INSTITUTE OF ENERGY FOR SE EUROPE

INSTITUTE OF ENERGY
FOR SOUTH-EAST EUROPE

SE Europe Energy Outlook 2021/2022 and Key Regional Energy Issues

Presentation at the
International Energy Agency (IEA) Academy,
Paris

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By **Costis Stambolis**
Chairman and Executive Director of IENE

Study Scope and Focus (I)

Study Scope

(a) To present a **critical assessment** of the current status of the energy market in SE Europe

(b) To bring together the latest available knowledge on energy developments in the region and also **provide comprehensive data** on energy demand/ consumption, the major energy projects, pursued energy policies as well as trends, estimates and projections

(c) Taking into consideration the economic and political background of SE Europe, it **analyses the dynamics** of regional integration process from an **energy perspective**

(d) To provide an outlook for energy supply/demand, consumption and energy mix in the region

Study Scope and Focus (II)

- Study Focus

(a) Historical, political and socio-economic background of SE Europe

(b) Outlook on energy demand/consumption trends

(c) Sub-sector analysis: oil, gas, electricity (including solid fuels and nuclear), energy efficiency, co-generation, renewable energy sources

(d) Country Analysis

(e) Legal and Regulatory environment

(f) Major energy projects (national and transnational)

(g) Energy technology aspects

(h) Investment outlook

(i) Energy and environmental policy challenges

Methodology

- **Data acquisition and analyses from various studies and research work undertaken by IENE between 2018 and 2021**
  - Contributions by individual energy experts from all different countries of the region focusing on Country Profiles and Sectorial Analysis
  - From published sources including IEA, EIA, OPEC, IAEA, European Community, Energy Community, IENE (analyses, reports, newsletters) and from several European bodies (ACER, ENTSO-E, ENTSO-G, GIE, Eurogas, Eurelectric, Fuels Europe, EWEA, Solar Power Europe, ESTIF, COGEN Europe, EREF). Also, from various national statistical organisations and national energy regulatory agencies
- **Analysis**

  Various conventional analytical tools and computer simulation models were used in analysing quantitative data for macroeconomic and energy demand forecasting. In this respect, IENE cooperated closely with external senior energy modelers **George Giannakidis** and **Rocco De Miglio**
- **Synthesis**

  Undertaken in-house by IENE's core study team comprising economists, engineers, political scientists, history and strategy majors and experts from all different areas of the energy sector

Contents of SEEEO 2021/2022 Study

Raison d' Être

- Why a regional approach?

Because SE Europe, on the strength of its history, cultural background and current urban and industrial setting, constitutes a region both geographically and geopolitically and it has a strong impact on the rest of Europe and the East Med (see Energy Security).

- The need to **understand** the geopolitical and geographical sphere within which IENE operates, but also to **define** and **evaluate** in an objective manner the major policy challenges of the energy sector of the region.
- To **study, analyse** and **understand** the region's energy market structure and associated energy flows.
- To **identify** the important investment and business opportunities across the SE European area and assess the region's energy related investment potential within the given business climate.
- Energy Atlas of the region.
- An in-depth study of the energy prospects and perspectives of a particular geographic region, such as SE Europe, has an impressive cumulative effect, as the **sum often exceeds the value of its constituent parts**. Very much along the lines of Aristotle's logic when he proclaimed the *"The whole is greater than the parts"*.

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

2020 Basic Energy Data for SE Europe, Including Turkey

Region	Final Oil Consumption (thousand tonnes)	Gas Inland Consumption (bcm/y)	Gross Electricity Production (TWh)
SE Europe	84,737.4 (20.6% of EU-27)	86.5 (21.6% of EU-27)	597.6 (21.4% of EU-27)
EU-27	411,530.4	399.6	2,786

Source: IENE study "SE Europe Energy Outlook 2021/2022", Athens, 2022

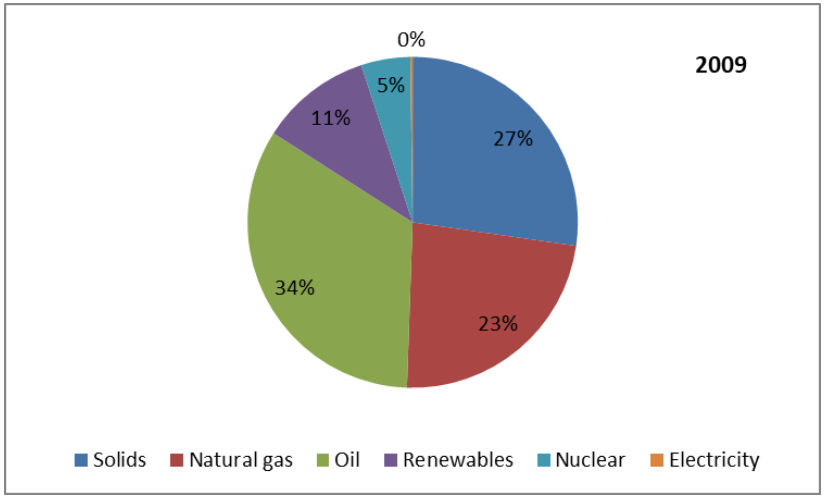
The magnitude of the region's oil, gas and electricity consumption is not insignificant compared to the total numbers involved at EU level.

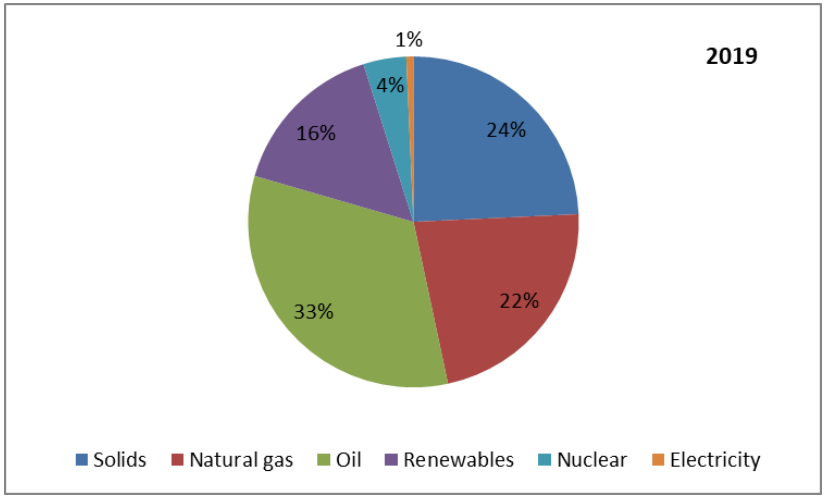
Key Regional Energy Issues

The following stand out as key issues of the regional energy landscape:

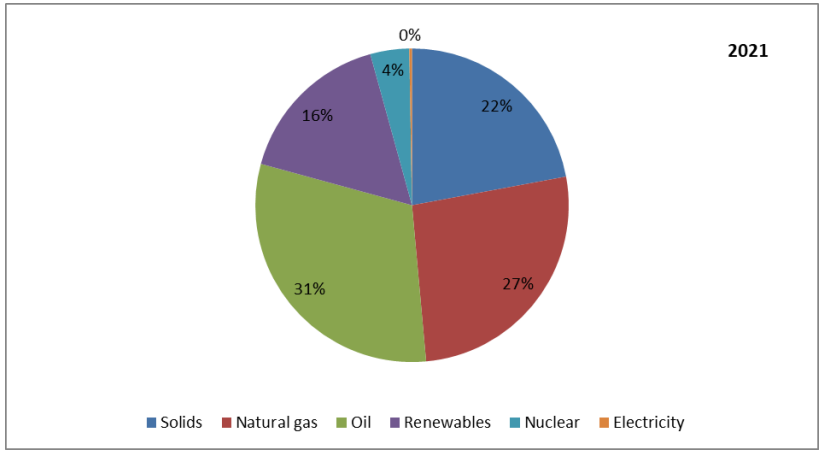
- A more balanced energy mix could be the answer to several key issues (i.e. energy security, decarbonisation)
- High oil and gas import dependence (87% for oil and 82% for gas in 2021)
- SEE's path towards decarbonisation is uncertain and fraught with difficulties
- Coal/lignite is and will continue for sometime to be relevant
- Marked divergence between EU and SEE energy strategies
- RES growth impeded due to past and present policy failures and electricity grid constraints
- SEE is more energy security vulnerable than the rest of Europe
- Gas has emerged as a strategic fuel during latest energy crisis, especially LNG
- Electricity's newcomer gas alters supply balance
- Lack of adequate electricity and gas interconnections
- Nuclear remains a viable option for SEE power generation

SE Europe's Energy Mix, Including Turkey, 2009, 2019 and 2021 - High Oil and Gas Import Dependence



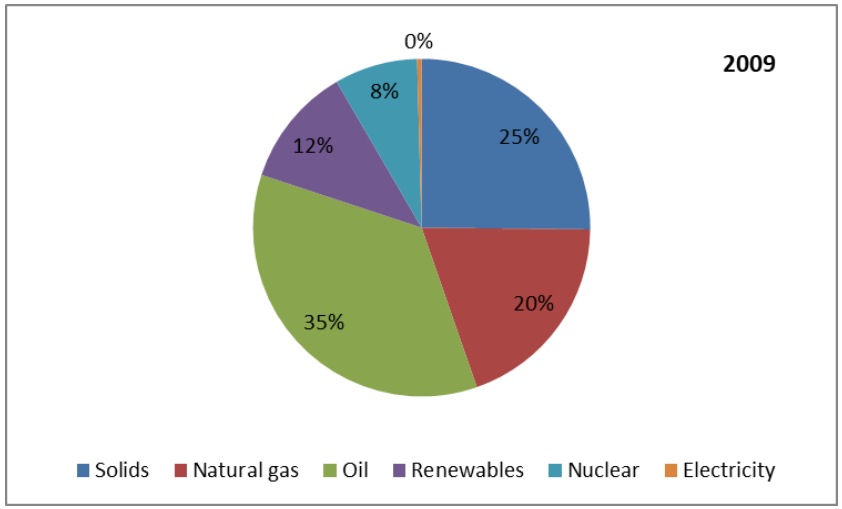


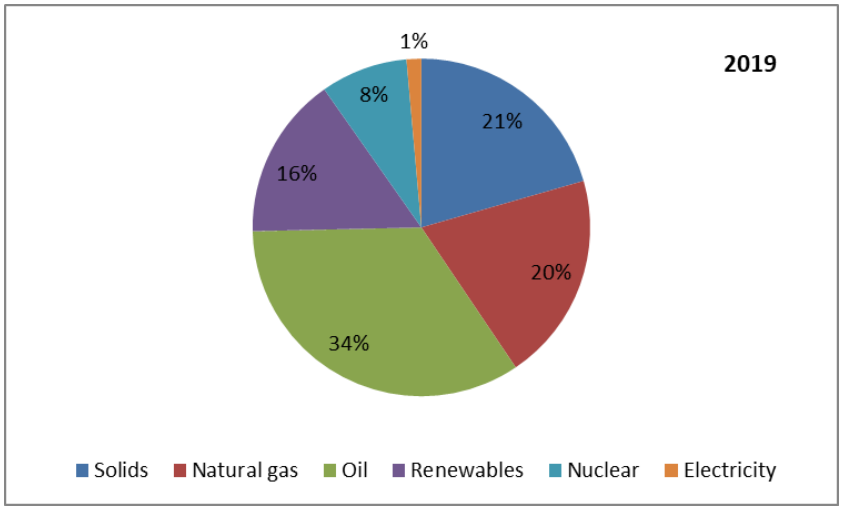
Over the last 10 years, we notice decreased solid fuel use, a marginal increase in gas consumption, a marginal drop in oil use, much higher RES deployment and less nuclear use.



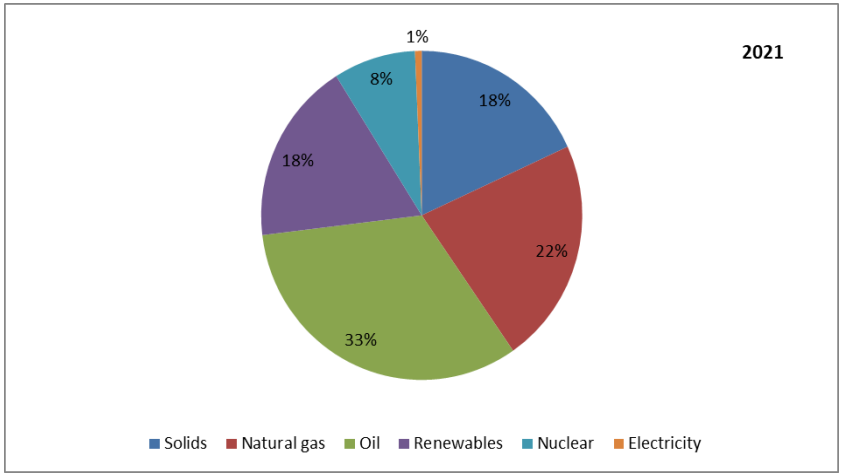
Source: Eurostat

SE Europe's Energy Mix, Without Turkey, 2009, 2019 and 2021 - High Oil and Gas Import Dependence





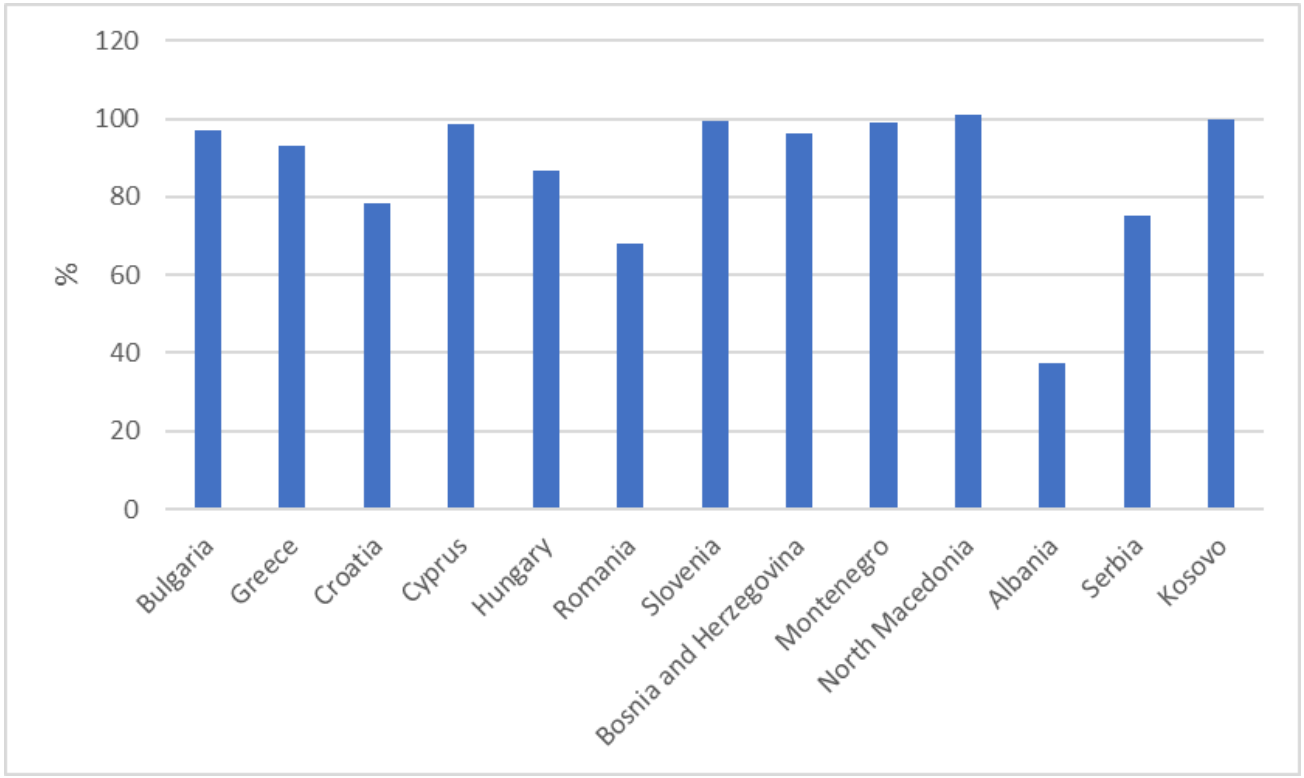
Over the last 10 years, we see considerably less solid fuel use, higher gas consumption, marginally less oil use, much higher RES deployment and steady nuclear use.



Source: Eurostat

Key Regional Energy Issues – Oil Import Dependency

Oil Import Dependency (%) in SE Europe (2021)



Note: A dependency rate in excess of 100% relates to the build-up of stocks.

Sources: Eurostat, IENE

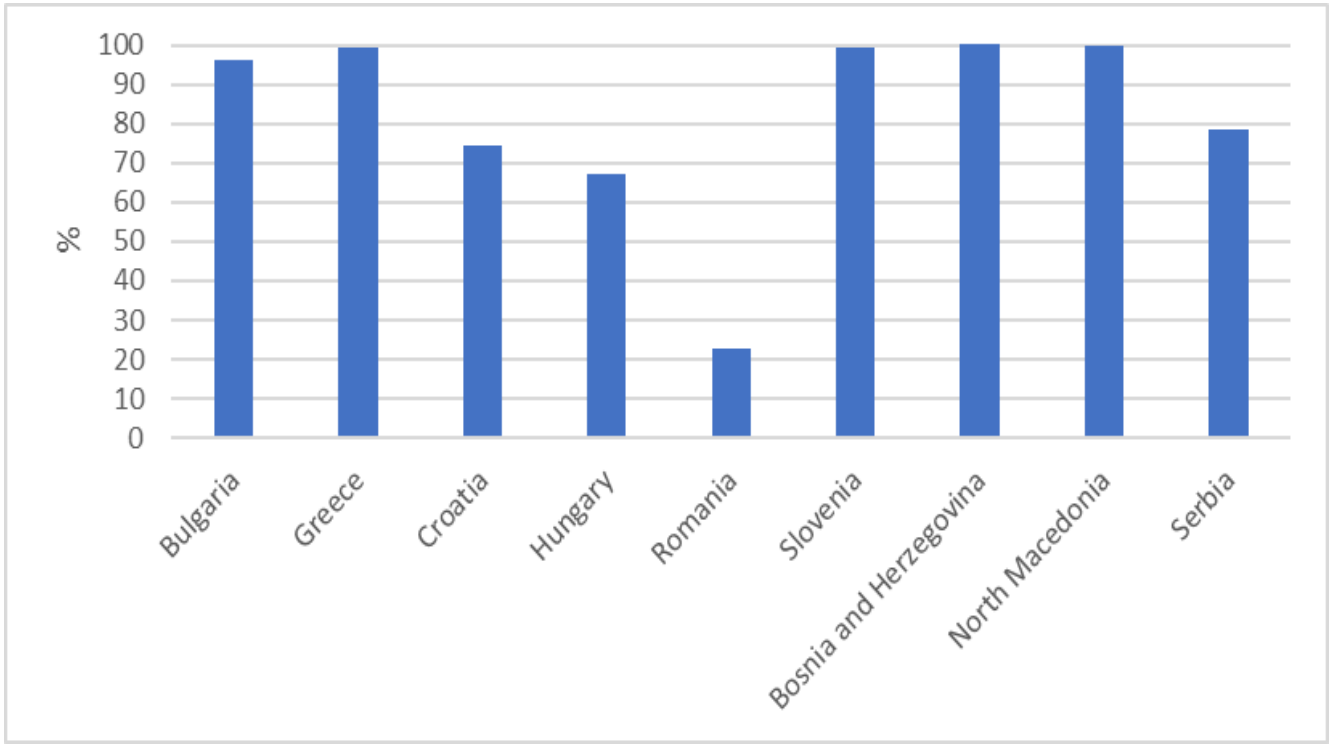
Oil Production and Consumption in SE Europe (2019)

Country	Crude Oil Production (barrels/day)	Gross Inland Crude Oil Refined Consumption (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: IENE study “SE Europe Energy Outlook 2021/2022”, Athens, 2022

Key Regional Energy Issues – Gas Import Dependency

Gas Import Dependency (%) in SE Europe (2021)



Note: Albania, Cyprus, Montenegro and Kosovo do not produce, import or consume natural gas. A dependency rate in excess of 100% indicates that natural gas has been stocked.

Sources: Eurostat, IENE

Key Regional Energy Issues – Gas Import Dependency

Gas Production and Consumption in SE Europe (2008, 2020, 2025e)

Country	2008		2020		2025e	
	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	0.01	0.06	0.01	0.22
Bosnia and Herzegovina	0.0	0.31	0.0	0.22	0.0	0.45
Bulgaria	0.31	3.5	0.04	3.02	0.21	4.3
Croatia	2.03	3.1	1.03	3.04	1.52	3.3
North Macedonia	0.0	0.05	0.0	0.33	0.0	0.6
Greece	0.0	4.25	0.01	5.83	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	9.96	11.74	10.02	14.1
Serbia	0.25	1.92	0.44	2.49	0.51	2.8
Slovenia	0.0	0.51	0.01	0.8	0.0	1.07
Turkey	1.03	36.9	0.47	48.23	0.73	56.0
Total	**14.84**	**67.46**	**11.97**	**75.76**	**13.00**	**88.84**

Note: Albania, Cyprus, Montenegro and Kosovo do not produce, import or consume natural gas

Source: IENE study "SE Europe Energy Outlook 2021/2022", Athens, 2022

Key Regional Energy Issues – Decarbonisation in SE Europe

Challenges and Trends Towards SE Europe's Decarbonisation:

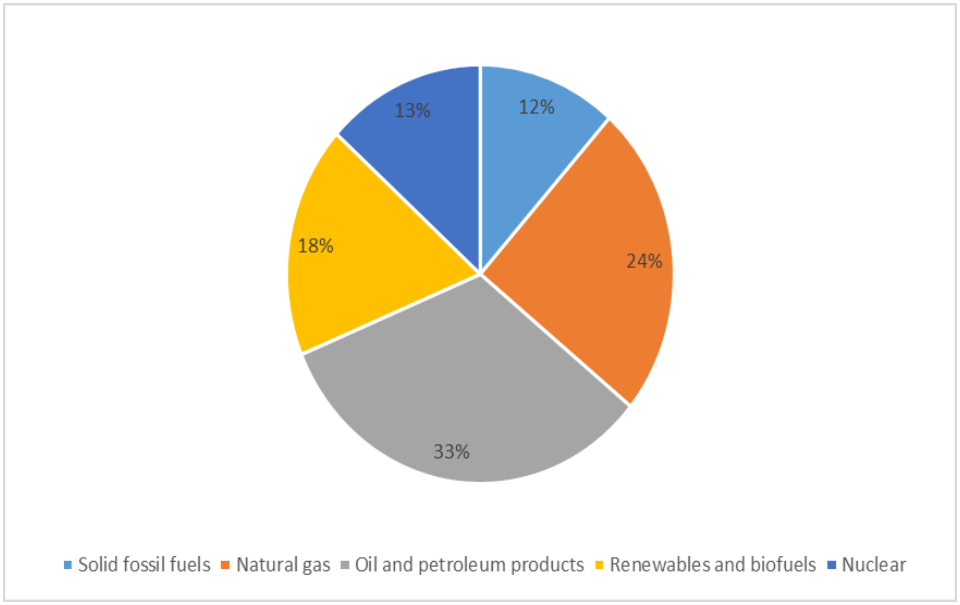
- The **coal predicament** of SE Europe – the region's great dependence on coal-fired power generation vs GHG emission reduction targets
  - According to IENE estimates, the **share of solid fuels to power generation** is anticipated to **increase steadily** in several countries of the region (most notably in Serbia, Kosovo, Croatia, Bosnia and Herzegovina, Montenegro and Turkey) over the next 10-15 years, as they will struggle to meet increased demand.
  - **North Macedonia and Serbia are the second most coal dependent countries after Kosovo at regional level**, while proposed lignite-based/coal-fired power plants in Bosnia and Herzegovina and Serbia would not be in line with EU climate targets, and would downgrade the solar PV, wind, hydropower, and biomass opportunities in the region.
  - **Effective climate change policies in SE Europe have not been implemented so far**, but there is still room for change in order to avoid becoming further "locked in" to the use of fossil fuels.
  - In SE Europe, **economic development**, largely based on the utilization of indigenous lignite/coal resources, **will have to be reconciled with COP 26 commitments**. Therefore, the planning of clean-cut and compatible long-term energy and economic strategies becomes a real challenge.
    - A lot more analytical and assessment work (e.g. examine CCS/CCU options) needs to be undertaken before introducing realistic policies for decarbonisation.

Decarbonisation and Related Technologies

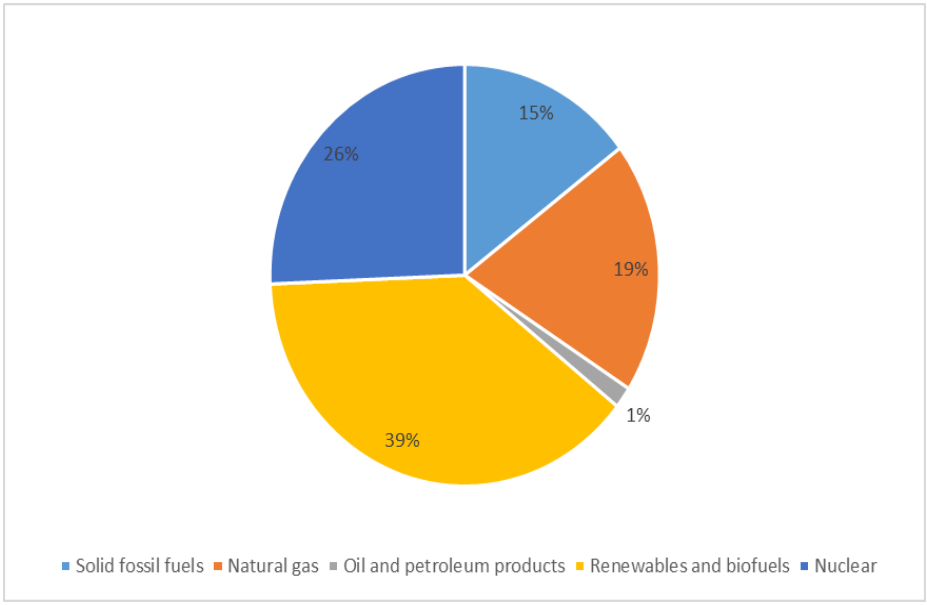
- Decarbonisation in the region can be pursued in two parallel streams:
  - through **policy**, which incorporates the aforementioned energy mix issue and economic assessment through which the rate of decarbonization is determined.
    - The main question arising therefore is **how the rate of decarbonization can be related to economic development and what the investment implications are** and
  - through **technology**, whose degree of deployment depends on the policies to be implemented and could contribute significantly towards decarbonisation through, for instance, the use of CCS/CCU or dual-fuel power plants.
- There is no agreed regional roadmap towards decarbonisation, while cooperation between the countries in the region focus on energy security.
- There is an urgent need to introduce latest technologies in order to improve decarbonisation efforts, energy efficiency and upgrade operation of existing networks (e.g. CCUS, solar thermal systems, power electronics, energy storage)

Energy and Electricity Mix in EU-27, 2021

Energy Mix in EU-27



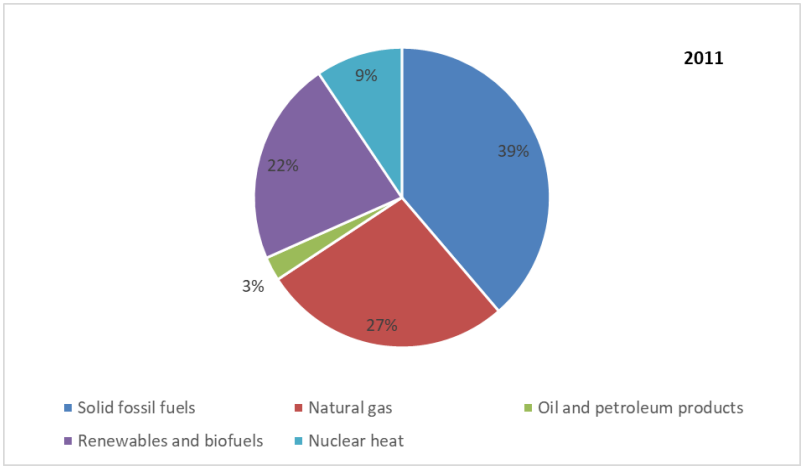
Electricity Mix in EU-27

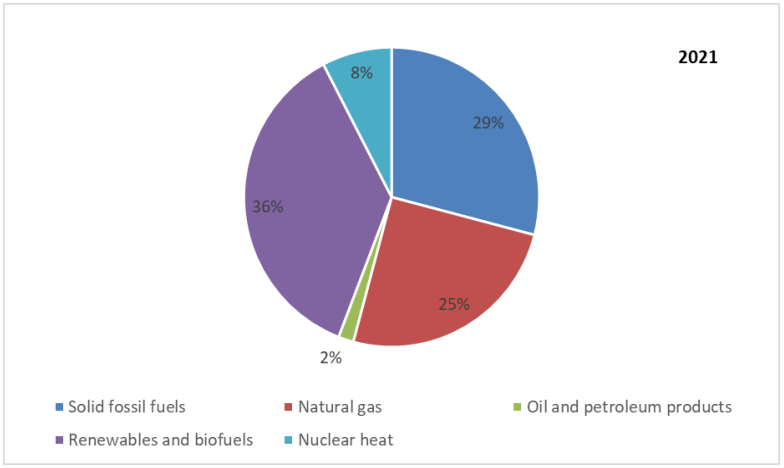


Sources: Eurostat, IENE

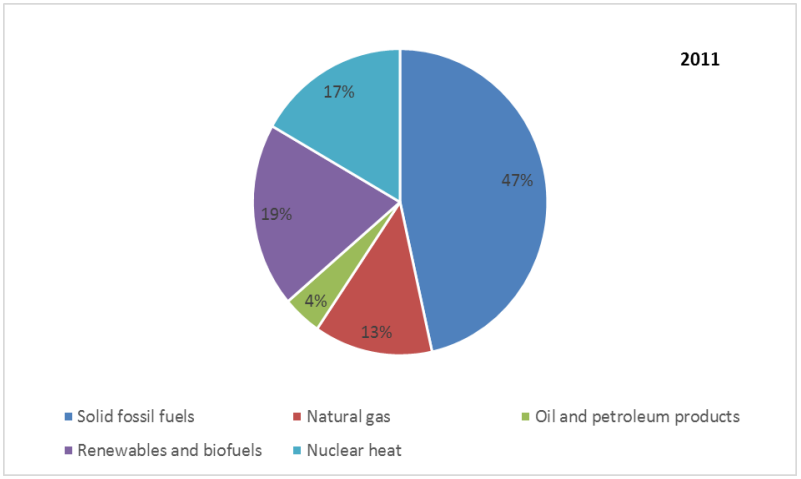
Power Generation Mix per Fuel in SE Europe (2011 and 2021), **Including and Without Turkey**

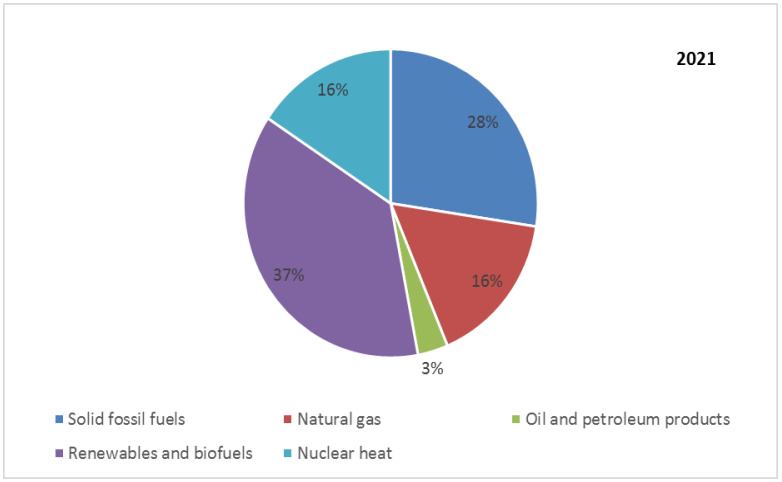
With Turkey





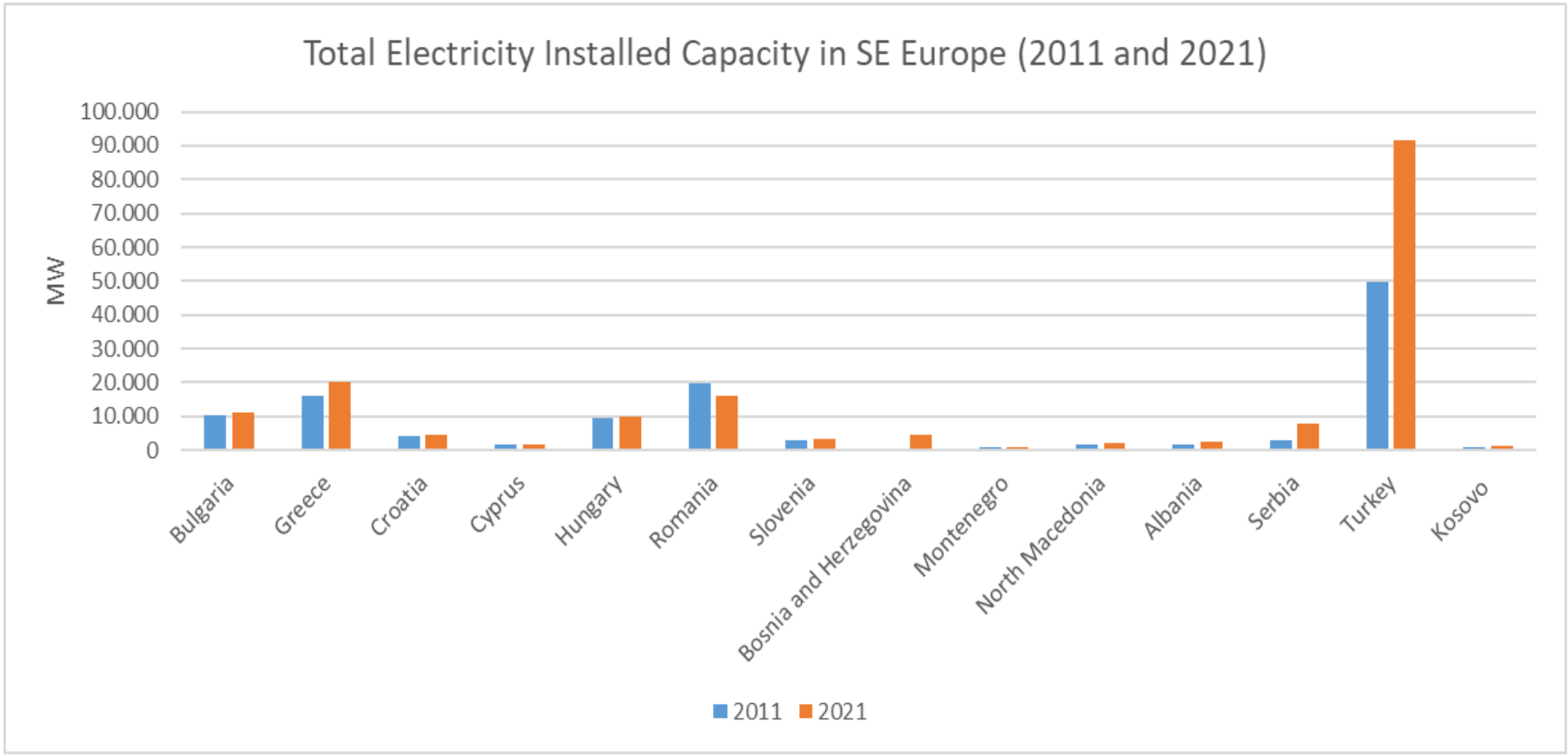
Without Turkey





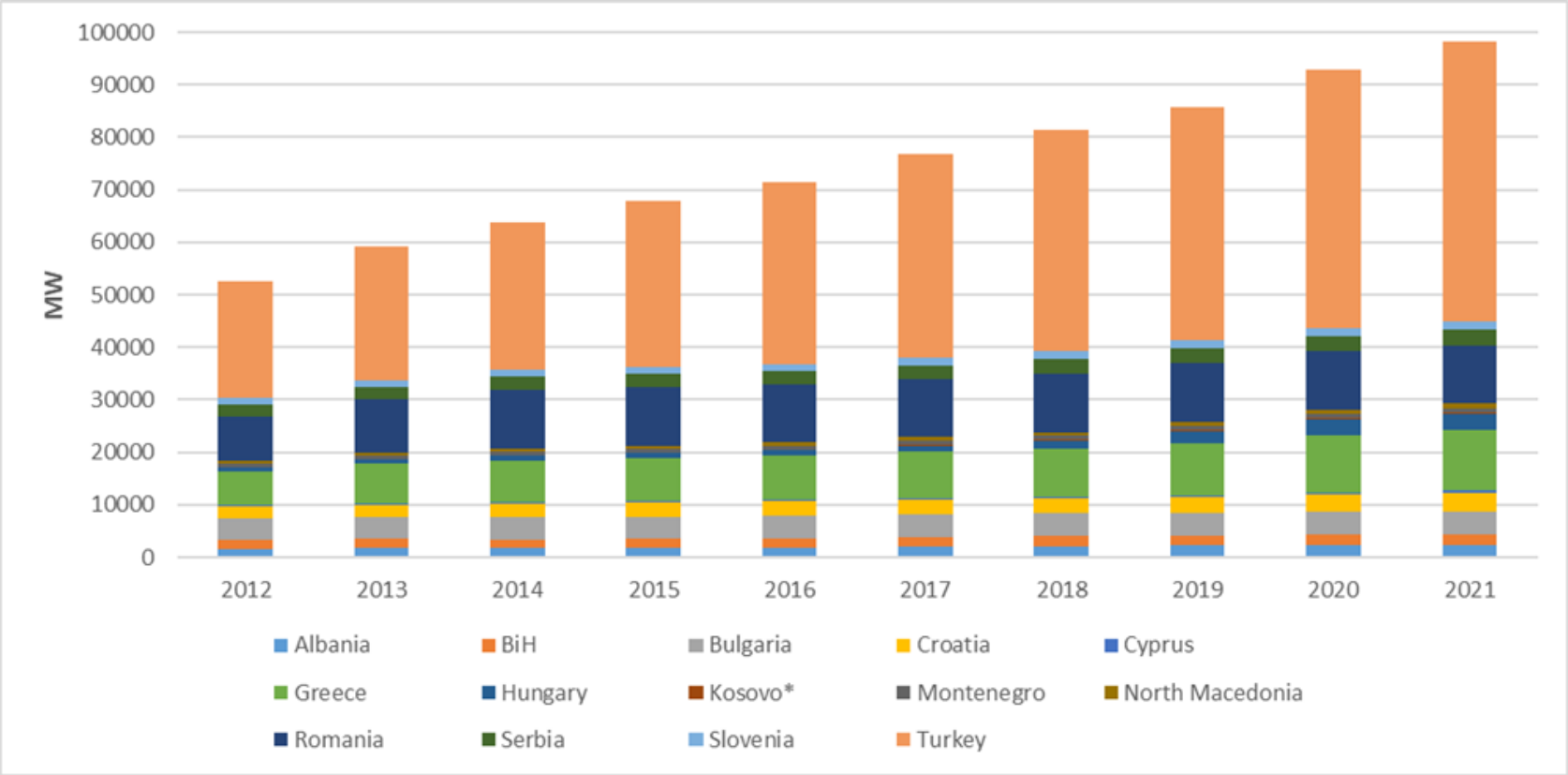
Sources: Eurostat, IENE

Total Electricity Installed Capacity (MW) in SE Europe (2011 and 2021)



Sources: Eurostat, IENE

Total Installed Capacity of RES Systems by Country in SE Europe, Including Hydro, 2012-2021



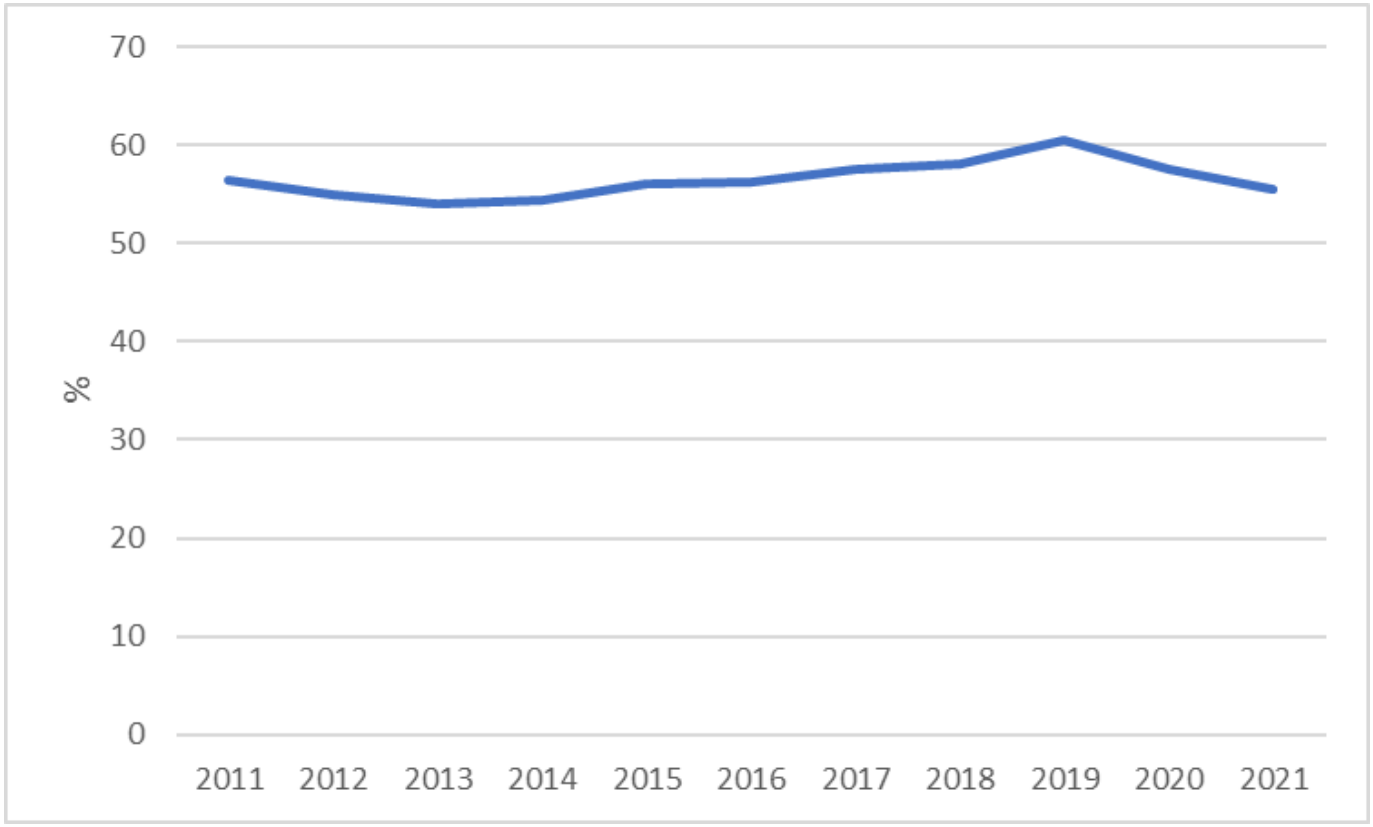
Note: *Kosovo is presented separately without prejudice to positions on status and in line with the United Nations Security Council Resolution 1244 (1999)

Sources: IRENA, IENE

Key Regional Energy Issues
- Energy Security in SE Europe (I)

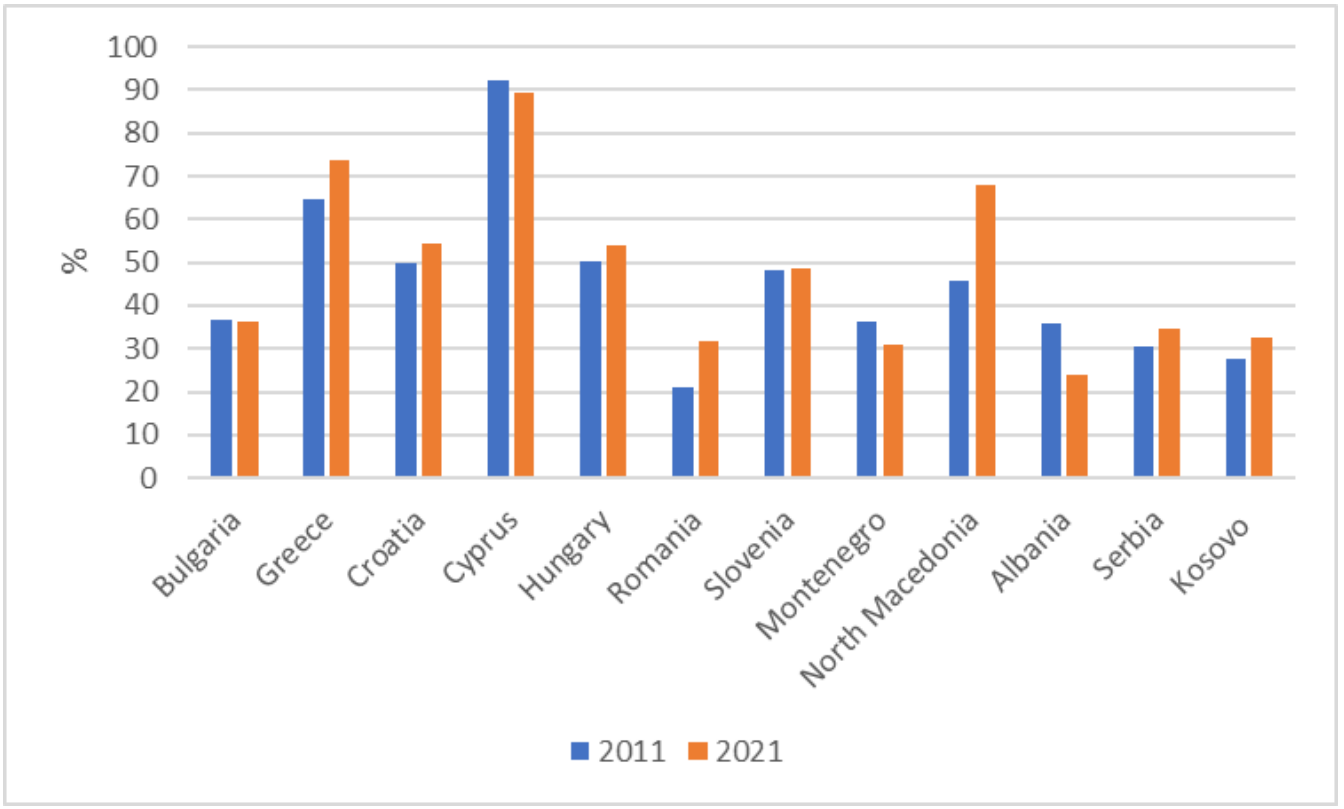
- **Energy security is a complex issue** and as such cannot be considered in isolation.
  - SE Europe, because of its geography, its proximity to high-risk conflict zones (i.e. Syria, Iraq, Ukraine), refugee flow from the Middle East and North Africa and the location of some of its countries (i.e. Turkey, 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.

Evolution of the EU-27 Energy Dependence (%) over 2011-2021



Sources: Eurostat, IENE

High Energy Dependence in SE Europe (2011 and 2021)



Sources: Eurostat, IENE

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.
- **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 (*IENE organised an Ad hoc meeting for energy security on March 15, 2017*).
- The various vulnerable key energy infrastructure locations in SE Europe constitute **potential energy security hot spots** and as such should be properly identified, 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).

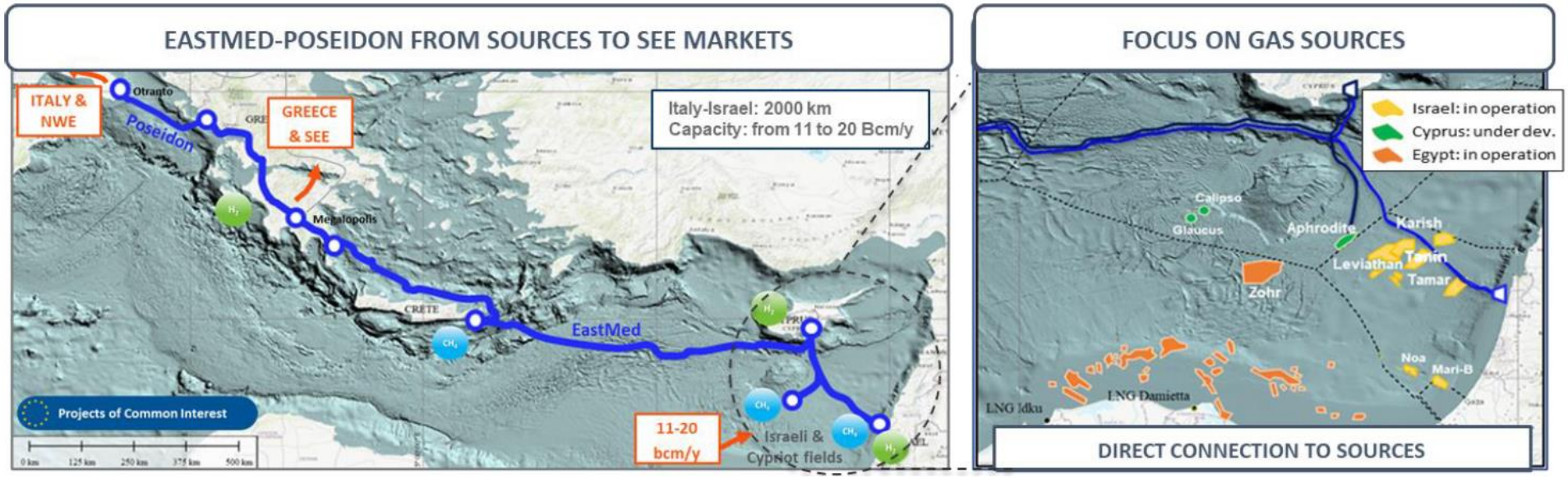
Energy Security in SE Europe (III)
- Towards a Redefinition of the South Corridor

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

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

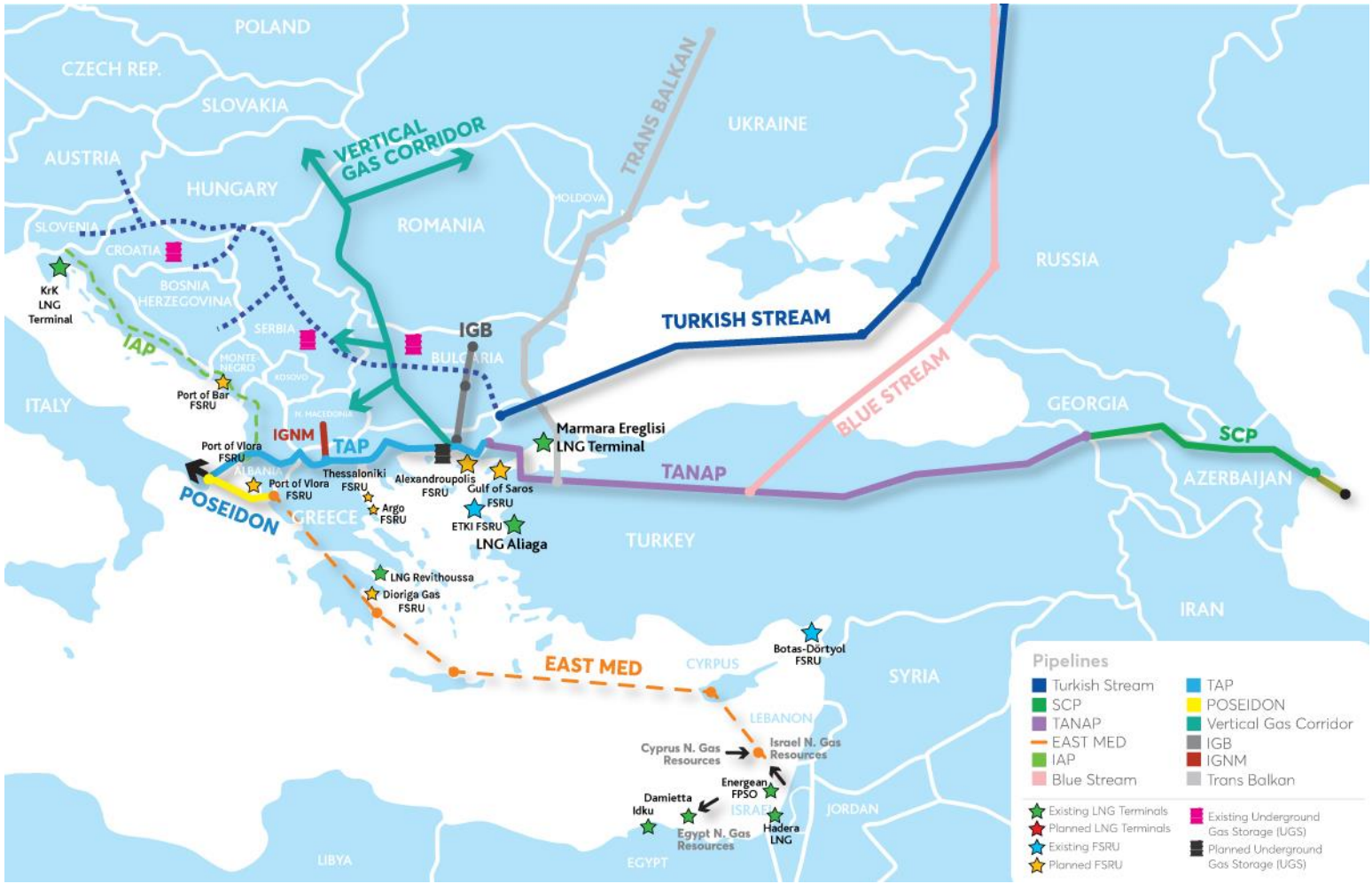
- Another option apart of TAP – TANAP system is the **East Med Pipeline** which again, due to the significant technical challenges, could also accommodate limited quantities of gas in the regions of 8.0 to 12.0 BCM's per year. Meanwhile, EC is actively exploring the possibility of massively increasing the member countries' LNG capabilities as part of Energy Union priorities, despite the recent negative stance from the US.

EastMed - Poseidon Pipeline



Source: DEPA International Projects

An Expanded South Gas Corridor



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

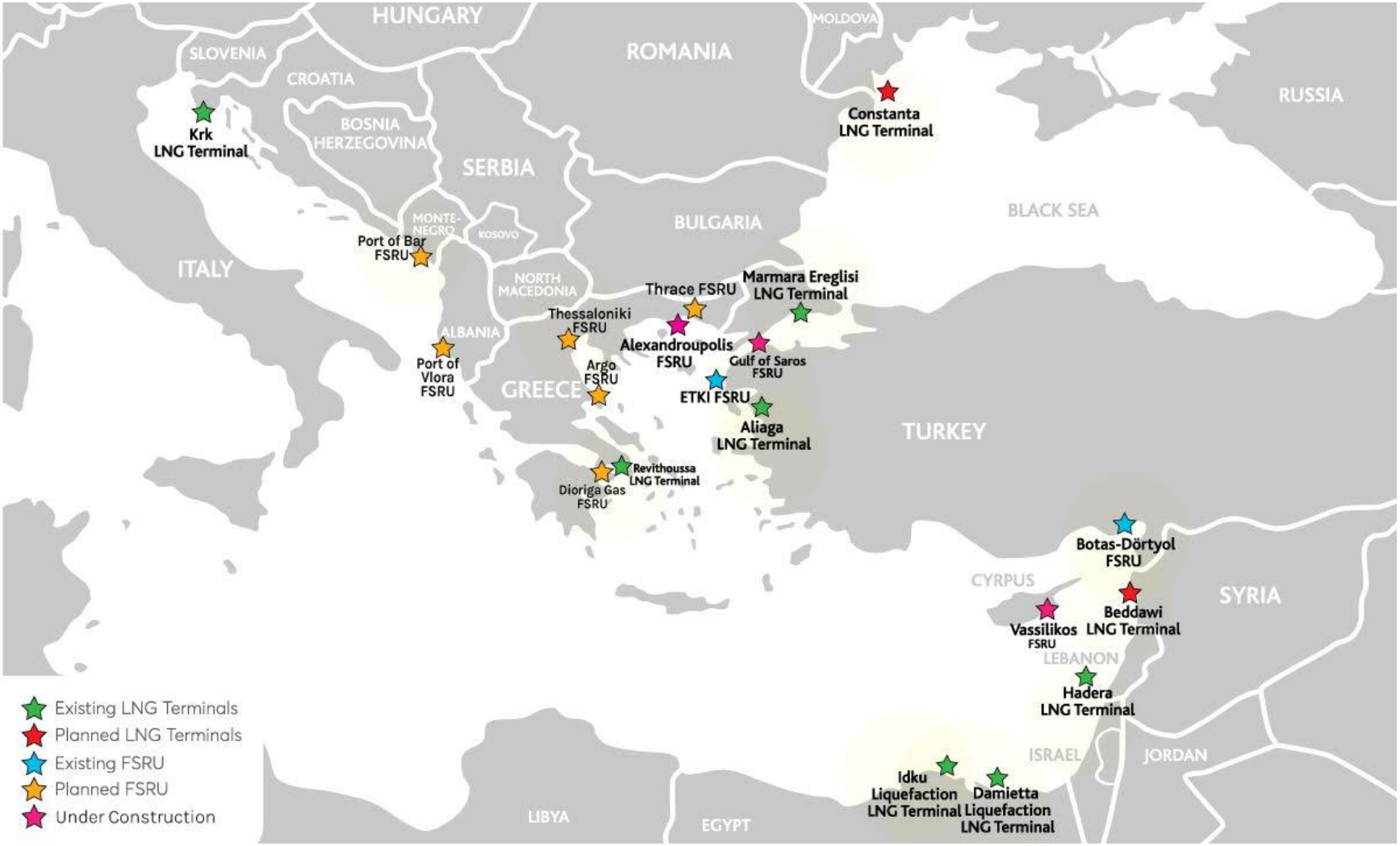
Source: IENE study "SE Europe Energy Outlook 2021/2022", Athens, 2022

The Growing Importance of LNG in SE Europe

- Today, there are **6 LNG importing terminals in operation** across SE Europe:
  - 2 land based and 2 FSRU in Turkey
  - 1 FSRU in Croatia (Krk)
  - 1 land based in Greece (Revithoussa)

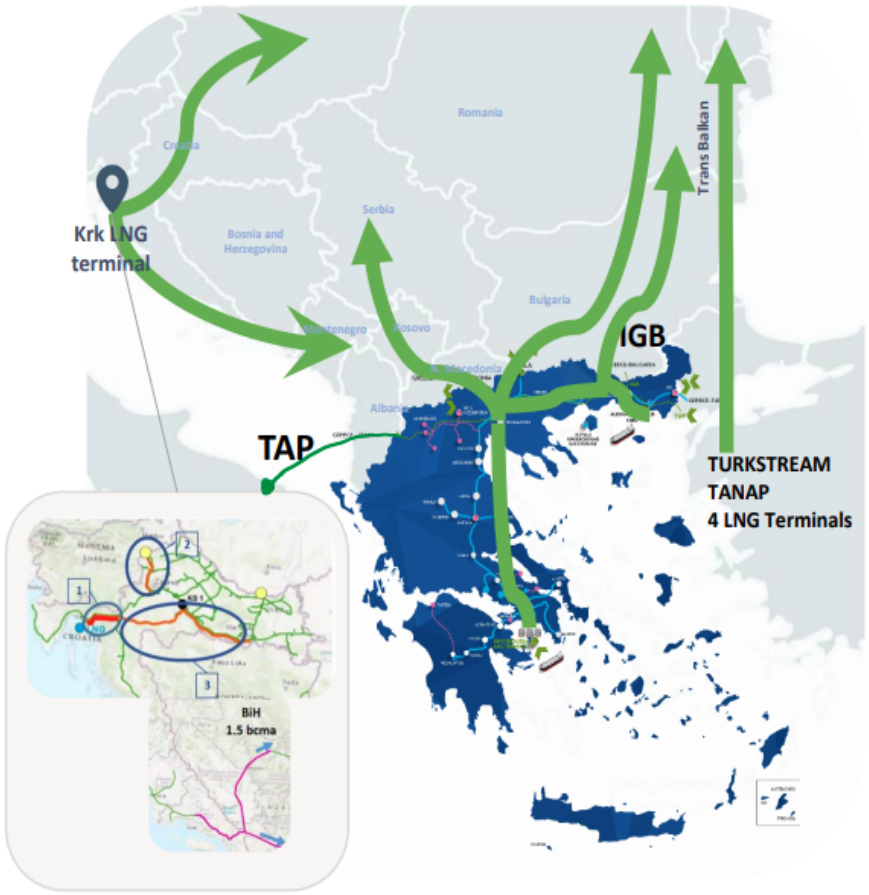
- By 2025, a number of **new LNG terminals** will be added:
  - 1 FSRU in Turkey (Gulf of Saros)
  - 2 FSRU in Greece (Alexandroupolis and Dioryga Gas in Corinth)
  - 1 FSRU in Cyprus (Vassilikos)

LNG Terminals in SE Europe



Source: IENE

Greece Has Emerged as an Important Source of LNG For Europe But is Facing Stiff Competition in the Potential Supply Routes For Gas in SE Europe



CROATIA

- ✓ Closer to the main lines that bring gas to Central Europe & Ukraine
- ✓ Has a newly built FSRU - **Krk LNG**
- ✓ The Croatian **government is financially supporting the de-bottlenecking of the national network** to accommodate transit flows
- — Challenges related to expansion of transit capacity

Greece

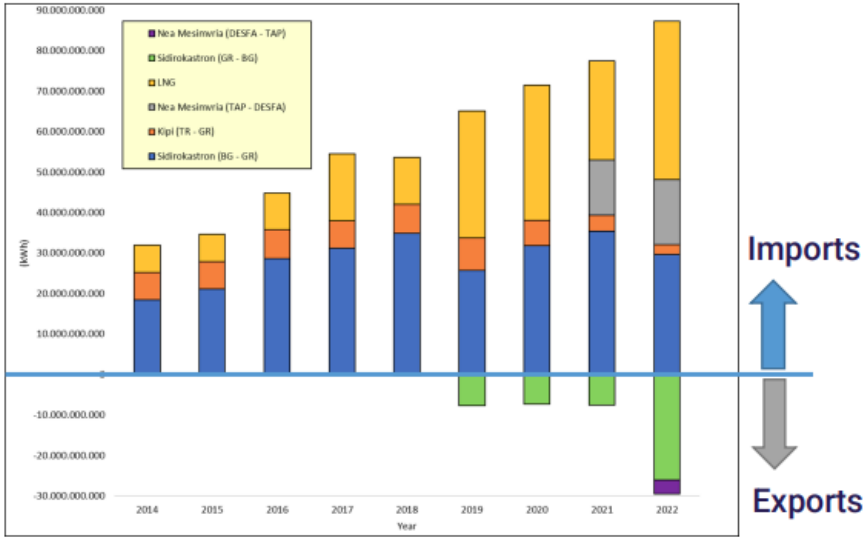
- ✓ Very well placed, with one large LNG import Terminal
- ✓ One FSRU under construction and a 2nd in planning phase
- ✓ Two connections to Bulgaria which grant access to Trans Balkan pipeline
- — Congested national gas network & large **investments needed for the upgrade for LNG Transit**
- — No "free money" any longer for natural gas but only for H2

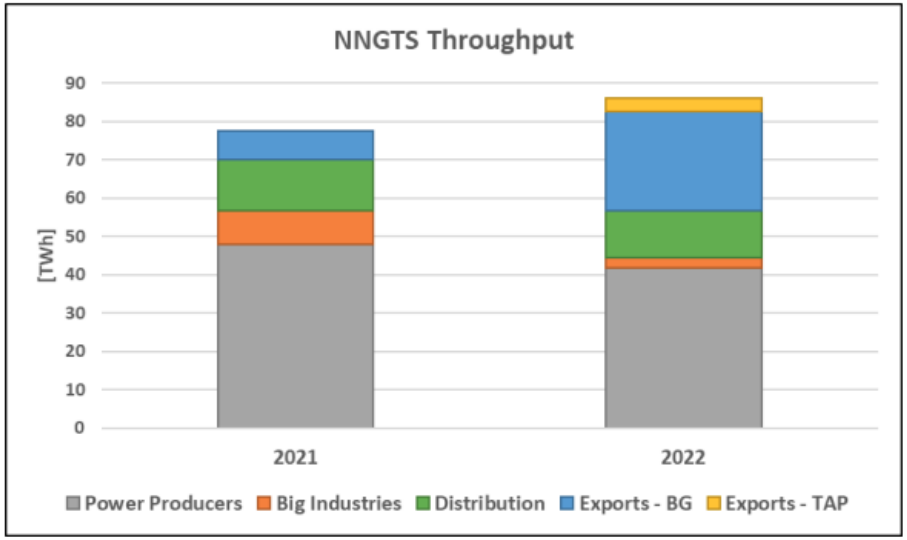
Turkey

- ✓ Most diversified gas supply portfolio in the region & Important transit country, largest connection to the Transbalkan pipeline
- ✓ 4 LNG Terminals in operation and a 5th in planning phase
- ✓ Large consumer with modern Energy Exchange in operation
- ✓ EU is hoping for gas from Turkey;
- — Large domestic needs, especially in the European part of the country
- — National grid needs reinforcement for exports to EU
- — Non EU member with protectionism for national champions – no TPA
- — Ambiguous relations with Russia on gas issues

Source: DESFA

The Gas Landscape is Changing with Greece Becoming an Exporting Country

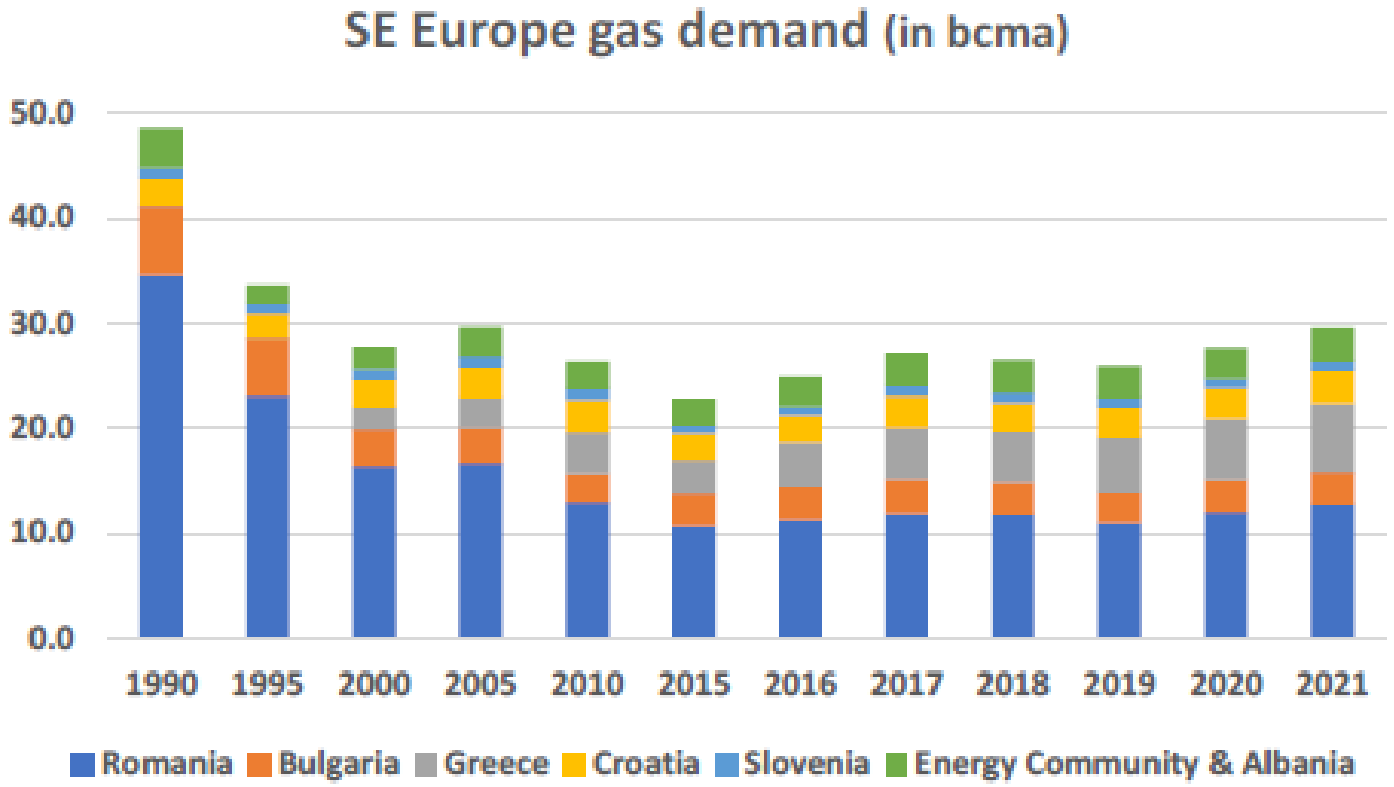




- ✓ Annual throughput has been steadily increasing during the last nine years (from 32 TWh in 2014 to 87 TWh 2022)
- ✓ Exports increased by appr. 300% in 2022 compared to the average of the preceding three years period
- ✓ Domestic demand was decreased by 19% in 2022, compared to the previous year
- ✓ LNG imports hit a max in 2022 (more than 39 TWh)

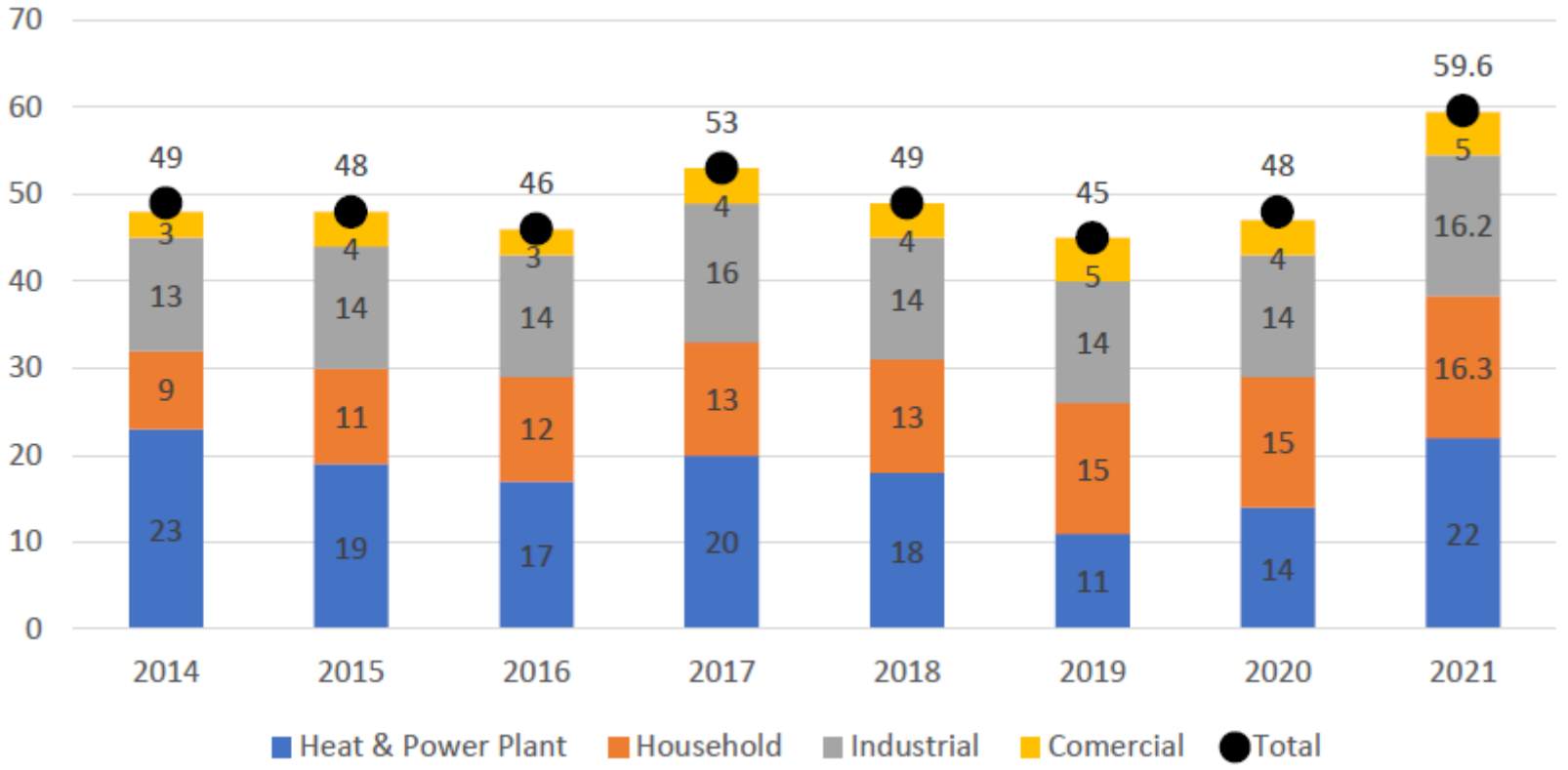
Source: DESFA

SE Europe's Gas Demand, 1990-2021



Source: OIES

Turkish Gas Demand by Sector and in Total (Bcm Per Year)



Sources: EPDK, OIES

Gas Market Liberalization in SE Europe

- There is **a highly fragmented landscape** for the gas market development in the SEE region:
  - Very little cross-border trading. Gas trading hubs are either non existent in the majority of the countries, or even where they exist (Slovenia and Romania) their liquidity is extremely low.
  - There are elements of the national gas market legislation and regulation that would **allow the development of gas trading** in the way performed in the more mature gas hubs of Europe and the US.

- The **only way forward** for the appropriate development of the regional gas market is the consistent and rapid implementation of the provisions of the Third Energy Package, at least to the extent that the countries have committed to implement it in a legally binding way, i.e. the EU Member States and the Energy Community Contracting Parties.

Electricity Grids Play Key Role in Decarbonisation

- The SEE region is in need of more and better electricity interconnections, something which is especially visible in island regions, such as Greece and Cyprus.
- Advancing international electricity interconnections, especially between Italy and Western Balkans and between mainland Greece and the Israel-Cyprus-Crete axis, is becoming a priority in view of the fast advancing electricity market integration in the region.
- Of great significance are the developments regarding the electricity interconnections of the islands with the power grid in mainland Greece, and improved cross-border interconnections that will enable the national electricity transmission system to cover the requirements of the new targets for RES penetration and the incorporation of energy storage systems by 2030.
- Currently, planned projects for cross-border electricity infrastructure in SE Europe are critical both to prevent market congestion and to enable the integration of electricity from RES, but their impact is more clearly visible after 2030.
- The promotion of the use of hybrid stations with RES, i.e. RES and storage, is another solution in cases where the electricity interconnection of the islands is not economically viable, but such stations will have to be assessed as to technical and economic factors and compared to the existing situation, and their installation and operation can be promoted only if it is ensured that power generation costs are reduced in total in the autonomous system involved each time and as compared to other mature solutions.
- The so-called peripheral countries are playing an increasingly more influential role in the channeling of energy flows into the SEE region. Hence, there is a continuous need for the upgrading of international electricity interconnections.

Electricity Interconnections in SE Europe

Source: IPTO's Ten Year Network Development Plan 2021-2030

Planned Electricity Interconnections in SE Europe, Including Greece

Project	Distance (km)	Capacity (MW)	Cost (€ million)	Company
EuroAsia Interconnector	1,208	2,000	2,400	EuroAsia Interconnector Ltd
EuroAfrica Interconnector	1,396	2,000	2,500	EuroAfrica Interconnector Ltd
Greece-Egypt Power Interconnector	954	3,000	4,200	ELICA SA
Greece-Africa Power Interconnector	420	2,000	1,300	GAP Interconnector S.M.S.A
Interconnector Greece-Italy	275	1,000	606	IPTO, TERNA
Interconnector Greece-Bulgaria	151	2,000	66	IPTO, ESO EAD
Interconnector Greece-Albania	145	2,000	15.3	IPTO, OST
Interconnector Greece-North Macedonia*	-	-	-	IPTO, MEPSO
Interconnector Greece-Turkey	130	2,000	24.2	IPTO, TEIAS
Green Energy Corridor*	Through Albania, Montenegro, Croatia, Slovenia, Austria and southern Germany	3,000-9,000	-	-

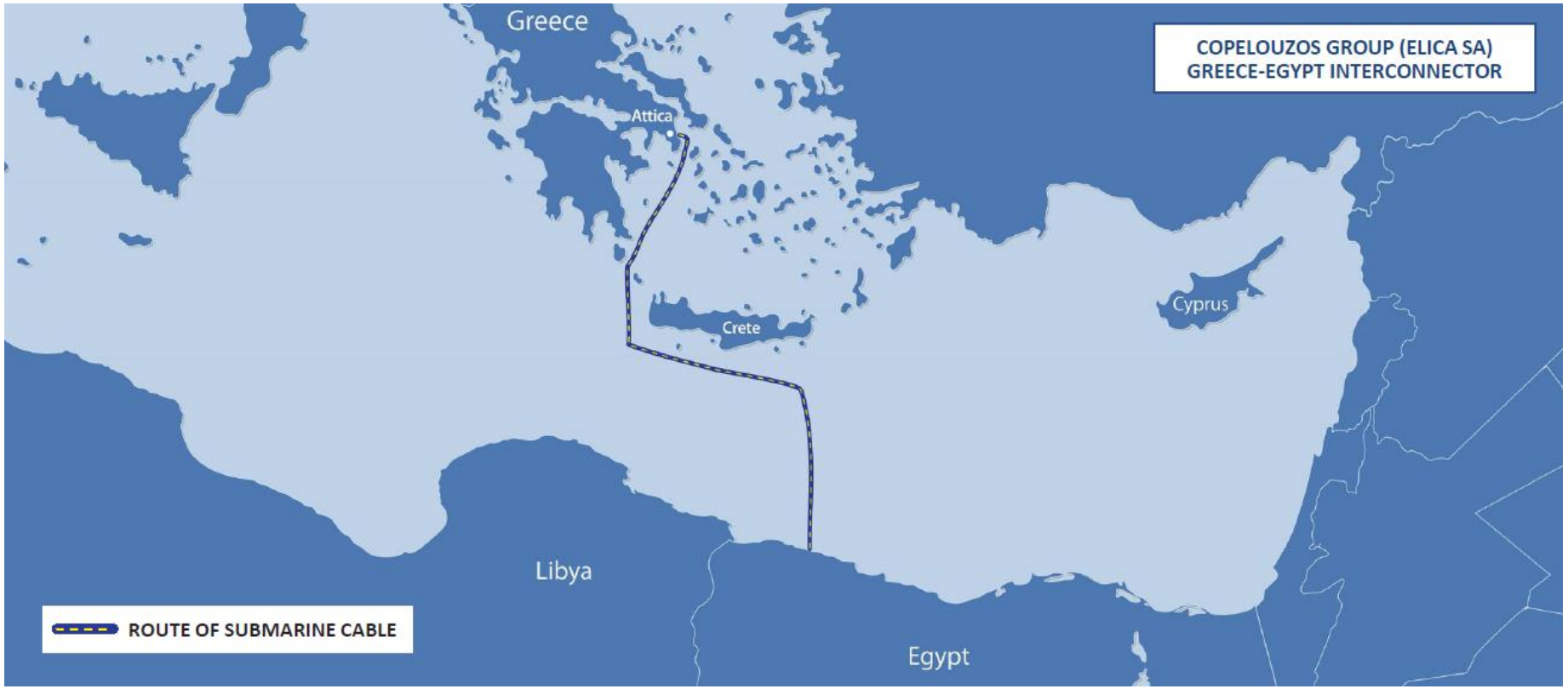
Note: *No more information and data are available.

Sources: Various websites, IENE

EuroAsia Electricity Interconnector

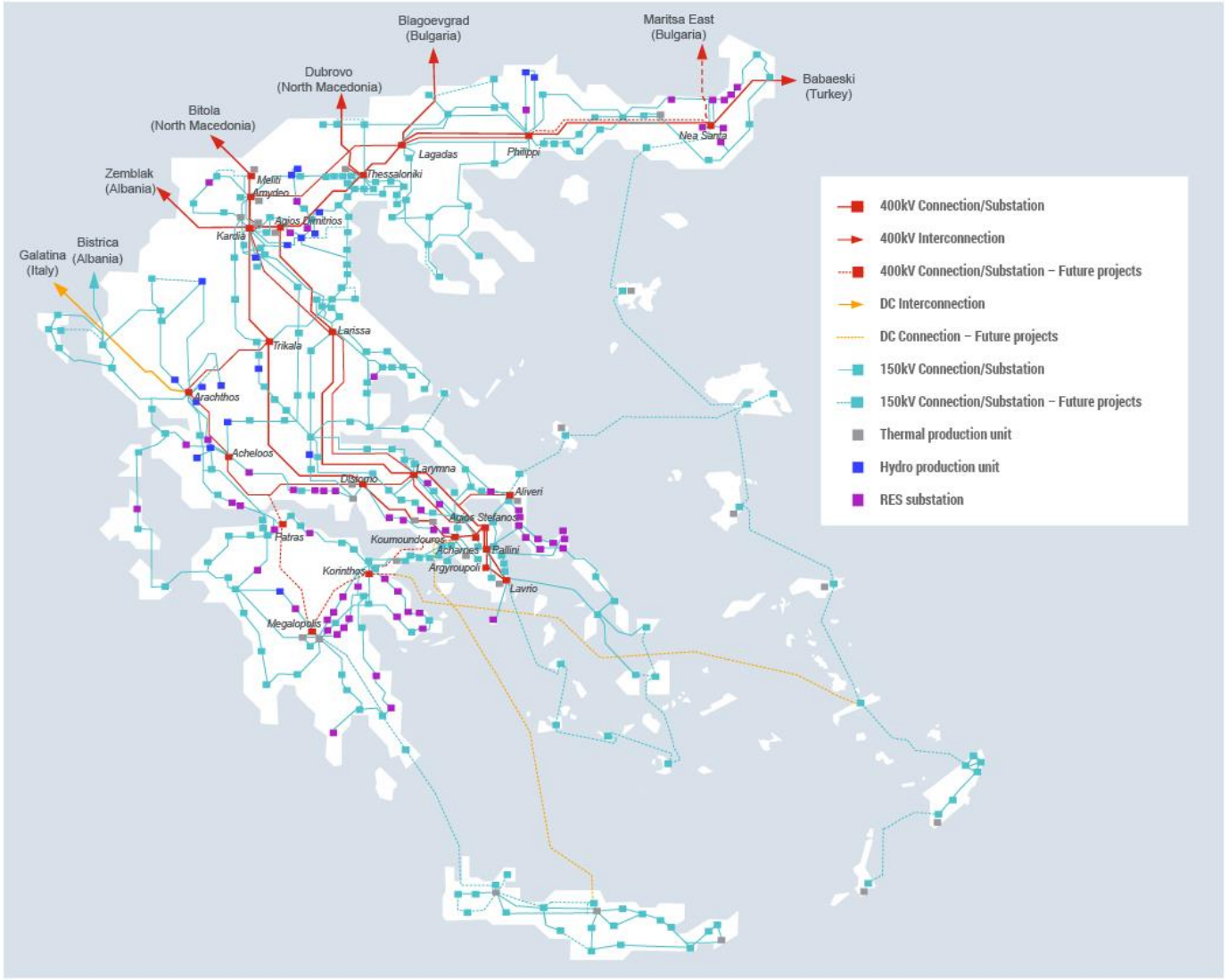
Source: EuroAsia Interconnector

Greece-Egypt Electricity Interconnector



Source: ELICA Group

Domestic and Cross Border Electricity Interconnections in Greece



Source: IPTO

Electricity Storage Will Become Crucial for Higher RES Penetration

- Apart from a number of pumped hydro storage schemes operating in almost all countries in SEE, there are not any battery storage units
- Although several such units have been licensed and are expected to come on steam in Greece, Romania, Croatia and Turkey in 2023/2024
- The addition of electricity storage units in SEE grids is now becoming an urgent priority
- The potential for energy storage in SEE is substantial and IENE is currently conducting a study to determine the actual capacity necessary for enhancing greater RES use
- Without adding adequate electricity storage (batteries and pumped hydro) to the system in certain countries (e.g. Greece, Bulgaria, Romania), the further built up of RES capacity cannot proceed since already the system on many occasions is rejecting RES produced electricity

The Nuclear Power Option for SE Europe

- Today, nuclear plants operate in 5 SEE countries (Bulgaria, Romania, Slovenia/Croatia, Hungary) with Turkey a newcomer from May 2023. Between them, they cover 8% of electricity consumption, all of it base load needs
- In the context of much needed decarbonisation in SEE, there is huge scope for further power generation from nuclear power
- On February 2, 2022, the European Commission presented a **Taxonomy Complementary Climate Delegated Act**, which may reignite nuclear projects in SE Europe. There appears to be **limited interest for new nuclear power plants in the region**. Only Romania and Turkey have specific plans.

Source: IENE study "SE Europe Energy Outlook 2021/2022", Athens, 2022

Electricity Market Liberalization in SE Europe

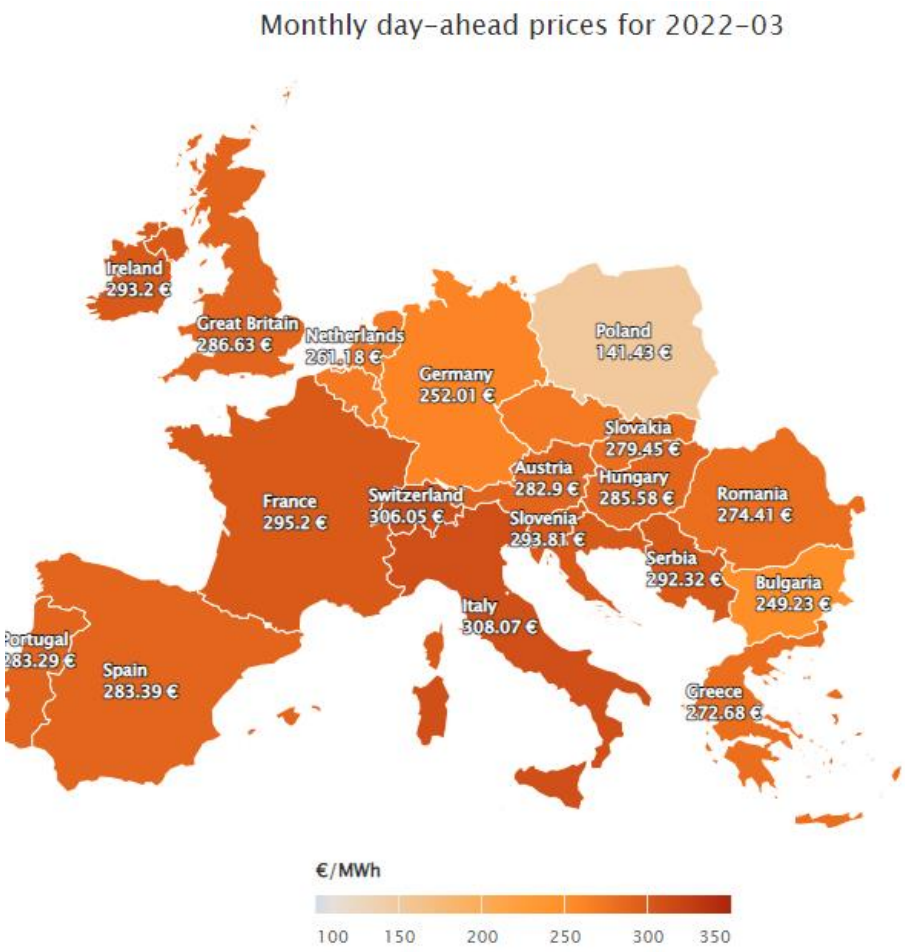
- In SE Europe, the electricity market liberalization has faced **several difficulties and numerous non-technical obstacles** in the past as the incumbent companies in almost all countries solidly resisted any change on the grounds of losing control of the market and hence weakening of their bureaucratic hold.
- Currently, the situation in **EU member countries** looks varied with certain countries having managed to complete what appeared to be an anomalous transition period and other countries still trying to adapt to EU competition rules.
  - In the case of **Turkey**, the achieved progress in electricity market operation unbundling and competition in the retail area has entered a critical stage with the market opening up much faster than anticipated.
  - In the case of the **Western Balkans**, we have the intervention of the Energy Community through the contracting parties, which has facilitated the overall transition process to European Acquis.
  - In the case of the **Eastern Balkans** (Greece, Bulgaria, Romania), gas and electricity markets are fully liberalized.
- Hence, some solid steps have been made towards electricity market competition. However, progress is not very satisfactory in most contracting parties, largely because of the inflexible market structure and the stiff hold of the state over market mechanisms.

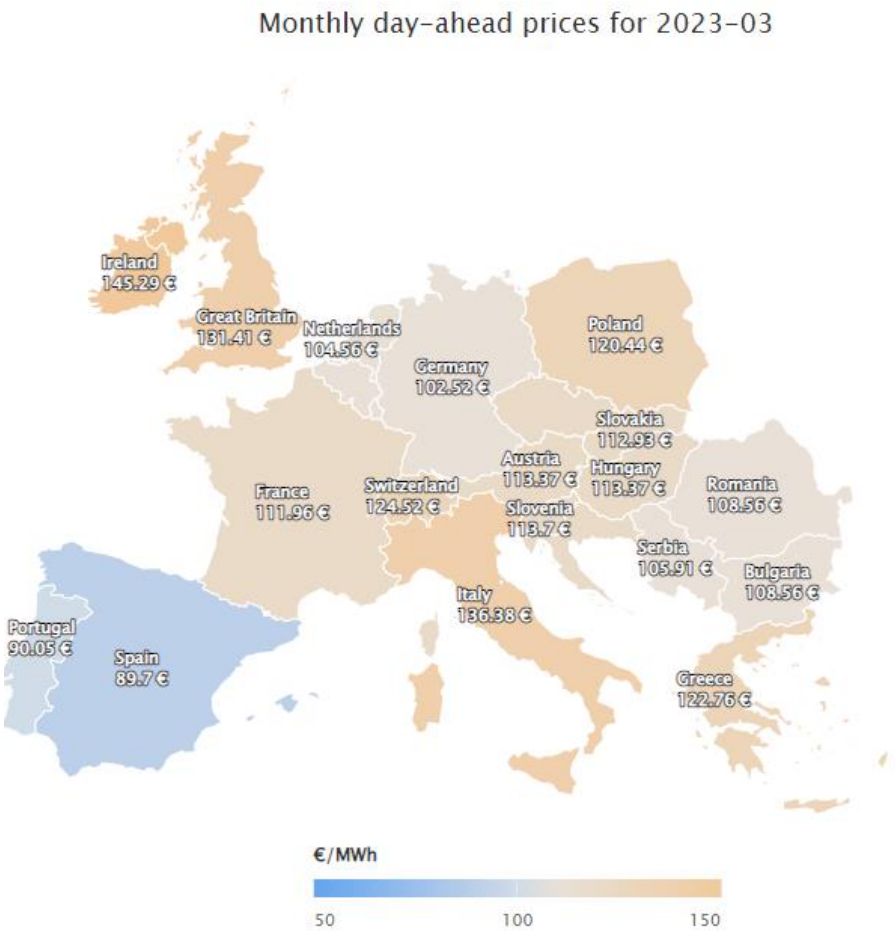
Power Exchanges Play Vital Role in Electricity Market Operation in SEE

- Currently, there are **nine active power exchanges** in SE Europe: in Albania, Bulgaria, Hungary, Croatia, Greece, Serbia, Romania, Slovenia and Turkey.
- In Albania, ALPEX launched regular operations with the establishment of a day-ahead market in April 2023.
- The Montenegrin Power Exchange – MEPX was supposed to come online by the end of 2022 with the introduction of a day-ahead market, but the go-live was pushed back to April 26, 2023. North Macedonia is preparing to launch an electricity exchange in May 2023.

Source: IENE study "SE Europe Energy Outlook 2021/2022", Athens, 2022

Average Day-ahead Electricity Prices in Europe





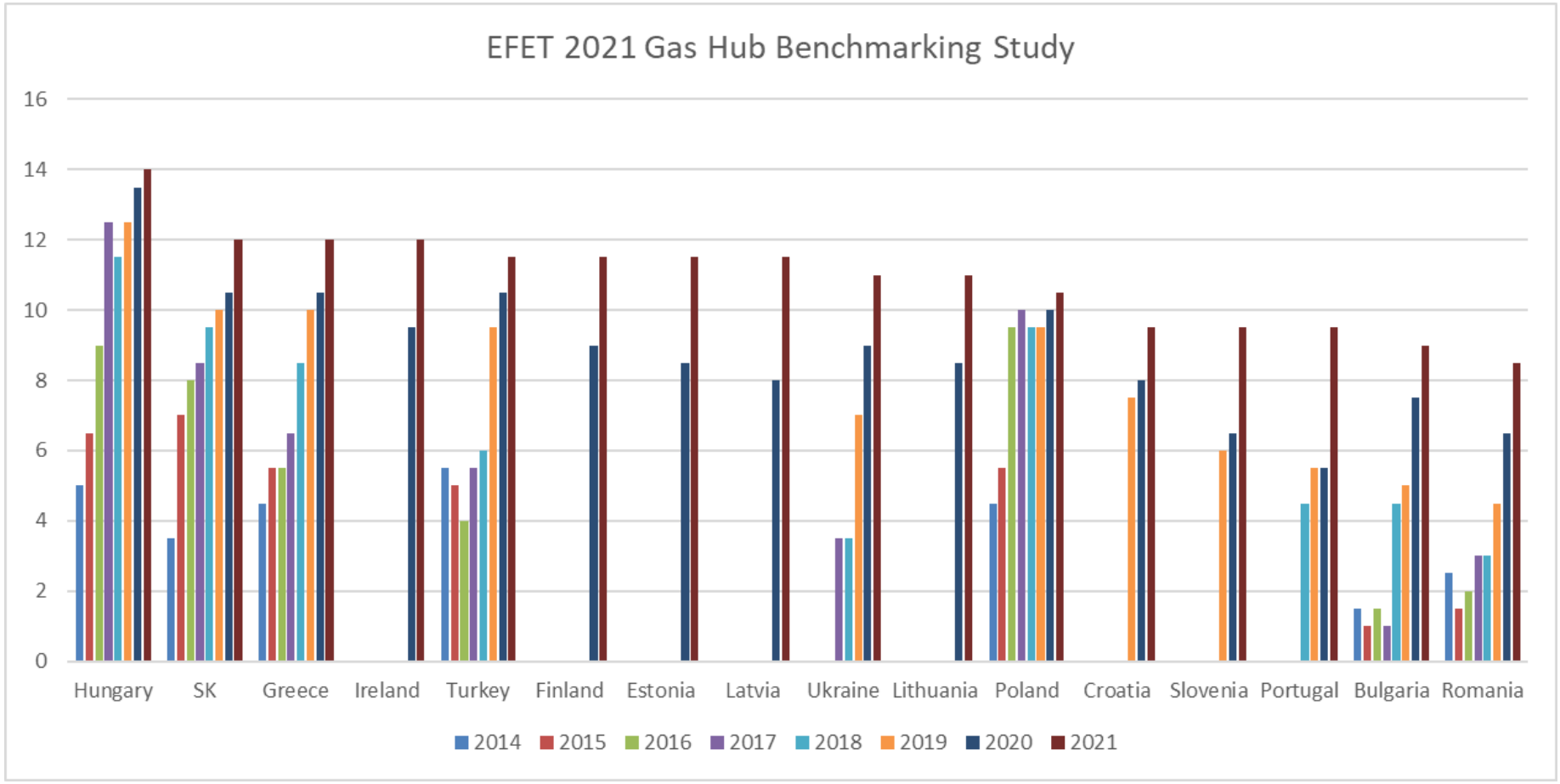
Natural Gas Trading Hubs to Facilitate Market Development in SEE

- The establishment of regional natural gas hubs is expected to **facilitate the wholesale trading of natural gas between participants** in SE Europe.
- They allow **gas supply and demand to meet in a marketplace** by providing a platform for physical and/or financial transaction.
- They **enable competitive markets to function**, even though they will probably have an administrative role in the beginning of their operation.
- Although it is difficult, at this stage, to predict market behaviour and its reflection on spot prices, once the hubs enter full operation, based on European hub operation experience, one could safely assume that **spot prices will be determined through hub trading will be lower than oil-indexed ones**.
- Once more cross border 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.

European Gas Regions, Markets and Hubs: 2020

Source: OIES

EFET's Annual Scorecard 2021



Source: EFET

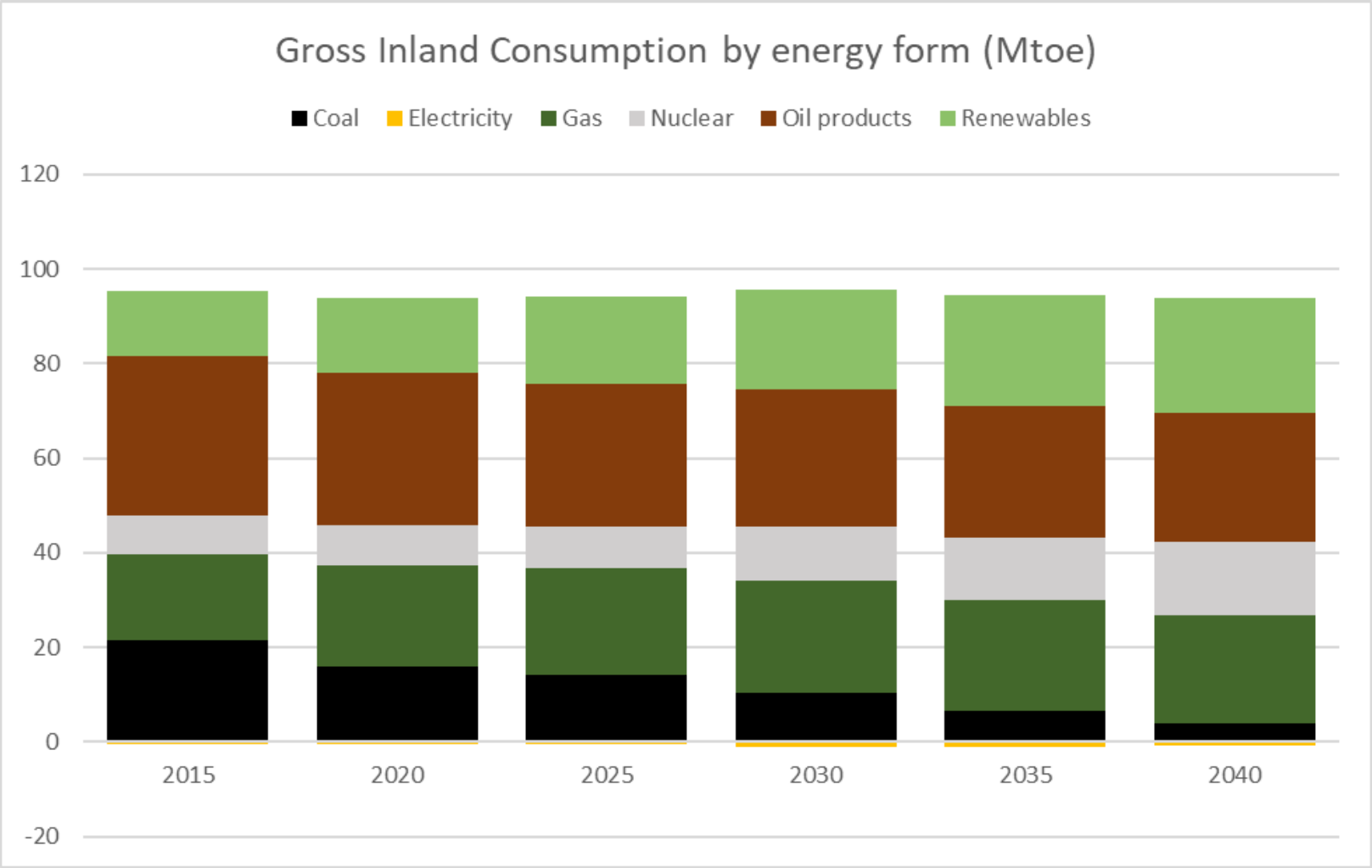
Energy Demand and Supply Projections in SEE - Methodology

- In the context of the "SEE Energy Outlook" and given the amount of data collected and analysed, it is important to be in a position to estimate future demand and supply trends under certain assumptions.
- The projections for the development of the energy systems of the SEE countries under **a "Baseline" scenario** approach was considered appropriate in order to present the possible future pathways paved by current policies.
- The **most recently available studies** and the **official country submissions of strategic documents** (such as the Integrated National Energy and Climate Plans) were used in order to collect and analyse these projections.
- The purpose is to present the evolution of the national energy systems corresponding to a **"where we are heading" storyline**, providing a simple but comprehensive picture of the energy and GHG emissions dynamics under the "current policy" efforts until 2040.
- **It should be noted that most of the available analyses do not include the effect of the COVID-19 pandemic and its possible long-term effects to the macroeconomic development and the energy systems of the countries in the region.**

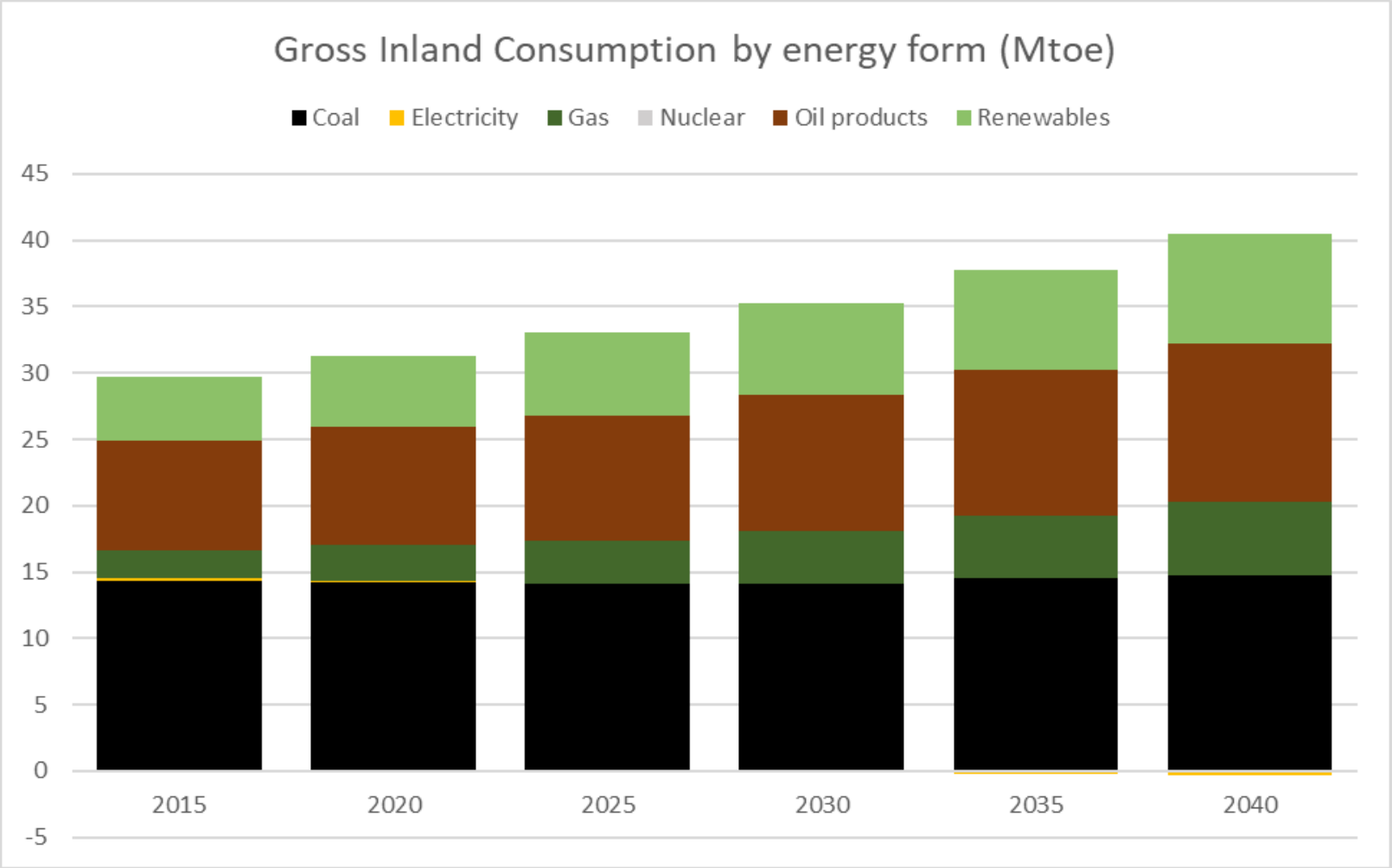
Scenario Results per Group of Countries

- **Results are presented per Group of Countries - EU Member States, West Balkans and Turkey**
- Looking at the projection of the gross inland consumption in the **EU member states of the SEE region** (Bulgaria, Croatia, Cyprus, Greece, Romania, Slovenia), the overall tendency shows a stabilisation and even a small reduction in the time horizon to 2040.
  - The decrease of the use of coal is evident, reaching a minimum level by 2040 while oil products lose part of their share in the GIC. The winners to this change are renewable energy and nuclear energy. The group remains a net importer in the time horizon until 2040, but the import dependency is reduced between 2020 and 2030 and then stabilised at a level close to 42% until 2040. Crude oil and oil products cover the majority of imports (68% in 2040), imports of coal are reduced significantly, while imports of natural gas remain at a level close to 12 Mtoe after 2030.
- The projection of Gross Inland Consumption in the **six Western Balkan countries** (WB6: Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) presents a rather different story from that of the EU member states in the region.
  - Following the expected growth of GDP, GIC is projected to increase by almost 40% between 2015 and 2040, with the amount of coal being held almost constant, close to 15 Mtoe. Natural gas is the emerging fuel with a constant gradual increase, connected with the pipeline expansion projects in the Western Balkans region. Crude oil and oil products increase by 45% reaching 12 Mtoe in 2040, and renewable energy increases substantially (by 70%) to 8.3Mtoe in 2040, but still covers only 20% of the total GIC of the group of countries. The group remains a net importer of energy and furthermore, import dependency increases to a level of 42% in 2040 (from 33% in 2015). Crude oil and oil products cover the largest part of imports reaching almost 11 Mtoe by 2040 and the imports of natural gas are continuously increasing, reaching 5.4 Mtoe in 2040.
- In **Turkey**, gross inland consumption is projected to increase by more than 50% between 2020 and 2040. The role of renewable energy is seen to increase notably, reaching 28% of the GIC in 2040, the amount of coal remains at the level of 50 Mtoe with its relative contribution being reduced to 23% in 2040 and the contribution of natural gas is decreased to 17% of the GIC. Nuclear energy appears for the first time in the GIC of Turkey after 2025 with the operation of the Akkuyu nuclear power plant and is increasing until 2050, following the nuclear expansion program of the country.

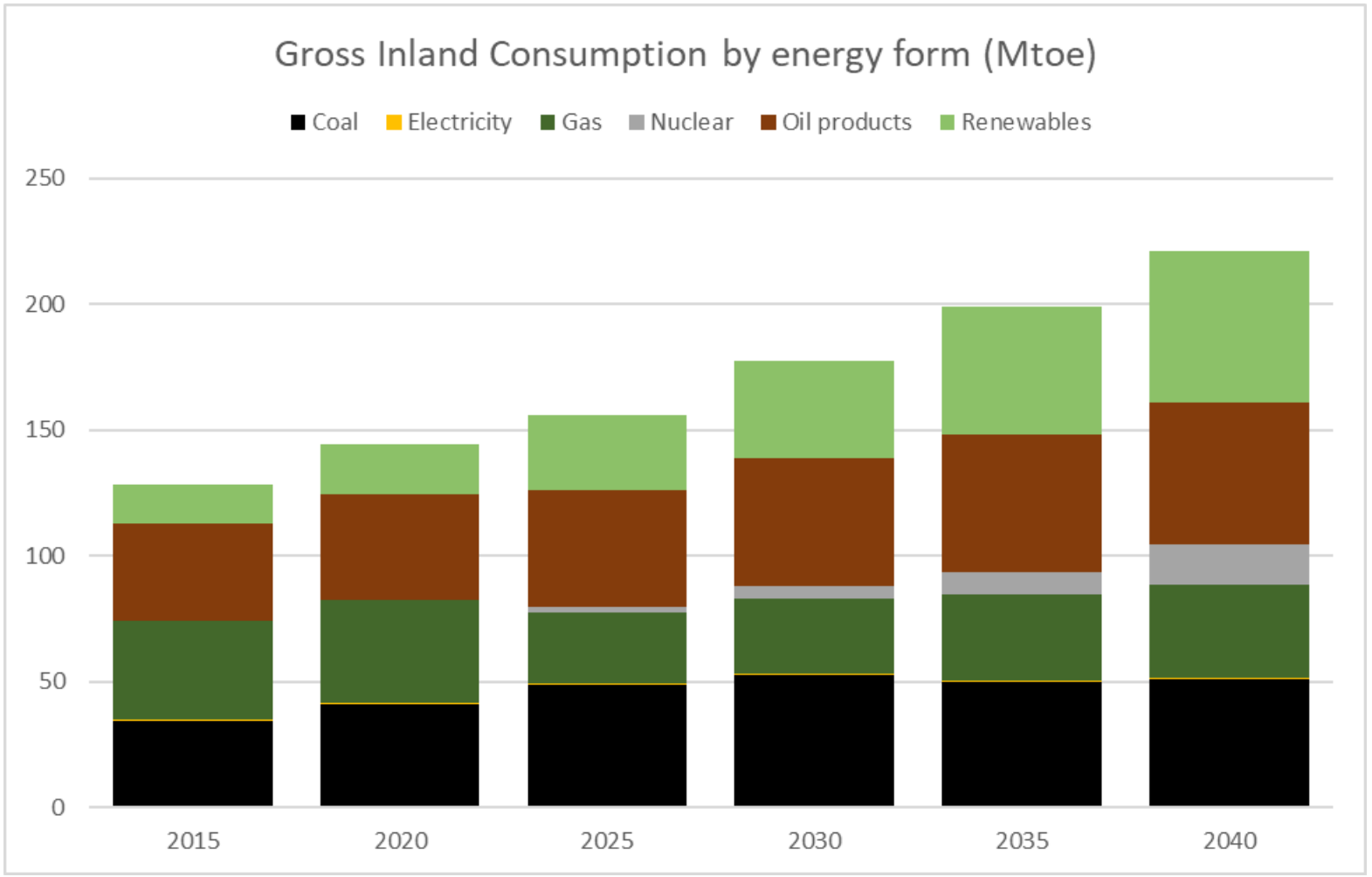
EU Member States in SE Europe: Gross Inland Consumption (2015-2040)



Western Balkan Countries: Gross Inland Consumption (2015-2040)



Turkey: Gross Inland Consumption (2015-2040)



SEE Energy Investment Outlook 2021-2030

- The **investment prospects** in the energy sector of SE Europe over the next 10 years can only be described as **positive**.
- In terms of planned investments, a group of **five countries (i.e. Turkey, Bulgaria, Romania, Serbia, Greece)** appear to be moving **much faster than others** in attracting the needed investment for a variety of energy projects, while progress in the rest of the countries is moving more slowly.
- The region as a whole can be considered as presenting **attractive business opportunities in almost all branches of the energy sector**. The present analysis shows that investment in the energy sector will be spread as follows between countries and interregional projects.
- Compared to investment estimates made in the 2017 edition of IENE's "SEE Energy Outlook", the current estimates for energy related investments in SEE are much higher (+€137.5 billion) for the 13 country reference group, indicating strong interest for investments in the region.

Findings of SEE Energy Investment Outlook Per Country (2021-2030)

Country	Estimated Investment (mn €) 2021 Estimate	Estimated Investment (mn €) 2017 Estimate	GDP growth 2021 (%) IMF World Economic Outlook	GDP growth annual projection to 2025 (%)
Albania	4,500	7,460	5.3	**3.5-4.5**
Bosnia and Herzegovina	9,400	8,722	2.8	**3-3.2**
Bulgaria	47,000	11,050	4.5	**3.1-4.5**
Croatia	21,000	8,525	6.3	**3.2-5.8**
Cyprus	16,200	7,350	4.8	**2.7-3.6**
Greece	44,400	23,300	6.5	**1.5-4.6**
Hungary	25,300	-	7.6	**2.6-5.1**
Israel	39,300	-	7.1	**3.2-4.1**
Kosovo	7,400	2,605	4.8	**n/a**
Montenegro	4,600	2,400	7.0	**2.9-5.6**
North Macedonia	10,400	3,400	4.0	**3.6-4.2**
Romania	50,100	20,630	7.0	**3.6-4.8**
Serbia	15,200	11,260	6.5	**4.0-4.5**
Slovenia	12,100	3,185	6.3	**2.9-4.6**
Turkey	130,000	124,935	9.0	**3.3**
TOTAL	**436,900**	**234,822**		

NB. Hungary and Israel were not included in the 2017 SEE Country Survey and hence no estimates have been prepared by IENE.

Findings of SEE Energy Investment Outlook Per Sector (2021-2030)

	Project sector	Description	2021 Investment estimate (€ mn)	2017 Investment estimate (€ mn)*
OIL	Upstream	• Field Exploration • Development of new oil and gas wells	63,000	38,790
	Downstream	• Refining (upgrading) • Loading Terminals • Storage facilities • Crude / Product Pipeline(s)		
GAS	Country Gas Network	• Grid development • Main intra country pipeline(s) • Storage facilities • FSRU and LNG Terminals	25,150	16,550
ELECTRICITY	Power Generation	• Lignite • Coal • Gas (including CHP) • Nuclear • Large Hydro	150,150	139,550
	Electricity Grid	• New H/V transmission lines • Upgrading and expansion of existing grid		
	RES	• Small Hydro • Wind farms • Photovoltaics • Concentrating Solar Power • Biomass (including liquid biofuels) • Geothermal	109,900	40,009
ENERGY EFFICIENCY		• Buildings • Industry • Electric vehicles	88,700	-
	Total anticipated investments by 2021-2030		436,900	234,822
	Gas infrastructure		23,303	33,350
	Electricity Interconnections		8,440	4,700
	Cross-border energy projects (total)		31,743	38,050
	Grand Total		**468,643**	**272,872**

*(1) This estimate refers to Scenario A as stated in SEE Energy Outlook 2016/2017, p. 1123-1124.
(2) No investment estimates for Energy Efficiency applications were provided in the SEE Energy Outlook 2016/2017.

Key Messages of SEEEO 2021/2022 (I)

- **Geography**, followed by **economy**, has emerged as a key factor in SEE's energy assessment
- **Energy strategies and policies:** There is considerable divergence between stated objectives and actual progress on the ground (e.g. Decarbonisation, RES penetration, regional co-operation)
- There is **clear failure at EU policy level** in achieving national targets especially in RES, as conflict is in evidence over strict budgetary rules and allowed deficit levels
- The **coronavirus pandemic (COVID-19)** led governments to impose unprecedented containment measures on transportation and economic activity in general. Combined with a fall in global oil prices, especially during March-May 2020, this crisis is producing imbalances in the energy sector, affecting both investments and the transition to decarbonisation
- The SEE region's **energy mix** is still characterized by glacial change in terms of differentiation of the dominant fuels
- The **persisting relevance of solid fuels** is explained on account of the large amounts of indigenous coal and lignite deposits and are seen as partly preventing a determined move towards decarbonisation
- The SEE region is characterized by **high oil and gas import dependence**
- The outlook for the SE European **upstream oil and gas industry** has rarely looked so uncertain
- **Peripheral countries** are playing an increasingly more influential role in the channeling of energy flows into the SEE region
- **Natural gas is becoming increasingly important** to the energy mix of the various SEE countries, both for power generation and commercial/domestic use

Key Messages of SEEEO 2021/2022 (II)

- **Market liberalization** in the electricity sector has made huge strides over the last five years with unbundling having taken place and competition in the retail area now evident after many years of protectionism. Less impressive is progress in the natural gas sector where competition, is largely limited to the industrial sector with retail lagging seriously behind
- **Nuclear power**, although it contributes only 4.1% to total gross inland consumption and 8.0% to electricity mix in SEE (including Turkey), remains a viable option since it covers important base load requirements in certain key countries (Romania, Bulgaria, Croatia, Slovenia, Hungary) and is fully compatible and supportive of EU's (revised) decarbonisation policies
- **Energy efficiency** in SE Europe until very recently was not given enough priority or attention although its role has been recognized in all EU Member States. Further efforts are required to introduce Energy efficiency as an integral part of national energy planning
- The SEE countries have particularly high levels of **energy poverty** due to low incomes, high energy needs stemming from energy-inefficient housing, and limited access to diversified energy supply
- In terms of **security of energy supply**, the SEE region as a whole appears more vulnerable than the rest of Europe (mainly Western European countries)
- Alongside power grid reinforcement, a diverse mix of **flexible generation technologies** in SEE can facilitate the integration of variable RES – especially wind and solar PV.
- In SE Europe, the **Electric Vehicle deployment** is still at a very early stage, even though it shows significant annual growth.

Key Messages of SEEEO 2021/2022 (III)

- Looking at the **projection of gross inland energy consumption in the EU member states of the SEE region**, the overall tendency shows a stabilisation and even a small reduction in the time horizon to 2040
- In contrast, the **projection of gross inland energy consumption in the six Western Balkan countries** presents a rather different story from that of the EU member states in the region. Following the expected growth of GDP, gross inland energy consumption is projected to increase by almost 40% between 2015 and 2040, with the amount of coal being held almost constant, close to 15 Mtoe
- **Gross inland energy consumption in Turkey** is slated to increase by more than 50% between 2020 and 2040
- **Investment prospects** for energy related basic infrastructure and energy projects across the board look positive over the next decade
  - Compared to projections made in 2017 for the period 2016-2025, total estimated energy related investment in the region is much higher and amounts to €483.7 billion.
  - Corresponding investments for the original 13-country group (as they appear in the 2017 Outlook) are slated at €372.3 billion, which is 58.5% higher compared to the 2017 estimates.
  - **This is a vast improvement compared to 5 years ago and clearly shows the substantially increased interest and appetite for energy investments in SE Europe.**

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www.iene.eu
cstambolis@iene.gr