SE Europe's Energy Overview and Greek-Bulgarian Cooperation

Greek-Bulgarian Energy Meeting

Organised by the Energy Management Institute (EMI)

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INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE

The SE European Region Defined

Core countries

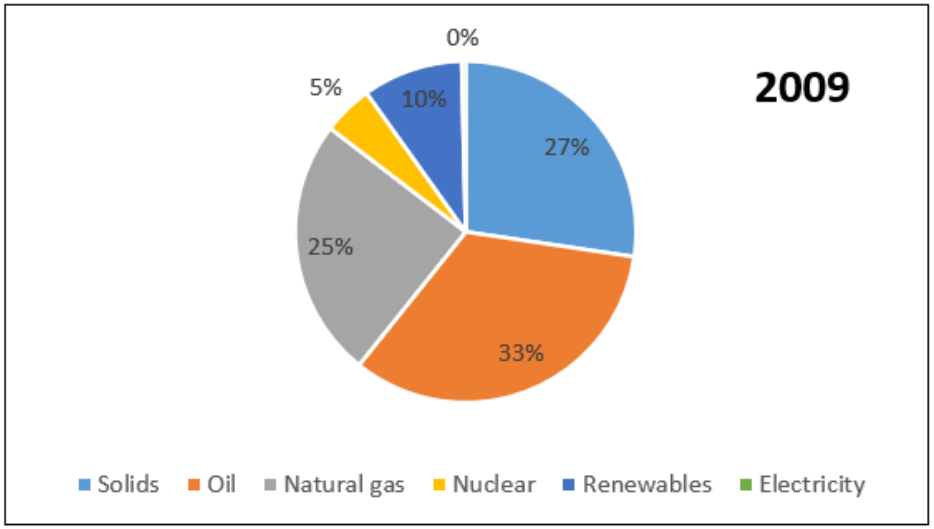
- Albania
- Bosnia and Herzegovina
- Bulgaria
- Croatia
- Cyprus
- Greece
- Hungary
- Israel
- Kosovo
- Montenegro
- North Macedonia
- Romania
- Serbia
- Slovenia
- Turkey

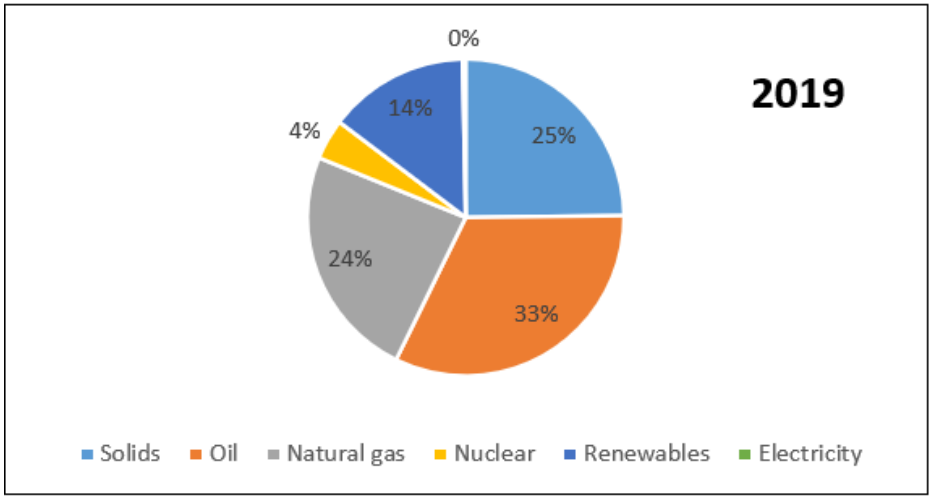
Peripheral countries

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

Source: IENE

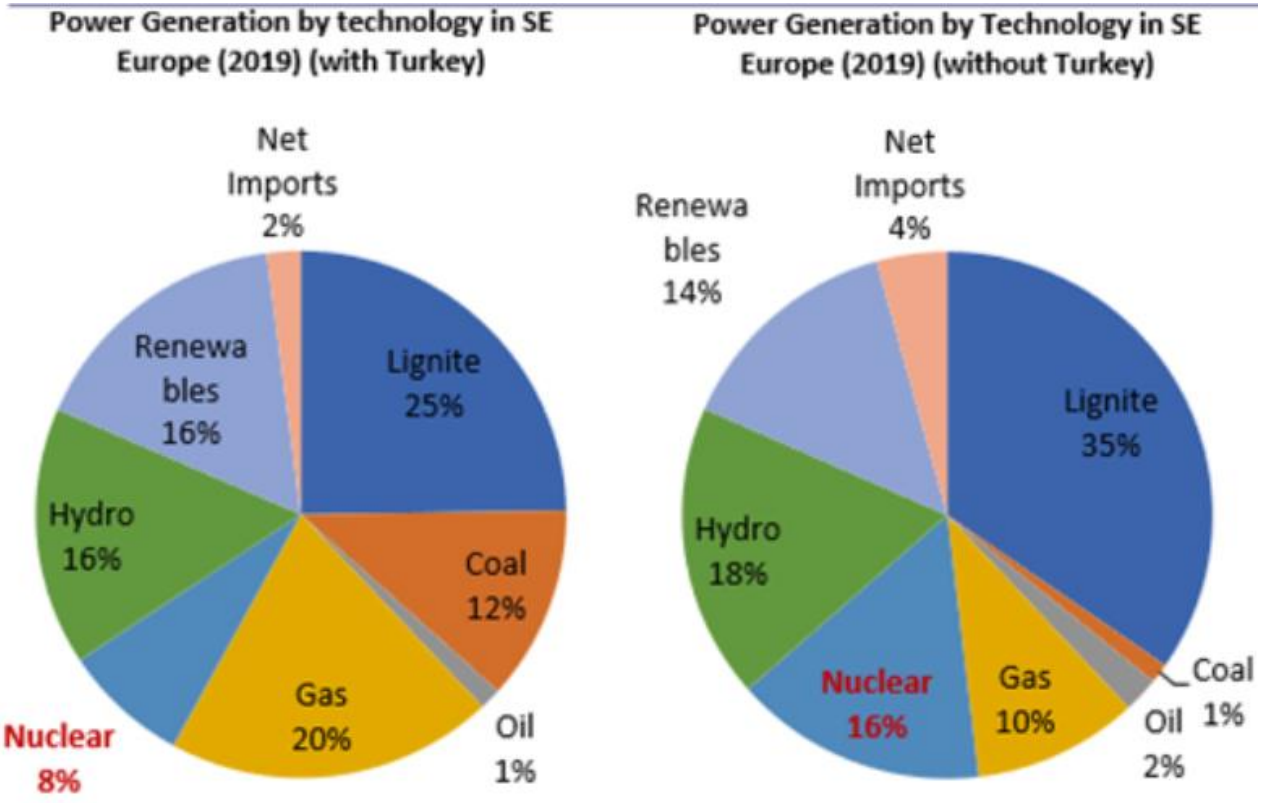
SE Europe's Energy Mix, **Including Turkey**, 2009 and 2019





Source: Eurostat

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



Source: IENE

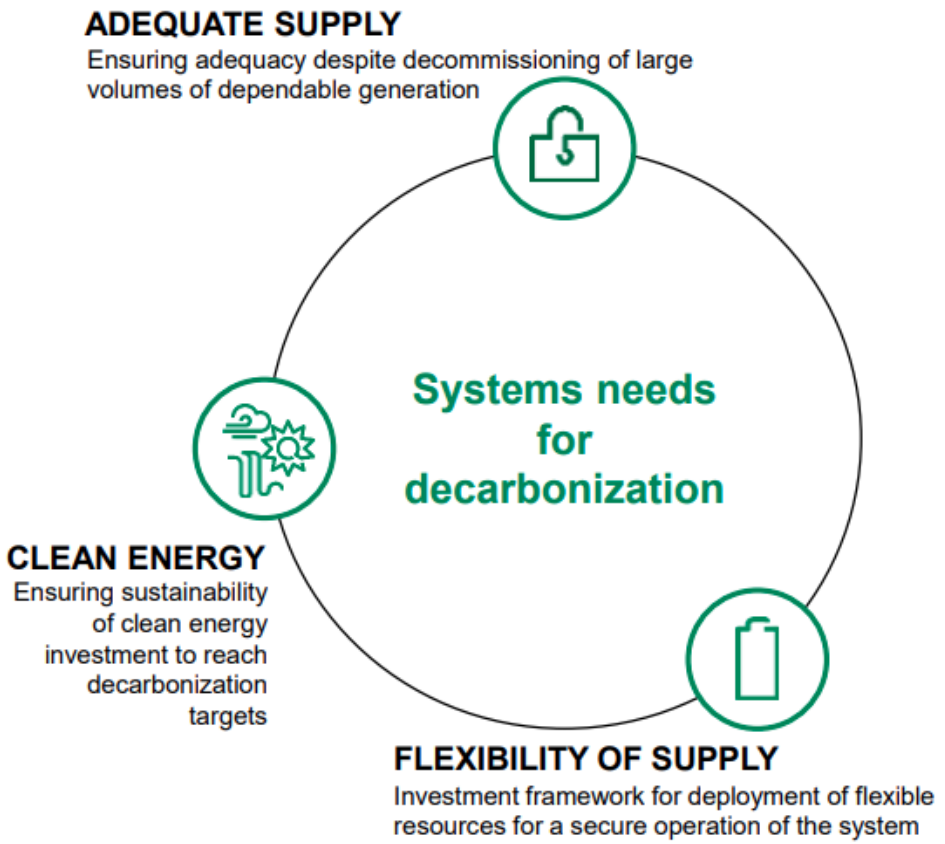
2030 EU Targets

-55% GHG emissions reductions (vs. 1990)

38% Share of renewable energy

40% Improvement in energy efficiency

85% Carbon-neutral electricity



Source: European Commission

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.

EU Energy Policy Framework: How Does This Stand for SE Europe?

- It seems that an **inverted pyramid arrangement** has been developed in SE Europe, compared to pursued official Energy Union policies and stated targets as economic development at all costs remains number one priority for most countries.

- The energy policy priorities in broad terms for SEE would appear as follows:
  - Further large scale development of **coal and lignite resources** without any real recourse CCS/CSU provisions and plans
  - Further development of **electricity and gas interconnections in order to maximise cross border trade**
  - Promotion of **oil and gas exploration activities (onshore and offshore)** aiming towards maximizing production in the mid- and long-term
  - Further development of **renewables** in all application areas (i.e. solar, wind, biomass, hydro and geothermal) without necessarily aiming to adhere to specific targets (set by the EU)
  - Promotion of **energy efficiency**, focusing primarily on the building sector, incentivized by EU and green fund financing facilities
  - **Diversification** of supply routes and suppliers in order to secure future gas supplies
  - Reduction of CO_2 emission levels (least of priorities)

Summary of 2030 National Objectives in Greece's and Bulgaria's NECP

Greece

Year of objective: 2030	Final NECP	Initial NECP draft	New NECP objectives compared to EU objectives
RES share in gross final energy consumption	≥35%	31%	More ambitious than the corresponding core EU objective of 32%
RES share in gross final electricity consumption	≈61-64%	56%	
Final energy consumption	≈16.1-16.5 Mtoe (≥38% compared to the 2007 predictions)	18.1 Mtoe (32%) (referring to 17.3 Mtoe without ambient heat)	More ambitious than the corresponding core EU objective of 32.5% and attainment of the objective on the basis of a new EU indicator for reducing consumption compared to 2017
Share of lignite in power generation	0%	16.5%	
Reduced GHG	≥42% compared to 1990, ≥56% compared to 2005	33% compared to 1990, 49% compared to 2005	Identical with core EU objectives and overperformance compared to national commitments in non-ETS sectors

Bulgaria

	National targets and contributions	Latest available data	2020	2030	Assessment of 2030 ambition level
GHG	Binding target for greenhouse gas emissions compared to 2005 under the Effort Sharing Regulation (ESR) (%)	21%	20%	0	As in ESR
	National target/contribution for renewable energy Share of energy from renewable sources in gross final consumption of energy (%)	20.5	21.4	27.09	Adequate (27% is the result of RES formula)
	National contribution for energy efficiency: Primary energy consumption (Mtoe) Final energy consumption (Mtoe)	18.34 9.9	16.9 8.67	17.5 10.3	Low Very low
	Level of electricity interconnectivity (%)	7.1	11.3	15	N.A

Source: Greece's and Bulgaria's NECP

Primary Crude Oil Production and Refining in SE Europe (2019)

COUNTRY	CRUDE OIL PRODUCTION (barrels/day)	GROSS INLAND CRUDE OIL REFINED (barrels/day)
Bulgaria	0	138,934
Greece	3,302	458,630
Croatia	13,600	53,136
Cyprus	0	0
Hungary	18,644	136,425
Romania	67,040	238,447
Slovenia	5	0
Montenegro	0	0
North Macedonia	0	0
Albania	20,183	6,732
Serbia	18,026	66,528
Turkey	62,297	709,676
Bosnia and Herzegovina	0	1,563
Kosovo	0	0
Total	**203,096**	**1,810,071**

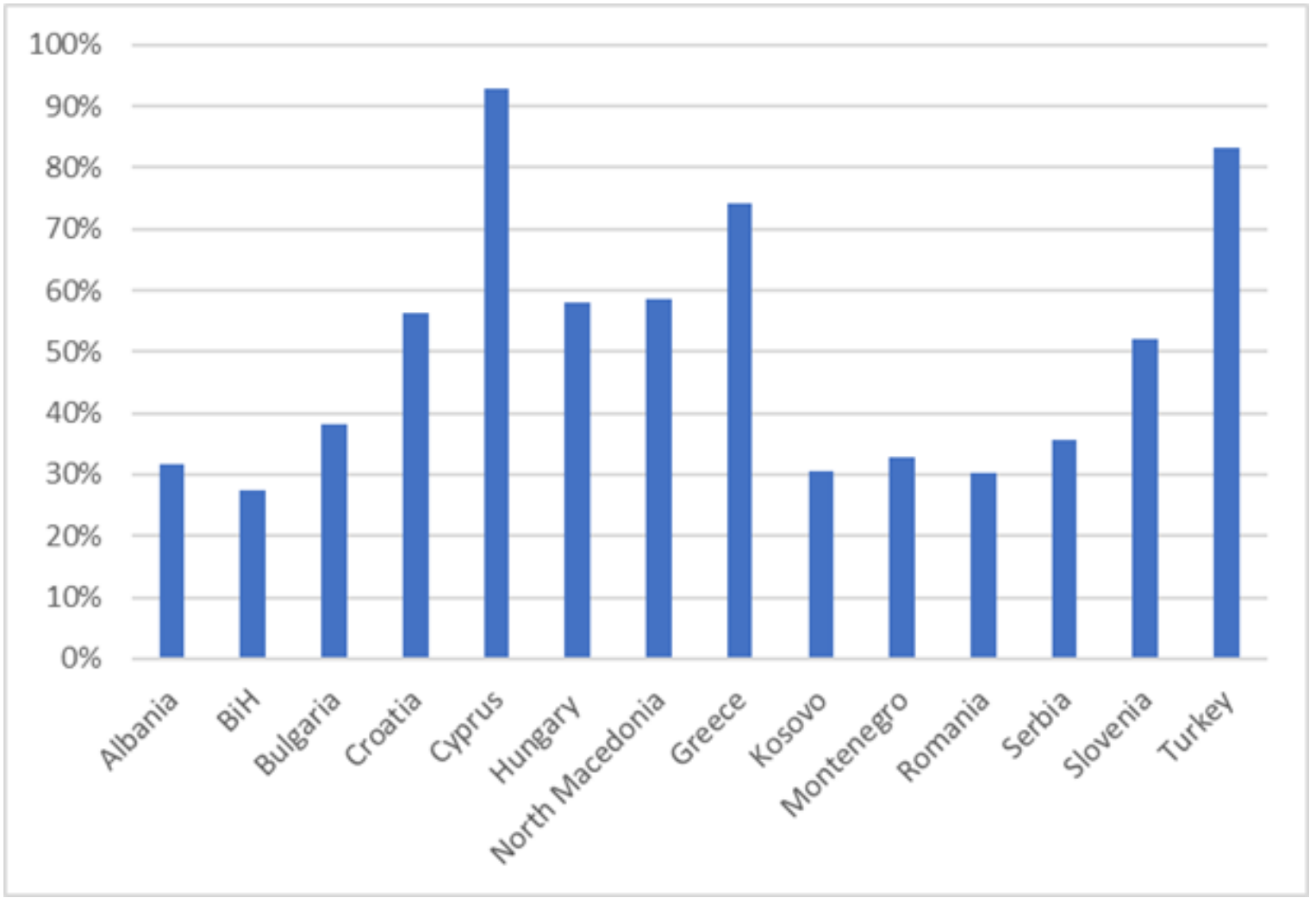
Source: Eurostat

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

Energy Dependence (%) in SE Europe (2019)



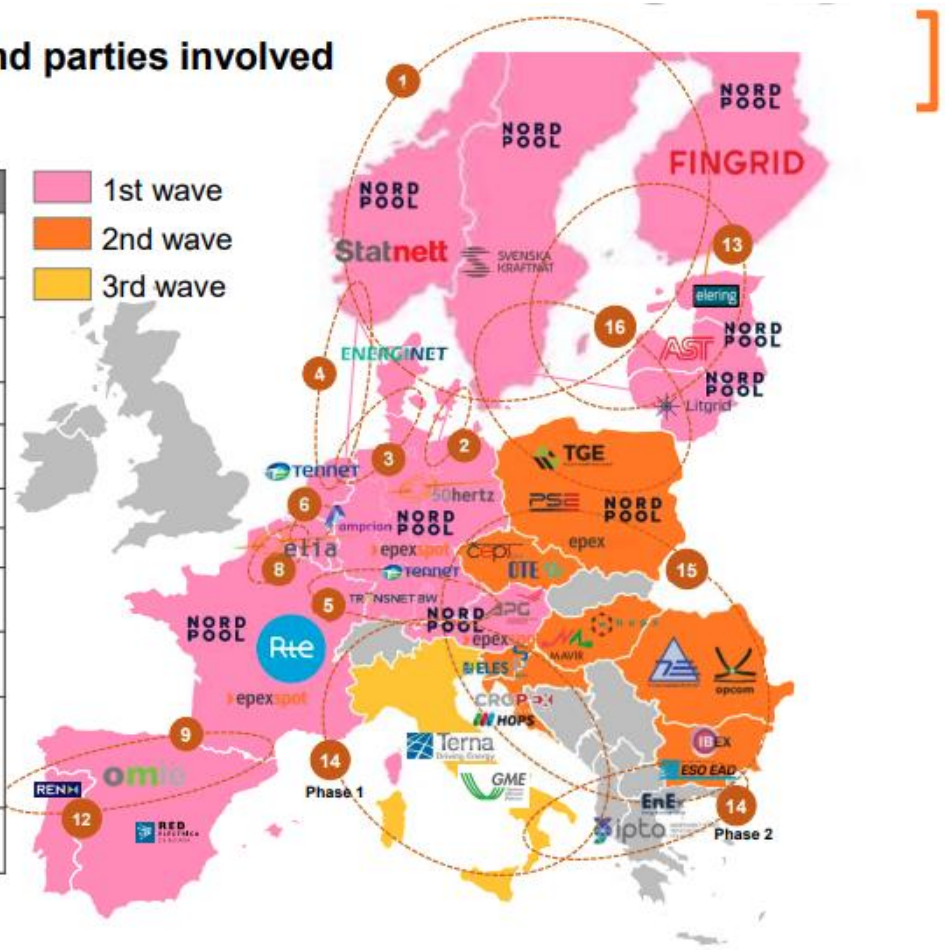
Source: Eurostat

Single Intraday Coupling (SIDC) in Europe (I)

1. Overview of 1st and 2nd go-live waves and parties involved

- **LIPs part of 1st and 2nd waves go-live:**

LIP		Participants	Allocation
1	Nordic	Fingrid, Energinet, SvK, Statnett, Nord Pool, EPEX	• Implicit
2	Kontek	Energinet, 50Hz, Nord Pool, EPEX	• Implicit
3	DK1/DE, DE/NL	Energinet, TenneT NL& DE, Amprion, EPEX, Nord Pool	• Implicit
4	NorNed	Statnett, TenneT NL, EPEX, Nord Pool	• Implicit
5	FR/DE, DE/AT	Amprion, TransnetBW, APG, RTE, EPEX, Nord Pool, Tennet DE	• Implicit - all • + Explicit (DE/FR)
6	NL/BE	Elia, TenneT NL, EPEX, Nord Pool	• Implicit
8	FR/BE	RTE, Elia, EPEX, Nord Pool	• Implicit
9, 12	FR/ES& ES/PT	RTE, EPEX, OMIE, REE, REN, Nord Pool	• Implicit
13	Baltic	Elering, Litgrid, AST, Fingrid (Estlink), Svenska Kraftnät (NordBalt), Nord Pool	• Implicit
15	AT-CZ, AT-SI, AT-HU, BG-RO, CZ-DE, CZ-PL, DE-PL, SI-HR, HR-HU, HU-RO	BSP, Cropex, EPEX, HUPX, IBEX, Nord Pool, OPCOM, OTE, 50Hertz, APG, CEPS, ELES, ESO, HOPS, MAVIR, PSE, Transelectrica, TTG	• Implicit • + Explicit (SI-HR)
16	LT-PL, PL-SE	Nord Pool, TGE, Litgrid, PSE, Svk	• Implicit



Source: EPEX SPOT

Single Intraday Coupling (SIDC) in Europe (II)

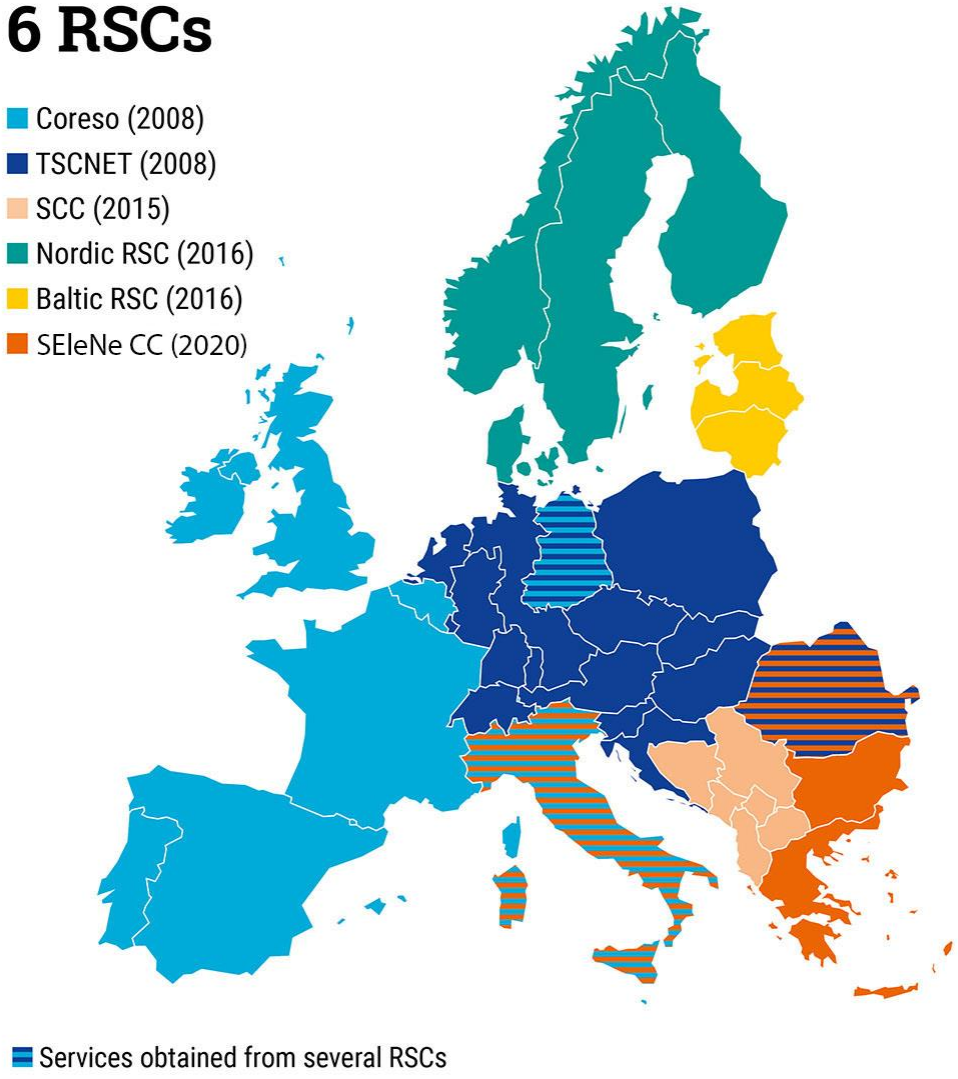
Overview of 3rd and 4th go-live waves and parties involved

LIP	Go-live	Border	Participants	Foreseen allocation
14	3rd wave	IT-FR, IT-AT, IT-SI, Italian Internal BZBs	**NEMOs**: GME, BSP, EPEX, EMCO **TSOs**: TERNA, RTE, APG, ELES	Implicit
	4th wave	GR-IT, GR-BG	**NEMOs**: HENEX, GME, IBEX **TSOs**: IPTO, TERNA, ESO	Implicit

Operational
3rd wave
4th wave
Operational, part of 3rd wave
Operational, part of 4th wave

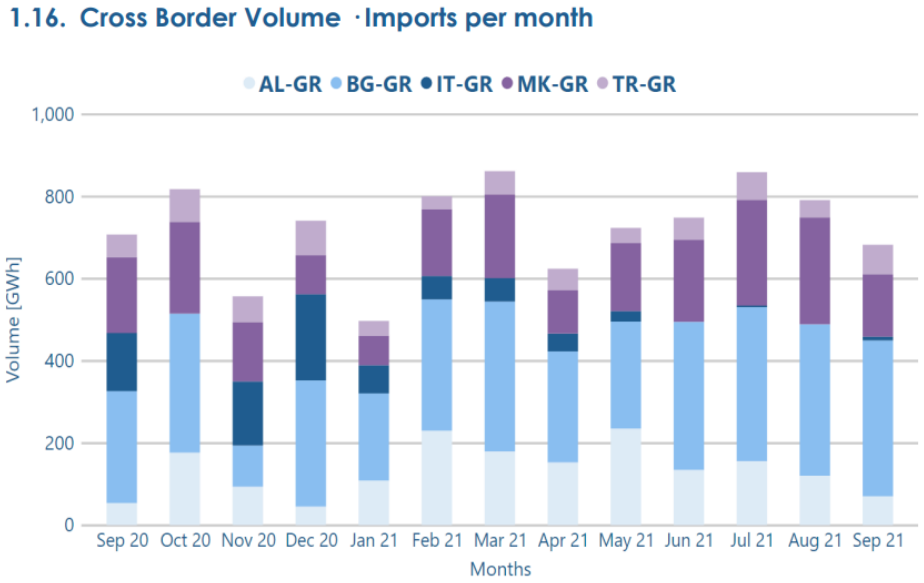
Source: EPEX SPOT

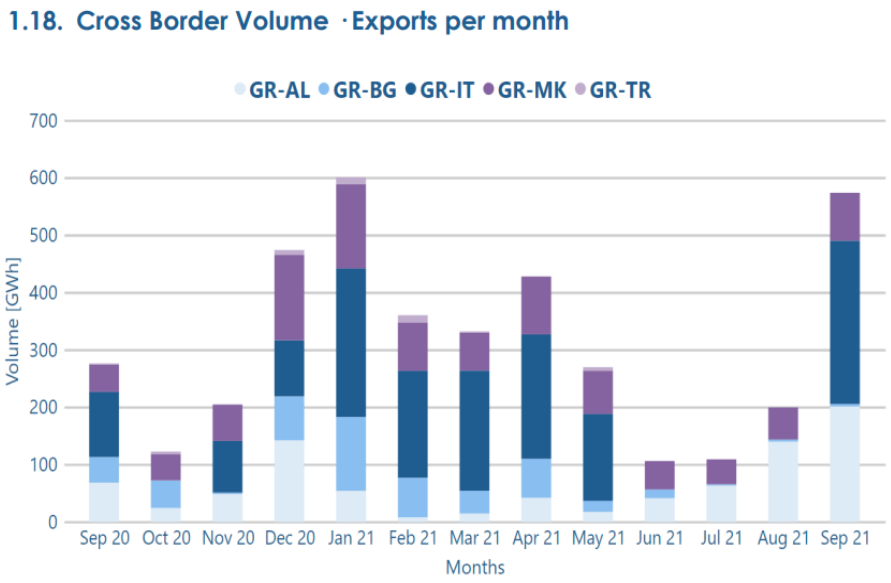
Regional Security Coordinators (RSC)



Source: ENTSOe

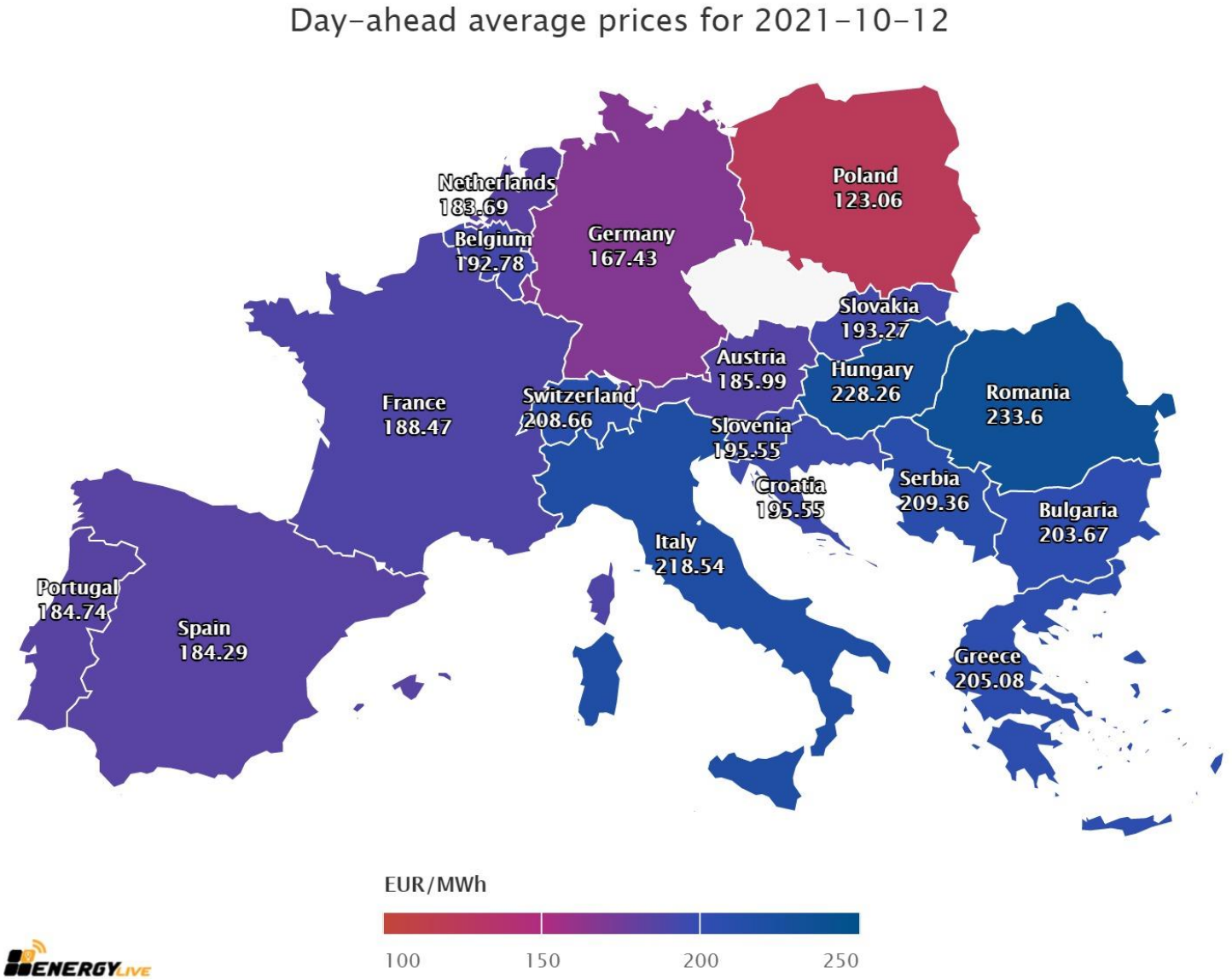
Cross Border Electricity Trade in Greece, September 2020 – September 2021





Source: HENEX

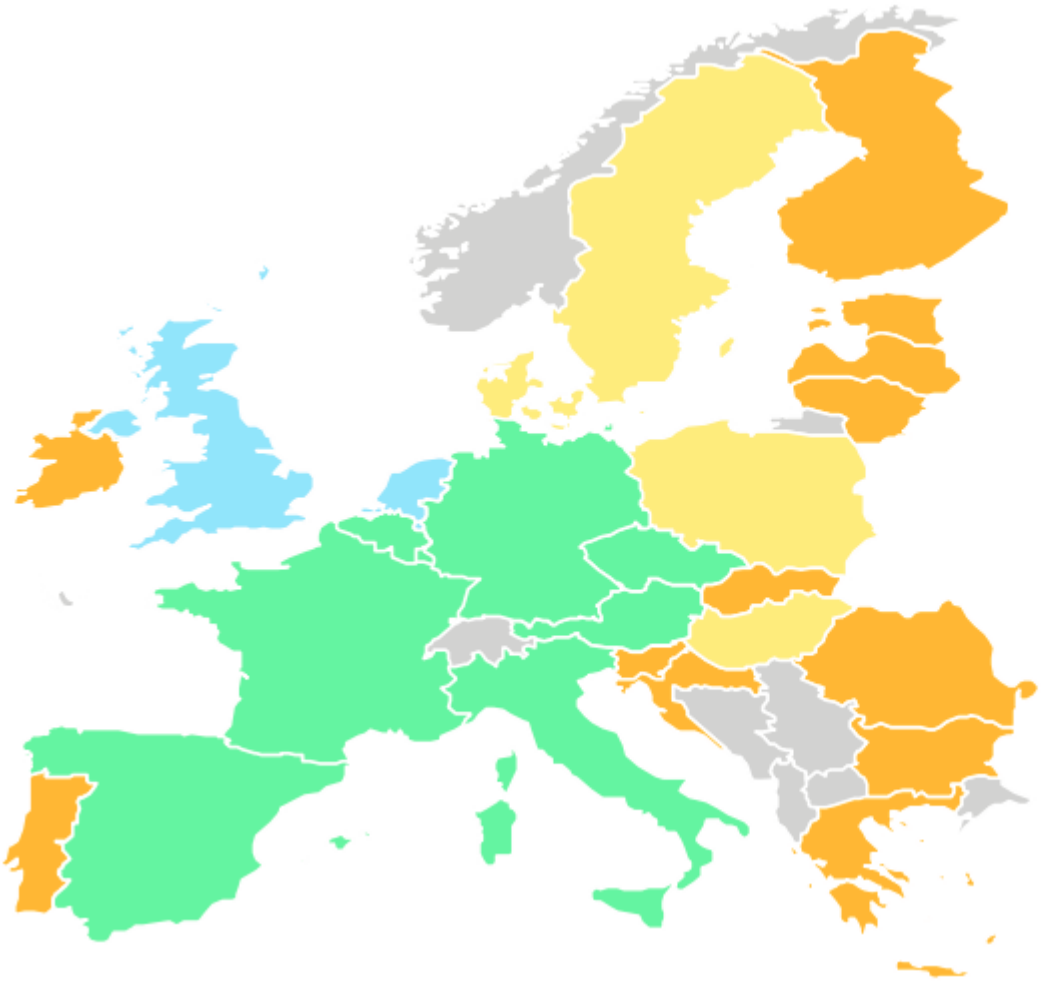
Wholesale Electricity Prices in SE Europe



European Gas Regions, Markets and Hubs: 2020

Source: OIES

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

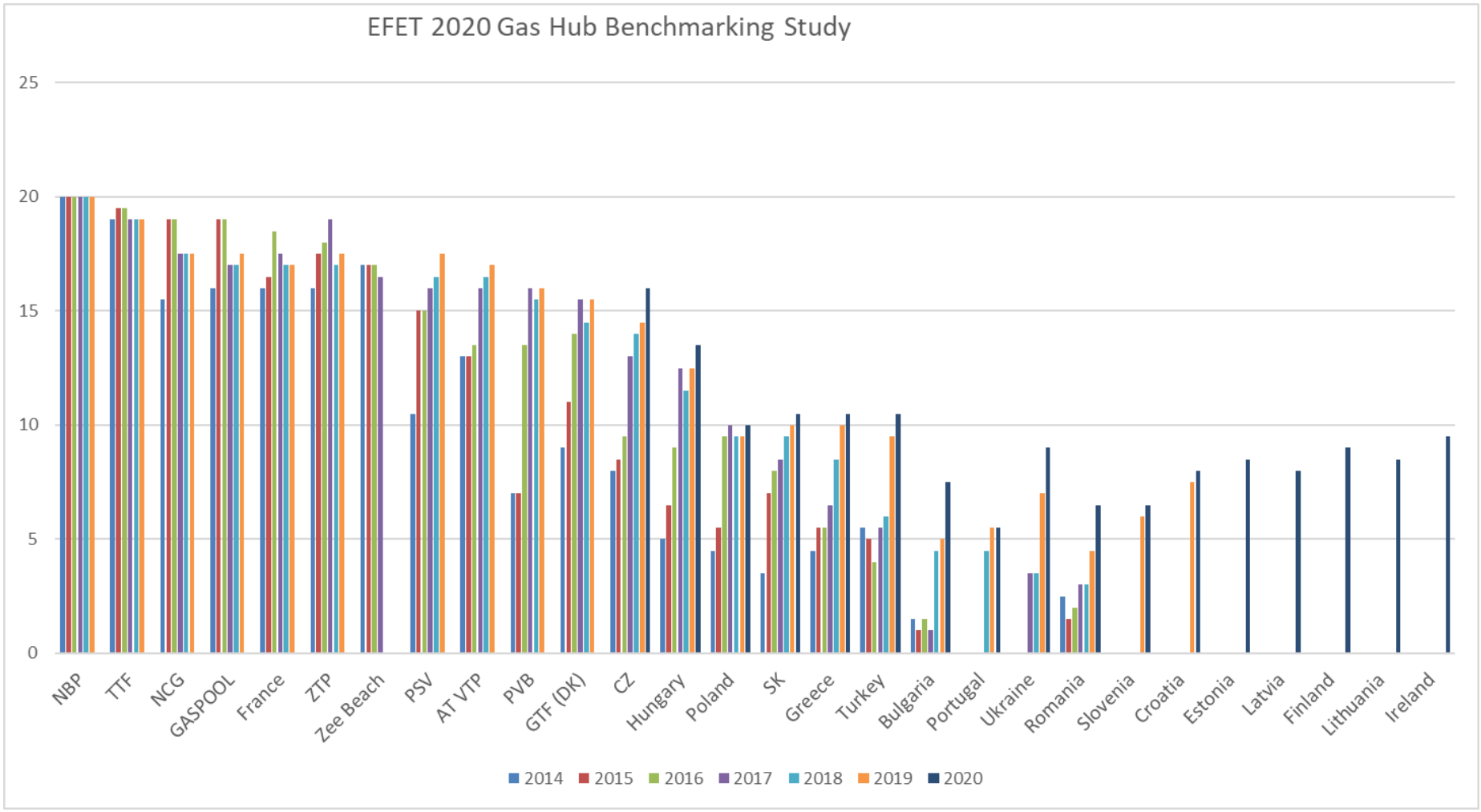
Advanced hubs
- High liquidity
- More reliant comparatively on spot products
- Progress on supply hedging role but relatively lower liquidity levels of longer-term products

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 2020

EFET's Annual Scorecard 2020

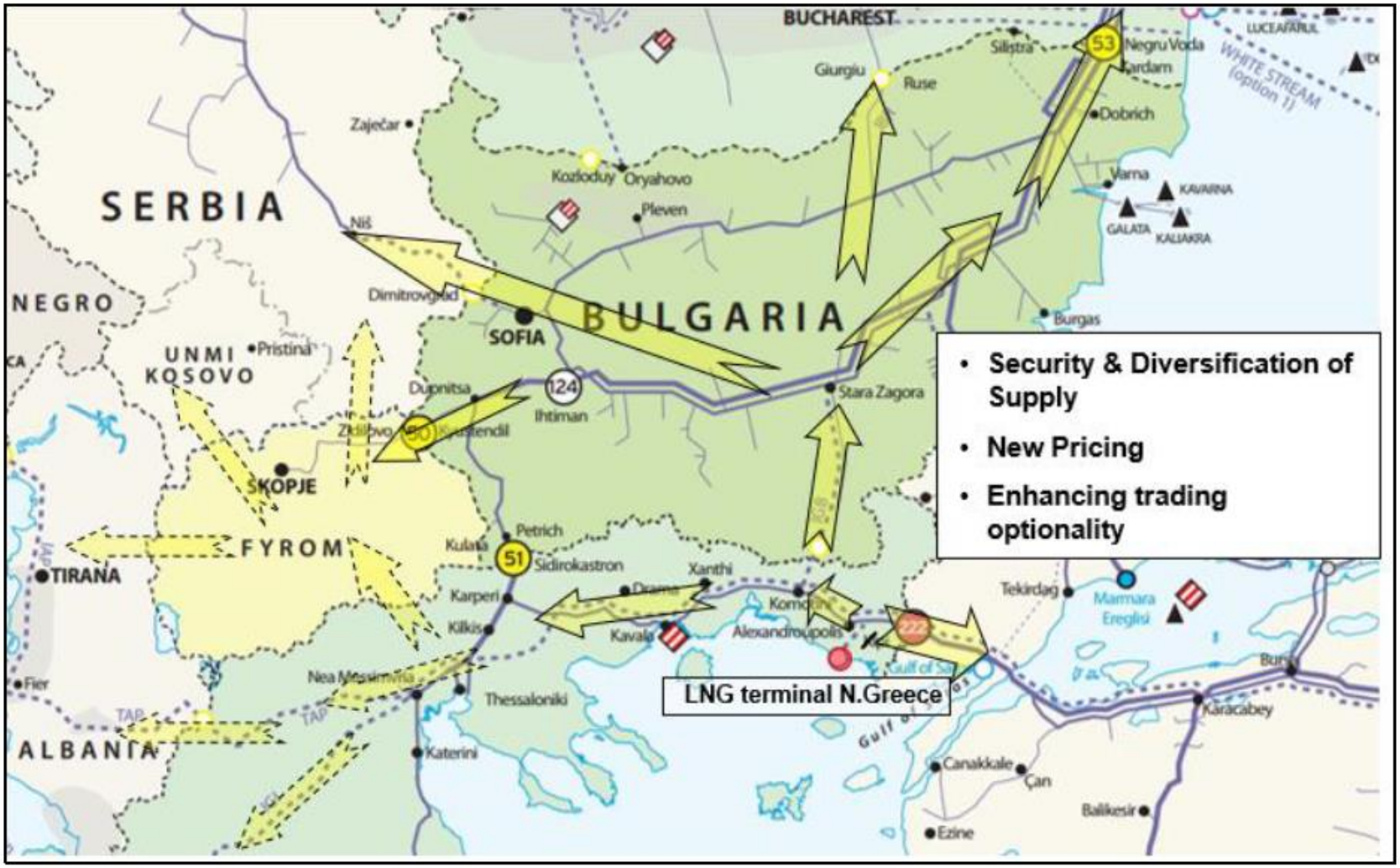


Source: EFET

Balkan Gas Hub

Source: Republic of Bulgaria

The Alexandroupolis FSRU



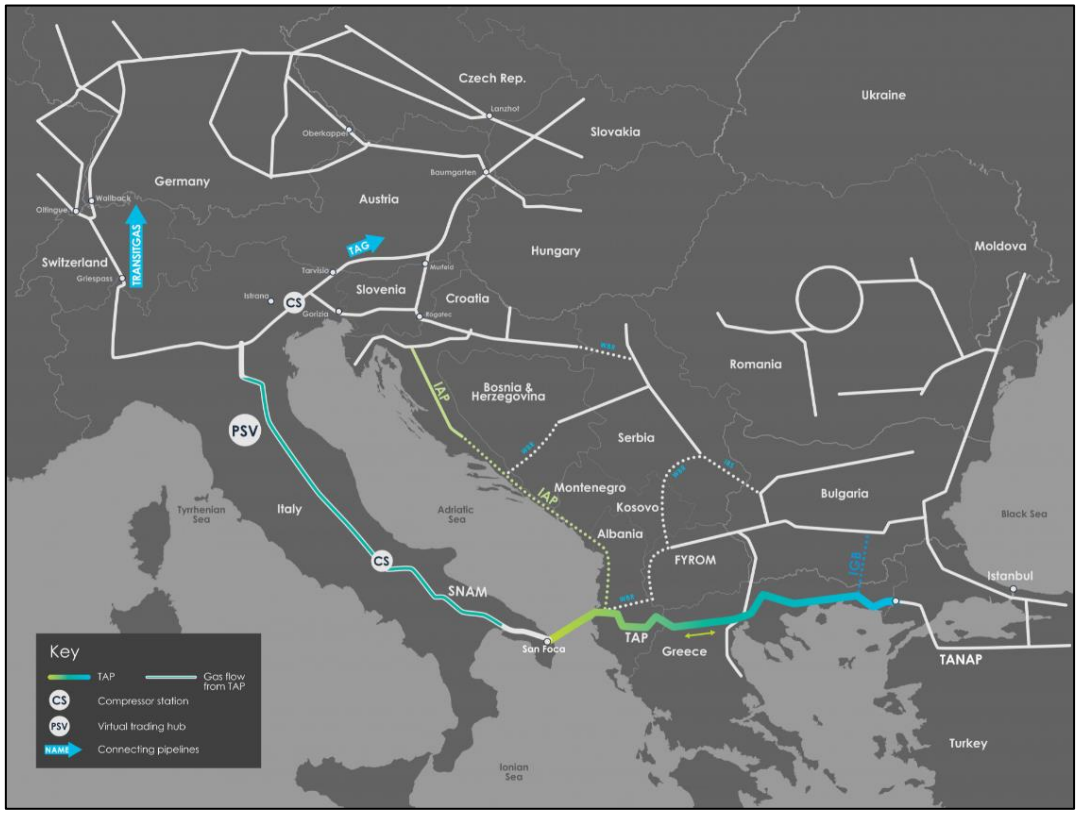
Source: Gastrade

Interconnector Greece-Bulgaria (IGB) (Under Construction)

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

Source: ICGB AD

The TANAP-TAP System (Completed)



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

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

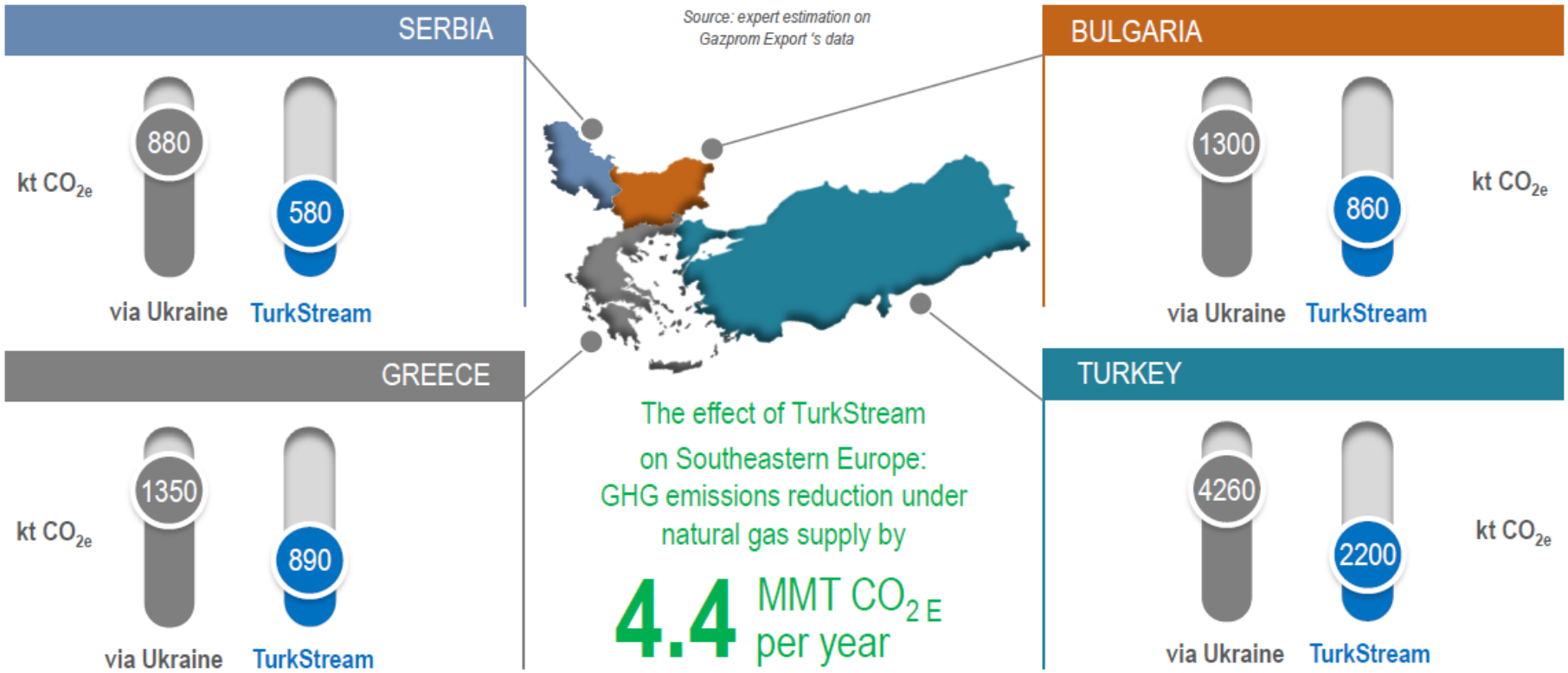
Source: TAP AG

Turkish Stream (Completed)

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.

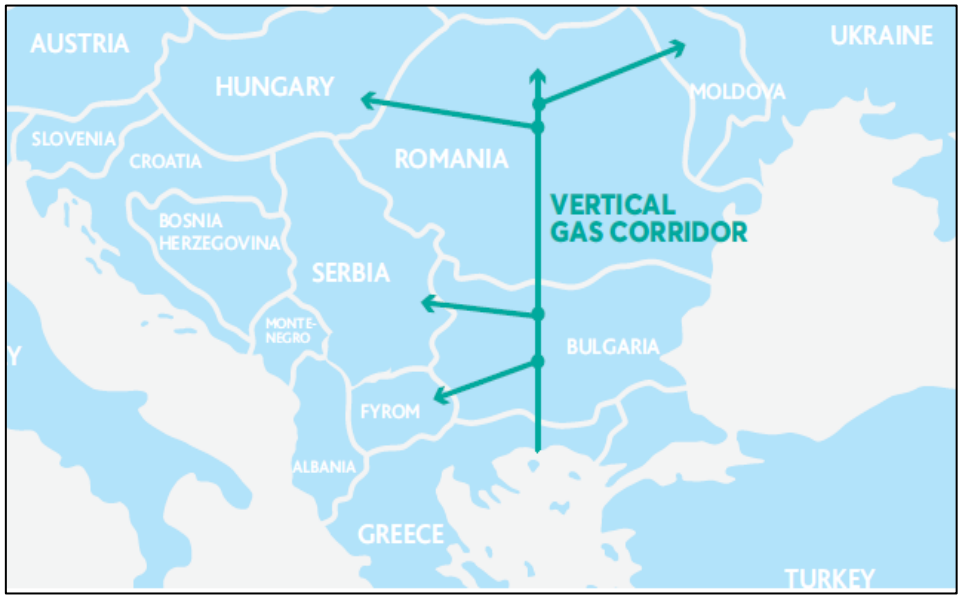
Source: Gazprom

Annual GHG Emissions Cut Under Gas Supply via Turkish Stream

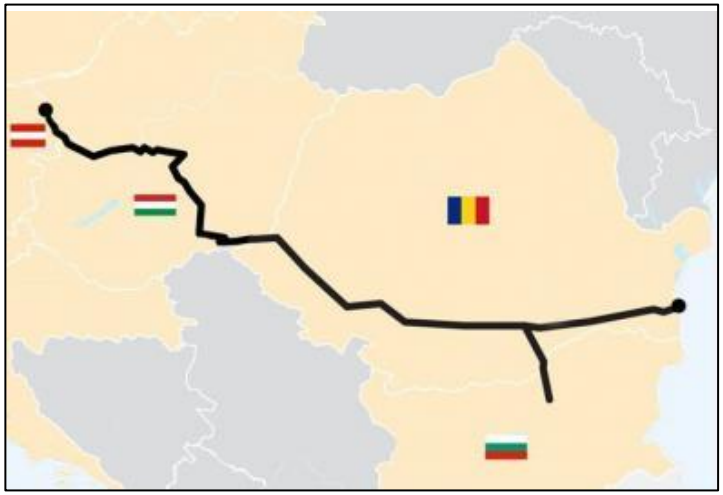


Source: Gazprom

Vertical Corridor and BRUA (Under Construction)



Source: IENE



Source: European Commission

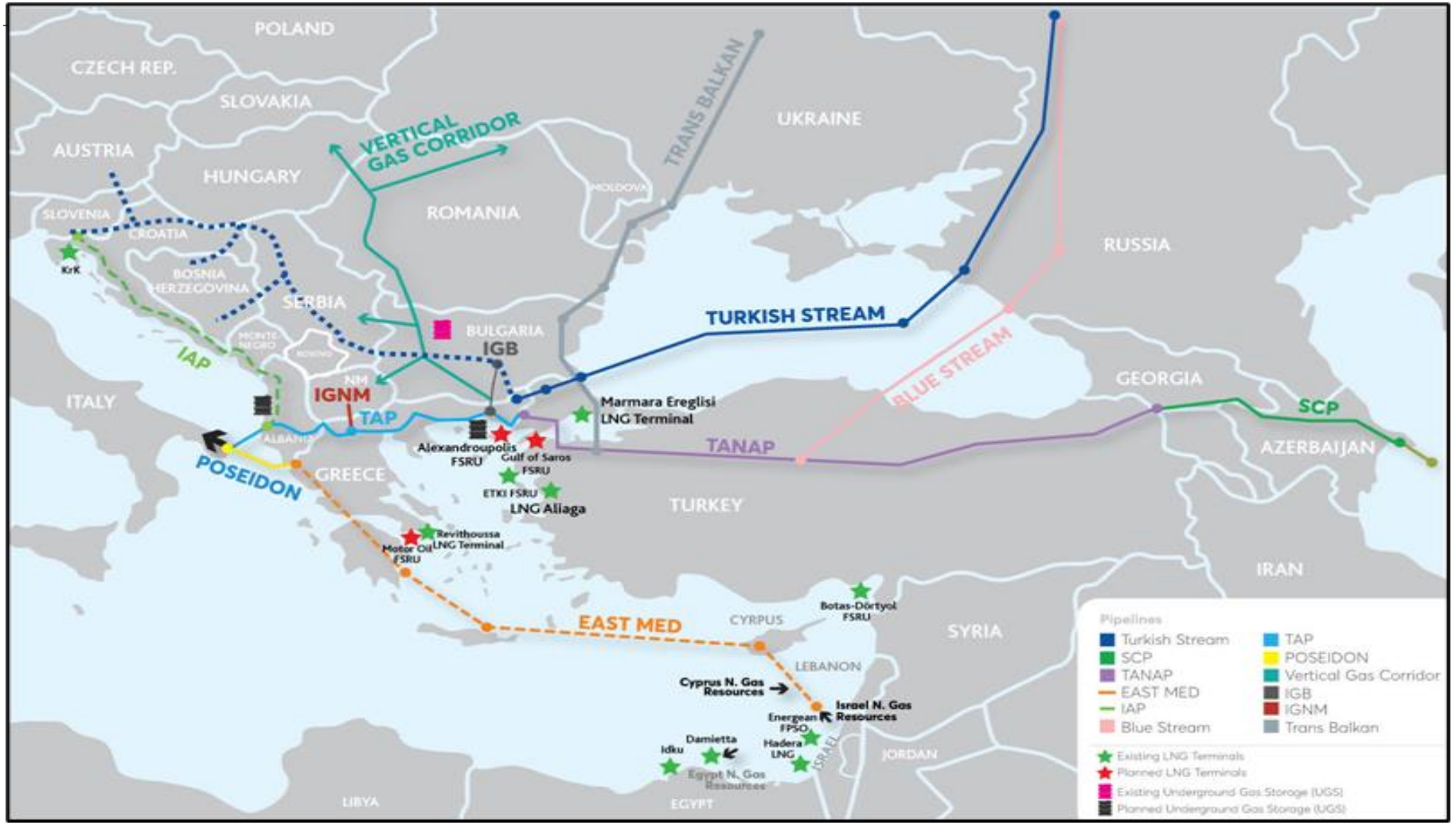
BRUA	
Length	843 km
Diameter	32-inch (813 mm) pipes
Capacity	0.5 bcm/y transport capacity towards Bulgaria and 4.4 bcm/y towards Hungary

South Kavala Underground Gas Storage (Conceptual Stage)

Source: ENTSO-G

South Kavala UGS	
Storage Facility Type	Aquifer
Capacity	0.36 bcm/y

An Expanded South Gas Corridor



Note: The TANAP, TAP and Turk Stream have been completed, while BRUA and IGB are still 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

Energy Security in SE Europe (I)

- **Energy security is a complex issue** and as such cannot be considered in isolation.
  - SE Europe because of its geography, its proximity to high risk conflict zones (i.e. Syria, Iraq, Ukraine), a growing and uncontrolled refugee flow from the Middle East and North Africa and the location of some of its countries (i.e. Turkey, Greece, Romania) at vital energy supply entry points, faces **higher energy security threats** than the rest of Europe.
- There is a need to strengthen available mechanisms
  - The **strengthening of Emergency and Solidarity Mechanisms** and the **maintenance of adequate oil, coal and gas stocks**, constitute a short- to medium-term relief solution.
  - The achievement of a **balanced energy mix** provides the best long-term option in enhancing energy security both at country and regional level.
- Security of **supply/demand** and **differentiation of supply sources**
  - In the case of gas, it is becoming more important and pressing compared to other fuel sources, such as electricity, oil, coal and possibly uranium.
  - Gas is a primary area of concern largely because of its rather inflexible transmission method, mainly by means of pipelines.

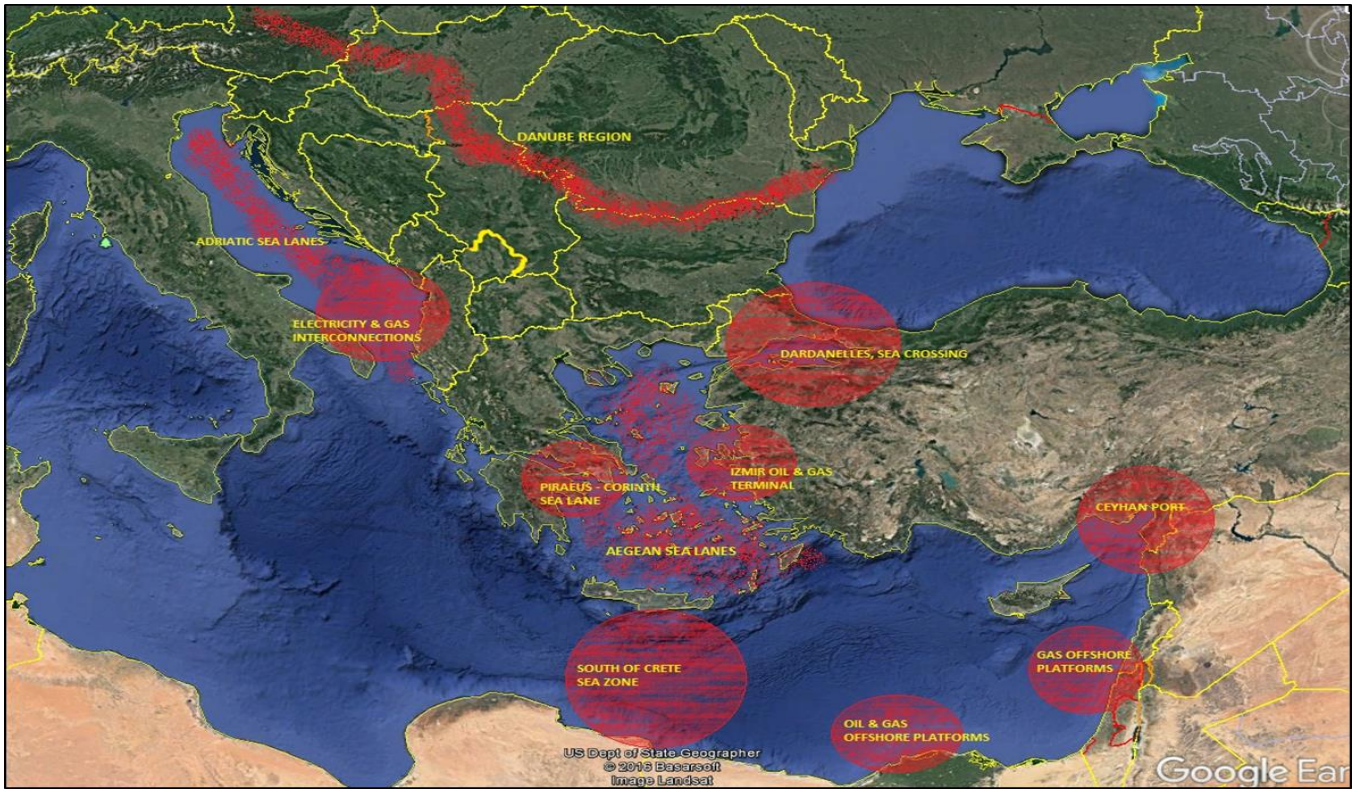
Energy Security in SE Europe (II)

- Security of **transportation**, shipment of **oil and gas**
  - Gas deliveries were twice disrupted (i.e. 2006 and 2009) with the shipment of Russian gas, through Ukraine, to Europe but also from Turkey and Greece (i.e. 2011 and 2016).

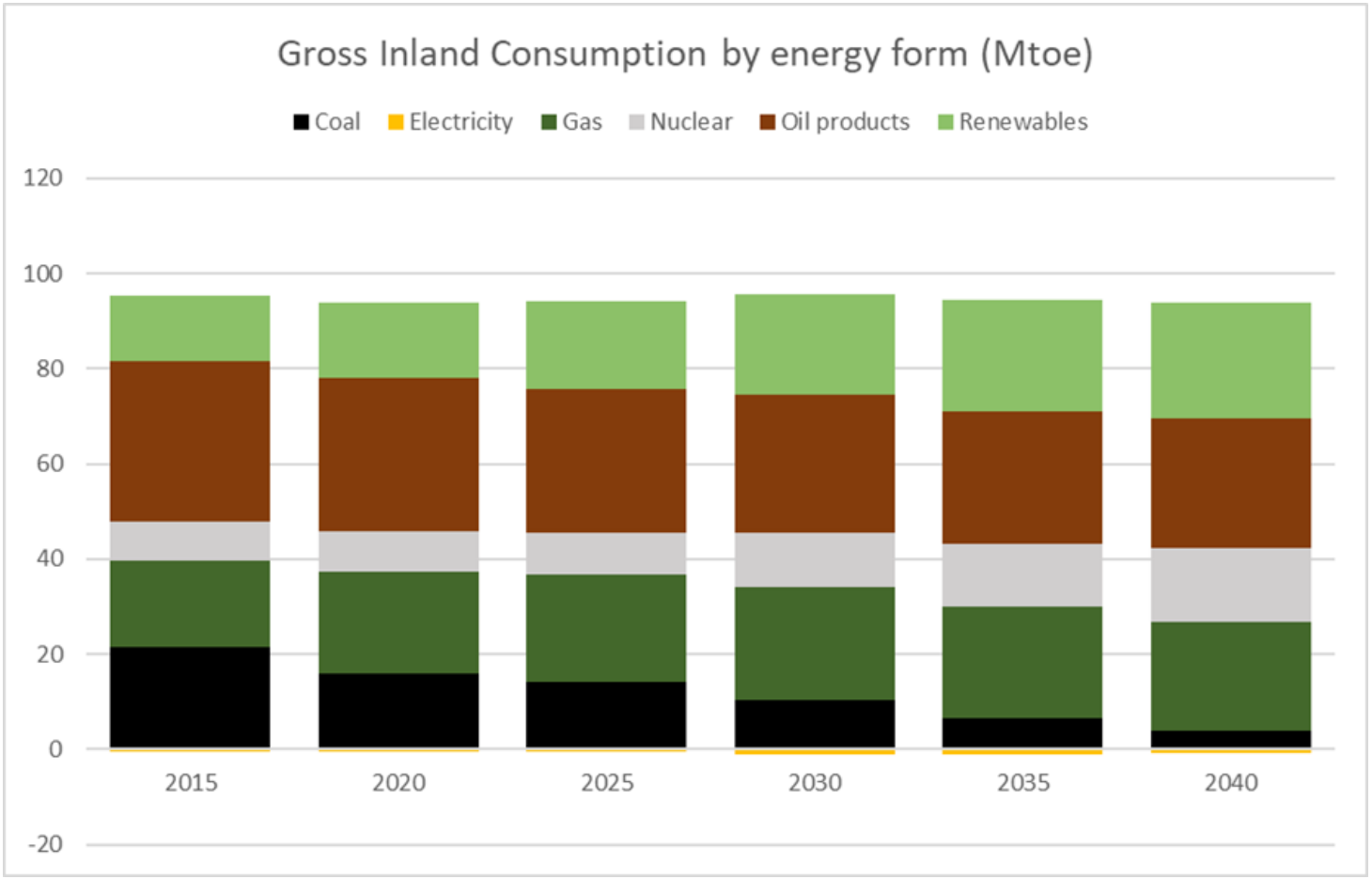
- **Smooth supply of electricity** and urgent need to connect various island groups to the mainland grid
  - Mitigation of possible power supply failures and shortfalls and minimization of environmental impact through the retirement of fuel oil or diesel powered electricity generators on several islands.

Energy Security in SE Europe (III)

- **Effective protection of energy infrastructure**
  - Mitigation of terrorist threats and advanced level of safety against of physical hazards (e.g. hurricanes, floods, earthquakes) and cyber threats.
- The various vulnerable key energy infrastructure locations in SE Europe constitute **potential energy security hot spots** and as such should be properly identified (***see following Map***), while also crisis management plans must be prepared in order to meet any emergencies (e.g. physical hazards, large scale industrial accidents or terrorist actions).

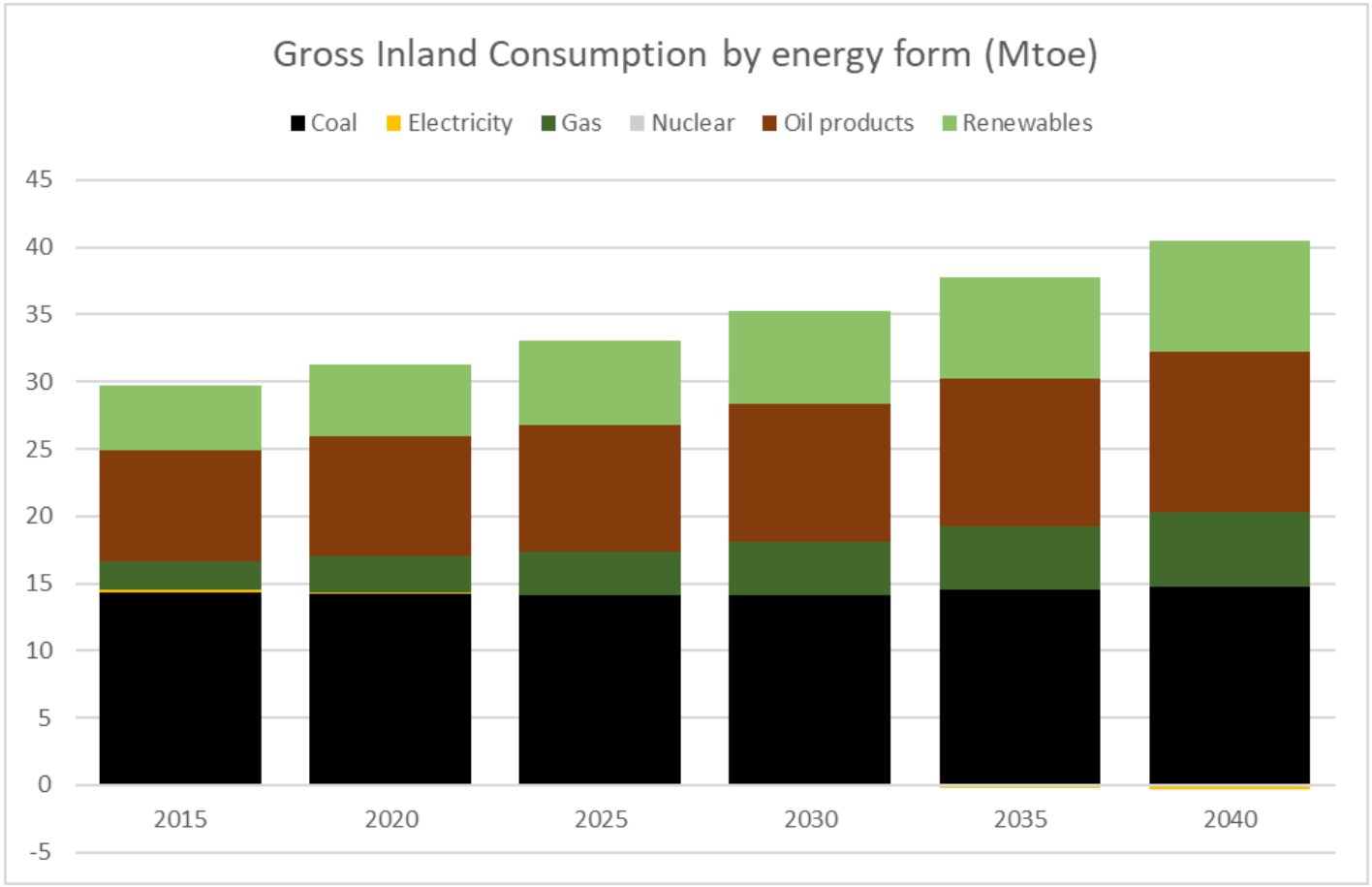


EU Member States in SEE: Gross Inland Consumption (2015-2040)



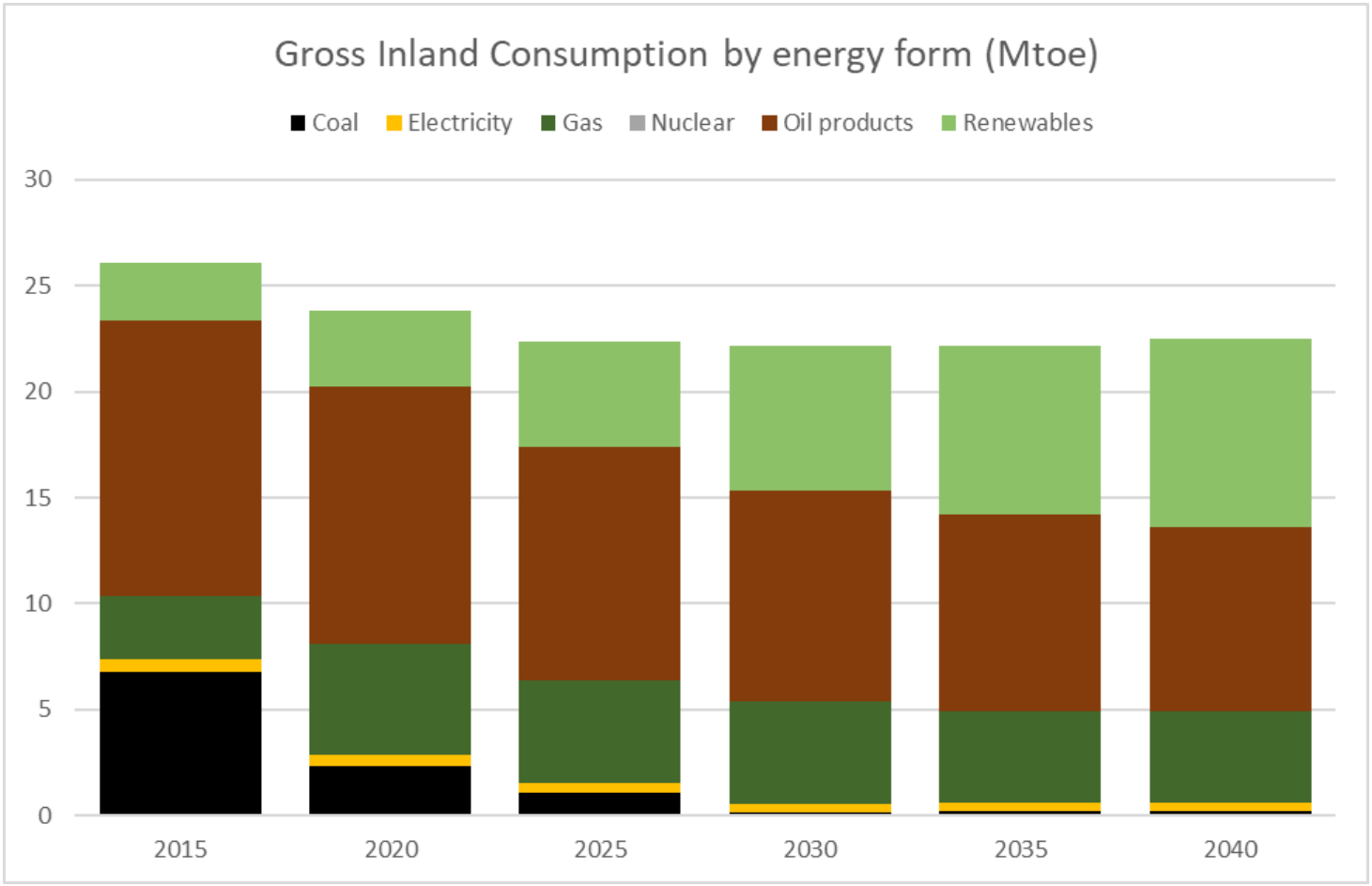
Source: IENE's "SEE Energy Outlook 2021/2022"

Western Balkans: Gross Inland Consumption (2015-2040)



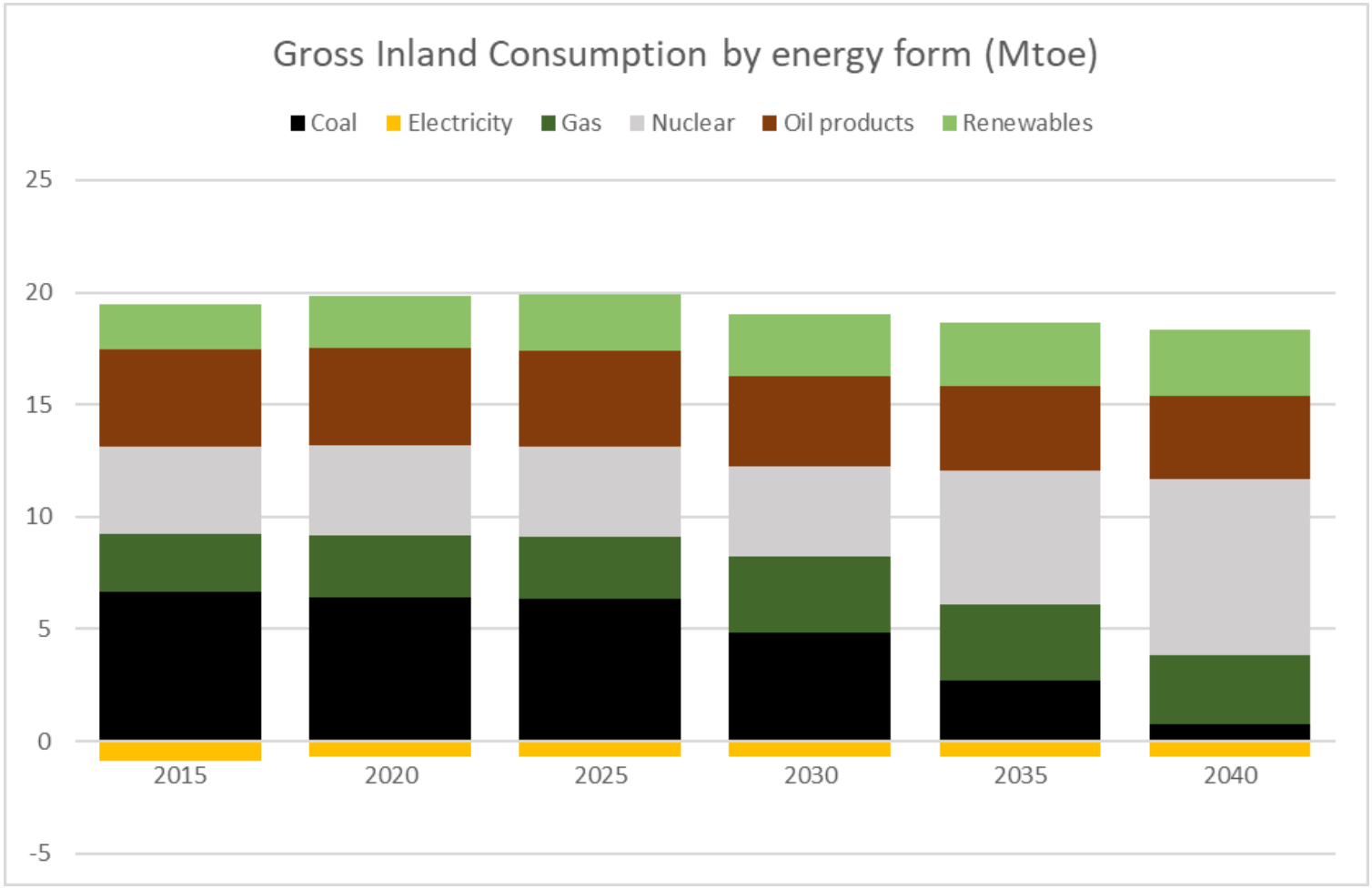
Source: IENE's "SEE Energy Outlook 2021/2022"

Greece: Gross Inland Consumption (2015-2040)



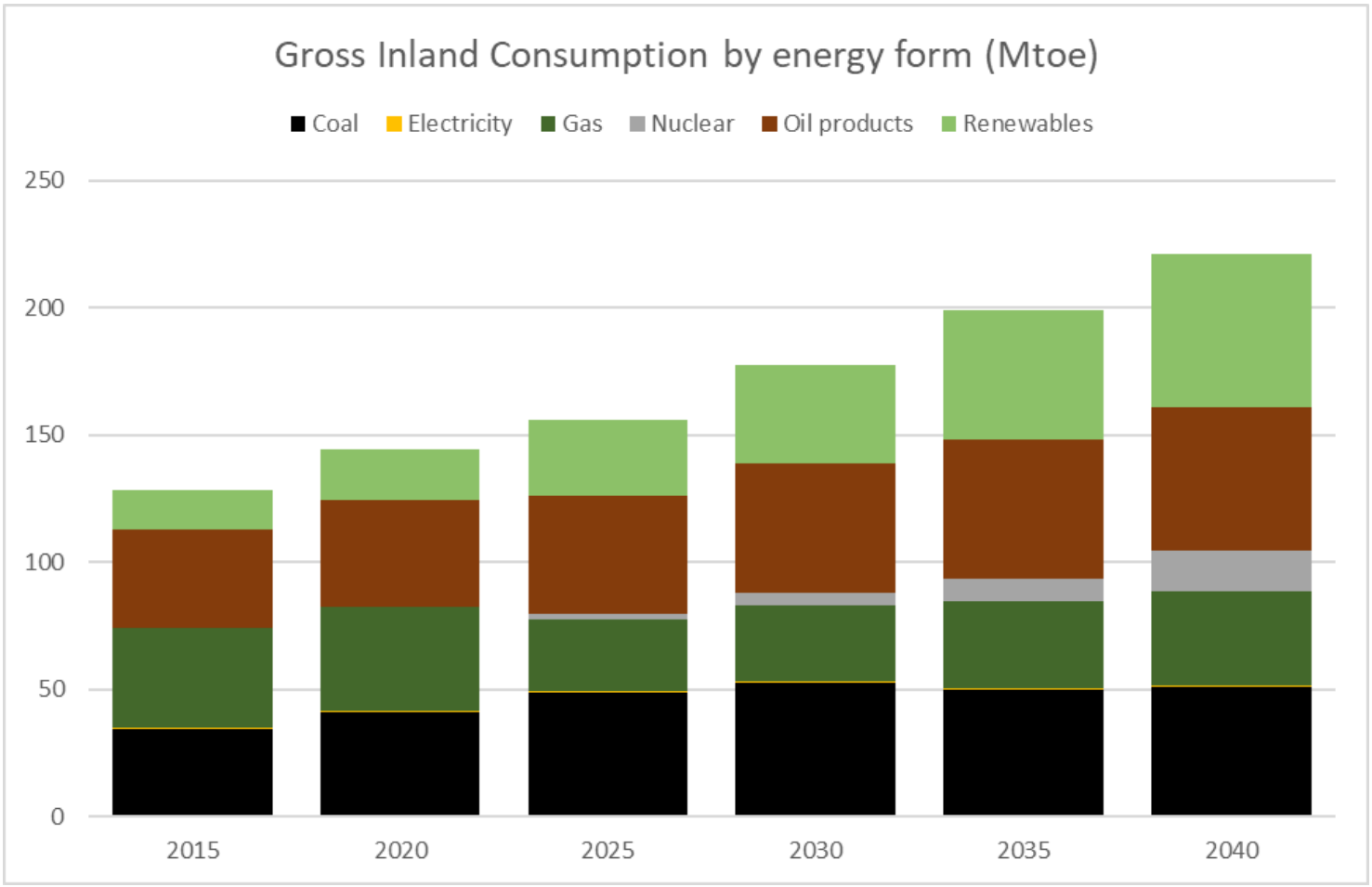
Source: IENE's "SEE Energy Outlook 2021/2022"

Bulgaria: Gross Inland Consumption (2015-2040)



Source: IENE's "SEE Energy Outlook 2021/2022"

Turkey: Gross Inland Consumption (2015-2040)



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