Introduction to the Expanded South Corridor Concept

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A Presentation by Mr. **Costis Stambolis**
Executive Director, IENE

INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE

Introduction

- Opening up a new South route to bring gas from **new supply sources** (other than Russian) to meet (then) rising European gas demand became an EC energy strategy priority in the early 2000's.

- The key objective, then as now, being the **diversification of gas supply sources and gas supply routes**.

- The South Corridor, in its present status, **satisfies the "route" diversification requirement**, but not necessarily the "supply" one.

- There is a **new architecture** to be considered in how the South Corridor is shaping up with multiple pipelines and LNG terminals, several entry points and a number of suppliers (e.g. Azerbaijan, Turkey basket, Russia, LNG).

- In view of the failure of securing sizeable gas quantities outside Russia and the changing architecture of the South Corridor, there is a need for a **wider debate** in order to redefine and reconsider priorities and expectations.

Towards a Redefinition of the South Corridor (I)

- The **Turkish Stream**, now under construction, should also be considered as a potentially vital gas supply route to be part of the Expanded South Gas Corridor concept.

- The Turkish Stream pipeline raises the prospect for the **stalled ITGI** natural gas pipeline to be built. ITGI (Greece-Italy Gas Interconnector) has also been included in the European Commission's latest PCI list although it is not linked as yet to any particular gas supplier. Russia's latest proposal for natural gas supply to Europe via the Greek-Turkish border could incorporate ITGI into its plan.

- Although Turkish Stream's role in supplying **alternative gas quantities** to Turkey is well defined, its role in supplying extra gas to Europe is not yet clearly understood. Where and how will their gas be channeled to European markets (via a reverse-flow of the Trans Balkan pipeline, a new pipeline to cross Greece along ITGI footpath?)

Towards a Redefinition of the South Corridor (II)

- Alongside of the East–West route, the **Vertical Corridor** is a gas system that will facilitate the connection between existing national gas grids and other gas infrastructure in East Balkans in order to secure easy gas transiting, thus contributing to energy security and market liquidity. Such a gas system (which will bring together national grids, underground gas storage facilities, interconnectors, LNG terminals) will form an important new corridor from South to North whose operation will be fully aligned with EU Directives and European energy policy.

- Initially, the Vertical Corridor will manage the transportation of some 3-5 bcm per year commencing from the Greek national grid in Komotini. Greece will by then satisfy its domestic gas demand from four (4) different entry points (TAP, Revithoussa LNG, Kipoi, FSRU Alexandroupolis) while there will be some excess gas quantities that can be exported.

Towards a Redefinition of the South Corridor (III)

East Med Developments and Their Importance for the South Corridor

- Several gas exploration projects are in the development stage in the **East Mediterranean** region with important new gas discoveries such as the Leviathan and Tamar fields in Israel, Zohr in Egypt, Kalypso and Aphrodite (which borders with Zohr) in Cyprus's EEZ.

- A number of alternative plans are under discussion for channeling this gas to Turkey, for local consumption, but also to Europe proper for transit to the continent's main gas markets. These plans include subsea gas pipelines, liquefaction plants for LNG export and FSRU terminals to be tied up into the TANAP-TAP system.

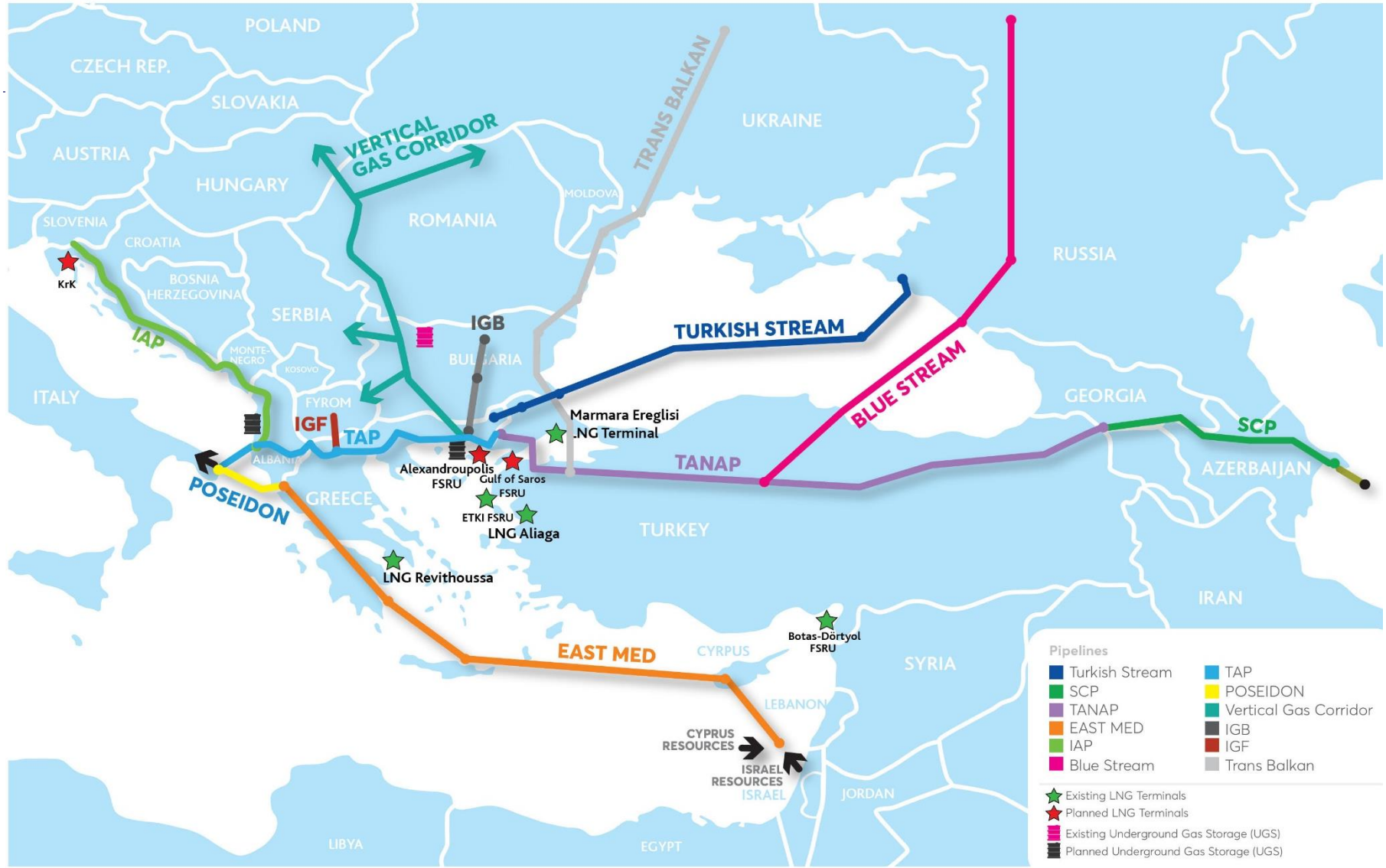
- Another option apart of TANAP-TAP system is the **East Med Pipeline** which again, due to the significant technical challenges, could also accommodate limited quantities of gas in the regions of 8 to 12 bcm per year. Meanwhile, EC is actively exploring the possibility of massively increasing the member countries' LNG capabilities as part of Energy Union priorities.

Towards a Redefinition of the South Corridor (IV)

- In view of several new projects under development in the region, it is time to **redefine the South Corridor** by including these new potential gas supply sources and routes. Therefore, an **Expanded South Corridor** should be considered and defined as such, to include all major gas trunk pipelines and terminals which will feed gas into the system which will then be directed towards the main European markets.

- An Expanded South Corridor with its multiple gas entry points and linked underground gas storage and LNG facilities will provide the necessary background for the operation of a **Regional Gas Trading Hub(s)** as IENE has already proposed in its relevant study "The Outlook for a Natural Gas Trading Hub in SE Europe" (IENE Study Project No. M19, September 2014).

An Expanded South Gas Corridor



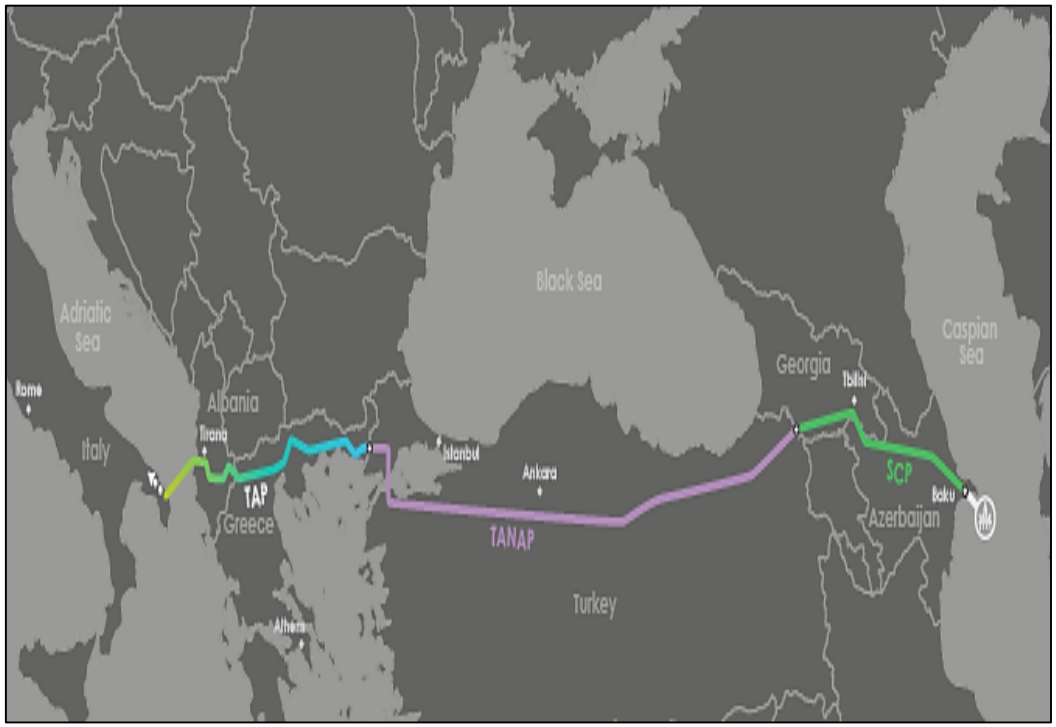
NB.: The TANAP and TAP gas pipelines as well as Turkish Stream are under construction, with IGB at an advanced planning stage with FID already taken. The IAP, the IGI Poseidon in connection with East Med pipeline and the Vertical Corridor and the IGF are still in the study phase. Blue Stream and Trans Balkan are existing pipelines.

Source: IENE (February 2018)

Main Recent Gas Discoveries in Offshore Eastern Mediterranean – Gross Mean Resources (bcm)

Sources: European Parliament, Financial Times

The TANAP-TAP System (Under Construction)



Source: TAP AG

TAP	
Length	878 km
Diameter	48-inch (1,200 mm) pipes
Capacity	10-20 bcm/y
Anticipated Operational Date	2020

TANAP	
Length	1,850 km
Diameter	48-or-56-inch (1,200 or 1,400 mm) pipes
Capacity	up to 31 bcm/y
Anticipated Operational Date	2019

Turkish Stream (Under Construction)

Source: Gazprom

Turkish Stream	
Length	1,100 km
Diameter	Outer diameter of 32 inches (812.8 mm) and will be installed in water depths up to 7,220 ft (2,200 m).
Capacity	Two stretches: Each stretch will have a capacity of 15.75 bcm/y.
Anticipated Operational Date	2020

Interconnector Greece-Bulgaria (IGB) (Implementation Stage)

Source: ICGB AD

IGB	
Length	182 km
Diameter	32-inch (813 mm) pipes
Capacity	3-5 bcm/y
Anticipated Operational Date	2020

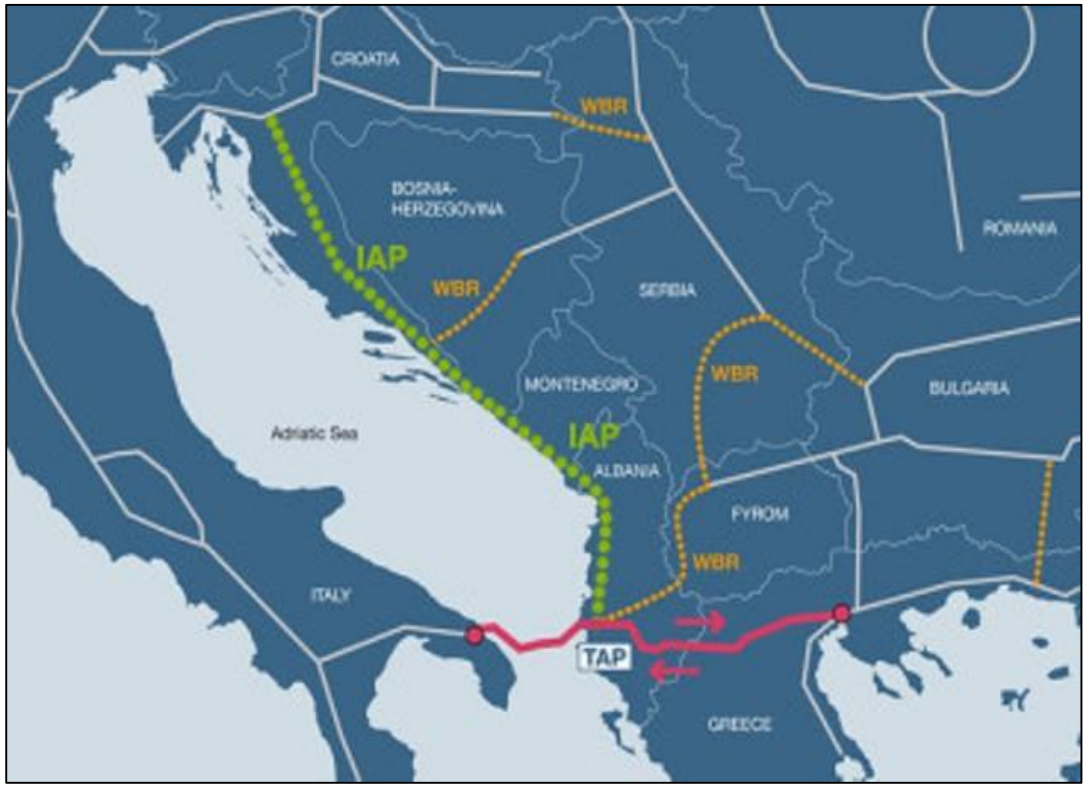
East Med and Interconnector Greece-Italy (IGI) Poseidon (Conceptual Stage)

Source: DEPA

East Med	
Length	1,300 km (offshore) 600 km (onshore)
Diameter	32-inch (813 mm) and 48-inch (1,200 mm) pipes
Capacity	up to 15 bcm/y
Anticipated Operational Date	2025

IGI	
Length	216 km
Diameter	32-inch (813 mm) pipes
Capacity	14-20 bcm/y
Anticipated Operational Date	2020

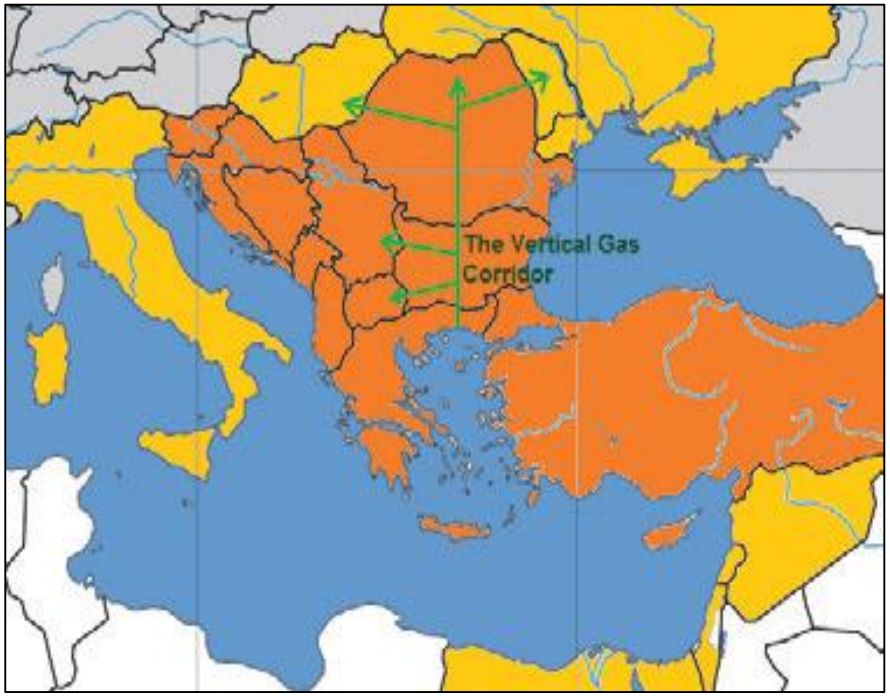
Ionian Adriatic Pipeline (IAP) (Conceptual Stage)



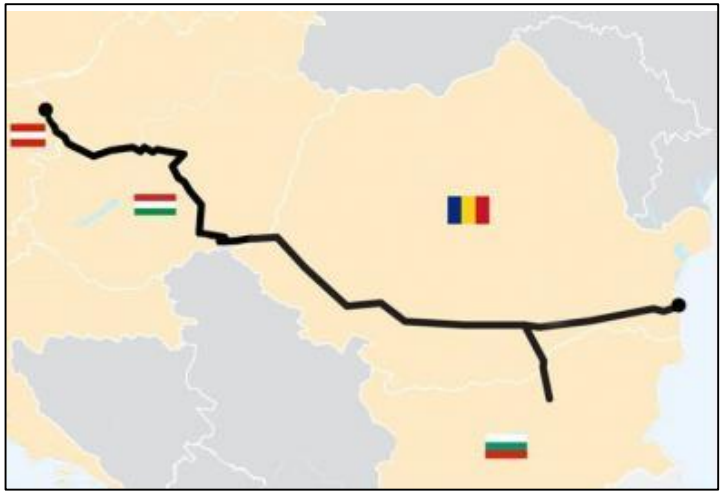
IAP	
Length	540 km
Diameter	32-inch (813 mm) pipes
Capacity	up to 5 bcm/y
Anticipated Operational Date	2023

Source: Independent Balkan News Agency

Vertical Corridor and BRUA (Conceptual Stage)



Source: IENE



Source: European Commission

BRUA	
Length	843 km
Diameter	32-inch (813 mm) pipes
Capacity	.5 bcm/y transport capacity towards Bulgaria and 4.4 bcm/y towards Hungary
Anticipated Operational Date	2023

Interconnector Greece-FYROM (IGF) (Conceptual Stage)

IGF	
Length	115 km
Capacity	1.5 bcm/y
Anticipated Operational Date	2020

Sources: ENTSO-G map and ECA recommendations

South Kavala Underground Gas Storage (Conceptual Stage)

Source: ENTSO-G

South Kavala UGS	
Storage Facility Type	Aquifer
Capacity	0.36 bcm/y
Anticipated Operational Date	2022

Current Expansion of Revithoussa LNG Terminal (2nd Upgrade)

Source: DESFA

Expansion of Revithoussa LNG	
Capacity	**Storage capacity:** 225.000 m3 (currently, 130.000 m3) **Max Ship size:** 260.000 m3 (currently, 140.000 m3) with the addition of a 3rd tank
Anticipated Operational Date	2018

Existing Land-based and FSRU Terminals in SE Europe

Country	Terminal	Start	Storage	Regasification capacity/year	Owners	Concept
Greece	Revithoussa	2000	130,000 m^3 LNG	5.0 billion m^3	DESFA (100%)	Onshore
Turkey	Aliaga LNG	2006	280,000 m^3 LNG	6.0 billion m^3	Egegaz (100%)	Onshore
	Marmara Ereglisi	1994	255,000 m^3 LNG	8.1 billion m^3	Botas (100%)	Onshore
	ETKI LNG	2017	145,000 m^3 LNG	7.1 billion m^3	Etki Liman Isletmeleri Dolgalgaz Ithalat ve Ticaret (100%)	FSRU
	Botas-Dörtyol	2017	131,000 m^3 LNG	5.3 billion m^3	Botas (100%)	FSRU

Source: IENE

Planned FSRU Terminals in SE Europe

Country	Location	Storage capacity (cm)	Annual capacity (bcm)	Technology
Croatia	Krk island	2x180,000	4-6	FSRU
Greece	Alexandroupolis	170,000	5.5-8.3	FSRU
Turkey	Gulf of Saros	70,000	5-6	FSRU

Source: IENE

Total Estimated Cost of Selected Gas Infrastructure Projects in SE Europe

Under Construction and Implementation Projects	Cost
TAP	$5.3 billion
TANAP	$10 billion
Turkish Stream	$11.4 billion
IGB	$200 million
Total	**$26.9 billion**

Source: IENE

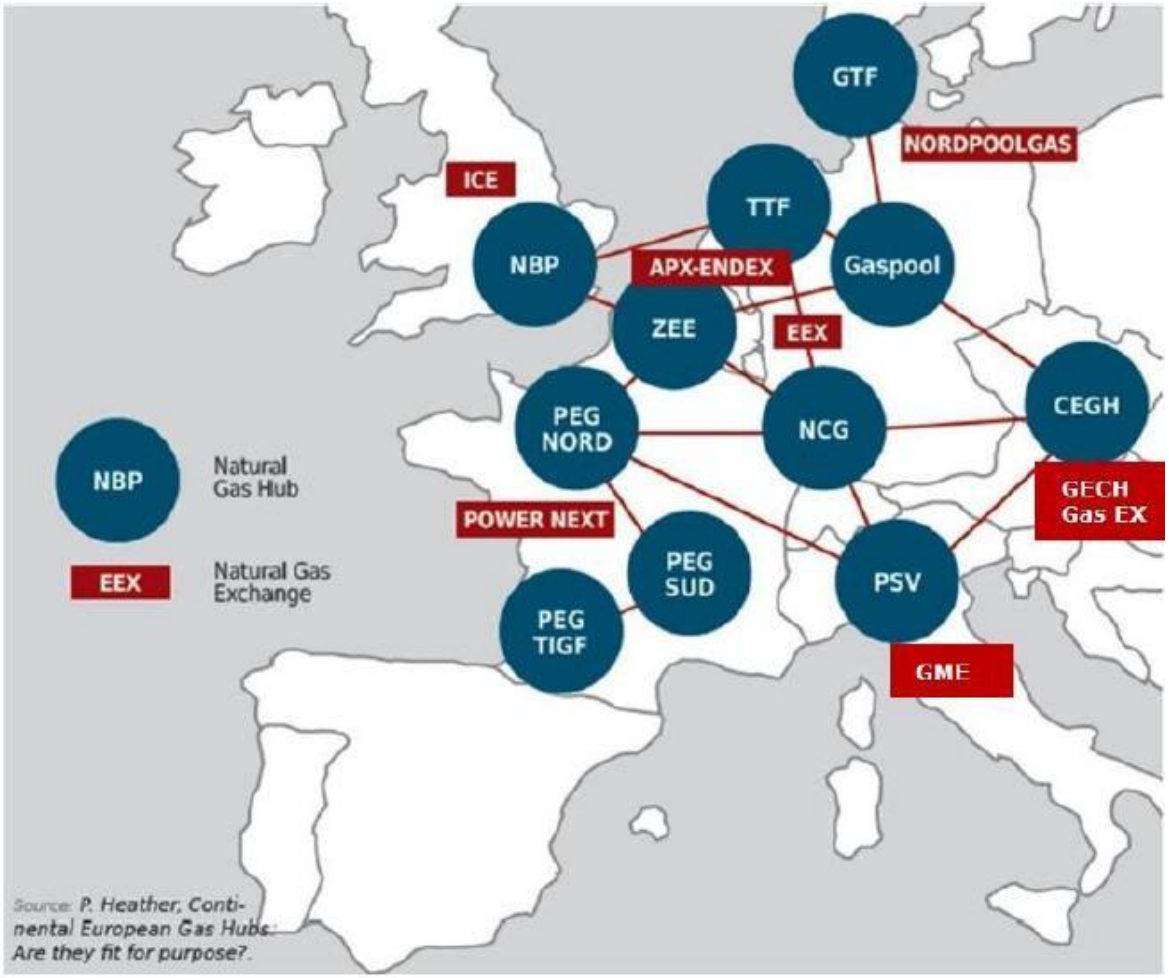
Projects At Conceptual Stage	Cost
IAP	$600 million
IGI Poseidon	$1 billion
IGF	$200 million
East Med	$7 billion
BRUA Corridor	$450 million
South Kavala UGS	$400 million
Alexandroupolis FSRU	$350 million
Total	**$10.0 billion**

Source: IENE

- The total estimated cost of selected gas infrastructure projects in SE Europe stands at **about $37 billion or €30 billion**.
- **All these projects will have a very strong combined character and the expanded South Corridor can play an important role in SE Europe and in Europe generally with Greece and Turkey being its major "operators".**

European Gas Hubs and Exchanges

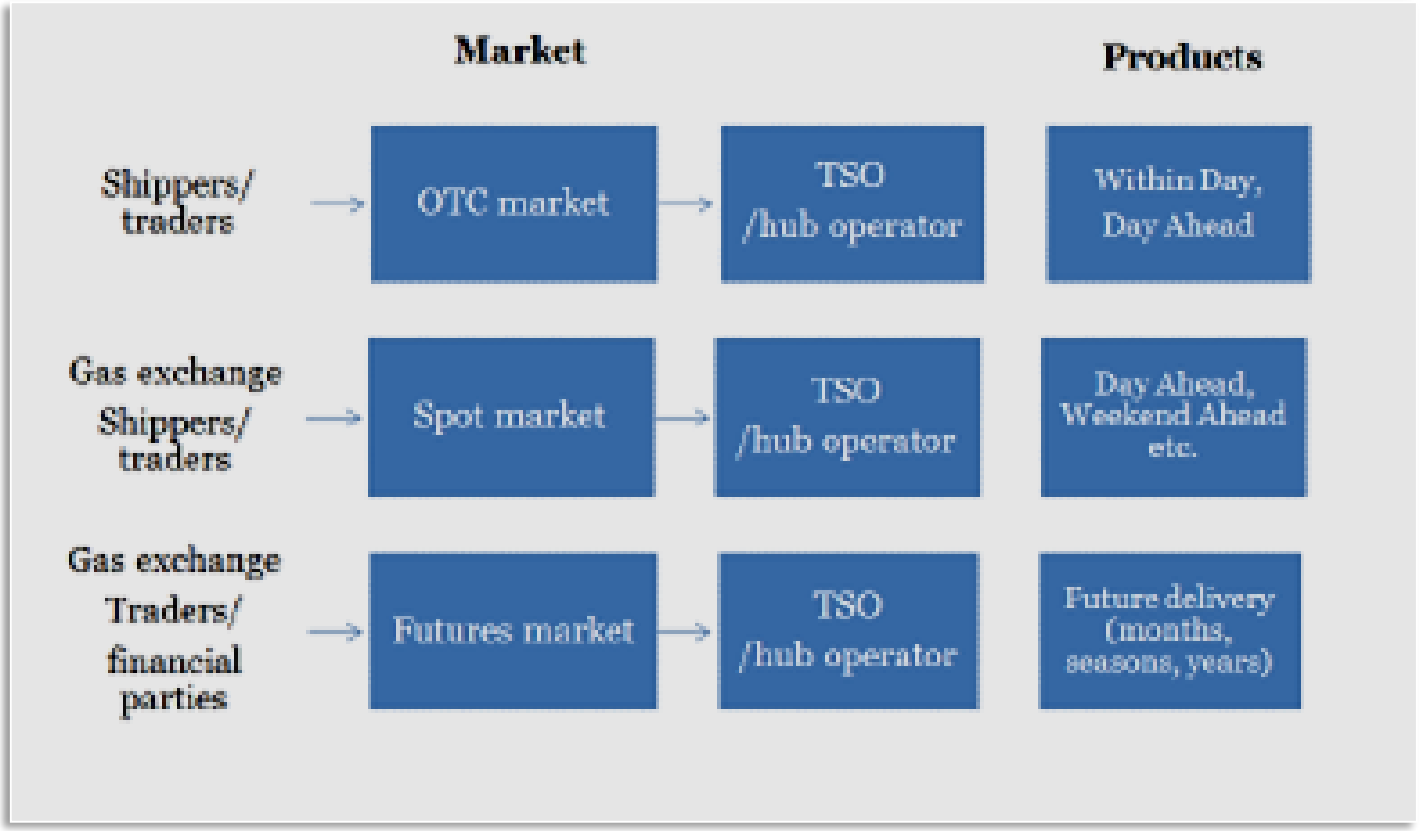
- Today, there is not a single gas trading hub east and south east of Vienna whose CEGH could act as a pivot for organizing gas trading in this region.



Creating A Natural Gas Trading Hub in SE Europe

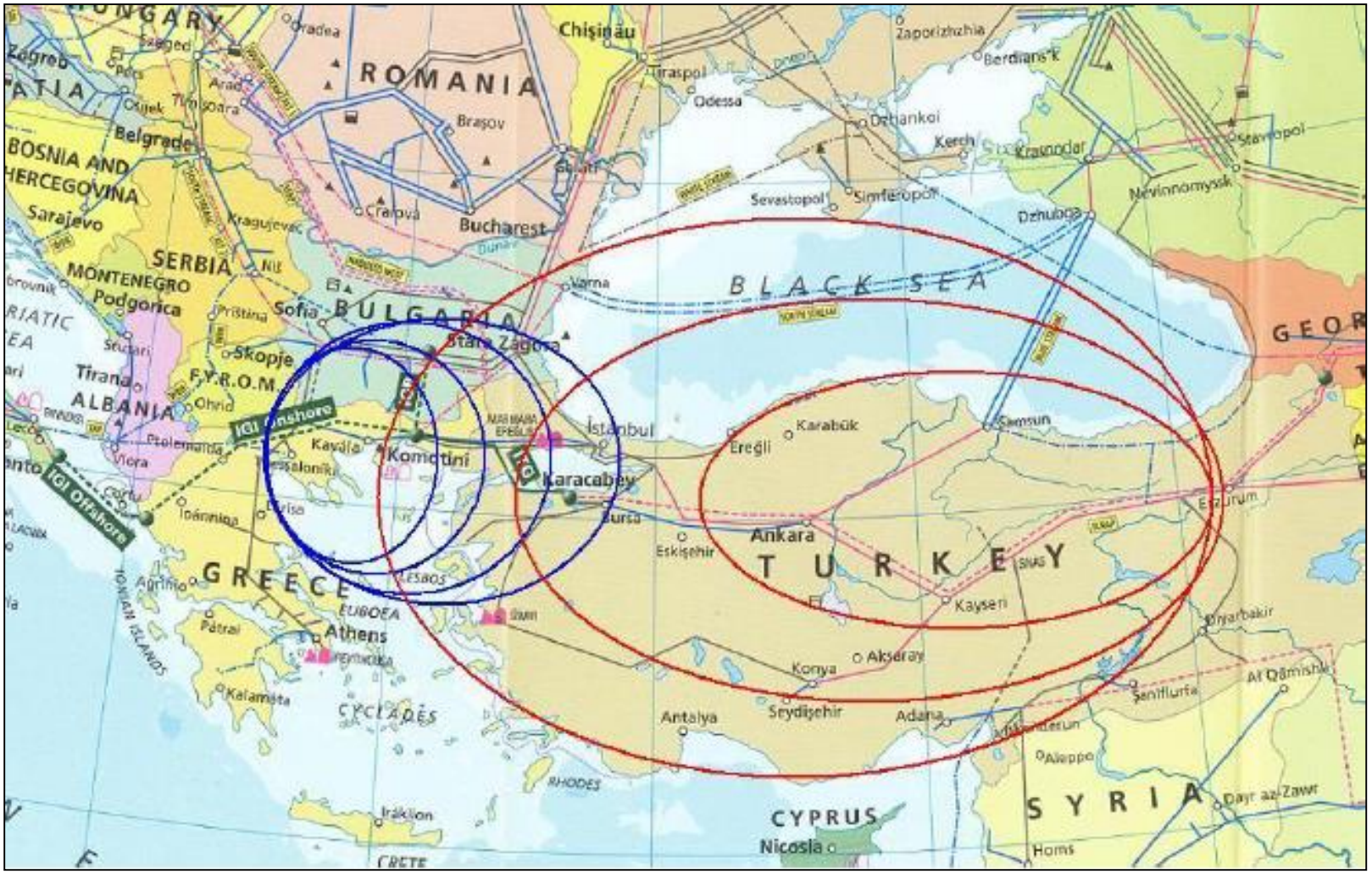
- As gas volumes increase in SE Europe attracting more market players, there is a need for the establishment of a gas trading hub.
  - This will facilitate **gas supply and demand to meet in a marketplace** by providing a platform for physical and/or financial transaction.
  - It will **enable competitive markets to function**, even though it will probably have an administrative role in the beginning of its operation.
- Although it is difficult, at this stage, to **predict market behaviour** and **impact on spot prices**, once the hub enters full operation, based on European hub operation experience, one could safely assume that **spot prices determined through hub trading will be lower than oil-indexed ones**.
- Once the interconnections are in place and an effective gas exchange mechanism exists, traders would be willing to buy available gas, which will become available from main gas importers, by placing bids through the "hub" for both physical quantities and gas futures. Such trading activity will inevitably lead to the **formation of a new climate of competitive prices**, exerting pressure on traditional suppliers to revise their contract prices.
- IENE has carried out a detailed study (2014) for the establishment of a gas trading hub in SE Europe. The findings indicate that there is scope for the operation of such hubs in Greece and Turkey to be linked with existing and planned Energy Exchanges in the region.

Proposed Hub Design



Source: IENE study, "The Outlook For a Natural Gas Trading Hub in SE Europe", (M19), Athens, September 2014

Gas Hubs in Greece and Turkey Can Coexist



Source: IENE study, “The Outlook For a Natural Gas Trading Hub in SE Europe”, (M19), Athens, September 2014

Some Further Thoughts Concerning the Expanded South Corridor Concept

- How feasible and desirable is to discuss an integrated approach at this stage? Can we anticipate some form of cooperation between the main gas suppliers and pipeline operators?
- It seems that we do not have as yet a clear picture of Azerbaijan's long term supply capability. Hence, the gas supply situation of the TANAP-TAP system needs to be clarified.
- On the other hand, we have a far better prognosis of Russian gas supplies to be channeled through Turkish Stream.
- LNG can play a balancing role in securing the flow of steady gas volumes through the Expanded South Corridor.
- Can Greece (in cooperation with Turkey?) play a logistics support role in coordinating gas flows through an enlarged South Corridor?

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Thank you for your attention

www.iene.eu

cstambolis@iene.gr