Gas Prospects in SE Europe

USAID/USEA Electricity Market Initiative (EMI) Working Group meeting

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INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE

The SE European Region as Defined by IENE

Core countries

- Albania
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- Cyprus
- Greece
- Hungary
- Israel
- Kosovo
- Montenegro
- North Macedonia
- Romania
- Serbia
- Slovenia
- Turkey

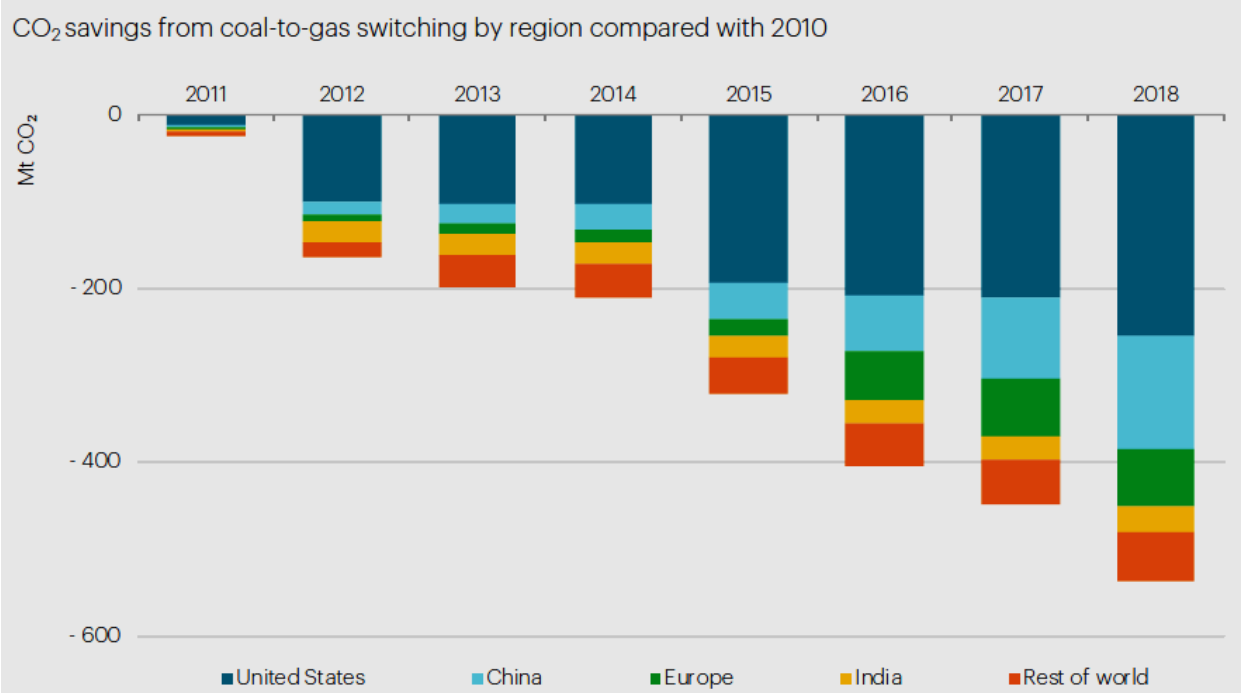
Peripheral countries

- Austria
- Egypt
- Italy
- Lebanon
- Moldova
- Slovakia
- Syria
- Ukraine

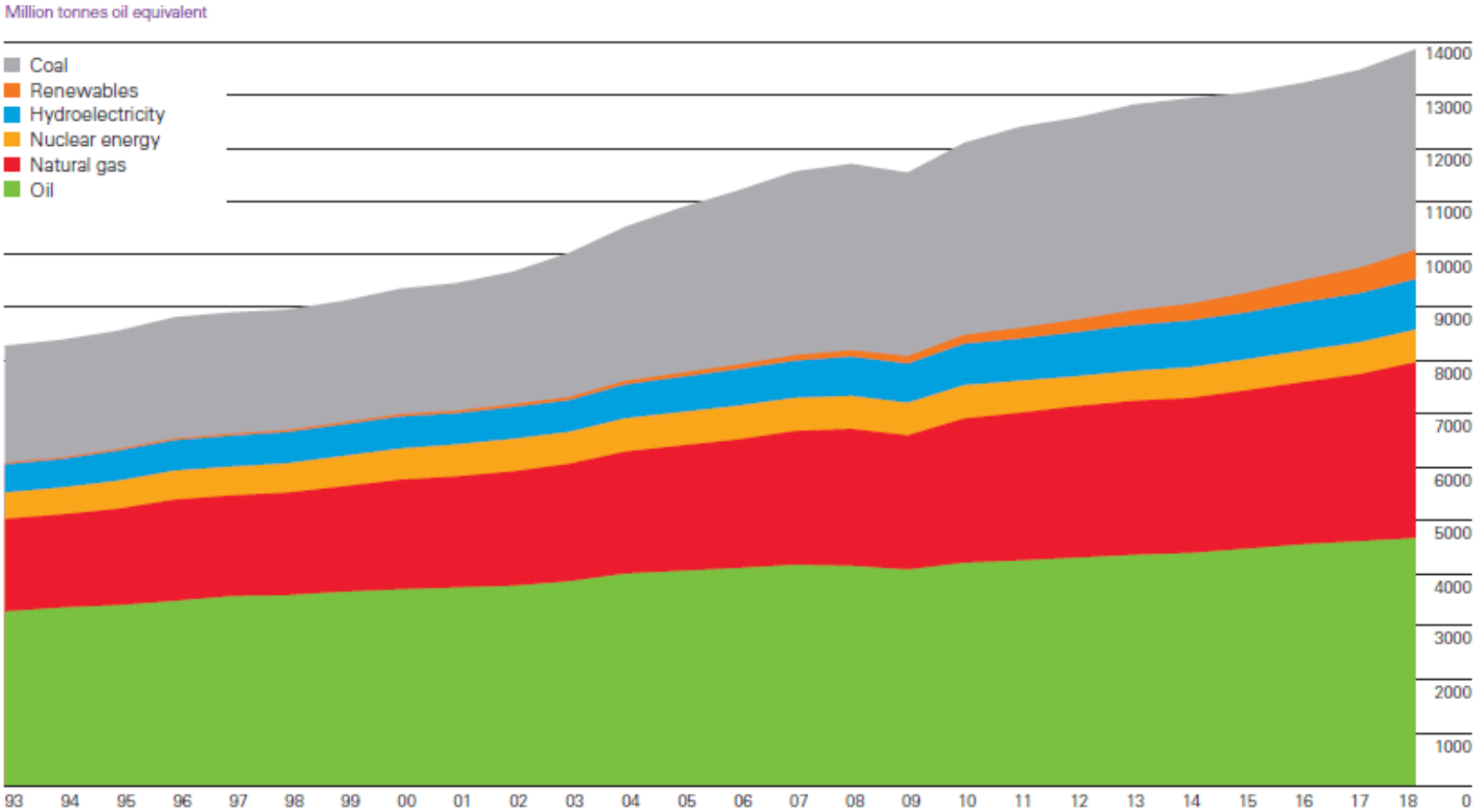
Source: IENE

The Role of Gas in Global Energy Transition

- Natural gas is one of the mainstays of global energy: worldwide consumption is rising rapidly and in 2018 gas accounted for almost half of the growth in total global energy demand. Gas plays many different roles in the energy sector and, where it replaces more polluting fuels, it also reduces air pollution and limits emissions of carbon dioxide.
- IEA found that switching to natural gas has already helped to limit the rise in global emissions since 2010, alongside the deployment of renewables and nuclear energy and improvements in energy efficiency.

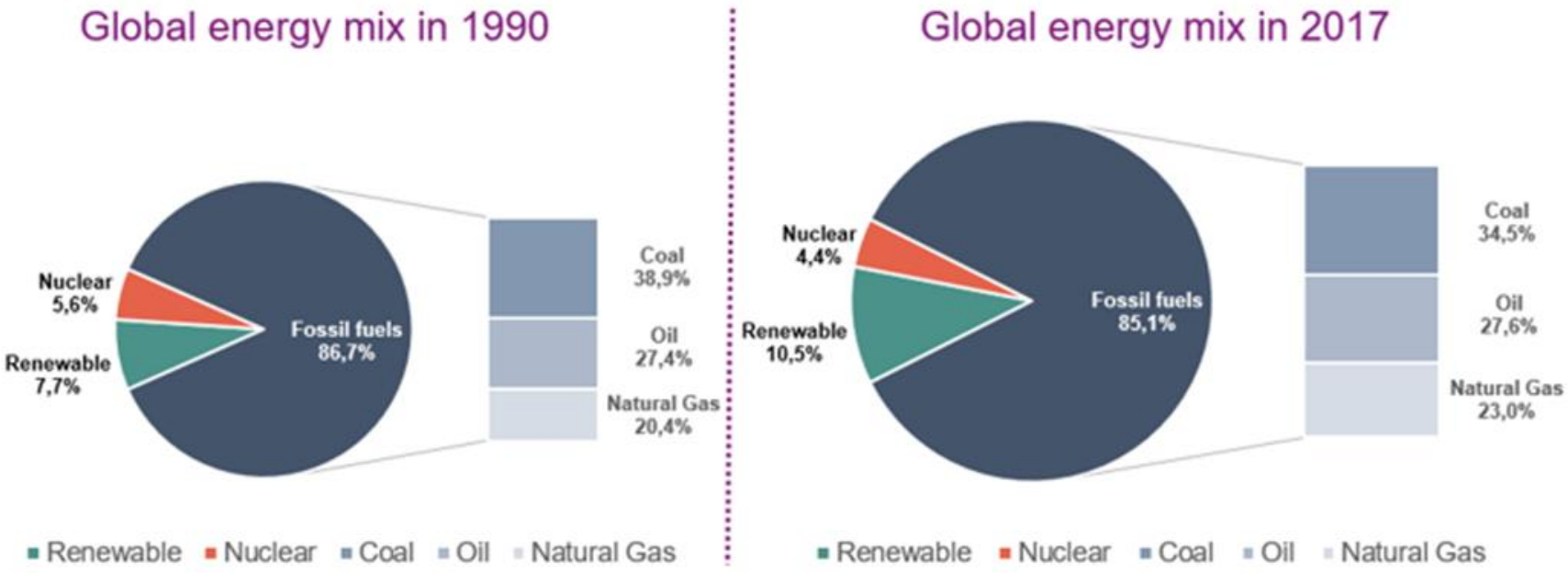


World Energy Consumption



Source: IEA

The Evolution of the Global Energy Mix (1990 and 2017)



Sources: Edmond de Rothschild Financial Group, IEA

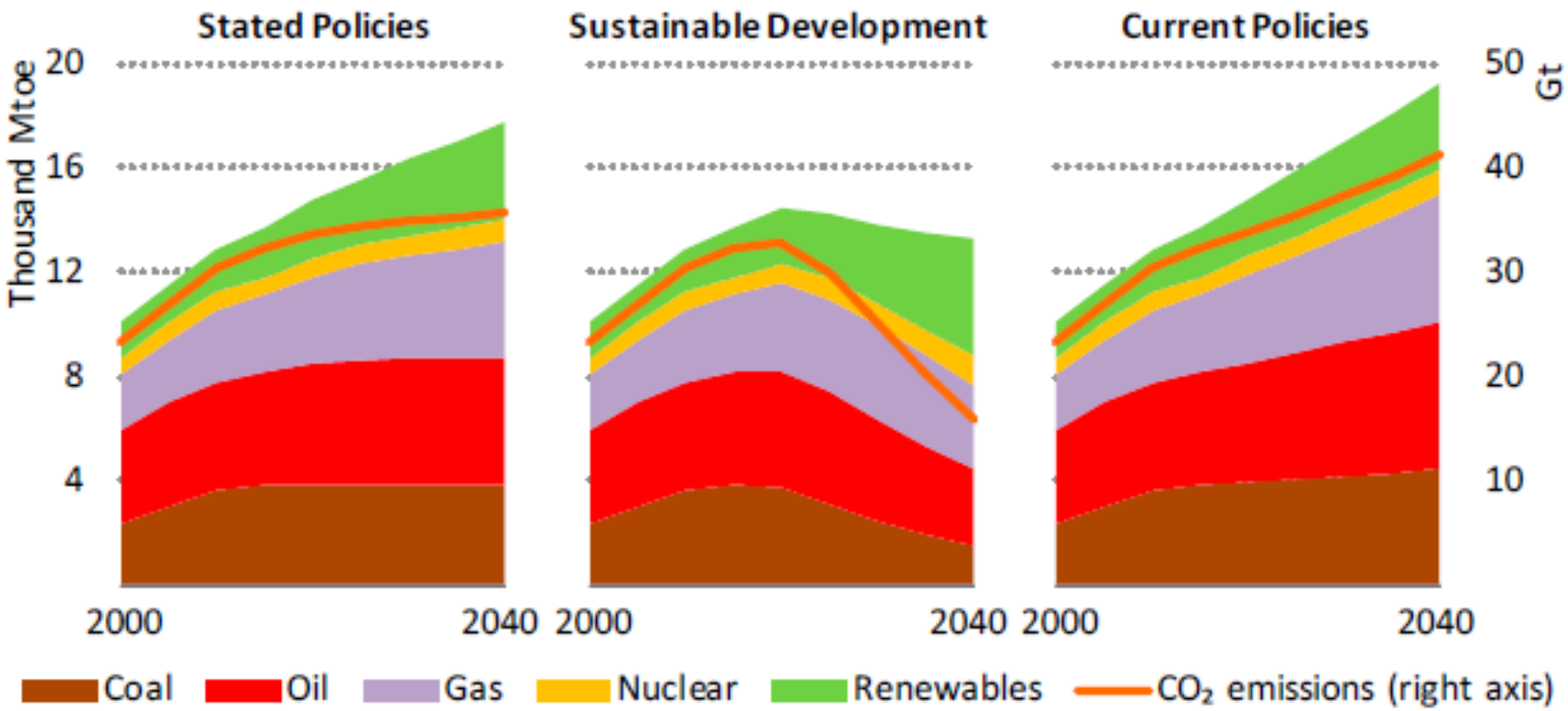
World Primary Energy Demand by Fuel and Scenario (Mtoe)

			Stated Policies		Sustainable Development		Current Policies	
	2000	2018	2030	2040	2030	2040	2030	2040
Coal	2 317	3 821	3 848	3 779	2 430	1 470	4 154	4 479
Oil	3 665	4 501	4 872	4 921	3 995	3 041	5 174	5 626
Natural gas	2 083	3 273	3 889	4 445	3 513	3 162	4 070	4 847
Nuclear	675	709	801	906	895	1 149	811	937
Renewables	659	1 391	2 287	3 127	2 776	4 381	2 138	2 741
Hydro	225	361	452	524	489	596	445	509
Modern bioenergy	374	737	1 058	1 282	1 179	1 554	1 013	1 190
Other	60	293	777	1 320	1 109	2 231	681	1 042
Solid biomass	638	620	613	546	140	75	613	546
Total	10 037	14 314	16 311	17 723	13 750	13 279	16 960	19 177
Fossil fuel share	*80%*	*81%*	*77%*	*74%*	*72%*	*58%*	*79%*	*78%*
CO_2 emissions (Gt)	23.1	33.2	34.9	35.6	25.2	15.8	37.4	41.3

Notes: Mtoe = million tonnes of oil equivalent; Gt = gigatonnes. Other includes wind, solar PV, geothermal, concentrating solar power and marine. Solid biomass includes its traditional use in three-stone fires and in improved cookstoves.

Source: IEA

World Primary Energy Demand by Fuel and Related CO_2 Emissions by Scenario

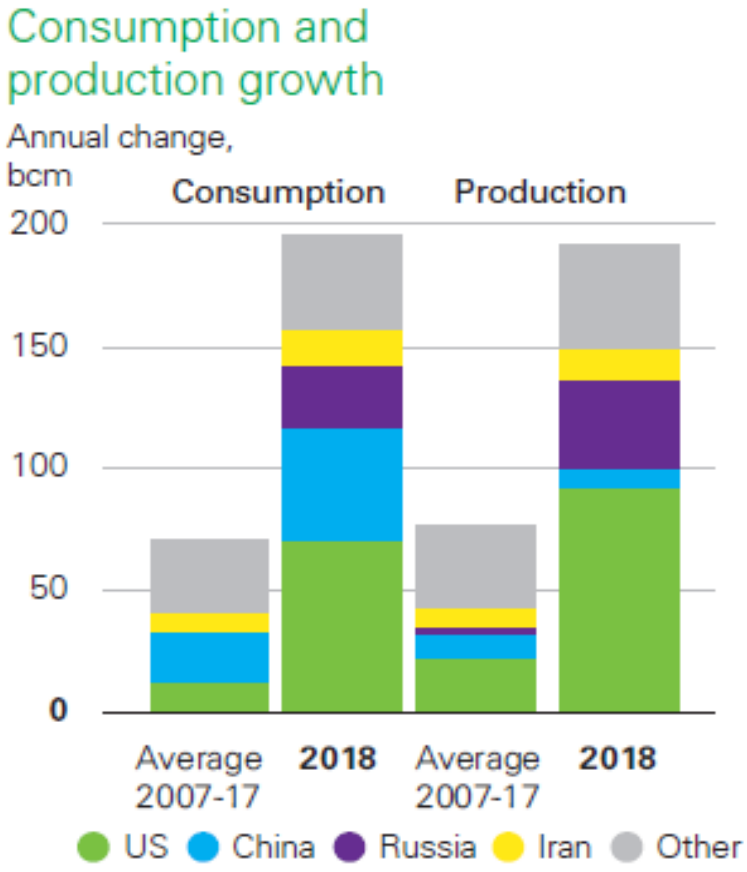


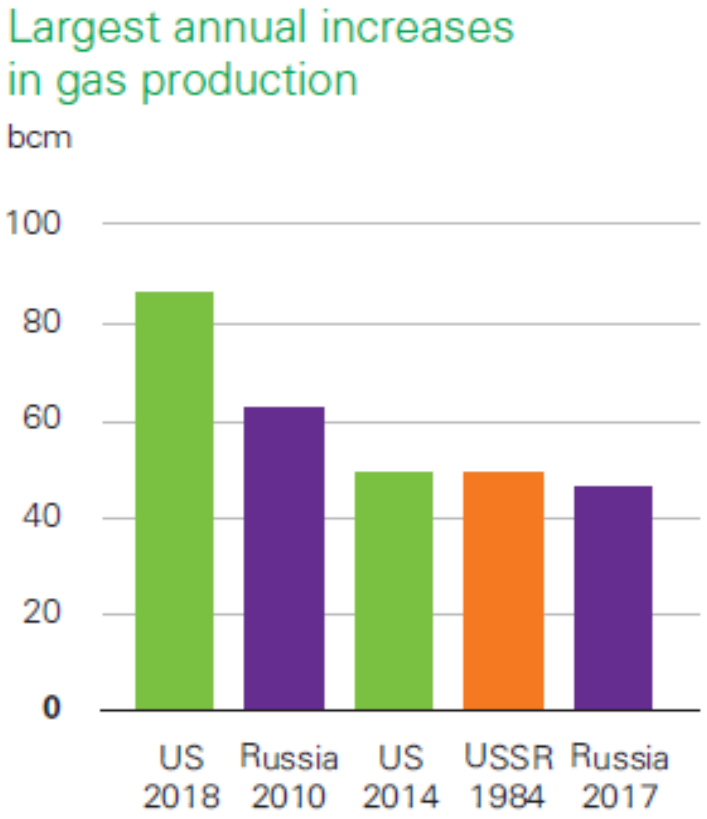
Source: IEA

Gas Remains Key in Meeting Global Energy Demand Growth and of Achieving Lower GHG Emissions

- With the exception of coal, all fuels and technologies contribute to meeting demand growth in IEA's Stated Policies Scenario (most probable) with lead taken by RES (50%) and gas (35%).
- A 60% increase in electricity demand to 2040 in the above scenario is supplied by an increasingly low carbon generation mix, based on gas and RES.
- Over the next two decades, global demand for natural gas grows more than four times faster than demand for oil in above scenario. Natural gas sees broad based growth across energy economy.
- 2018 was an exceptional good year for gas with both global consumption and production increasing by over 5%, one of the strongest growth rates in either gas demand for over 30 years.
- The main actor for this phenomenal growth was the USA, accounting for almost 40% of global gas demand growth and over 45% of the increase in production - with most of the extra production being exported as LNG.

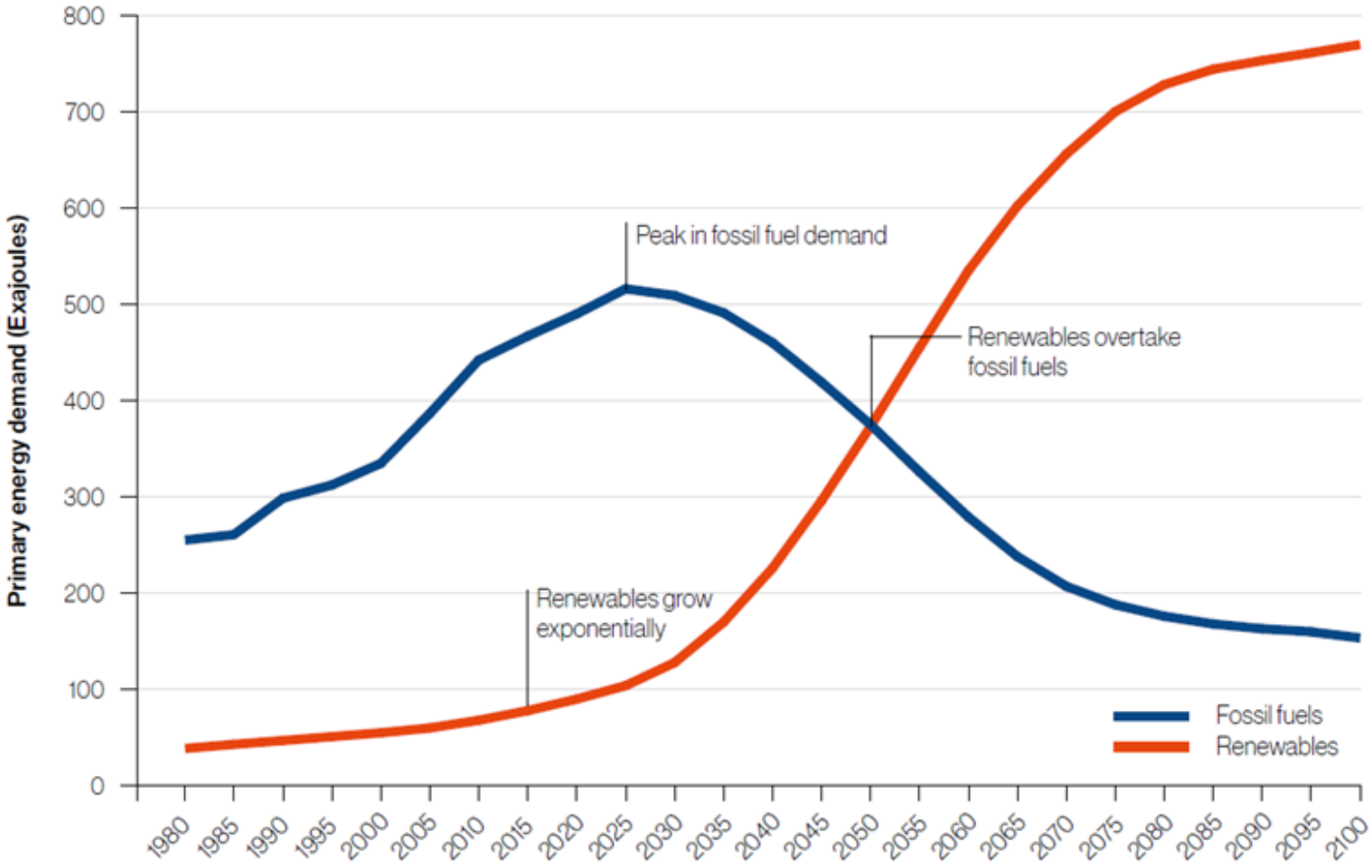
Global Gas Production and Consumption Growth





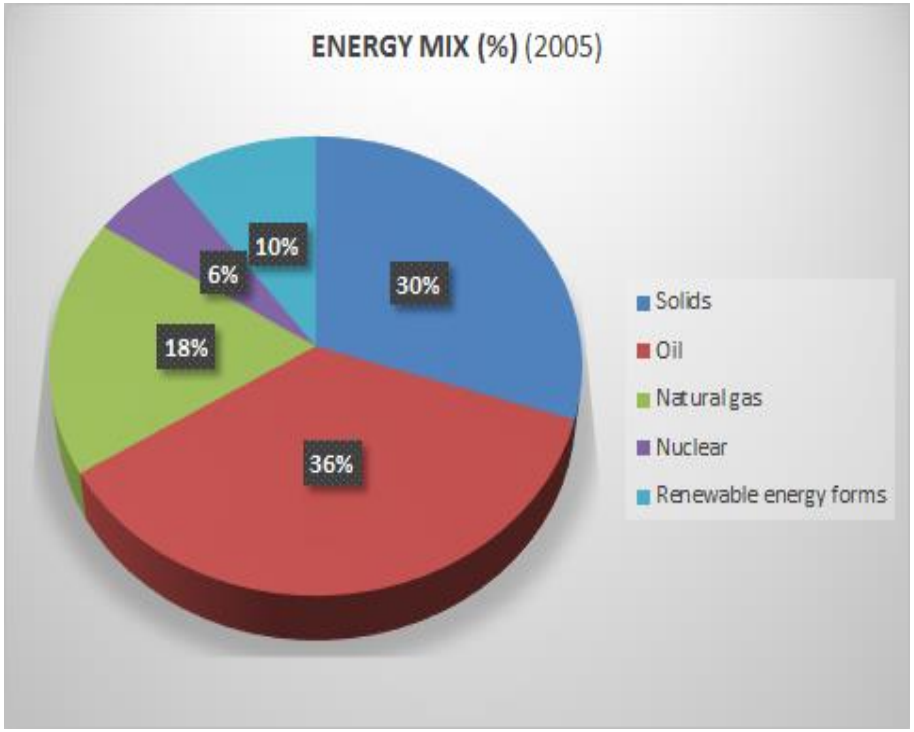
Source: BP Statistical Review of World Energy 2019

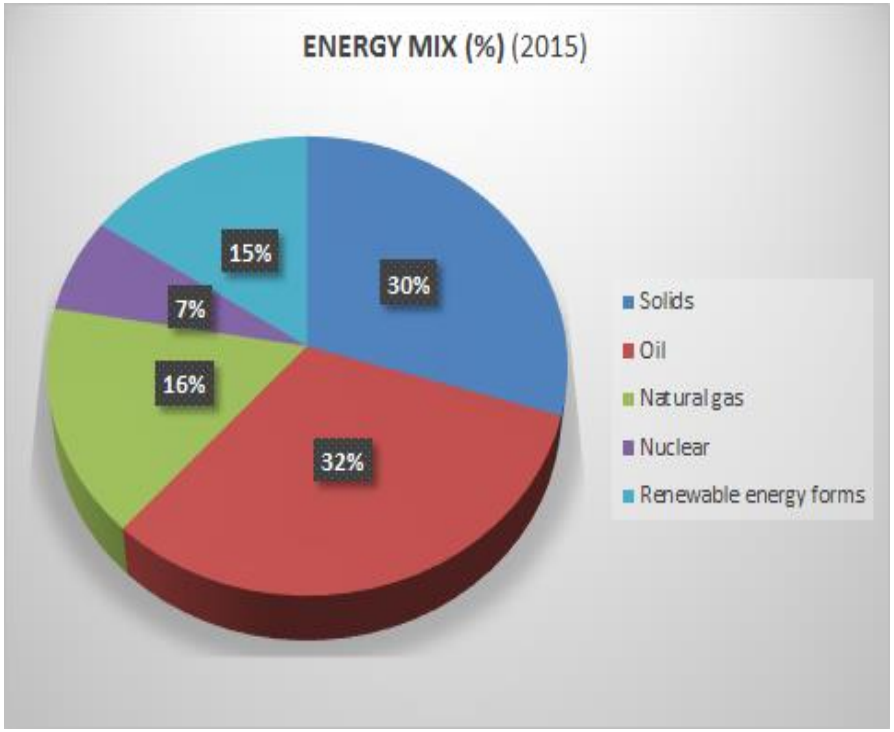
The Global Energy Transition Framework



Source: Shell Sky Scenario

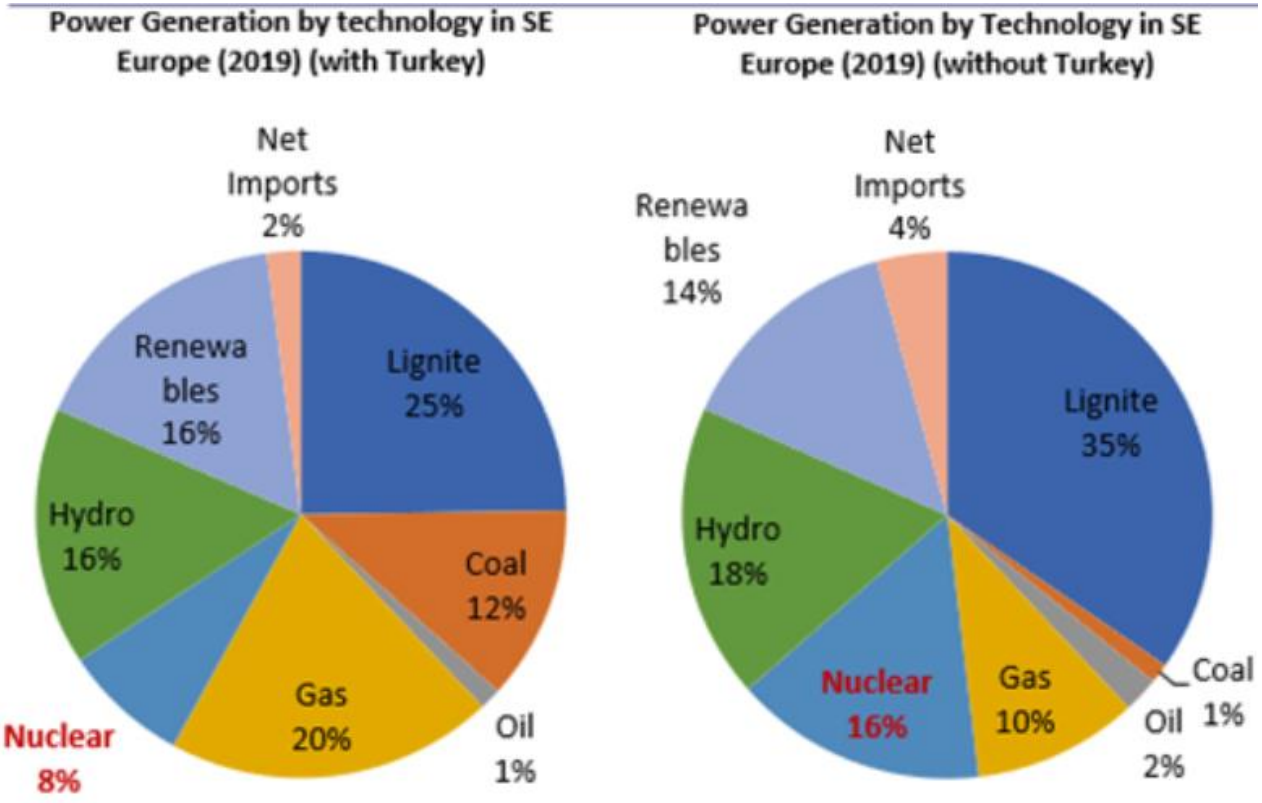
SE Europe: Gross Inland Consumption by Source, **Without Turkey** (2005 and 2015)





Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

SE Europe's Power Generation Mix, **With and Without Turkey** (2019)

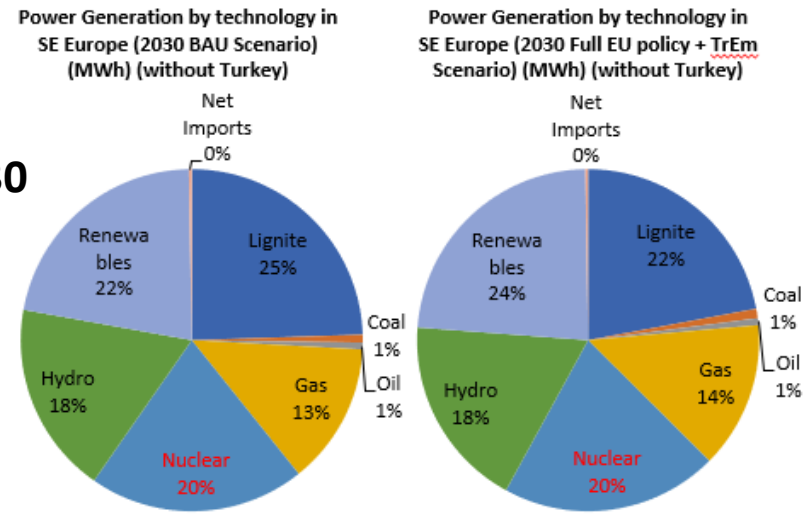


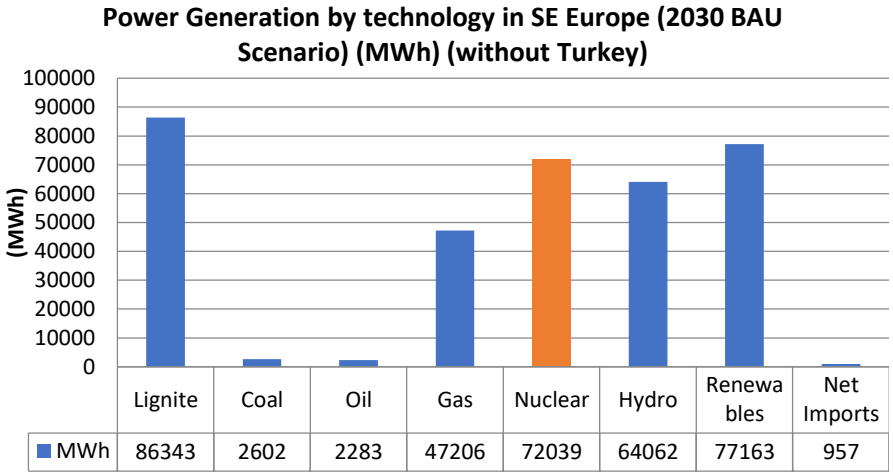
Source: IENE

Future of Power Generation in the SEE region

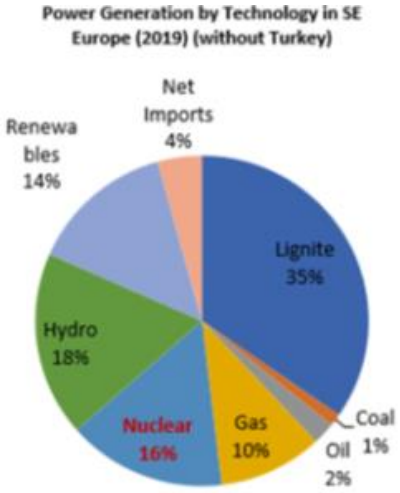
Comparison of BAU Scenario and
Full EU policy + TrEm Scenario (without Turkey)

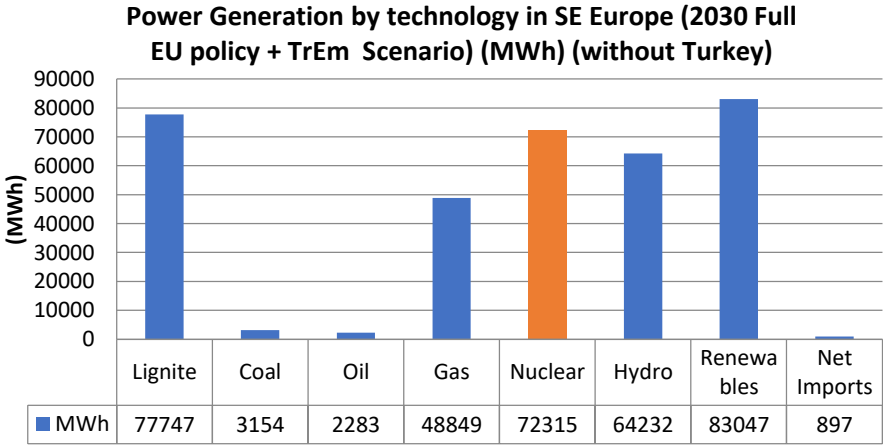
2030





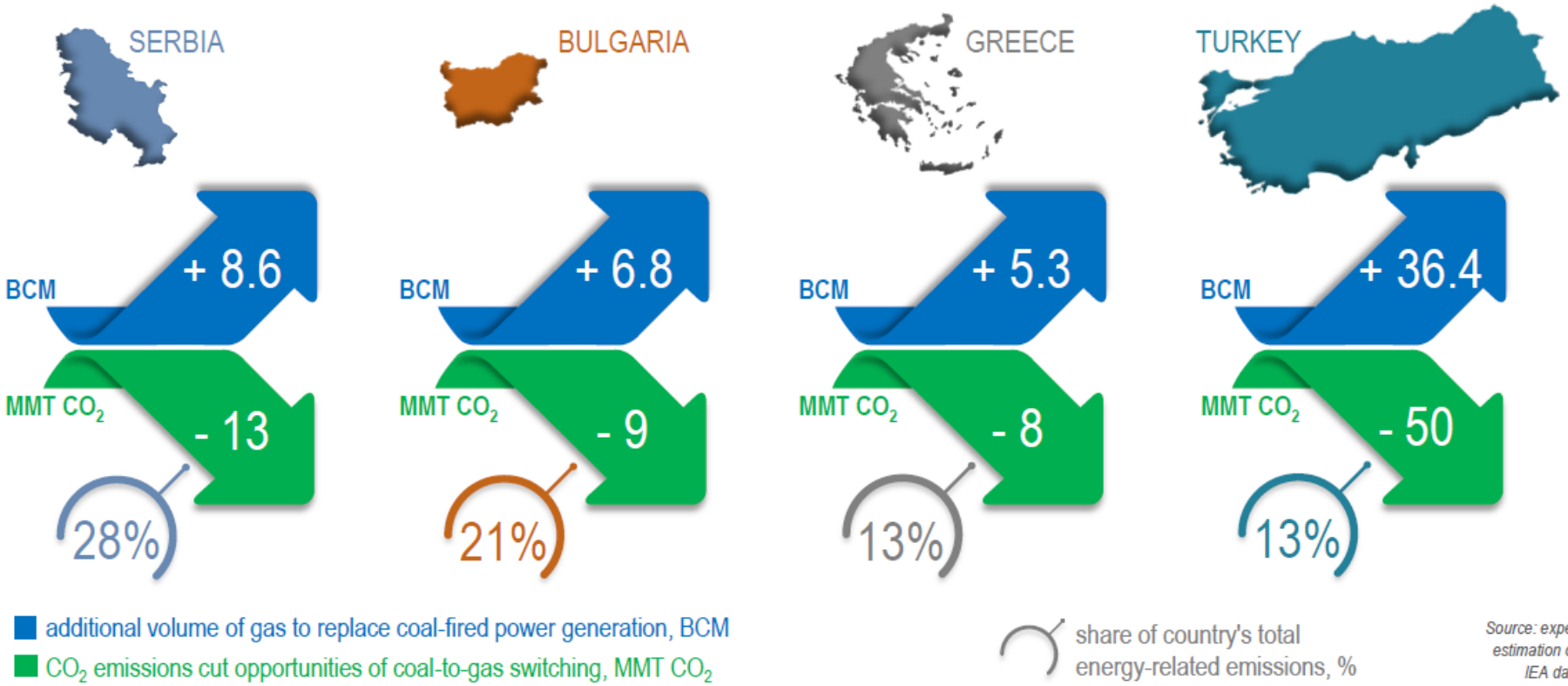
2019





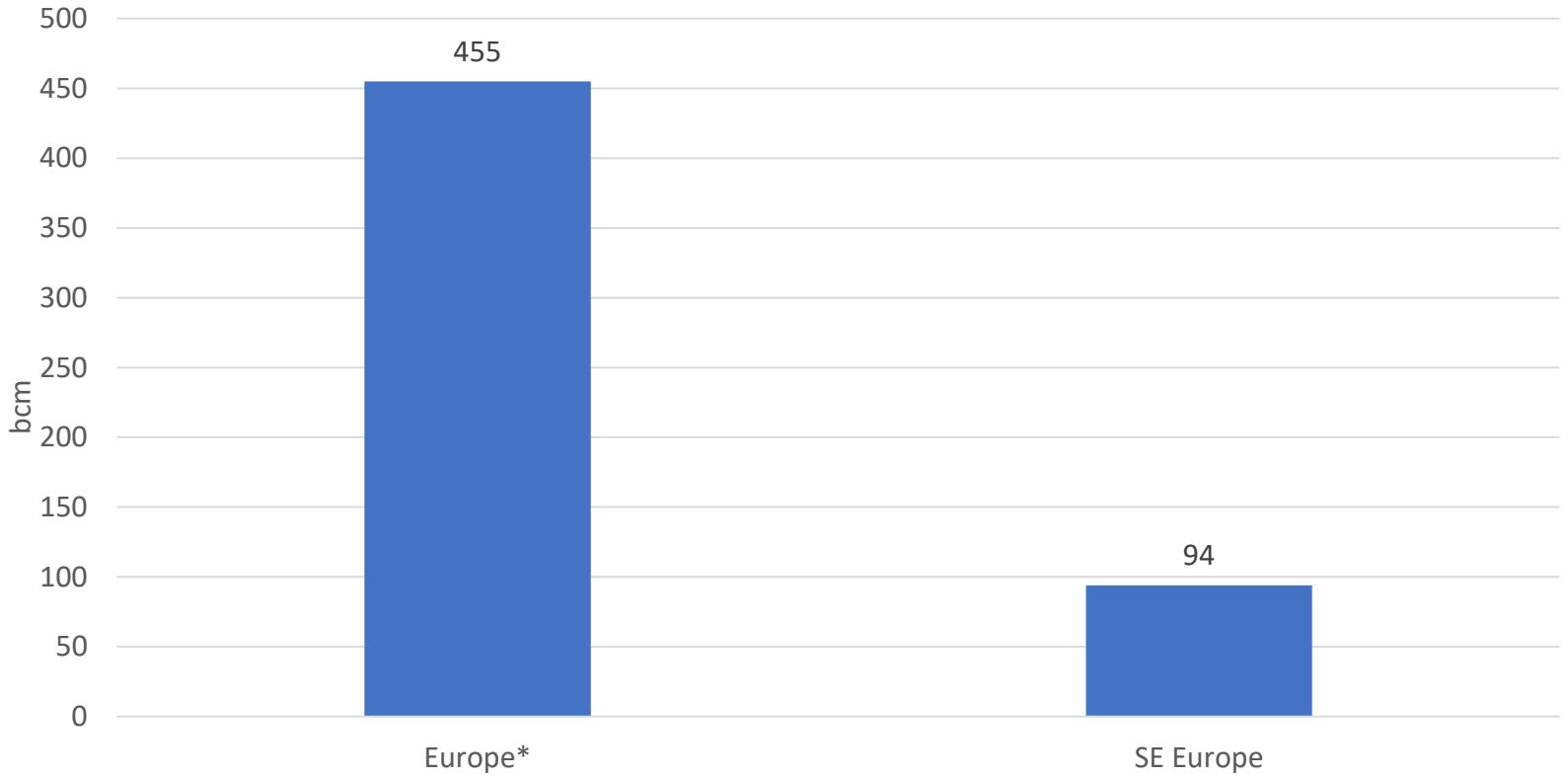
Source: IENE

Prospective Effect of Replacing Coal with Gas for Heat and Power Generation in SE Europe



Source: Gazprom

Gas Consumption in Europe and SE Europe (2018)



***Note:** Does not include Turkey

Source: BP Statistical Review 2019

Major Developments in SE European Gas Markets

- Today, the gas sector in SE Europe faces significant challenges which are mainly related to the ongoing process of market transformation within the EU but also as a result of global developments, where the fast rise of LNG is testing market norms.
- The market structure, in terms of ownership and regulation framework, being under consideration for a long time, is currently changing in many countries. The role of the state is being reconsidered and the level of privatization and liberalization of gas markets shapes the business environment in each country, creating new opportunities for market players, especially in the retail sector.
- In the case of **Turkey**, for example, the presence of new market entities, as a result of the privatization process, illustrates the magnitude of change that the gradual introduction of competition has brought about.
- In **Greece**, where the gas market is fully liberalized, we have seen a radical shift in terms of imports, now dominated by cheap LNG, and huge changes at consumer market level.
- In the case of EU member states in SE Europe and those of the Energy Community, the main challenges include reform efforts for improving the gas market model in line with EU thinking and directives, while drawbacks can be seen in the continuing dominance in many countries' public gas markets structure, the absence of market competition and the lack of diversification of gas supply.

Major Developments in SE European LNG Markets

- LNG prospects in SE Europe and the East Mediterranean in particular are far better placed than they were five years ago, with new projects getting ready to progress and LNG clearly emerging as a priority fuel for several industrial consumer groups helped by lower prices and increased availability.
- LNG has emerged as a realistic alternative fuel in SE Europe as it increases security of supply through multiple and independent supply sources, provides the opportunity for new LNG suppliers (e.g. Australia, US, etc.) to export gas to the region, enhances pricing flexibility and safer gas transportation and can also support underperforming gas pipeline projects.
- Greece and Turkey are playing a key role in LNG supply and trade in SE Europe. Following the latest upgrade of Revithousa LNG terminal and the forthcoming Alexandroupolis FSRU, Greece is on its way to become the LNG gate for SE Europe.

Decarbonisation in SE Europe

- In the case of WB6 the priority over the next decade will be to introduce gas, along with RES in order to produce electricity more efficiently but also in helping reduce the rise of GHGE.

- Introducing gas in some countries where no gas infrastructure exists yet will be a real challenge as is the case of Albania, Montenegro and Kosovo, whereas in the case of North Macedonia and Bosnia-Herzegovina a major expansion of its gas grid will need to be undertaken.

- A big challenge in the case of Kosovo, Montenegro and Bosnia - Herzegovina, and to a lesser extent for Albania, will be the use of gas for power generation. Such a development will come about following the application of mandatory CO2 emission charges and the urge to lower generation costs from coal/lignite stations.

The Need to Differentiate Gas Supply in SEE

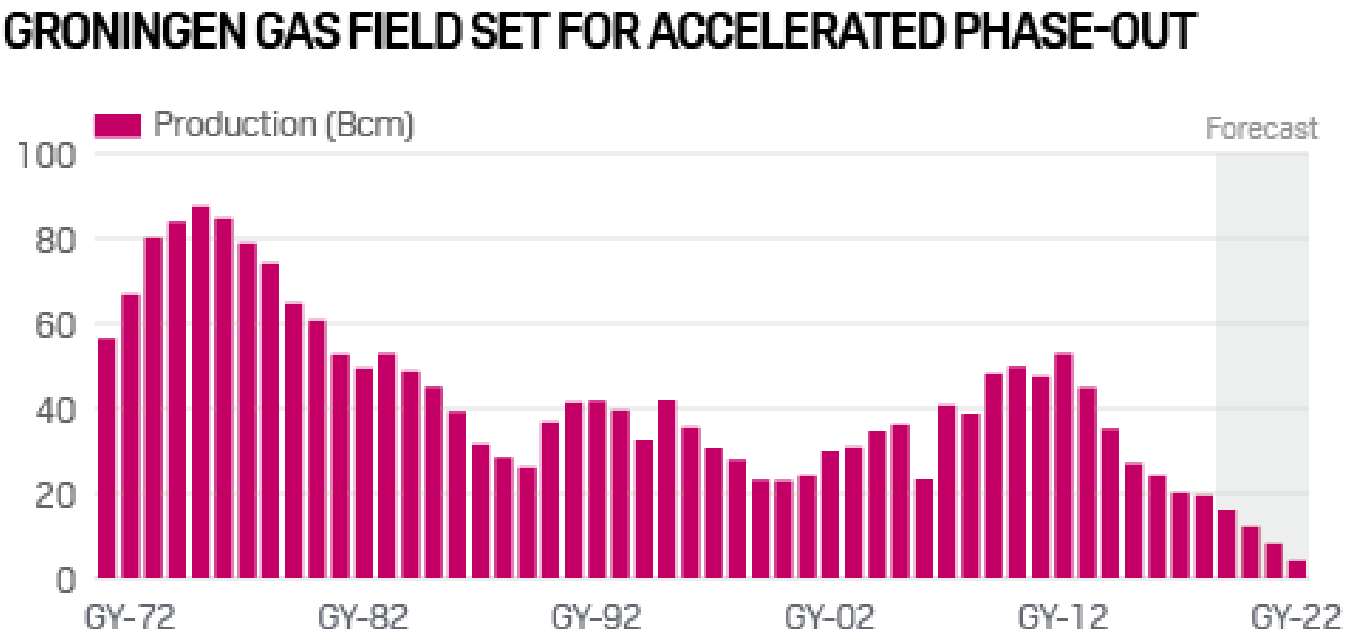
- Looking at the SEE gas supply picture (without Turkey), we see that this is dominated by gas deliveries through pipelines and gas purchase prices which are determined by oil-indexed long-term contracts.

- With the exception of Greece, where LNG was introduced in the mid 1990's, along with pipeline gas, no other country in the region has an LNG import terminal. There will soon be an FSRU family at Krk in Croatia while Greece is going ahead with plans for the introduction of two FSRU terminals, one offshore in Alexandroupolis in the north of the country and the other near Corinth in the south.

- Also, in the main European gas market, LNG is expected to play an increasingly important role as the continent will soon be facing a major gas supply gap since indigenous gas sources have entered a decline phase.

- Anticipated gas import requirements are set to increase by some 50,0 bcm/y by 2024,with total European gas imports amounting to some 60% of total gas consumption by 2025 (one of the reasons being much reduced indigenous gas production, as illustrated by the Groningen field in the Netherlands and maturity of several gas fields in the North Sea).

Netherlands to Halt Groningen Gas Production by 2022

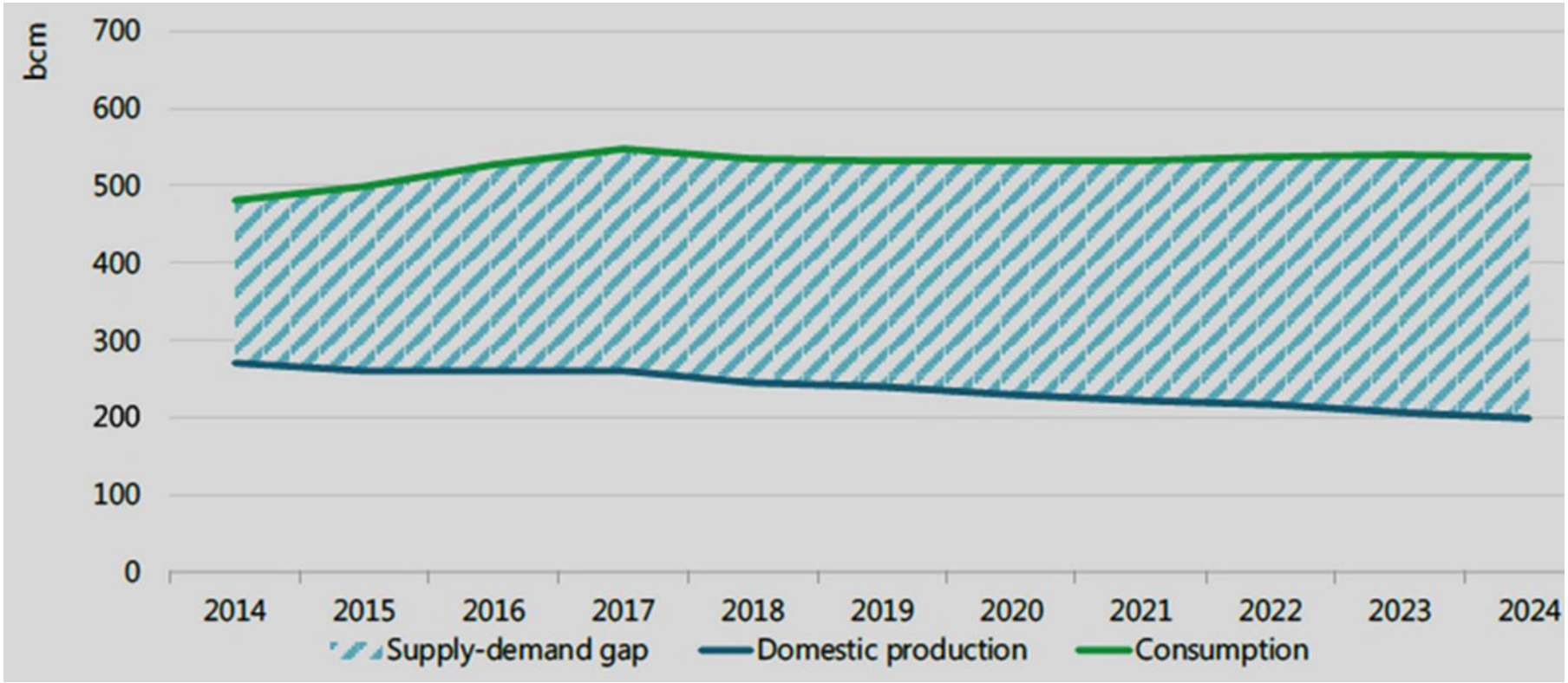


Groningen's phase-out will impact European gas trading.

Sources: S&P Global Platts, NAM

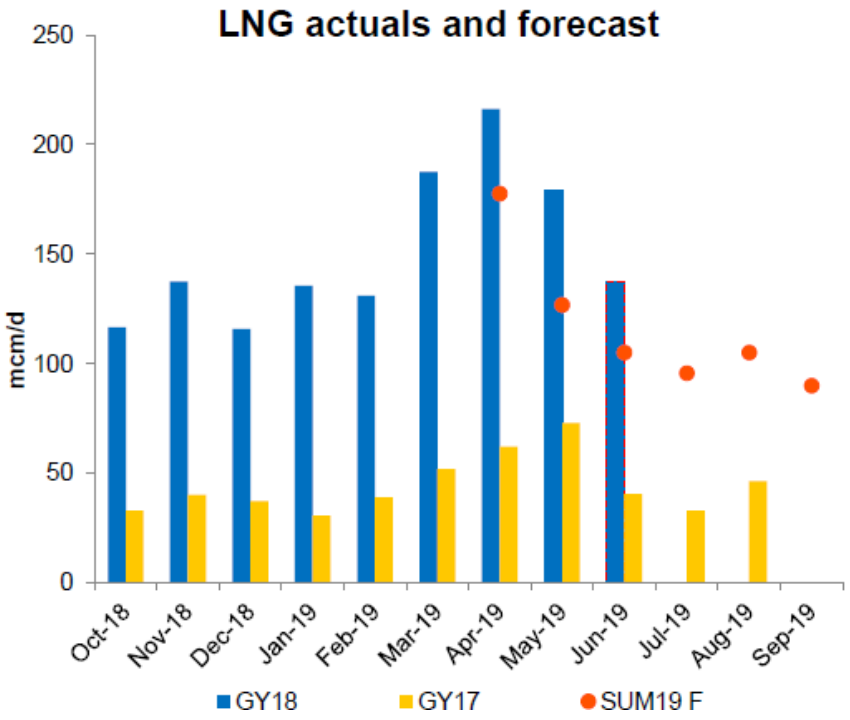
Gas Supply-Demand Gap in Europe (2014-2024)

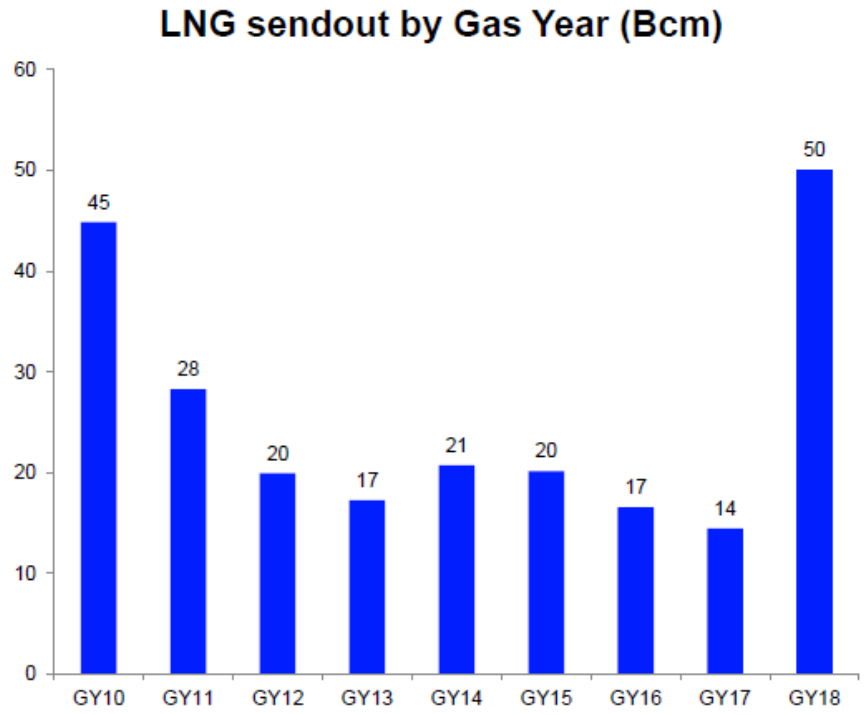
- With domestic production declining and consumption remaining flat, European gas import requirements are set to increase by almost 50 bcm/y between 2018 and 2024, reaching 336 bcm/y, based on IEA estimates.



Source: IEA

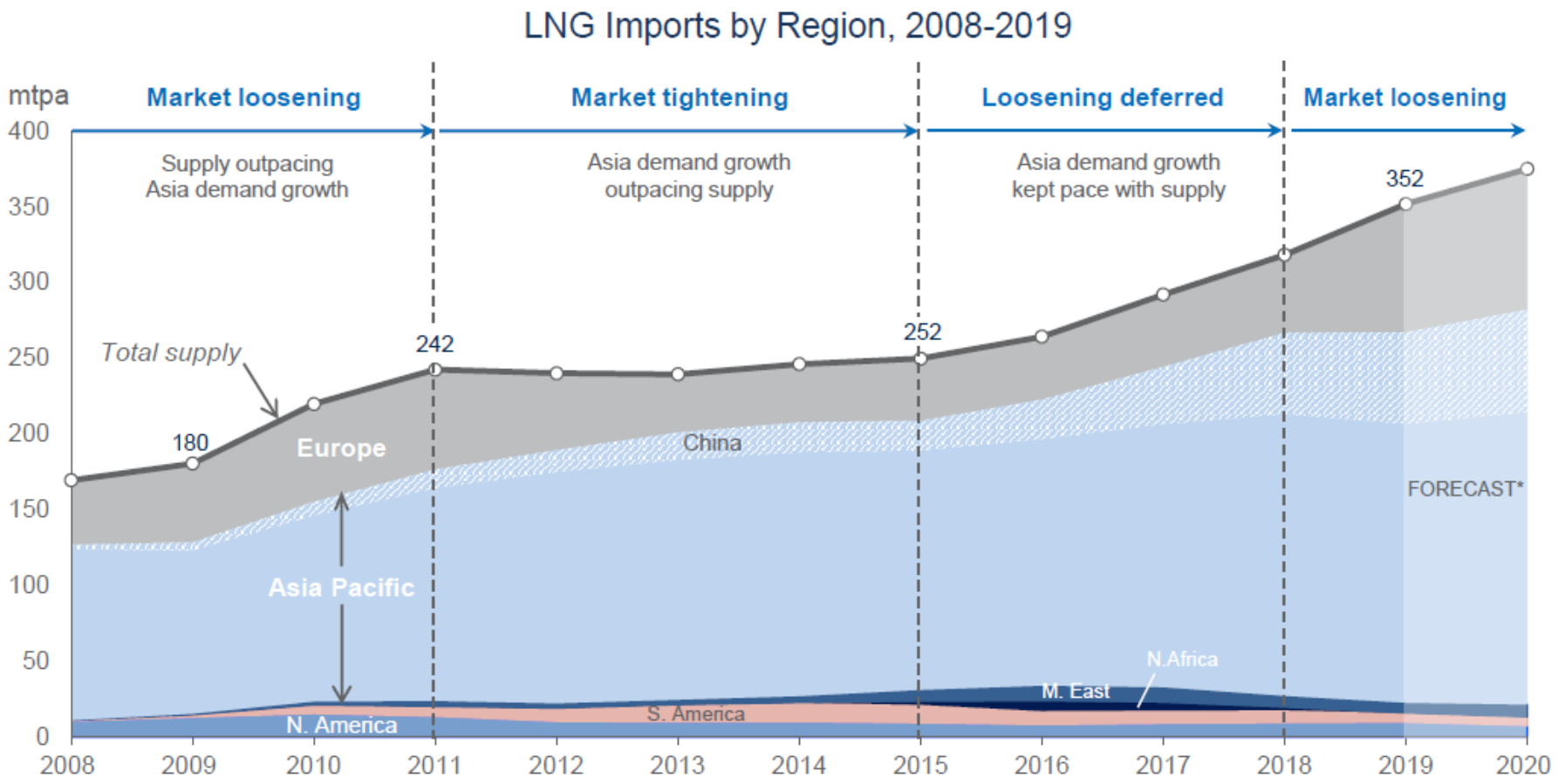
LNG to Europe at Record High Level





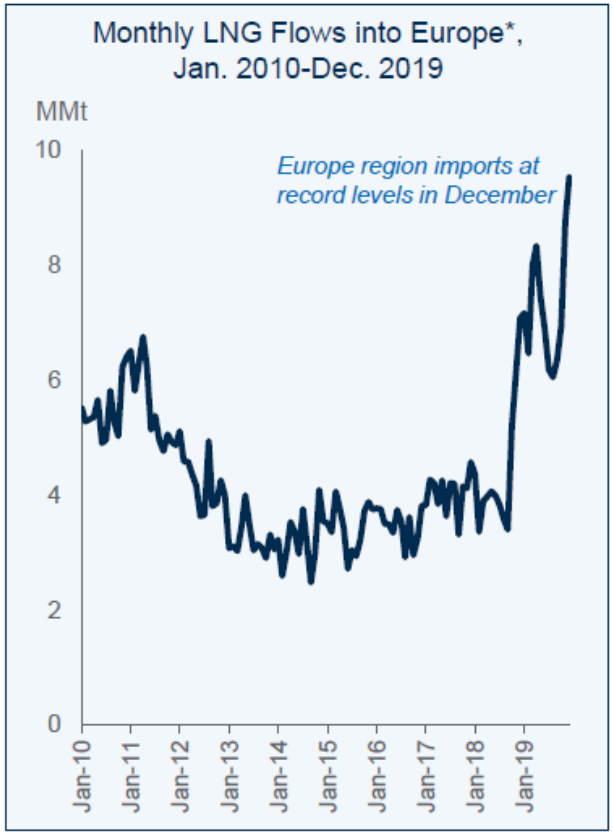
Source: Refinitiv

LNG Market Balance: 2008-2019

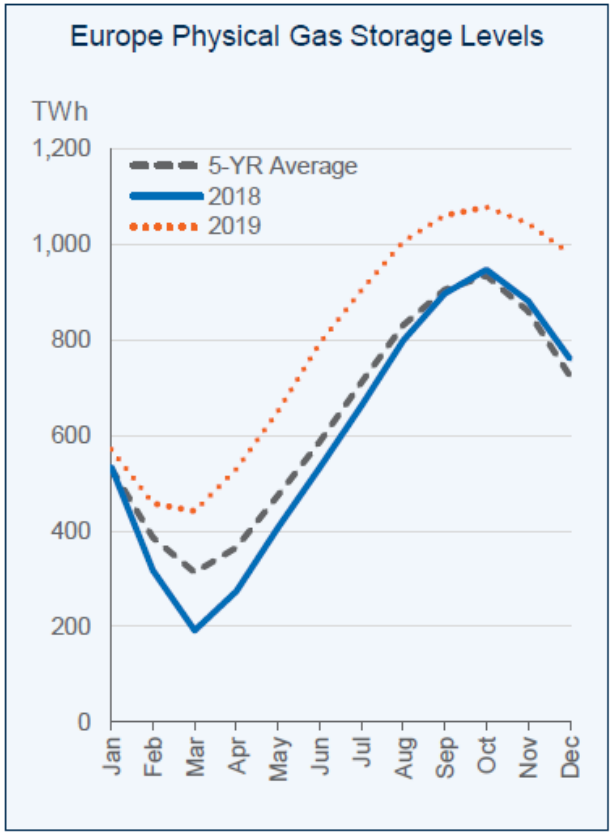


Source: Cheniere

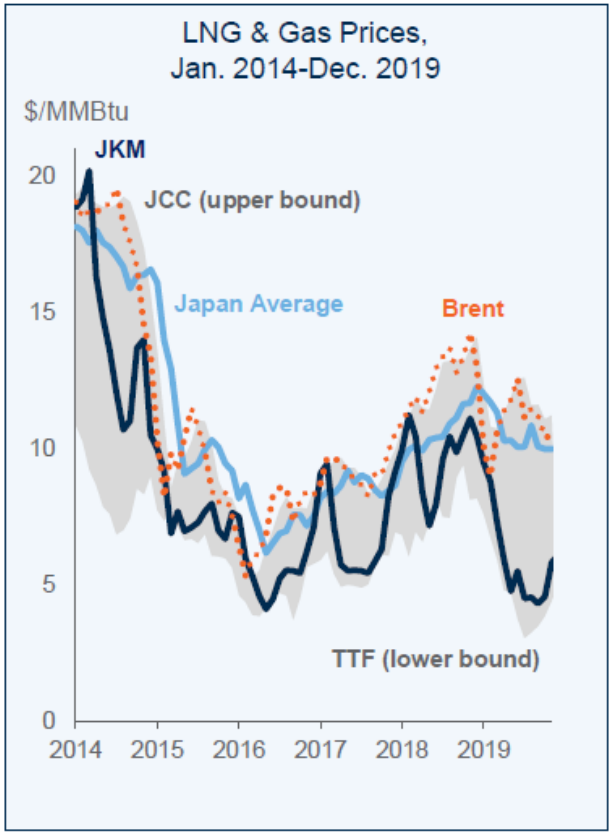
2019 Gas Volume and Price Dynamics



* Europe region includes Turkey.



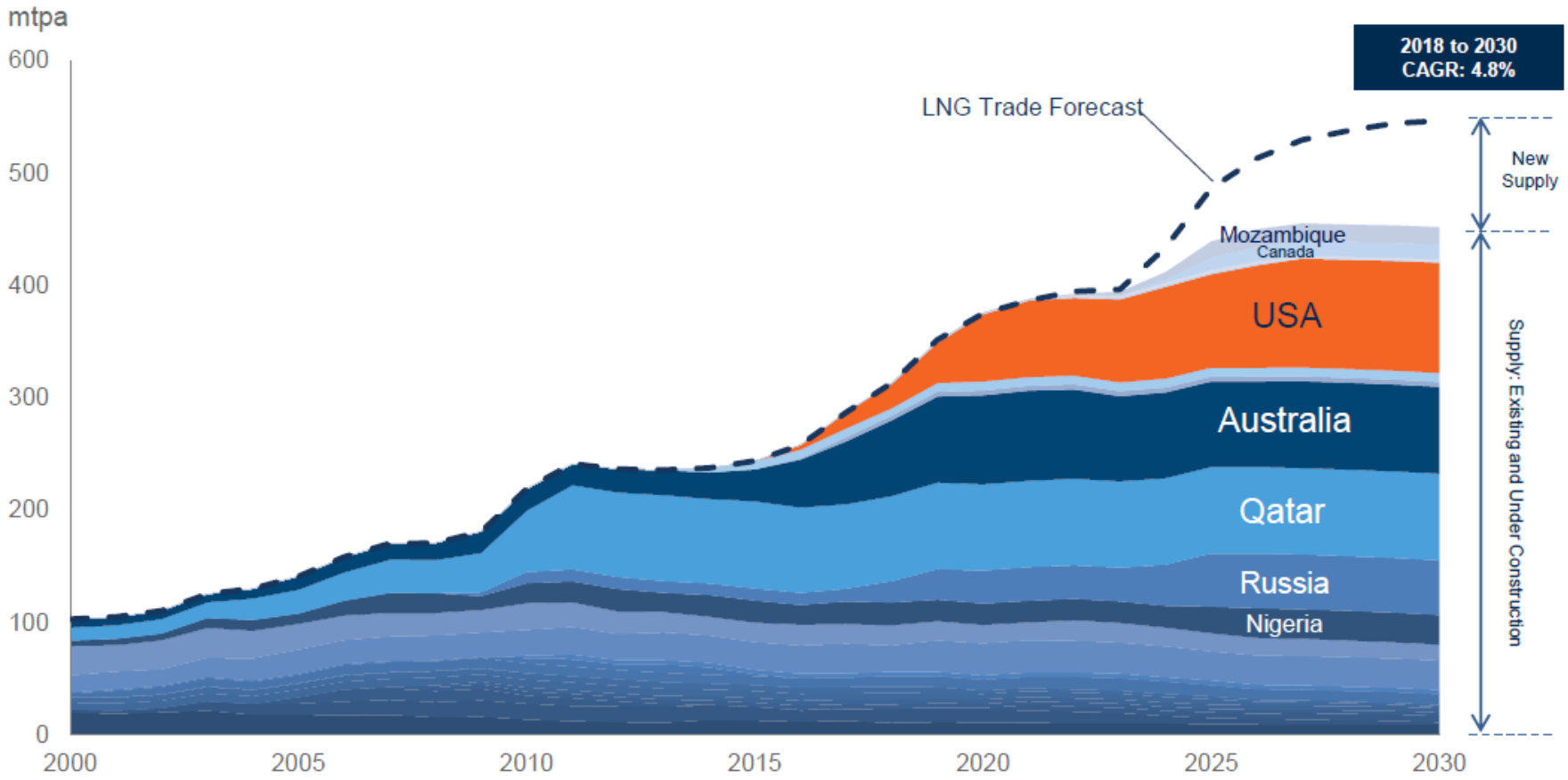
Source: Gas Infrastructure Europe



Source: Bloomberg, Japan Ministry of Finance

Source: Cheniere

Supply/Demand Forecast Supports Project Growth



Source: Cheniere

Europe is Set to Further Diversify Its Natural Gas Import Sources

Natural gas net imports to Europe in 2018

Import source	2018 share, %	2018
Russia	38.8	155.7
Norway	27.0	108.4
LNG	12.4	49.8
Netherlands	9.9	39.7
Algeria	8.2	33.0
Other	2.4	9.6
Libya	1.1	4.3
Turkey	0.2	0.6

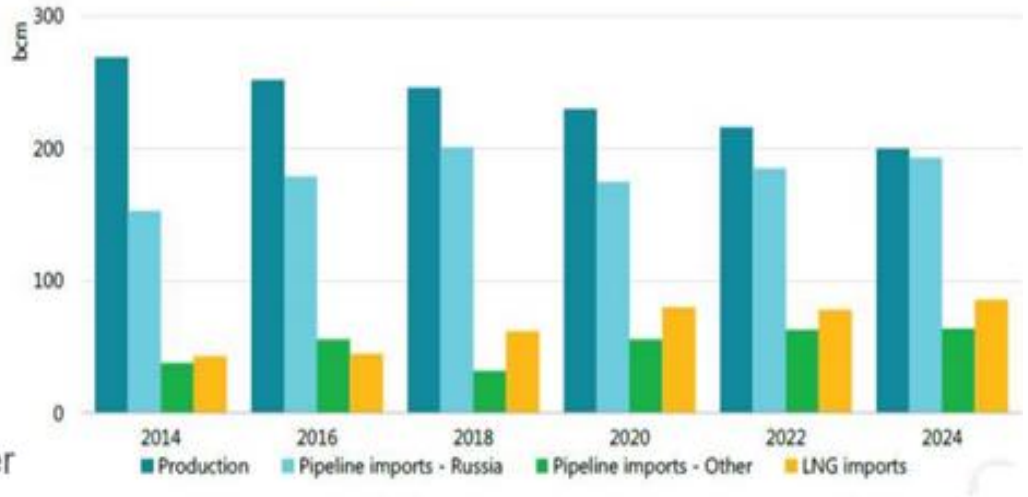
2018 total **401.1 bcm**
Year-over-year growth **2.6 bcm (0.6%)**

Source: McKinsey 2019

- The increase in LNG supplies leads to greater competition between LNG and pipeline gas in Europe

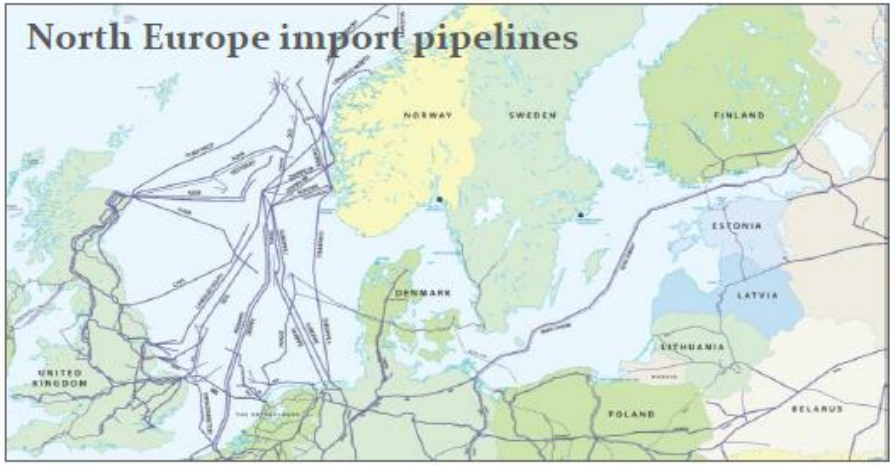
Gas balance in Europe 2014–24

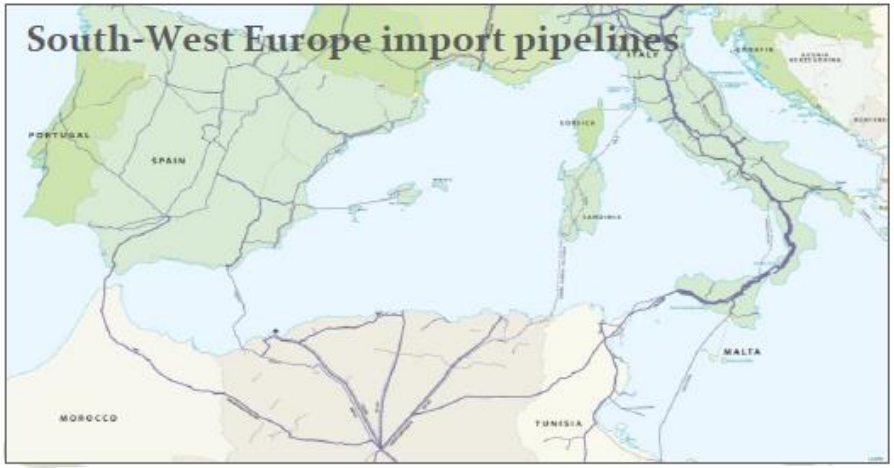
- LNG is expected to play an increasingly important role in Europe's, growing at a rate of 4% per year up to 86 bcm by 2024.



Source: IEA Gas Market 2019

European Gas Network: SEE EU Needs Additional Import Routes



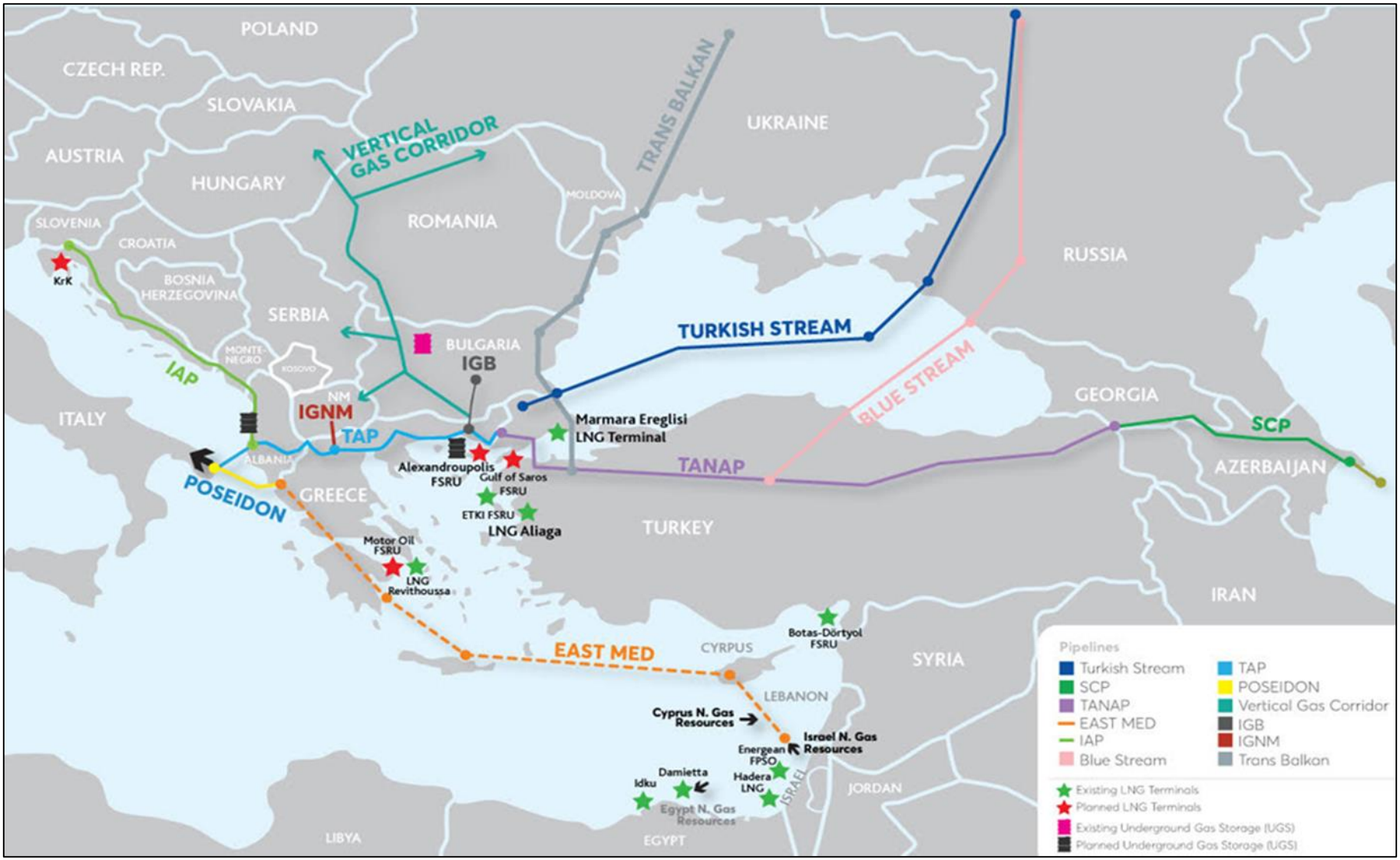


Source: DEPA

The South Corridor

- Conceived in the early 2000's as means of diversifying European gas supplies, mainly through gas pipeline deliveries from the nascent energy rich Caspian region.
- The SCP-TANAP-TAP pipeline system forms the backbone of this new supply route which will become fully operational by the end of the year (It already delivers some 6,0 bcm/y to Turkey).
- Initially contracted gas quantities to be delivered to European customers amount to 10,0 bcm/y (8,0 bcm to Italy, 1,0 bcm to Greece and 1,0 bcm to Bulgaria).
- SEE will benefit from 2,0 bcm/y a number which is likely to rise to 4,0 or even 5,0 bcm/y by 2030.
- IENE has formulated and proposed the Expanded South Corridor concept (EXSCO) to include additional pipelines, LNG terminals and underground gas storage (UGS) facilities. The EXSCO will provide the region with adequate gas liquidity which is a prerequisite for free market competition (see gas hubs).

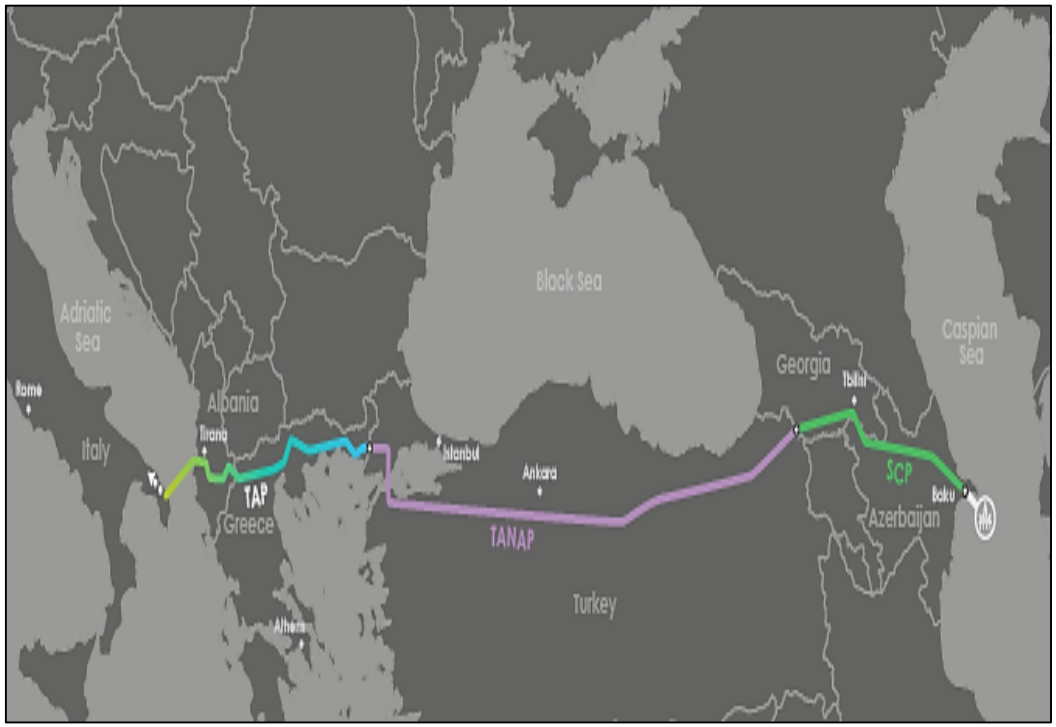
The Expanded Southern Gas Corridor



NB.: The TANAP has been completed, while TAP, Turkish Stream and IGB are under construction. 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

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

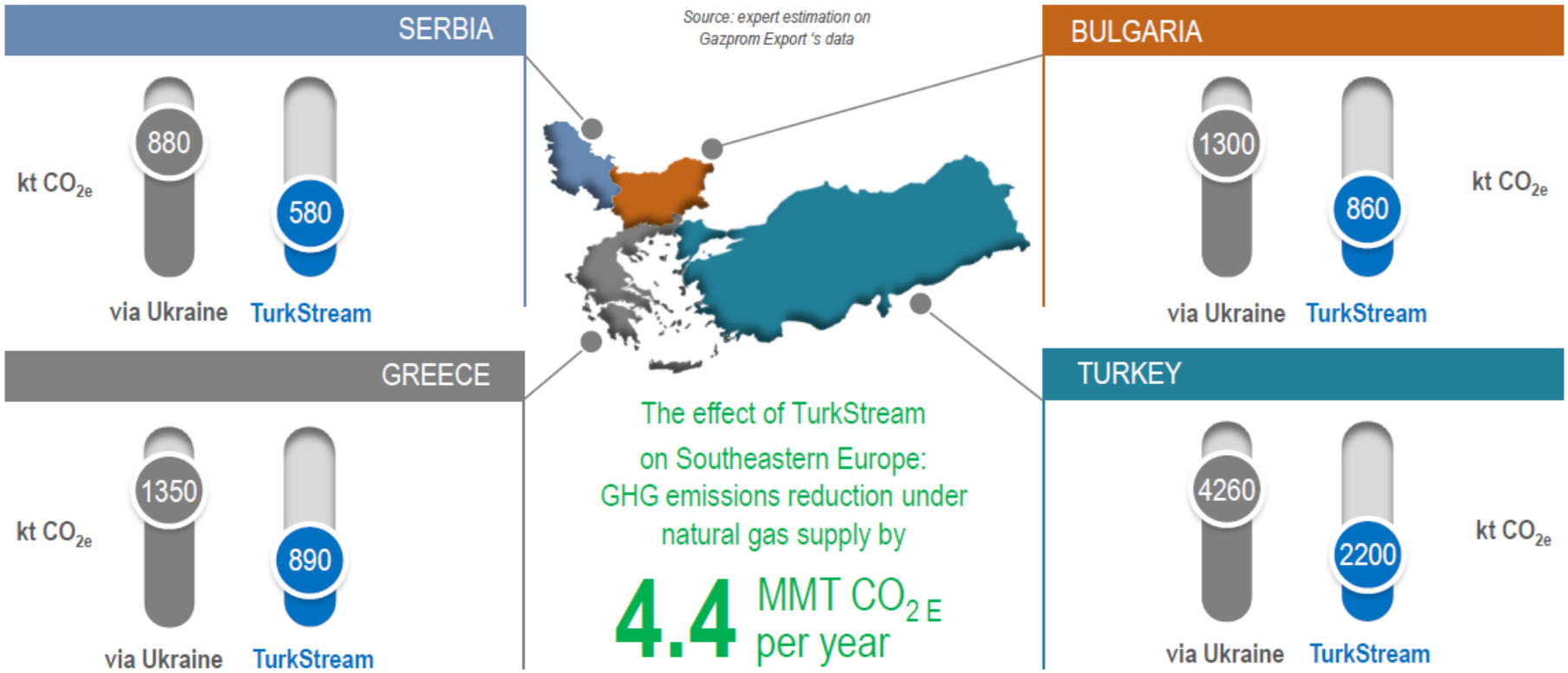
TANAP	
Length	1,850 km
Diameter	48-or-56-inch (1,200 or 1,400 mm) pipes
Capacity	up to 31 bcm/y
Anticipated Operational Date	2019

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

Annual GHG Emissions Cut Under Gas Supply via Turkish Stream



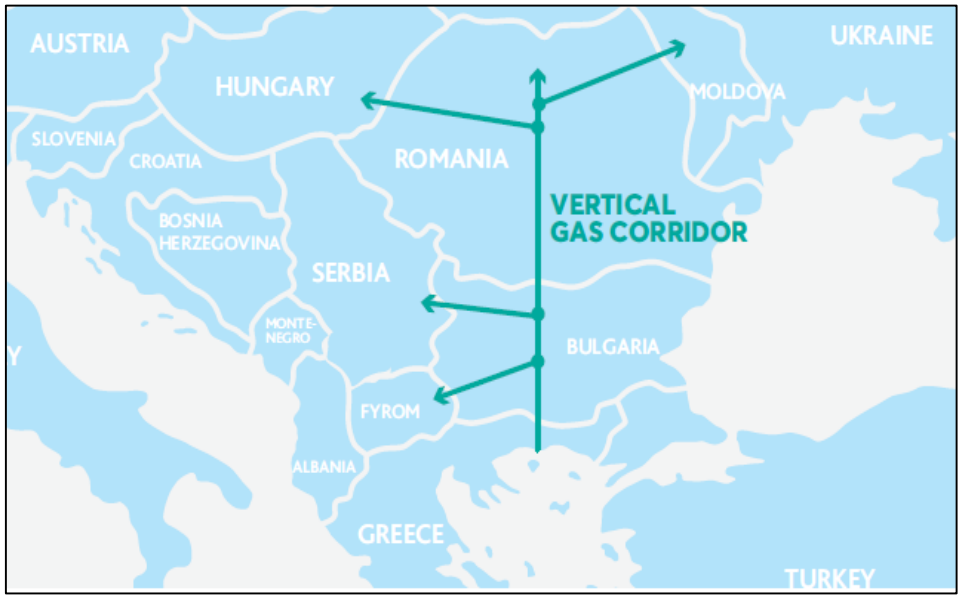
Source: Gazprom

Interconnector Greece-Bulgaria (IGB) (Under Construction)

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

Source: ICGB AD

Vertical Corridor (Conceptual Stage) and BRUA (Under Construction)

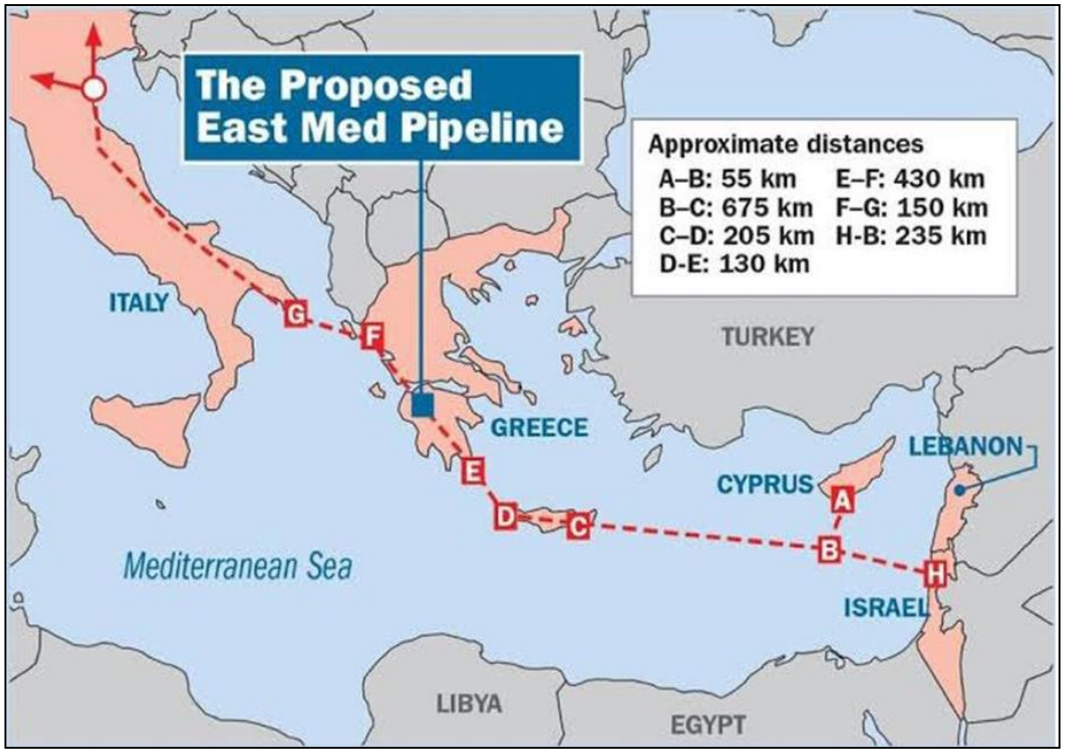


Source: IENE

Source: European Commission

BRUA	
Length	528 km
Diameter	32-inch (813 mm) pipes
Capacity	up to 6 bcm/y
Anticipated Operational Date	2023

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

Interconnector Greece-North Macedonia (IGNM) (Conceptual Stage)

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

Sources: ENTSO-G and ECA

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

Major Gas Pipeline Projects in SE Europe

Project	Shareholders	Length	Cost	Capacity
TAP	BP (20%), SOCAR (20%), Snam S.p.A (20%), Fluxys (19%), Enagás (16%) and Axpo (5%)	878 km	€4.5 billion	10.0-20.0 bcm/y
IGB	BEH (50%), IGI Poseidon (50%)	182 km	€220 million	3.0-5.0 bcm/y
Turkish Stream	Gazprom, BOTAS	1,100 km	€11.4 billion	31.5 bcm/y*
Bulgaria-Romania-Hungary-Austria (BRUA)	Bulgartransgaz, Transgaz, FGSZ, Eustream, GCA	500 km	€500 million	6 bcm/y

This amount corresponds to the first two strings of the pipeline with an additional 31.5 bcm foreseen when strings 3 and 4 will be constructed and become operational.

Source: IENE and involved energy companies

Overview of Underground Gas Storage Facilities in SE Europe (2018)

	Number of UGS Facilities	Working gas capacity (bcm)	Max. withdrawal rate (mcm/d)
In Operation			
Bulgaria	1	0.6	4
Croatia	1	0.6	7
Romania	8	3.1	32
Serbia	1	0.5	5
Turkey	2	3.4	45
Total	**13**	**8.2**	**93**
Under Construction			
Serbia	1	0.3	5
Turkey	3	6.5	110
Total	**4**	**6.8**	**115**
Planned			
Bulgaria	1	0.5	4.6
Croatia	1	-	2.4
Greece	1	0.4	4.0
Romania	4	1.2	9.3
Turkey	3	5.5	57.6
Total	**10**	**7.6**	**77.9**
Potential			
Albania	2	1.3	6.5
Bosnia and Herzegovina	1	0.1	1.9
Turkey	1	1.0	16.1
Total	**4**	**2.4**	**24.5**

Source: CEDIGAZ

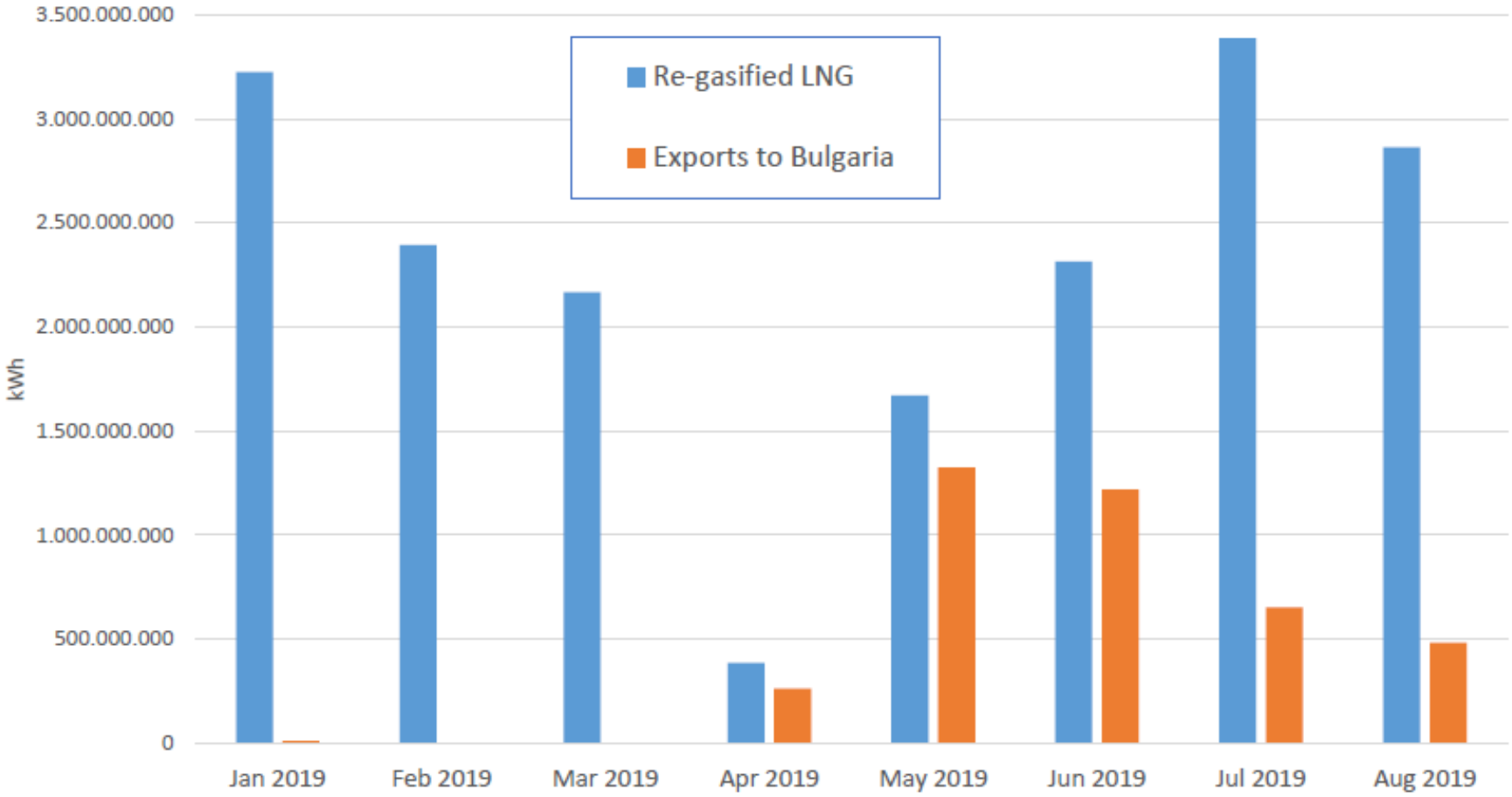
LNG Terminals in SE Europe

Source: IENE

Revithoussa LNG Terminal

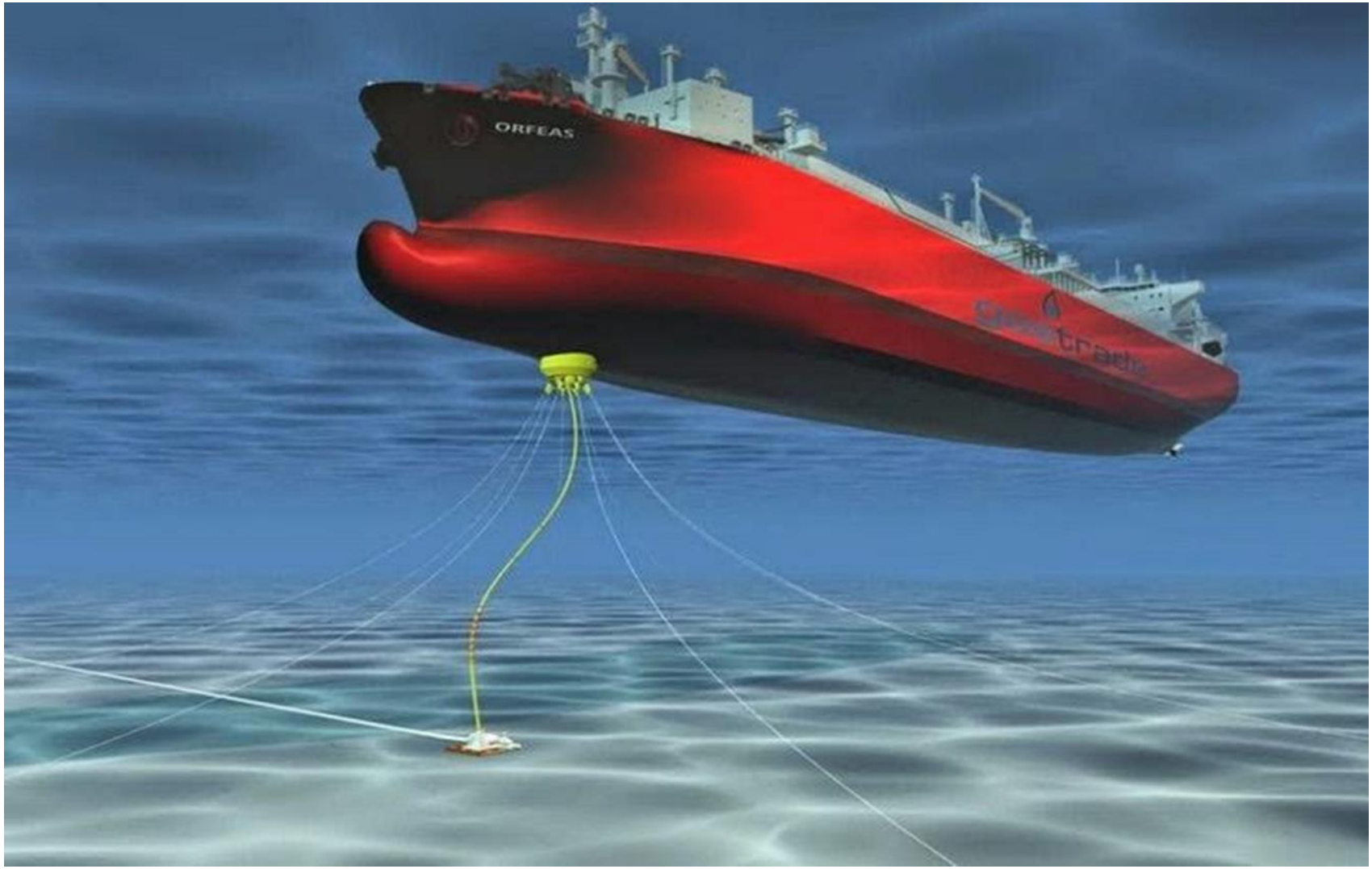
Source: DESFA

Revithoussa LNG Terminal Stimulates Cross Border Trading



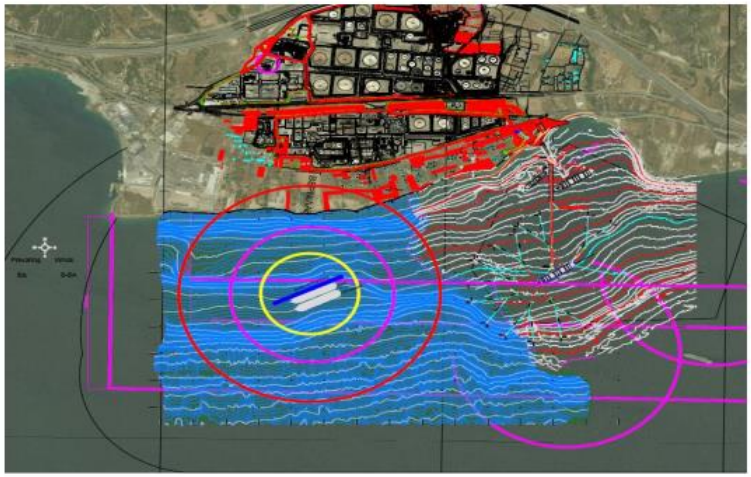
Source: DESFA

The Alexandroupolis FSRU



Source: IENE study, “Gas Supply in SE Europe and the Key Role of LNG”, (M46), Athens, January 2019

The Motor Oil FSRU



Source: Satras, N.

Krk LNG Terminal

Source: Independent Balkan News Agency

Anticipated Gas Volumes Through Greece (2021-2030)

- Through **TAP** ⟹ **10.0 bcm (2021)** (i.e. 1.0 bcm to Greece, 1.0 bcm to Bulgaria and 8.0 bcm to Italy), while **20.0 bcm (2030)** (i.e. 2.5 bcm to Greece, 1.5 bcm to Bulgaria and 16.0 to Italy)
- Through **IGB** ⟹ **1.0 bcm (2021)** and **4.0 bcm (2030)**
- Through **IGNM** ⟹ **1.0 bcm (2023)** and **1.5 bcm (2030)**
- Through the **Revithousa LNG Terminal** ⟹ **1.5 bcm (2020)** growing to **3.0 bcm (2030)**
- Through **Alexandroupolis FSRU** ⟹ **1.0 bcm (2022)** growing to **4.0 bcm (2030)**
- Through **East Med** ⟹ **0.0 bcm (2020)** with the prospect of **10.0 bcm (2030)**

- Based on the above, it is estimated that in the first phase (2021), **12.0-13.0 bcm** of additional gas volumes will be directed through Greece to various destinations, corresponding to 2.6% of European gas demand (excluding Turkey), while in 2030 these quantities may have reached **30.0 bcm**, which will correspond to approx. 6.4% of European gas demand.
- In 2030, **some 4.0-5.0 bcm of additional gas volumes** will be available locally (e.g. Greece, Bulgaria, North Macedonia) and a lot more from Turkey (more than 5.0 bcm) ⟹ available for gas trading.

Gas Production and Consumption in SE Europe

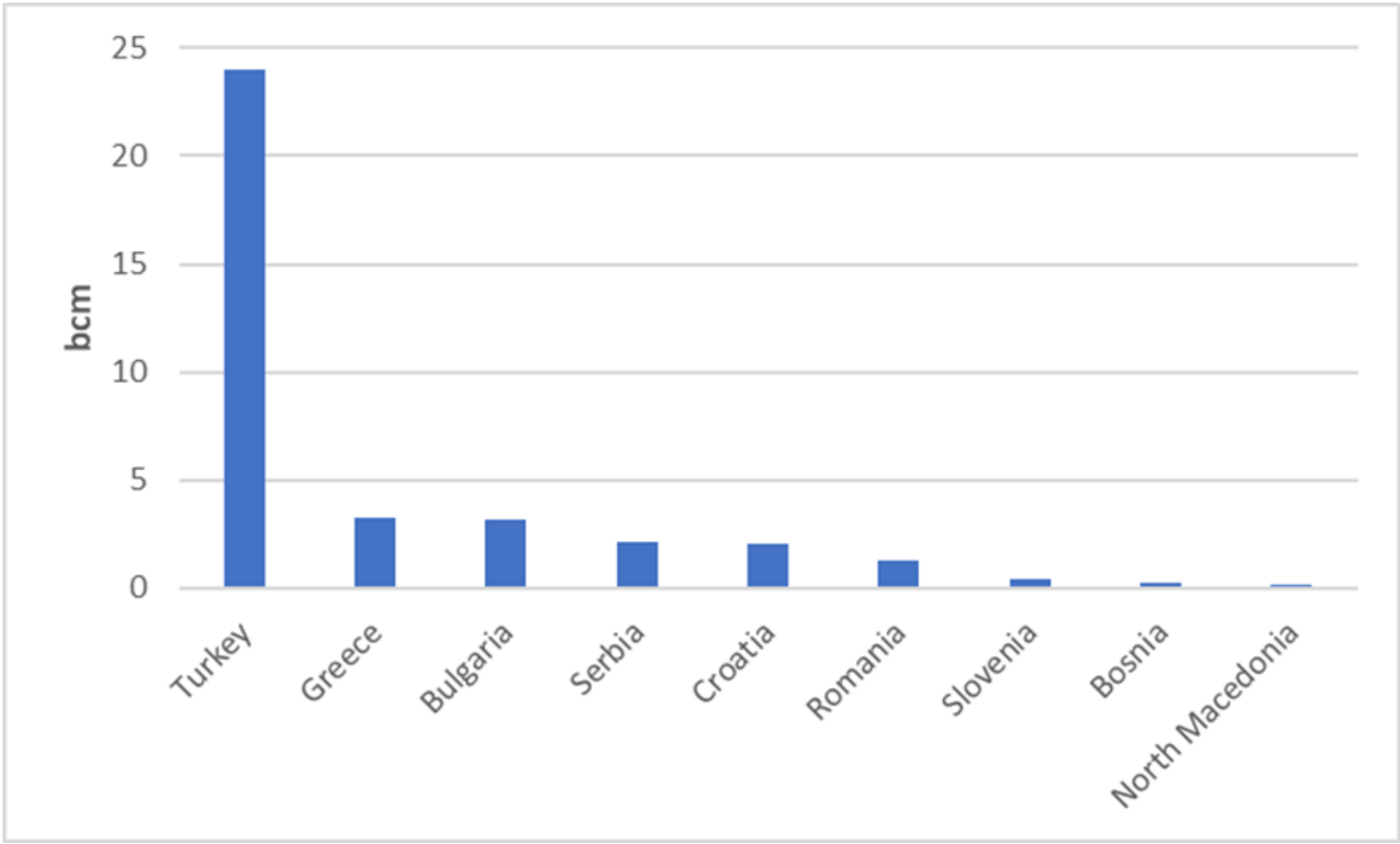
- SE Europe remains highly dependent on n. gas imports and is likely to remain so over the next decade.
- Indigenous production (excluding Turkey) was some 12,0 BCM in 2018, while total consumption was approx. 26,0 BCM. We are talking of a large import dependency nearing 54,0%.
- Gas imports to the region in 2018 reached 14,0 BCM and came largely from Russia with some LNG (via Greece) and from Turkey (Turkish basket).
- Russian Gazprom supplied some 11,5 BCM (or 44% of total consumption) with the rest coming from indigenous production (Romania, Croatia, Serbia, Bulgaria) and LNG imports, via Greece.
- As decarbonization in SEE is set to gain pace we shall see a lot more gas consumption estimated to reach some 33,0 BCM in 2025 from 27,0 BCM in 2018.
- Rough IENE estimates for 2030 will see total gas consumption in SEE (excl. Turkey) rising to 40,0 BCM per year as gas, along with RES and nuclear, dominates power generation.
- With local gas production likely to rise to 15,0 BCM (largely thanks to Romania and Greece) gas import dependency will rise even further to some 63%.

Gas Production and Consumption (bcm) in SE Europe (2008, 2018 and 2025)

Country	2008		2018		2025	
	Gas production (bcm/y)	Gas consumption (bcm/y)	Gas production (bcm/y)	Gas consumption (bcm/y)	Gas production (bcm/y)	Gas consumption (bcm/y)
Albania	0.02	0.02	0.1	0.09	0.01	0.22
Bosnia and Herzegovina	0.0	0.31	0.0	0.24	0.0	0.45
Bulgaria	0.31	3.5	0.01	3.04	0.21	4.3
Croatia	2.03	3.1	1.28	2.84	1.52	3.3
North Macedonia	0.0	0.05	0.0	0.18	0.0	0.6
Greece	0.0	4.25	0.1	4.87	0.0	6.0
Kosovo	0.0	0.0	0.0	0.0	0.0	0.0
Montenegro	0.0	0.0	0.0	0.0	0.0	0.0
Romania	11.2	16.9	10.26	11.97	10.02	14.1
Serbia	0.25	1.92	0.45	2.93	0.51	2.8
Slovenia	0.0	0.51	0.0	0.8	0.0	1.07
Turkey	1.03	36.9	0.51	49.64	0.73	56.0
Total	**14.84**	**67.46**	**12.71**	**76.60**	**13.00**	**88.84**

Sources: European Commission, IENE

Russia's Gas Supplies to Selected SEE Countries (bcm), 2018



Source: Gazprom Export

Fossil Fuel Prices by IEA Scenario

				Stated Policies				Sustainable Development		Current Policies	
Real terms ($2018)	2000	2010	2018	2025	2030	2035	2040	2030	2040	2030	2040
IEA crude oil ($/barrel)	40	90	68	81	88	96	103	62	59	111	134
Natural gas ($/MBtu)											
United States	6.1	5.0	3.2	3.2	3.3	3.8	4.4	3.2	3.4	3.8	5.1
European Union	4.0	8.6	7.6	8.0	8.0	8.4	8.9	7.5	7.5	8.9	9.9
China	3.5	7.7	8.2	9.1	9.0	9.3	9.8	8.6	8.7	9.8	10.7
Japan	6.7	12.7	10.1	10.0	9.7	9.8	10.2	8.8	8.7	11.0	11.4
Steam coal ($/tonne)											
United States	34	58	46	51	52	53	54	49	48	59	63
European Union	48	106	92	75	76	78	78	58	60	83	90
Japan	43	123	111	83	86	88	90	65	69	94	103
Coastal China	34	133	106	88	89	91	92	74	76	98	105

Source: IEA (2019), “World Energy Outlook 2019”

Range of Gas Costs for Power Generation in SE Europe

Natural gas cost including balancing gas and transport to power plants, €/MWh-fuel (net calorific value)				
	2018	2020	2025	2030
ALBANIA	28.7	26.9	29.9	31.3
BOSNIA_HERZEGOVINA	28.9	29.9	33.4	35.0
BULGARIA	29.5	30.5	34.1	35.7
KOSOVO	28.9	29.9	33.4	35.0
NORTH_MACEDONIA	29.5	30.5	34.1	35.7
MONTENEGRO	28.6	29.6	33.0	34.6
SERBIA	28.9	29.9	33.4	35.0
GREECE	28.5	26.7	29.7	31.1
ROMANIA	27.5	25.8	28.7	30.0

Sources: E3 Modelling and IENE

Gas Investment Barriers in SE Europe

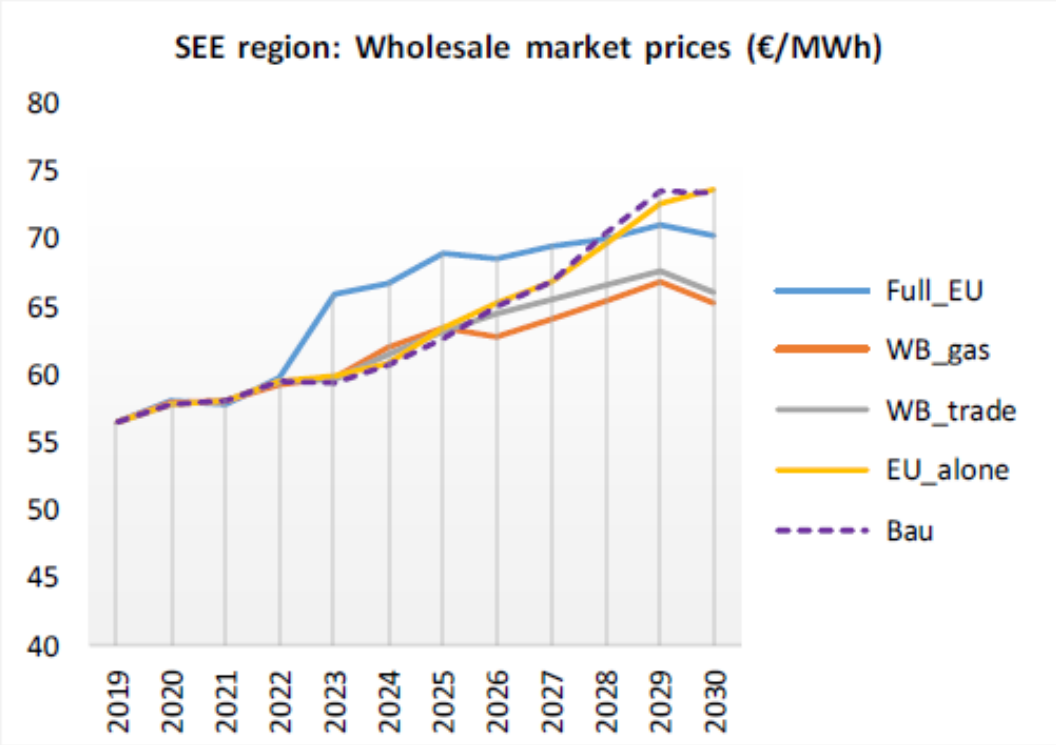
- Looking at the WB-6 region, the poor gas supply infrastructure, in particular the lack of interconnections and diverse entry points in the regional gas system, makes gas pricing and supply uncertain and discourages gas power plant investment, even in the context of carbon pricing of lignite-based generation.

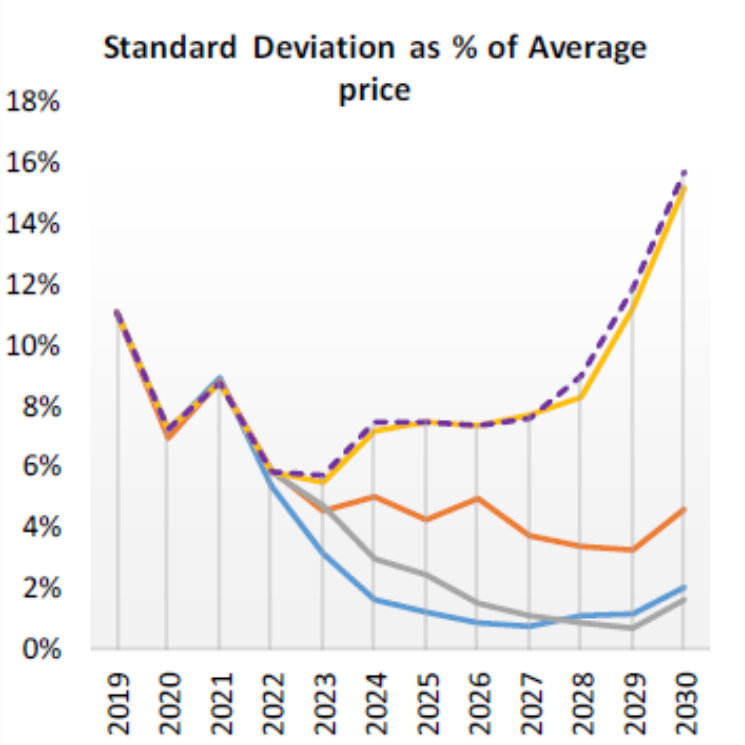
- From a market perspective, it is paradoxical to see a slow decline of solids-fuel power generation despite experiencing higher electricity costs than gas-based power.

- The factors hampering gas investment distort electricity system optimality in the WB-6 region, and at a lesser extent this happens also similarly in Bulgaria.

- Thus, mainly Greece, and Romania, are likely to experience gas supply expansion and opportunities to get cheap and abundant gas, allowing them to dispose of ample balancing resources for RES and expand exporting capacities.

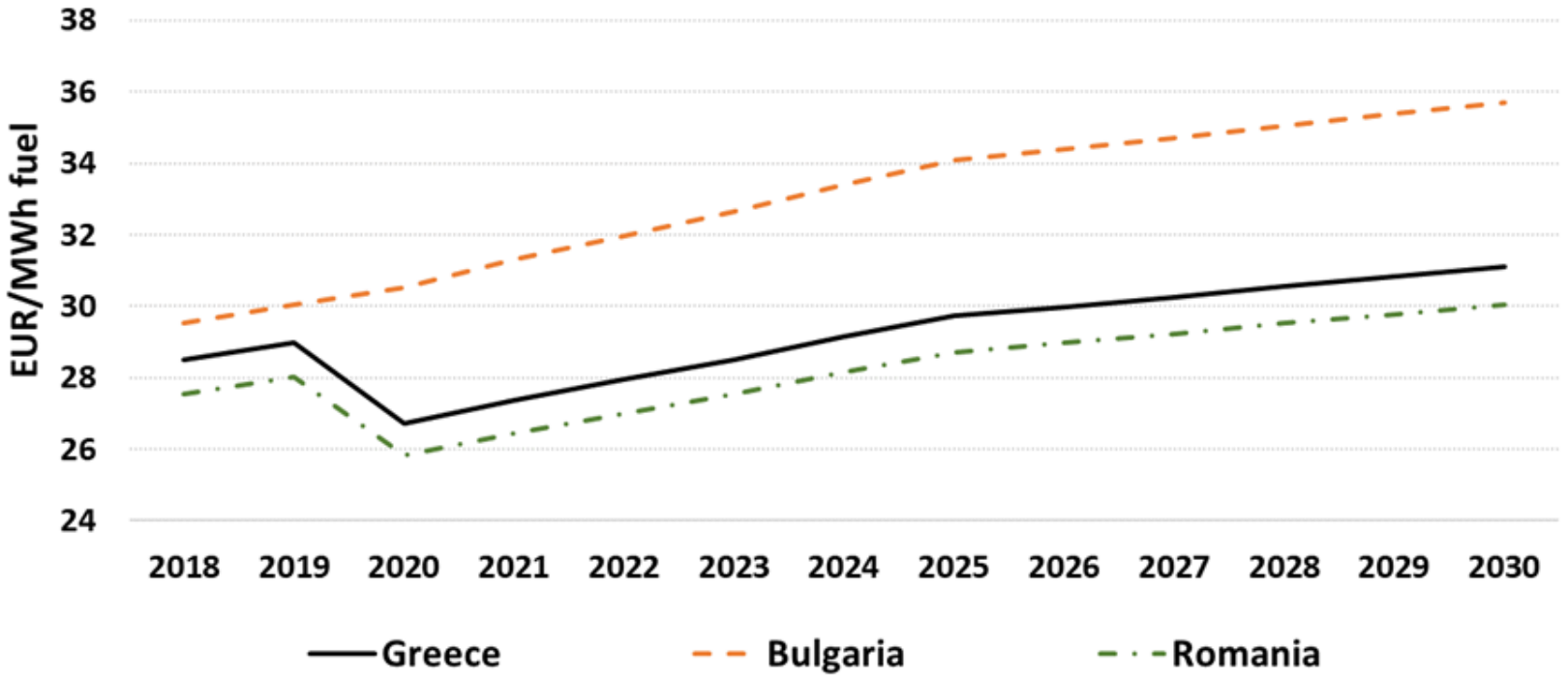
Average Wholesale Electricity Market Prices in the SEE Region





Sources: E3 Modelling and IENE

Projected Gas Prices in Power Generation (Including Transport and Balancing Costs) in Selected SEE Countries



Sources: E3 Modelling and IENE

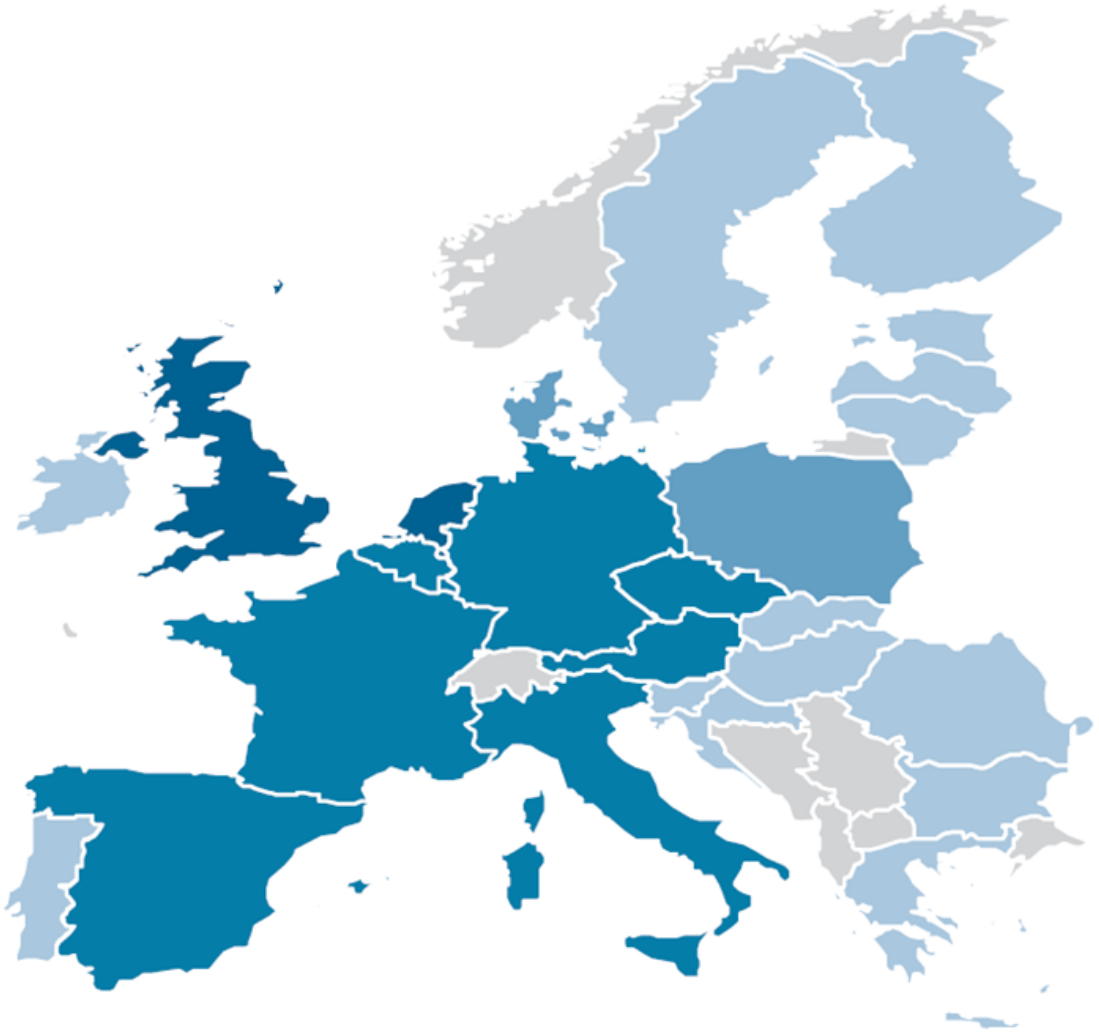
European Gas Hubs and Exchanges

Source: Interfax Global Energy

Gas Price Formation and Gas Trading in Europe is Changing

- The market is gradually moving away from oil-indexed contracts to prices set by gas to gas competition.
- In this respect gas trading hubs across Europe have a significant role to play.
- Adequate gas market liquidity is a sine qua non condition for gas trading hub operation.
- Gas trading hubs also require high market transparency, well tuned financial backing and stable financial conditions.
- Gas trading hubs facilitate short term and/or spot market contracts between players and further provide the basis for gas derivative products.
- The current trend in European gas markets is the emergence of several gas trading hubs, in competition between them, with the most successful ones (on account of traded volumes) such as the NBP (UK), TTF (Netherlands) and VTP (Austria) providing the basis for reference prices.
- There is not a single "established" gas hub east of Vienna.
- In SEE, we are now witnessing the emergence of a number of nascent gas trading hubs with the Greek Trading Point of DESFA, leading the race, followed by Poland, Turkey, Croatia, Ukraine, Slovenia, Bulgaria and Romania.

Where Does SE Europe Stand Today?



Established hubs
- Broad liquidity
- Sizeable forward markets which contribute to supply hedging
- Price reference for other EU hubs and for long-term contracts indexation

Advanced hubs
- High liquidity
- More reliant comparatively on spot products
- Progress on supply hedging role but relatively lower liquidity levels of longer-term products

Emerging hubs
- Improving liquidity from a lower base taking advantage of enhanced interconnectivity and regulatory interventions
- High reliance on long-term contracts and bilateral deals

Iliquid-incipient hubs
- Embryonic liquidity at a low level and mainly focused on spot
- Core reliance on long-term contracts and bilateral deals
- Diverse group with some jurisdictions having
  - organised markets in early stage
  - to develop entry-exit systems

Source: ACER Market Monitoring Report 2018

Hub Pricing is Expanding in Europe

GOG: gas-on-gas competition
OPE: oil price escalation

Figure 6.3 Europe Price Formation 2018

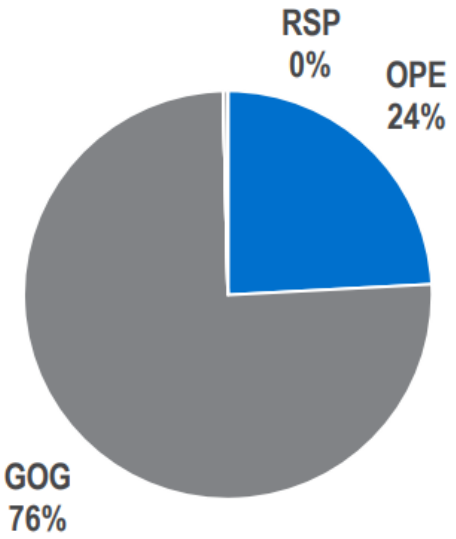
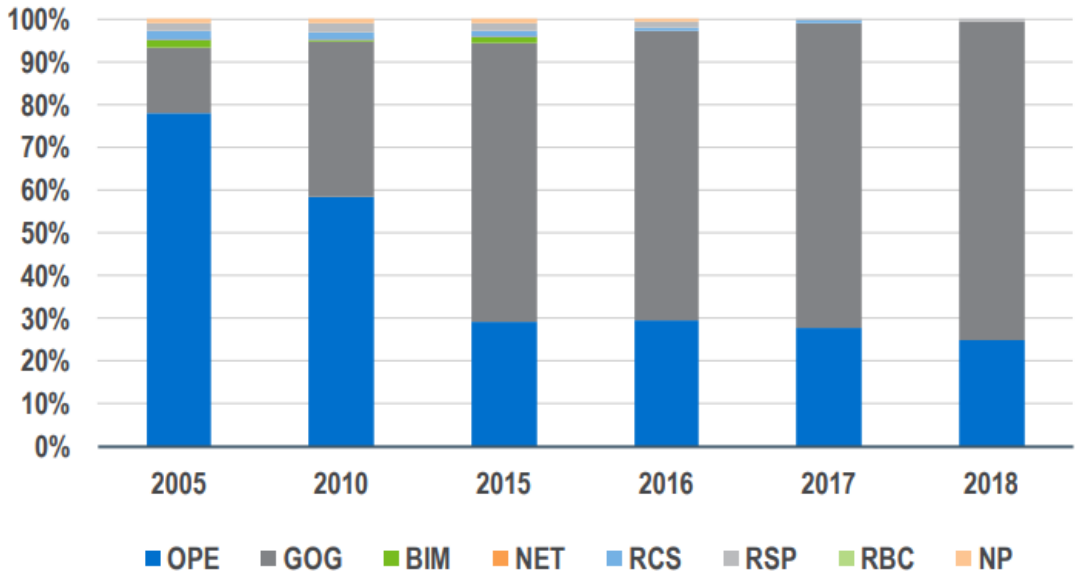


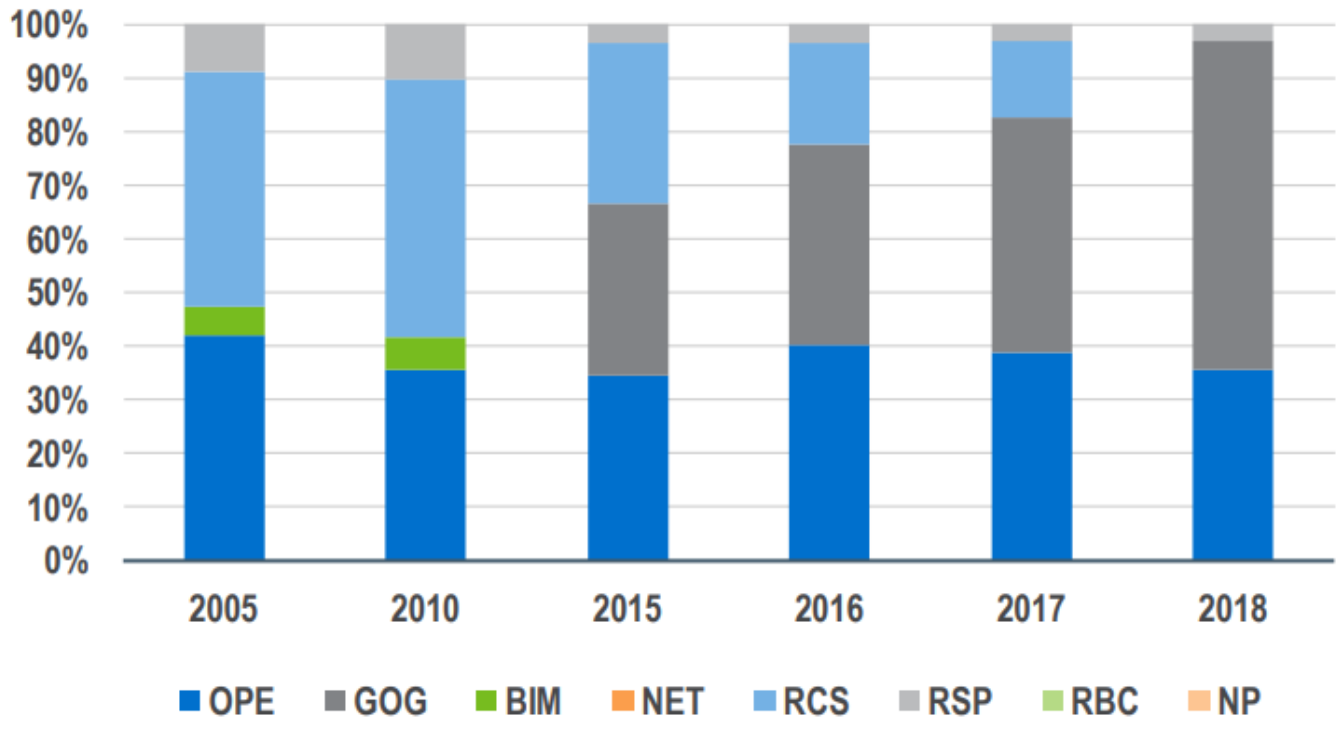
Figure 1.2 Europe Price Formation 2005 to 2018



Source: IGU Wholesale Gas Price Survey 2019

Hub Pricing is also Expanding in SE Europe

Figure 6.8 Southeast Europe Price Formation 2005 to 2018

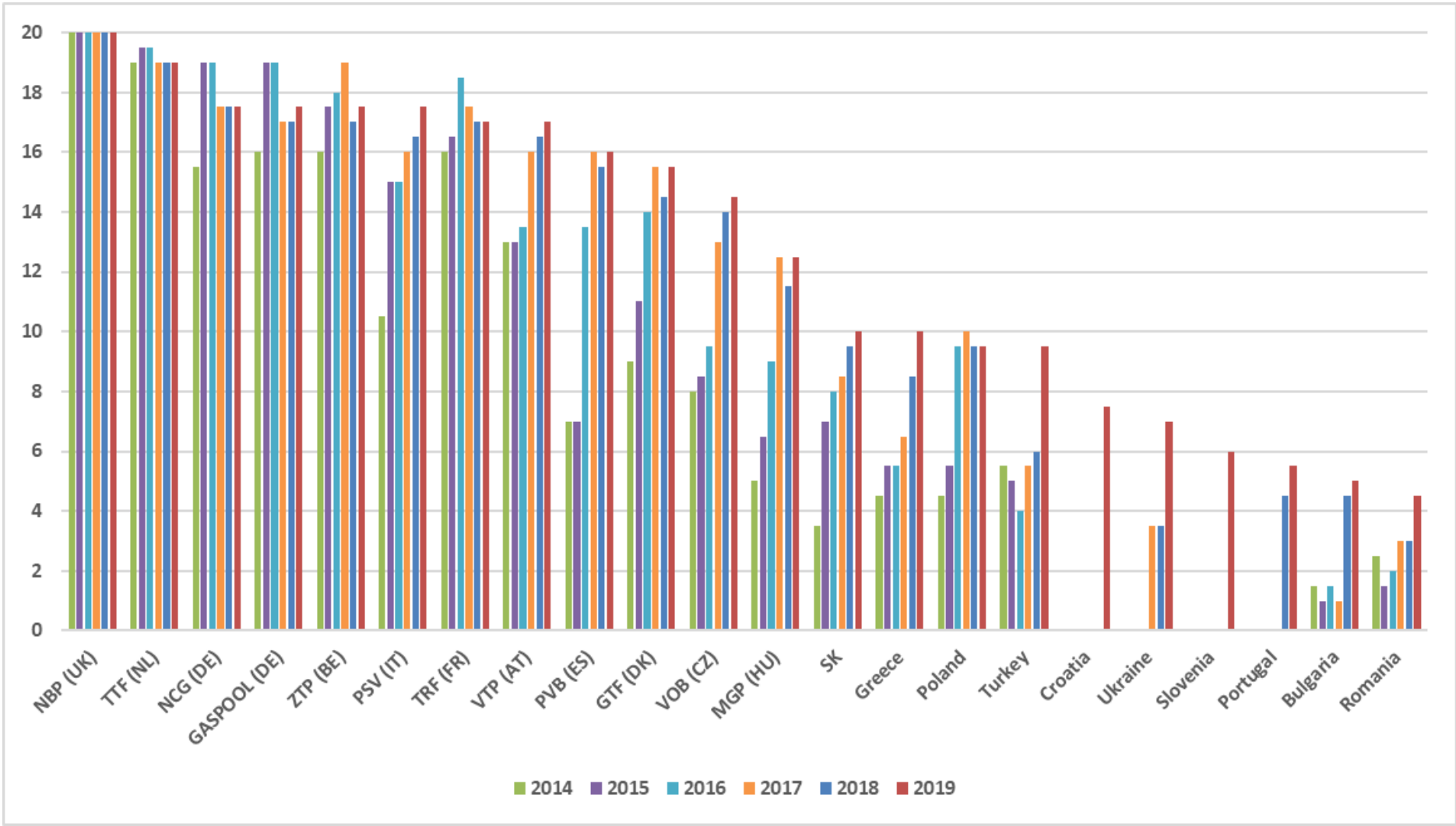


GOG: gas-on-gas competition
OPE: oil price escalation

Southeast Europe, as defined by IGU, includes Bosnia, Bulgaria, Croatia, North Macedonia, Romania, Serbia and Slovenia

Source: IGU Wholesale Gas Price Survey 2019

Annual Scorecard 2019 Update

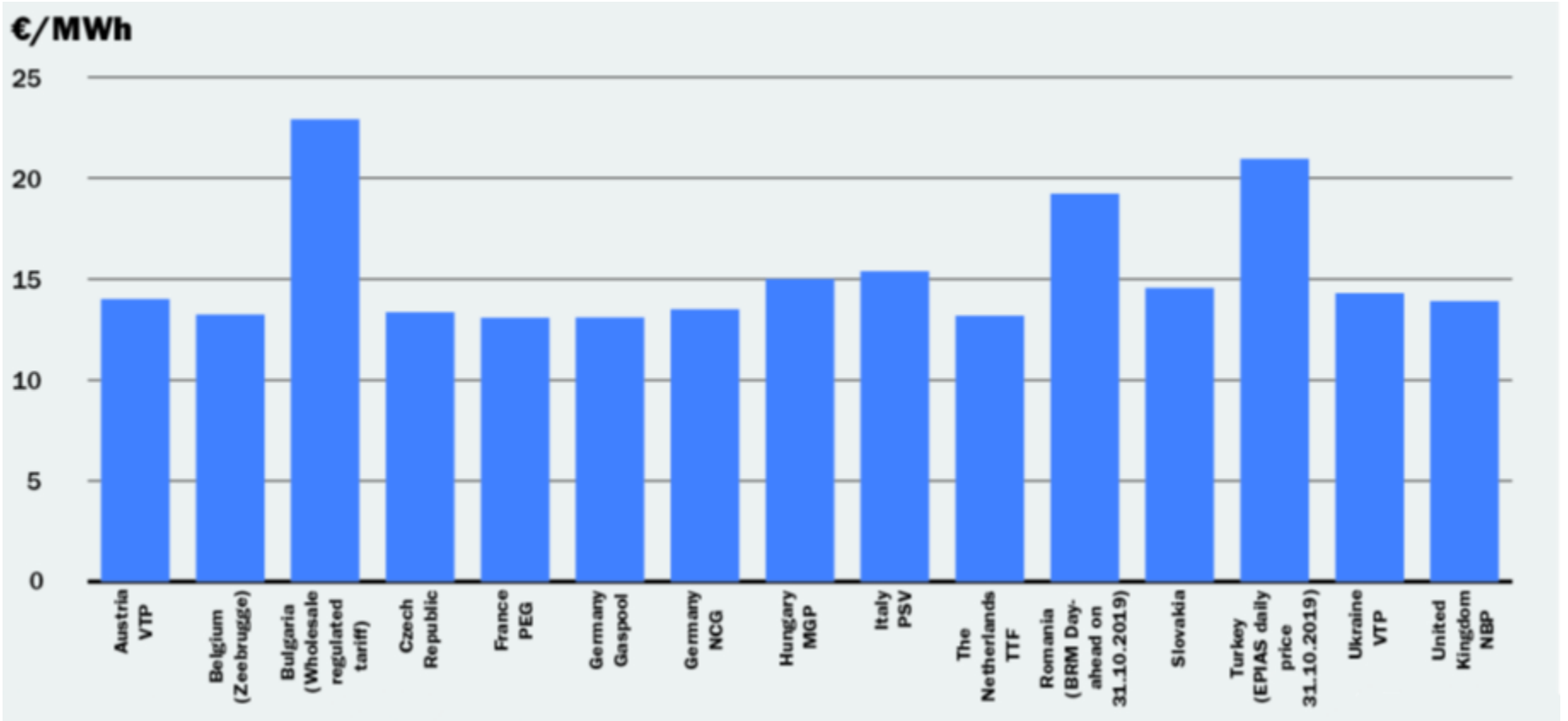


Source: EFET

Is There a Need for a Benchmark Gas Hub Price in SE Europe?

- Today, NBP is the £ benchmark for gas in the British Isles and some LNG supplies, while TTF has become the € benchmark hub for North West European gas supplies. Both are being widely used for risk management.
- In SE Europe, there is neither a market mechanism to buy or sell gas in an efficient manner, nor a pricing mechanism to determine spot prices. Gas exchange is still based on long-term bilateral agreements.
- Can the emerging gas trading hubs of Bulgaria, Romania, Ukraine, Greece and Turkey build a spot gas market individually or even regionally?
  - The country that will be able to be first in securing relevant investments in its energy infrastructure and interconnectors will be able to become the key player in the regional gas trading zone.
  - Neither TANAP nor Turkish Stream are likely to boost liquidity and support the formation of a reference price in SE Europe.
- **PSV reference hub?**
  - Although the PSV hub is not perfect and still has further to go on the road to maturity, it could become the reference hub in SE Europe, giving the pricing signals to attract LNG and possibly become, in time, a supply route for gas into northern Europe.
- **From a pricing perspective:**
  - The SEE region now carries a premium of anything between €9.00-€14.00/MWh ($2.98/MMBtu–$4.6/MMBtu) over western Europe.

November ’19 Gas Prices Across Markets

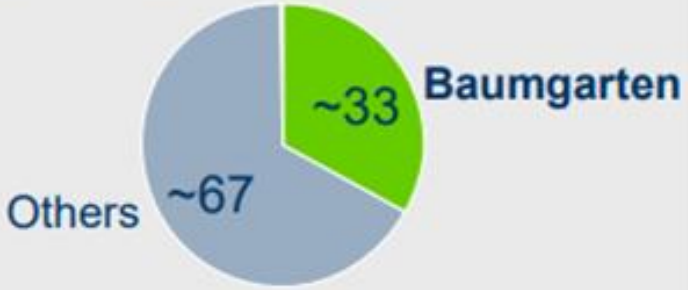


Sources: ICIS, BRM, EPIAS, EWRC

The Role of CEGH as a Benchmark and Pivot for Promoting Gas Trading in SE Europe

Gas hub Baumgarten

Russian gas exports to Western Europe, in %



Largest station for natural gas in CE and first major gas hub for gas from East

Infrastructure and storage facilities

20 storage facilities within 400 km

High storage capacity around Baumgarten assuring high flexibility and supply security

Source: CEGH

Key Challenges for SE European Gas Markets

- SE Europe is not a **cohesive or homogenous gas market**
- **Market liquidity remains at relatively low level,** because of (a) lack of adequate infrastructure and (b) alternative suppliers
- Following completion and full operation of a number of key gas infrastructure projects in the region, **market liquidity is set to improve enormously**
- SE Europe has long been and still is a transit region for **Russian** gas
- There is a **lack of adequate gas interconnections**
- The region has **high dependence on hydrocarbon imports**
- The region is **more vulnerable** to gas supply shocks than the rest of Europe
- Several gas infrastructure projects **recently completed, under construction or in a planning phase** (e.g. Turkish Stream, TANAP-TAP, IGB, Alexandroupolis FSRU, East Med, BRUA, etc.)
- A new gas pricing environment **is slowly evolving** across SE Europe
- Financing of new gas infrastructure projects in the region **will soon become problematic** following EU's launch of the New Green Deal last December and the wrong message it has send to financing institutions, e.g. EIB's highly contentious decision to cease financing all fossil fuel projects, including n. gas, from 2021 onwards
- Electricity's newcomer **gas alters supply balance**
- There is **high potential** for upstream and downstream development in the region (Black Sea, East Med)

INSTITUTE OF ENERGY
FOR SOUTH-EAST EUROPE

Thank you for your attention

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