordination by TAP, SRG and DESFA, to enable the offering of capacities at the IPs shared by the TSOs concerned.

The TAP expansion concerns 5 (five) Interconnection Points (IPs) along the route of the Trans Adriatic Pipeline (TAP), being: Kipoi (TR-GR), Nea Messimvria (GR), Korca (AL), Fier (AL), and Melendugno (IT).

Commissioning started in 2022 and will be finished in 2027.



**Figure 7. TAP**

*Source: TAP*

## **2.3 Eastern Mediterranean Gas Pipeline (EastMed)**

### **2.3.a EastMed**

Natural Gas Submarine Interconnector Greece-Italy Poseidon S.A

The EastMed project is an approximately 2000 km long offshore/onshore pipeline project that will directly connect the available and already in production gas fields in the Levantine basin to the European markets via Cyprus and Greece and with the IGI-Poseidon Pipeline to Italy. The project consists of 5 sections connecting the following areas: Levantine basin – Cyprus – Crete- Peloponnese – West Greece-Thesprotia. The project is designed to allow the transportation of **11 bcm/y, up to 20 bcm/y**, of gas, from Levantine Basin resources to Europe. The EastMed project has been granted the status of the Project of Common Interest (PCI 5th List Code n. 7.3.1) by the EU and was recognized, as a project of national importance and of public interest in Greece.

Project promoter is IGI POSEIDON composed by 50% DEPA INTERNATIONAL PROJECTS and 50% EDISON.

In order to sustain the energy transition in the area, the Project Promoter is designing the Project as “hydrogen ready” and is considering a design that could allow the opportunity to interconnect the future hydrogen renewable production sites located along the route.

The Project Promoter completed the feasibility studies of the Project in 2019, expects to conclude the FEED phase in the first half of 2023 and complete the construction phase in in 4 years in order to have the commercial operating date in 2027.

The EastMed Project will represent an enabler, providing a direct connection between the Eastern Mediterranean energy resources in the Levantine Basin and the European energy markets also via an interconnection with the offshore Poseidon pipeline, to Italy and beyond.

EastMed enhances diversification of sources and routes, enabling the delivery of gas from the new sources of the East Mediterranean to mainland Europe via a completely new route, by working in conjunction with the Poseidon pipeline. It promotes gasification and energy security by linking Cyprus to the energy hubs of mature European markets, lifting the isolation of this EU State. In complementarity with the Poseidon Pipeline Project, it boosts security by its potential to transport gas to Europe from throughout the SGC.

### **2.3.b Poseidon Pipeline**

The Poseidon Pipeline Project consists of a multisource offshore pipeline that will connect the Greek and Italian natural gas systems and transport natural gas available by East Mediterranean and the Middle East sources and the low carbon gases imported by the Levantin area or produced in Greece by the future renewable installed sources.

The EastMed project has been granted the status of the Project of Common Interest (PCI 5th List Code n. 7.3.3) by the EU.

The configuration of the project includes a 210 km of offshore from Greece (Florovouni) crossing the Ionian Sea up to the Italian landfall in Otranto. In its first phase, Poseidon pipeline would transport an initial capacity of 12 bcm/y allowing the flow of gas coming from Eastern Mediterranean region through EastMed pipeline, to which Poseidon pipeline will be connected in Thesprotia. The project will be able to transport up to 20 bcm/y in a second phase.

The project's development activities are on time, with the main engineering activities completed and construction tender almost finalized. The promoter has completed the authorization process on the Greek side, for the connection with EastMed pipeline.

The construction activities are planned to start within 2023 and the construction completion is expected in 2025.

Poseidon Pipeline, through EastMed, allows a permanent access to the new EU indigenous sources available in the Eastern Mediterranean (Levantine Basin) not currently reaching the Italian, Greek and EU MS. The onshore section allows to transport the gas volumes available at the Turkish / Greek border.

The Poseidon Project will represent an enabler, providing a direct connection between the Eastern Mediterranean energy resources in the Levantine Basin transported via an interconnection with the EastMed pipeline, to Italy and beyond.

The Poseidon project constitutes an investment contributing to territorial cohesion by overcoming significant gaps by linking Greece, Italy and potentially Cyprus, while lifting the latter's current isolation. One of the key aims of territorial cohesion, namely to distribute fairly available resources, opportunities and benefits is promoted by providing states on the EU's periphery with access to

European mature hub-based markets thereby fostering greater price approximation. By enabling the delivery of supplies entering Greece from throughout the SGC, Poseidon promotes an equal distribution of resources and enhances the EU’s overall energy security. By virtue of Poseidon, countries on the EU’s periphery are provided with the opportunities offered by the EU’s more mature hub-based markets thereby promoting price approximation and achieving the goals of territorial cohesion.



**Figure 8. EastMed and Poseidon**

*Source: IGI, 2021*

## **2.4 North Macedonia natural gas interconnectors**

Three gas interconnectors are envisioned by this project: interconnection of North Macedonia natural gas system with Albania, Greece and Serbia toward a fully integrated gas network.

North Macedonia has a forecast gas demand showing an important increase due to their need to replace polluting energy sources in some of their power plants, in the industry as well as in the residential space heating sector.

### **2.4.a Interconnection between Gas Transmission Systems of Serbia and North Macedonia**

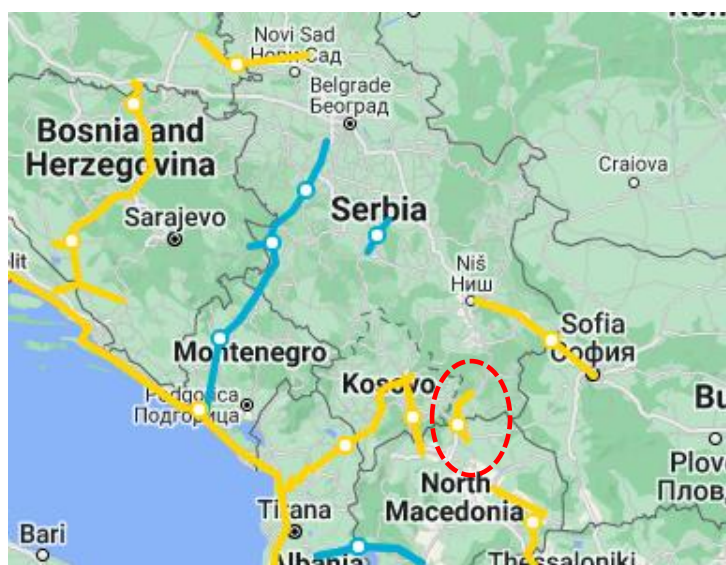
The project consists of an interconnection between the Serbian gas transmission system and Macedonian gas transmission system as a part of the Trans Balkan corridor. The project would allow:

- Competitiveness of natural gas market
- Connecting the gas transmission of both countries with the region (market integration) which would lead to economic, financial and social benefit.
- Development of the region by using the natural gas as energy source as well as security of energy supply in the economic development of the region- Introducing a higher level for achieving economic and social benefits
- Advancement and protection of the environment with higher utilization of natural gas as ecologically clean fuel, in the coal transition etc.
- Ensuring security of supply

Technical grant has been secured within IPA Instrument Investment framework of the Western Balkans (Flagship 5 - Transition from coal) for the project Gas interconnection with Serbia in 2021. Terms of reference for feasibility study and ESIA scope were completed in March 2023.

This is one of the projects with high priority for the country and has PECl status by the Energy Community with code GAS 11, and is included in the TYNDP developed by ENTSO-G.

The main purpose of the construction of this main gas pipeline section arises from the strategic commitment of the Government to achieve higher level of overall functionality of the energy system in the country and to provide conditions for greater infrastructure and economic integration with the neighboring and the remaining European countries. This project will ensure the diversification of natural gas sources and supply routes and possibility for transit of natural gas from Greece to Serbia.



**Figure 9. Interconnection Serbia – North Macedonia**

*Source: Energy Community*

#### **2.4.b Interconnection between the Natural Gas Transmission Systems of Greece and North Macedonia**

This project aims at Diversification of natural gas supply in the gas market of North Macedonia, given that the only source of natural gas in the country comes from the single interconnection point with Bulgaria.

The part of the gas interconnector with Greece in the territory of North Macedonia is with length of 68 km and in the territory of Greece consists of a 54 km pipeline, starting from Nea Messimvria and ending at the borders between Greece and North Macedonia, in Evzoni area, a border metering station (BMS) in the interconnection area and est.

Main purpose is to support the gasification of the country by providing an Interconnection Point that can supply large quantities of gas to meet the expected growth in demand, provide security of supply by offering diversification of routes and sources, ensure market integration aiming at allowing the consumers to have gas prices similar to those of the neighboring countries and to offer a sustainable energy source to the country that has a poor emission intensity index.

- The FS&CBA, ESIA and Basic (Detailed) design has been prepared and revised;
- Completed financial construction (EIB, IG and EBRD);
- Prepared tender documentation for Construction, Construction supervision, Inspection body and Management in accordance with EIB rules;
- The common FID is expected before the end of July 2023;
- Construction phase is expected to commence in Q4 2023 and Commissioning Q4 2025.



Figure 10. Interconnection Greece – North Macedonia

Source: Energy Community

#### 2.4.c Interconnection between the Albanian and Macedonian Natural Gas Transmission Systems (Lead Country: North Macedonia)

The main purpose of the construction of this main gas pipeline section arises from the strategic commitment of the Government in order to achieve higher level of overall functionality of the energy system in the country and to provide conditions for significantly greater infrastructural and economic integration with the neighbouring and the remaining European countries.

This project will ensure the diversification of natural gas sources and supply routes and the liberalization of South-eastern Europe's energy market.

Allowing access to energy fuel on the territory around City of Ohrid and possibility for interconnection with IAP on Albanian territory. This interconnection is also included in Albanian gas Master Plan and the project code in the TYNDP is TRA-N-998.

## 2.5 Gas storage

### 2.5.a Underground Storage Gas Facilities (USG)

Gas storage has an important role in ensuring security of supply and promoting decarbonisation, while also driving forward the energy transition. It is an integral technological and business activity of each gas system, and underground gas storage facilities are fundamental for security and flexibility of supply. While short-term gas supply disruptions have occurred in the past, several factors such as the Russian invasion of Ukraine since February 2022, price increases and the uncertainties related to future

changes in the geopolitical situation can lead to further disruptions of gas supplies and damage the countries still dependent on external gas supplies. Underground gas storage facilities contribute to the security of gas supply by absorbing supply shocks in case of strong demand or supply disruptions.

The storage system makes it possible to compensate for the different requirements for gas supply and consumption: whilst supply - consisting of imports from overseas and domestic production - has a substantially constant flow throughout the year, the demand for gas is concentrated mainly in the winter period. Storage also ensures that quantities of strategic gas are available to compensate for any lack of or reduction in non-EU supply or crises in the gas system.

In June 2022, the European Parliament and the Council adopted the proposal of Regulation on Gas Storage by the European Commission providing that underground gas storage of EU countries' territory must be filled to at least 80% of their capacity before the winter of 2022/2023 and to 90% before the following winter periods. The Energy Community has also adopted the Gas Storage Regulation in October 2022. Its Contracting Parties that have storages, notably the EUSAIR country Serbia, have the obligation to fill them to at least 80% of capacity. Contracting Parties and EU Member States without underground gas storage facilities should make arrangements and use underground gas storage facilities in other Member States with those facilities.

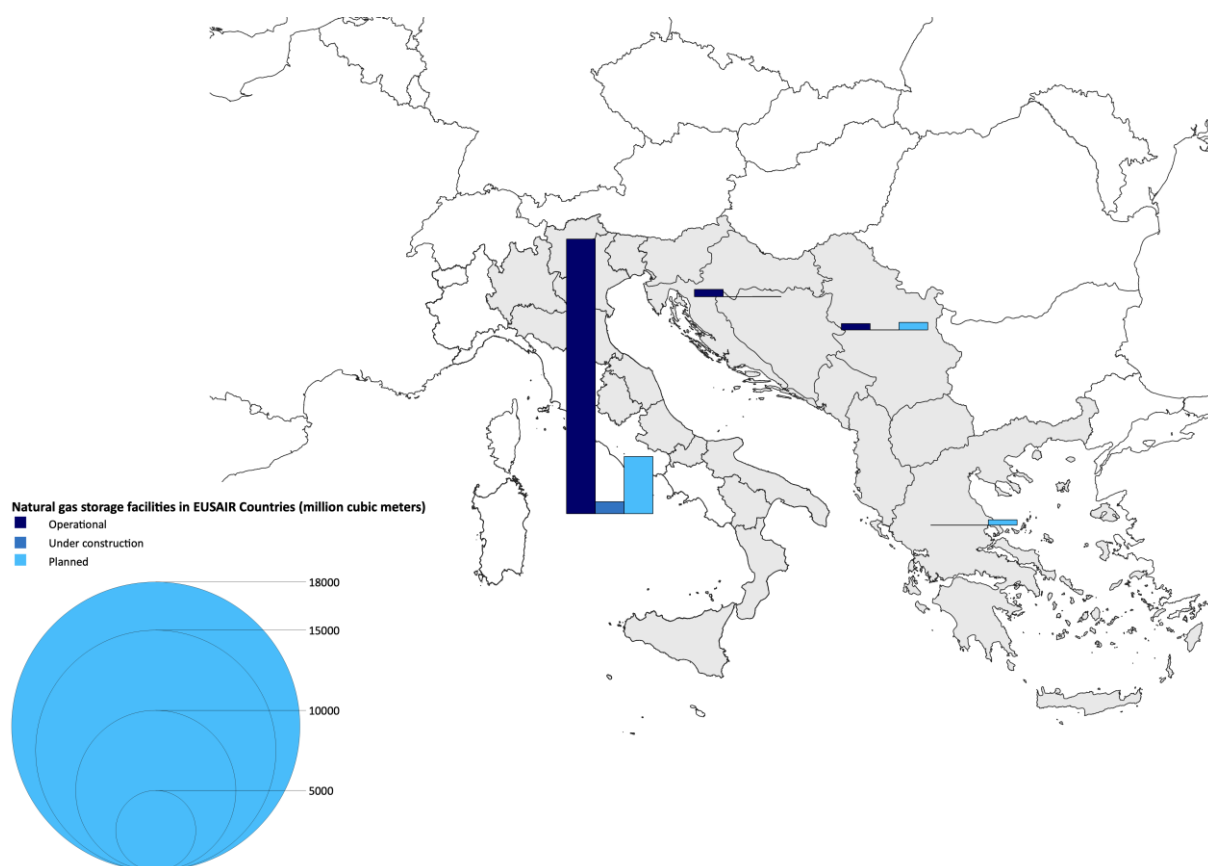
The efficient use of the existing infrastructure, including cross-border transmission capacities, underground gas storage facilities and LNG facilities, is important to safeguard the security of gas supply.

The following table and figure show the gas storage facilities across the EUSAIR countries.

		operational			under construction				planned				
Country	Operator	Facility location	City/Province	storage capacity million cubic meters	Operator	Facility location	City/Province	storage capacity million cubic meters	Operator	Facility location	City/Province	storage capacity million cubic meters	
Italy	Stogit	Bordolano	Cremona	1.650,0	Stogit	Sabbioncello (new facility)	Ferrara		Edison Stoccaggio	Palazzo Moroni on hold (Sant'Elpidio a Mare)	Fermo	50,0	
		Brugherio	Milano			Bordolano (extension)	Cremona		226,7	Gas Plus Storage	San Benedetto (new facility)	Ascoli Piceno	503,7
		Cortemaggiore	Piacenza			Minerbio (extension)	Bologna		381,3		Poggiofiorito (new facility)	Chieti	160,2
		Fiume Treste	Chieti			Ripalta (extension)	Cremona				Sinarca (new facility)	Campobasso	312,6
		Minerbio	Bologna			Sergnano (extension)	Cremona		145,3	Geogastock	Cugno le Macine (Grottole-Ferrandina) (new facility)	Matera	771,9
		Ripalta	Cremona			Stogit	Alfonsine (new facility)		Ravenna	136,0			
		Sabbioncello	Ferrara				Fiume Treste (new facility)		Chieti	181,4			
		Sergnano	Cremona				Fiume Treste F (new facility)		Chieti	181,4			
		Settala	Milano				Ripalta (extension)		Cremona	326,7			
							Settala (extension)		Milano	317,4			
	Edison Stoccaggio	Cellino	Teramo	120,0	GDF Suez Italy	Bagnolo Mella (on hold)	Brescia	633,3					
		Collalto	Treviso	600,0									
		Cotignola & San Potito	Ravenna	350,0									
		Ital gas storage	Cornegliano	Lodi	1.300,0								
Croatia	Podzemno skladište plina	Okoli	Zagreb	457,6				Podzemno skladište plina	Grubisno Polje	Bjelovar	25,0		
Greece								DESFA	South Kavala		338,6		
Serbia	Srbijagas/Gazprom	Banatski Dvor	Vojvodina	450,0				Srbijagas/Gazprom	Banatski Dvor (extension)	Vojvodina	300,0		

**Table 1 – Underground storage gas facilities in EUSAIR countries (million cubic meters)**

*Source: Consultant's elaboration on GAS LNG Europe data*



**Figure 11 – Natural gas storage facilities in EUSAIR countries (million cubic meters)**

*Source: Consultant's elaboration on NECP, Eurostat and IEA data*

## 2.5.b LNG Storage Facilities (LNG)

Liquefied Natural Gas (LNG) facilities provide delivery capacity during peak periods when market demand exceeds pipeline deliverability. LNG storage tanks possess a number of advantages over underground storage. As a liquid at approximately  $-163^{\circ}\text{C}$  ( $-260^{\circ}\text{F}$ ), it occupies about 600 times less space than gas stored underground, and it provides high deliverability at very short notice because LNG storage facilities are generally located close to market and can be trucked to some customers avoiding pipeline tolls. There is no requirement for cushion gas and it allows access to a global supply. LNG facilities are, however, more expensive to build and maintain than developing new underground storage facilities.

FSRUs (Floating Storage and Regasification Units) are terminals capable of **storing and regasifying** natural gas. They are mounted on ships located in the vicinity of a port area, on the quayside or offshore, and receive liquefied natural gas (LNG) at a temperature of  $-160^{\circ}\text{C}$  from other LNG carriers and regasify it (i.e. bring it to a gaseous state) in order to feed it into the national gas transmission network.

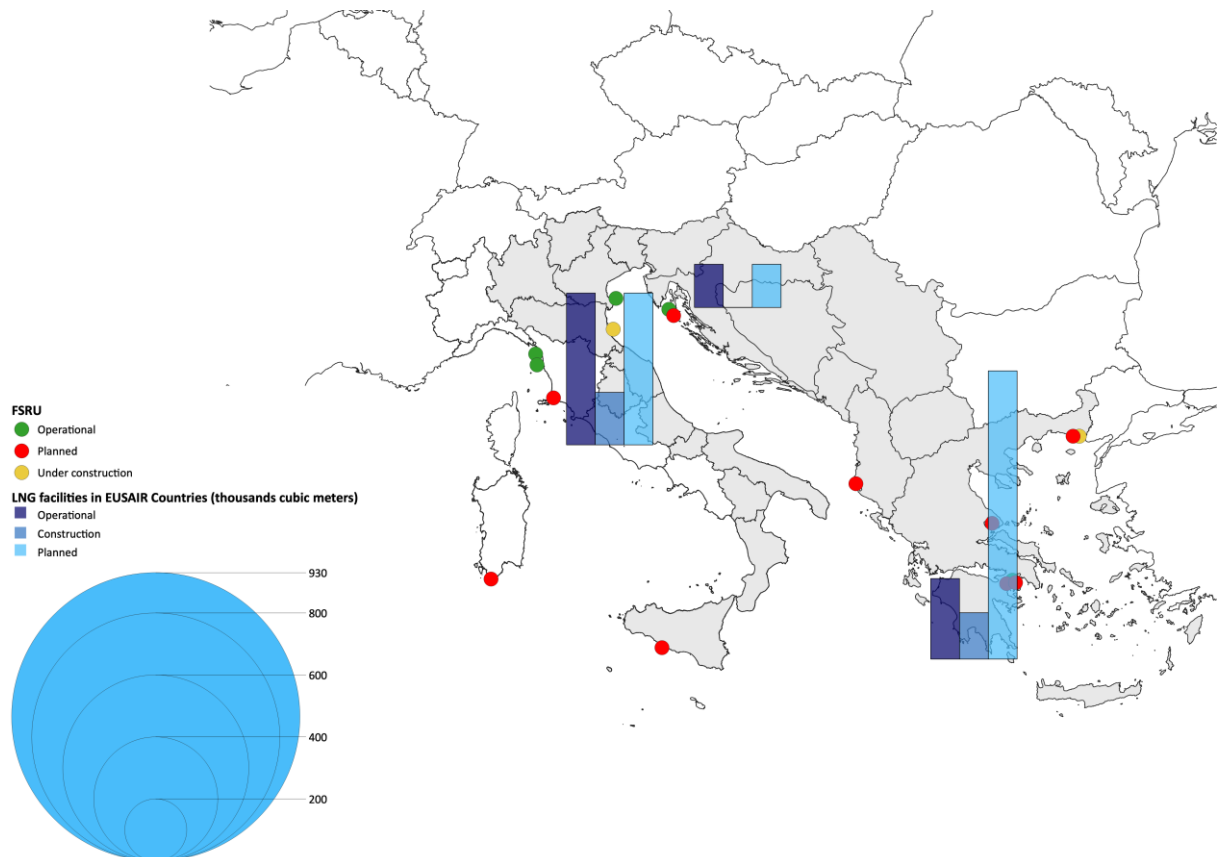
LNG storage capacity is between 160,000 and 180,000 cubic meters.

The following table and figure show the LNG facilities across the EUSAIR countries.

Country	Operational		Under construction		Planned		
	FSRU Facility name	storage capacity cubic meters	FSRU Facility name	storage capacity cubic meters	FSRU Facility name	storage capacity cubic meters	
Albania					Vlora Terminal (new facility) 2023	n/a	
Croatia	Krk LNG Terminal (LNG Croatia)	140.000			Krk FSRU (expansion)	140.000	
Greece	Revithoussa LNG Terminal	255.000	Alexandroupolis LNG terminal	153.500	Revithoussa LNG Terminal (expansion)	380.000	
					Argo FSRU (new facility) 2024	170.000	
					Thessaloniki FSRU 2025	140.000-170.000	
					Thrace LNG	170.000	
					Dioriga GAS FSRU 2023	210.000	
Italy	Panigaglia LNG Terminal	100.000	BW Singapore (Ravenna)	170.000	Golar Tundra (Piombino)	170.000	
					Porto Torres (Sardinia)	15.000	
					Portovesme (Sardinia)	140.000	
	Adriatic LNG	249.579				Porto Empedocle (Sicily)	320.000
							Gioia Tauro (Calabria)

**Table 2 – LNG storage facilities in EUSAIR countries (cubic meters)**

Source: Consultant's elaboration on GAS LNG Europe data



**Figure 12 – LNG facilities in EUSAIR countries (thousand cubic meters)**

Source: Consultant's elaboration on NECP, Eurostat and IEA data

## 2.6 Natural gas trading hub for the Balkan Region

As stated in the Study on Road Map towards a EUSAIR Power Exchange and Natural Gas Trading Hub for the Adriatic and Ionian Region, natural gas markets in the EUSAIR regions feature very different degrees of maturity. In particular:

- **Italy** is one of the largest gas markets in Europe, and as such its organisational structure reflects that of a very mature and liquid market. The wholesale price for gas delivered at the *Punto di Scambio Virtuale* (PSV) forms on a liquid market and acts as benchmark for actively traded futures exchanged on EEX. Transmission capacity is allocated via the PRISMA platform. Finally, the retail segment is fully liberalised.
- **Slovenia, Croatia and Greece** feature a fully liberalised wholesale gas market, implementing the third energy package including the development of natural gas exchanges and the efficient allocation of transmission capacity. With respect to Italy, also given their smaller sizes, these countries lack liquidity and do not have liquid long-term contracts for delivery – so that contract indexation at TTF is common<sup>1</sup>.
- **Serbia, North Macedonia and Bosnia and Herzegovina** haven't fully implemented the provisions of the third energy package yet. This impacts the efficiency of price formation in the region and the perspectives for an effective integration, since capacity storing by the incumbent operator has been reported at the Horgos interconnection point (north border between Serbia and Hungary).
- **Albania and Montenegro** do not have a gas sector altogether, so that no market is made necessary by the fundamentals.

### Looking at the utilisation of gas infrastructures, there is no evidence of structural congestions.

However, given the plan to eliminate Russian gas from the European energy mix the Balkan region will need to review its import strategy – and possibly extend its infrastructures to support the new market configuration. As of 2021, in fact, EUSAIR countries displayed a 42% dependency from Russian gas, in line with the European average of 40%. Some countries in the Balkan region are drastically impacted (in some cases, with a 100% dependency) by the decision to eliminate Russian gas flows, and reverse flows (from South to North) are becoming increasingly common. In particular, gas flows from Greece to Bulgaria at the Kulata IP have been observed in the course of 2022, and the new IGB (Interconnector Greece-Bulgaria) precisely aims at delivering gas imported into Greece (via LNG, also thanks to the new regassification infrastructures planned) to the wider Balkan region<sup>2</sup>. The IGB project commenced operations on 1<sup>st</sup> October 2022 and by December 2022 the utilisation rate increased to 94%.

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<sup>1</sup> This is the case, for instance, for Liquefied Natural Gas delivered in Greece

<sup>2</sup> The IGB project commenced operations on 1<sup>st</sup> October 2022

### 3 Level of implementation and gas demand scenarios by 2030

#### 3.1 Natural gas demand scenarios by 2030

Starting from the scenario results at individual country level developed in **Section 7**, a summary at the EUSAIR area level is provided below.

As regards natural gas consumption, based on the **CPS** and **NPS** scenarios by 2030, a significant drop in consumption is expected by 2030, falling from 65 billion cubic meters in 2019 to just over 58 billion cubic meters in the NPS scenario, while gas consumption remains substantially stable in the CPS scenario.

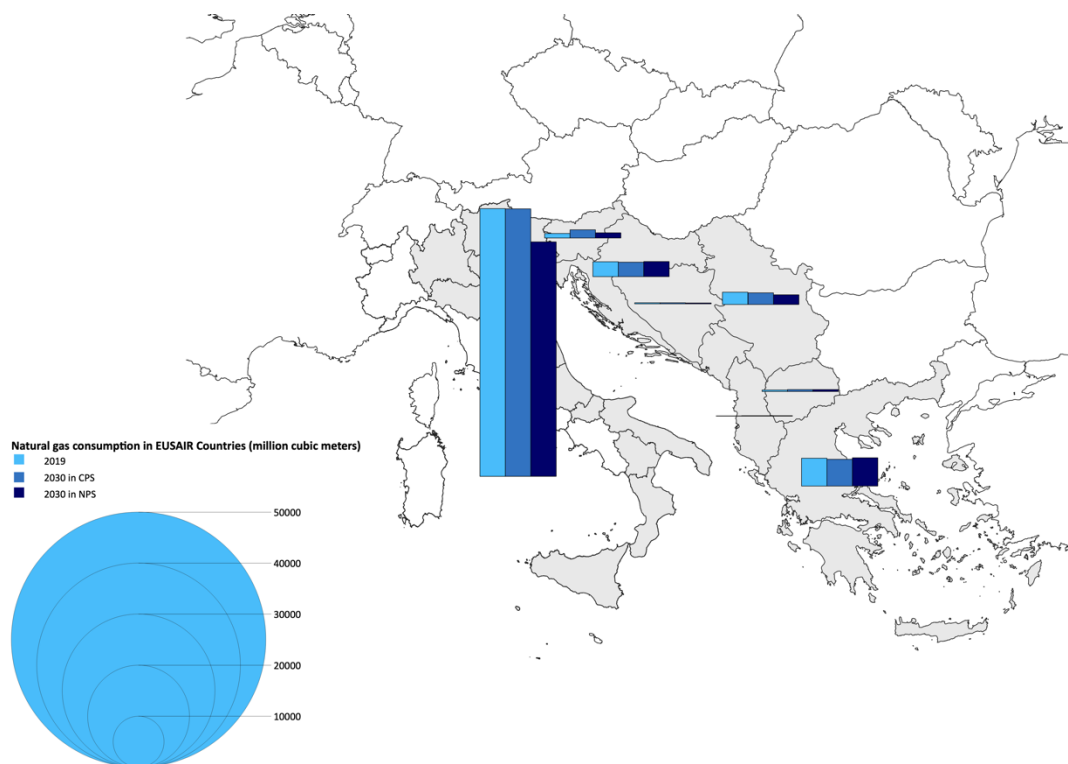
It is therefore a significant drop, equal to around 10% of consumption in the base year (2019), driven above all by Italy, which in the NPS scenario would lose around 6.5 billion cubic meters.

EUSAIR Country	2019	EUSAIR Scenarios in 2030	
		CPS	NPS
Albania	70	91	102
Bosnia and Herzegovina	230	217	180
Croatia	2.937	2.871	2.994
Greece	5.481	5.271	5.554
Italy (EUSAIR Region)	52.497	52.489	45.987
Montenegro	0	0	0
North Macedonia	298	387	405
Serbia	2.433	2.301	1.925
Slovenia	898	1.621	1.016
<b>Total</b>	<b>64.845</b>	<b>65.247</b>	<b>58.164</b>

**Table 3 - Summary of natural gas consumption scenarios in the EUSAIR area by 2030 (million cubic meters)**

*Source: Consultant's elaboration on NECP, European Commission, Eurostat and IEA data*

The expected decrease in gas consumption in Italy is evident from the following figure, where Italy's leading role emerges with respect to consumption in other countries, expected to increase slightly in some cases and moderately decrease in other cases.



**Figure 13 – Natural gas consumption in CPS and NPS EUSAIR Scenarios by 2030**

*Source: Consultant's elaboration on Eurostat, NECP and IEA data*

### 3.2 Level of implementation of gas interconnectors projects

The development scenario of the gas transport network starting from the project list of interconnectors reported in paragraph **Errore. L'origine riferimento non è stata trovata.**, takes into account the assumptions reported below for each EUSAIR country.



- The Omišalj-Zlobin gas pipeline, which will connect the LNG terminal on the island of Krk to the existing transmission system.
- Further development of the gas pipeline system from Zlobin to Slobodnica near Slavonski Brod (the Zlobin-Bosiljevo-Kozarac-Slobodnica gas pipeline) will increase the shipping capacity towards southeast Europe up to 7 bcm/y.
- The development of the Lučko-Zabok-Sutla gas pipeline system will allow gas to be transported from the LNG terminal to Slovenia and further to Central and Western Europe, as well as the access of the terminal users and gas users in the Republic of Croatia to the liquid gas exchange in this part of Europe in Baumgarten, Austria.
- The Ionian Adriatic Pipeline (IAP) would allow the supply of gas from the Trans-Adriatic Pipeline to Croatia and countries in the region and possible transport to Hungary, Slovenia and Austria.

For **Greece** is foreseen an important development of LNG production and an increase of board interconnector:

- LNG importing terminal at Revithousa, 45km West of Athens with total regasification capacity of 8.25 bcm/y and storage capacity of 225,000 cubic metres
- The Trans-Adriatic Pipeline (TAP), which links up with the Trans-Anatolian Pipeline on the Turkish-Greek border is designed to deliver volumes to the Greek market and through it to Bulgaria as well as transit gas to Italy.
- Interconnector Greece-Bulgaria that will enable has entered commercial operations in October 2022 with the capacity of 3 bcm/y with potential to expand its capacity to 5 bcm/y.
- The bidirectional interconnector Greece-North Macedonia will link the Hellenic VTP to Gevgelija – in North Macedonia. The interconnector is due to have an initial capacity of 1.5 bcm/year, could be doubled, depending on demand by 2025.
- The East Med pipeline.
- The Alexandroupolis terminal in northern Greece and close to the Bulgarian border
- Three other FSRUs are expected to cater for the domestic and regional markets.

For **Italy** the future gas demand will be covered mainly from:

- the use of LNG import capacity in terminals;
- use of a number of small-scale liquefied natural gas (SSLNG) coastal storage facilities;
- operation of the southern corridor by way of the TAP (Trans Adriatic Pipeline), and doubling of its capacity to 10 bcm/y (phase 2);
- EastMed project: although the project will allow further diversification of the current routes from 2025 onwards (throughout the EU, Italy is the country with the greatest diversification of its sources), it might not be a priority, given that the decarbonisation scenarios may be achieved through pre-existing infrastructure and the aforementioned TAP.

For **Montenegro** the entire demand will be covered by IAP as no alternative gas supplies exists.

For **North Macedonia** demand will be covered by interconnection of its natural gas system with Albania, Greece and Serbia toward a fully integrated gas network.

For **Serbia** the future gas demand will be covered mainly from:

- the Serbia-Bulgaria gas interconnector Projected capacity of this new gas pipeline will allow flow of 1.8 bcm/y. With its projected capacity the new gas pipeline will provide additional 80% capacity increase relative to Serbia's current annual gas needs (approx. 2.4 bcm/y) and largely increase the overall security of natural gas supply and contribute to cleaner energy targets.
- The interconnection of Croatia and Serbia is planned on the route Slobodnica - Sotin - Bačko Novo Selo. will also provide Serbia with the access to the Croatian LNG terminal.

Finally, **Slovenia** depends entirely on imports. Future demand will be covered by the gas from LNG Krk terminal as well as from the IAP through the Upgrade of Rogatec Interconnection between Slovenian and Croatian Gas Systems (M1A/1 Interconnection Rogatec) which will increase the transmission capacity and enable bidirectional operation.

The following table shows a summary of the main interconnection projects under construction and the comparison between the planned gas transport capacities with the expected consumption by 2030 in the individual EUSAIR countries (in NPS Master Plan Scenario).

**As can be seen, these are gas transportation capacities that often largely cover the gas demand of individual countries.**

**These greater volumes available and the possibility of cross-border gas exchanges could therefore favor the development of a more interconnected gas market between the EUSAIR countries, especially in the Balkan area.**

Gas infrastructure pipeline	Promoting country	Completion year	Gas flow (bcm/y)	Reverse flow	Expected 2030 annual consumption in NPS Master Plan Scenario (bcm/y)								
					Albania	Bosnia and Herzegovina	Croatia	Greece	Italy (EUSAI R Region)	Montenegro	North Macedonia	Serbia	Slovenia
Gas Interconnector Serbia-Bulgaria	RS - BG	2023	1.8	Yes								1.9	
North Interconnection BA-HR Gas Pipeline Project Slobodnica (HR) - Brod (BA) - Zenica (BA)	BA - HR	2026	1.3	Yes		0.18	3.0						
Western Interconnection Gas Pipeline BA-HR (Licka Jesenica-Trzacak-Bosanska Krupa with branches to Bihac and Velika Kladusa)	BA - HR	2026		Yes		0.18	3.0						
Gas Southern Gas Interconnection Pipeline BA - HR (Split-Zagvozd-Posusje-Novi Travnik	BA - HR	2024	1.5	Yes		0.18	3.0						

with a Main Branch to Mostar)													
Interconnector Serbia-Croatia	RS - HR	2030	1.8	Yes			3.0					1.9	
Interconnection Croatia/Slovenia (Lučko - Zabok - Rogatec)	HR - SI	2026	1.5 up to 5	Yes			3.0						1.0
Interconnector Greece-Bulgaria (IGB Project)	GR - BG	2022	3 up to 5	Yes				5.6					
Ionian Adriatic Gas Pipeline (IAP)	GR - HR - ME - AL	2025	5	Yes	0.1		3.0	5.6		0.0			
Trans Anatolian Pipeline (TAP)	GR-		10 up to 20										
EastMed Pipeline	GR	2027	11 up to 20	Yes				5.6					
Poseidon Pipeline	GR - IT	2025	12 up to 20	Yes				5.6	46.0				
Interconnection between Gas Transmission Systems of Serbia and North Macedonia	MK - RS	2026	1.4	Yes							0.4	1.9	
Interconnection between the Natural	MK - GR	2025	2.9 up to 3.8	Yes				5.6			0.4		

Gas Transmission Systems of Greece and North Macedonia													
Interconnection between the Albanian and Macedonian Natural Gas Transmission Systems	MK - AL	2023	2.2	Yes	0.1						0.4		

**Table 4 - Summary of main interconnection projects and the comparison between the planned gas transport capacities with the expected gas consumption by 2030 in NPS Master Plan Scenario**

## 4 Challenges and recommendations

The realisation of gas infrastructure projects in the EUSAIR countries ensures diversification of directions and sources of supply while increasing the security of supply of transit routes. In addition to improving the security of supply, the projects enable the integration of existing and future storage capacities of natural gas into a unified energy system.

The most important impacts and benefits of the gas infrastructure projects are:

- They provide viable and secure supply of EUSAIR countries, which are heavily dependent on the Russian gas
- They provide additional entry points, access to new markets ensuring the diversification of supply routes and sources
- They provide development of the gas market
- They facilitate market integration
- They contribute to the gasification of the entire region of the non-EUSAIR countries
- They compete lowering gas supply price
- They promote sustainability and attainment of EU emission reduction targets by introducing an environmentally more acceptable energy source (replacement for firewood, coal, fuel oil and complementary generation to renewable energy, and the potential for new CCGT);
- Strengthens sustainability promoting RES -gas as backup and built to be hydrogen ready
- Reducing CO<sub>2</sub> and SO<sub>2</sub> emissions in the region and facilitating economic development.

Gas infrastructures will:

- Expand existing gas transmission systems and interconnect them
- Be a backbone of development of the gas transmission systems in the countries where those systems are still underdeveloped
- Connect gas transmission systems of EUSAIR countries and integrate them into the comprehensive European gas transmission system
- Provide natural gas supply from new Middle East, Caspian and other sources
- Provide integration of EUSAIR gas market with the European gas market

Challenges, threats, opportunities and recommendation analysis

Challenges	Threats
<ul style="list-style-type: none"> <li>• security of energy supply and delivery, challenged by the Russia-Ukraine conflict</li> <li>• energy transition towards decarbonised energy systems,</li> <li>• phasing-out of coal-fuelled power plants, still in place in a medium term to avoid negative and social repercussions</li> </ul>	<ul style="list-style-type: none"> <li>• In 2021 the economic recovery drove an increase of electricity demand</li> <li>• Insufficient renewables and high gas prices drove a strong increase in generation from fossil fuels and a shift to coal</li> </ul>

<ul style="list-style-type: none"> <li>• developments of renewable energy sources; investments are needed</li> <li>• diversification of gas imports and routes to overcome shortfall of supplies, investments in networks</li> <li>• increasing gas storage and expansion of LNG regasification.</li> <li>• the situation varies greatly between EUSAIR participating Countries, although the majority of them are still dependent on fossil fuels.</li> </ul>	
<b>Opportunities</b>	<b>Recommendations</b>
<ul style="list-style-type: none"> <li>• Natural gas is expected to be an intermediate fuel in the process of transition to the zero-carbon economy</li> <li>• It can lead to improved energy efficiency and lower costs compared to other technologies</li> <li>• Natural gas storage and distribution system can be used also for CO2 transportation and storage</li> <li>• Production from natural gas using CCS could be integrated into industrial clusters.</li> <li>• Renewables and low carbon gases will play an important role</li> <li>• Reduction of the GHG emissions through a switch from fossil fuels to renewable and low-carbon energy sources. The share of natural gas in the energy mix will increase from 33% to 36% (CPS), and decrease to 29% (NPS) and 16% (Net-Zero) in 2030.</li> <li>• Development of hydrogen economies and infrastructure to be achieved by repurposing of existing gas grids and building dedicated hydrogen transmission infrastructure</li> <li>• Hydrogen production from renewable power sources through electrolysis is an option.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase LNG supply</li> <li>• Reverse flows from North to South and from South to North in the non-EU EUSAIR countries</li> <li>• Consider all opportunities offered by the existing gas infrastructure and gas in all its forms (natural gas, hydrogen)</li> <li>• Further expansion of network infrastructure to increase security of supply in the region (TAP expansion, USG and LNG storage, IAP, etc)</li> <li>• Establish a solid legislative and investment framework for gas infrastructure for the integration of the gas within the power, transport and heating sector</li> <li>• Phasing out of subsidies to coal mining</li> <li>• Enhancing the deployment of renewables through support schemes</li> <li>• Enhancing energy efficiency through investing in energy efficiency in buildings and introducing renewable energy in district heating systems</li> <li>• Contribute to global climate change efforts through reduction of the GHG emissions</li> </ul>

Expanding on the geography of the pipelines, there are advantages these pipelines could bring to the EUSAIR region and this has mostly to do with the sustainable security of supplies and decarbonization of the region, as well as removal of more polluting fuels, such as coal, and finally enhancing the region's

energy interconnectivity to that of larger European Union. These infrastructures are indicated as a means of helping the region to transition from coal to a cleaner form of energy, which is natural gas, recognised as another option to contribute to better and cleaner environment.