# Investment Outlook for SE Europe's Oil and Gas Sector with Special Reference to Greece

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TÜRKİYE BLACK SEA OIL AND GAS

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INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE

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# Presentation Outline

- SEE economic background and economic climate
- Energy demand projections (as per SEE Energy Outlook 2021/2022)
- Energy sector investment outlook (10 years)
- Oil and gas sector investment outlook
- Greece’s energy sector investment forecast
- Greece’s refining market
- Greece’s gas market and infrastructure
- Challenges ahead

# 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

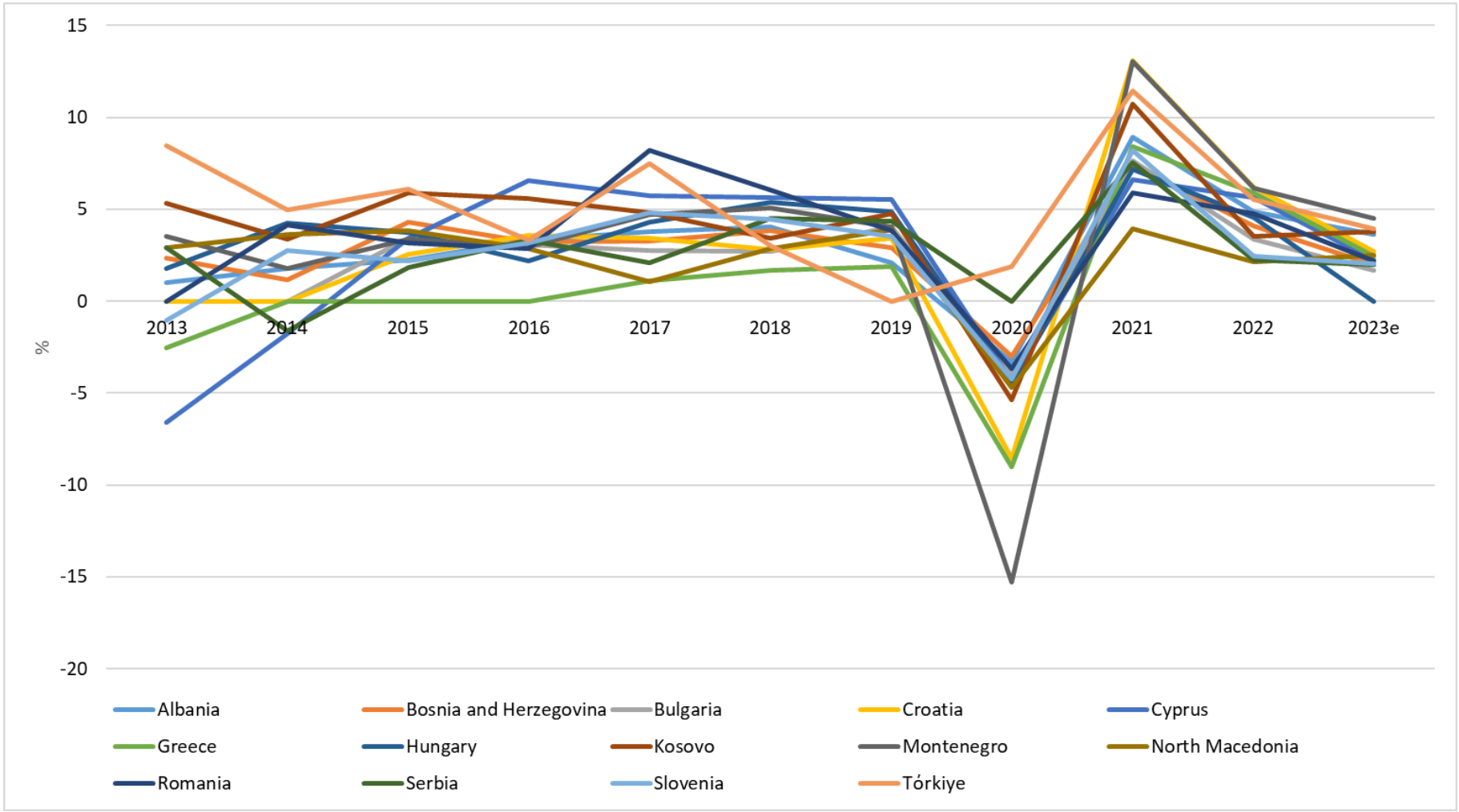


Source: IENE

# IENE's Major Study "SEE Energy Outlook 2021/2022"


Source: IENE

# The Economies of SE Europe – Real GDP (% Change), 2013-2023e






Source: IMF WEO (October 2023)

# Energy Demand and Supply Projections in SEE - Methodology (I)

- The **TIMES model** was used for estimating future demand and supply trends.
  - It combines two different, but complementary, systematic approaches to energy modelling: a technical engineering approach and an economic approach. TIMES is a technology rich, bottom-up model generator, which uses linear-programming to produce a least-cost energy system, optimized according to a number of user constraints, over medium to long-term time horizons.

- A **"Baseline" scenario** was used for the development of the energy systems of the SEE countries, which largely depicts current policies.

- Input data was based on the **most recently available studies** and the **official country submissions of strategic documents** (such as the Integrated National Energy and Climate Plans).

- 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.

# Energy Demand and Supply Projections in SEE - Methodology (II)

- **Data have been extracted, converted and in some cases processed, and used to generate six main energy and climate indicators at country level:**
  - Net import by energy commodity.
  - Gross Inland Consumption (GIC) by energy commodity.
  - Electricity generation by type.
  - Final Energy Consumption (FEC) by energy commodity.
  - Final energy consumption by sector.
  - GHG emissions (excluding LULUCF) with the GDP evolution.
- **Additional indicators and analyses** were derived from the combination of the above-mentioned basic information; for example, intensities were calculated as ratios (e.g. FEC over GDP or GHG emissions over GIC).
- A **consistency check of the data** has been carried out to validate and keep full consistency over the reported energy chains (energy imports - gross inland consumption – transformation sector - final energy consumption – related GHG emissions).

# Scenario Results per Group of Countries

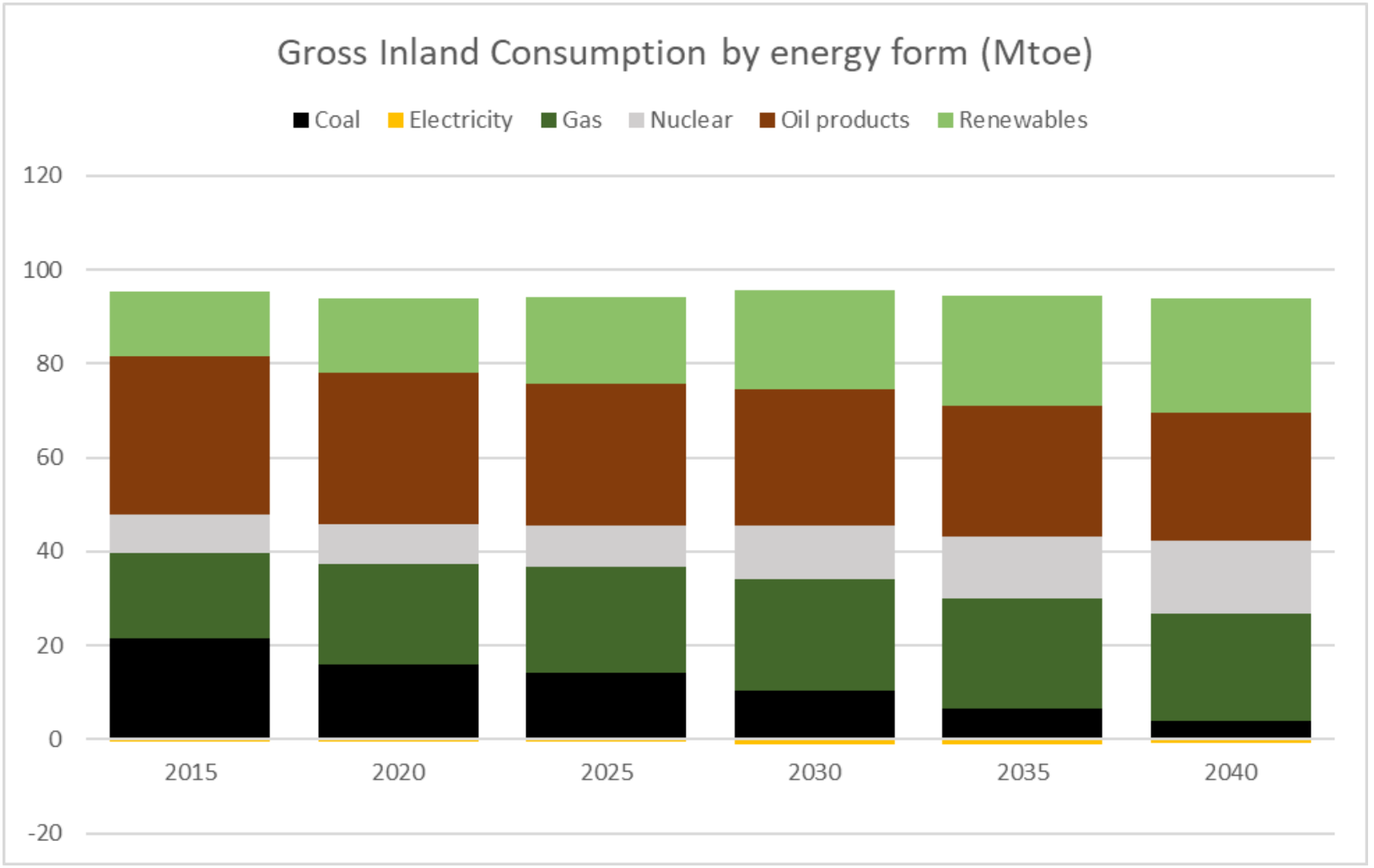
- **Results are presented per Group of Countries - EU Member States, West Balkans and Turkey**

- For 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.

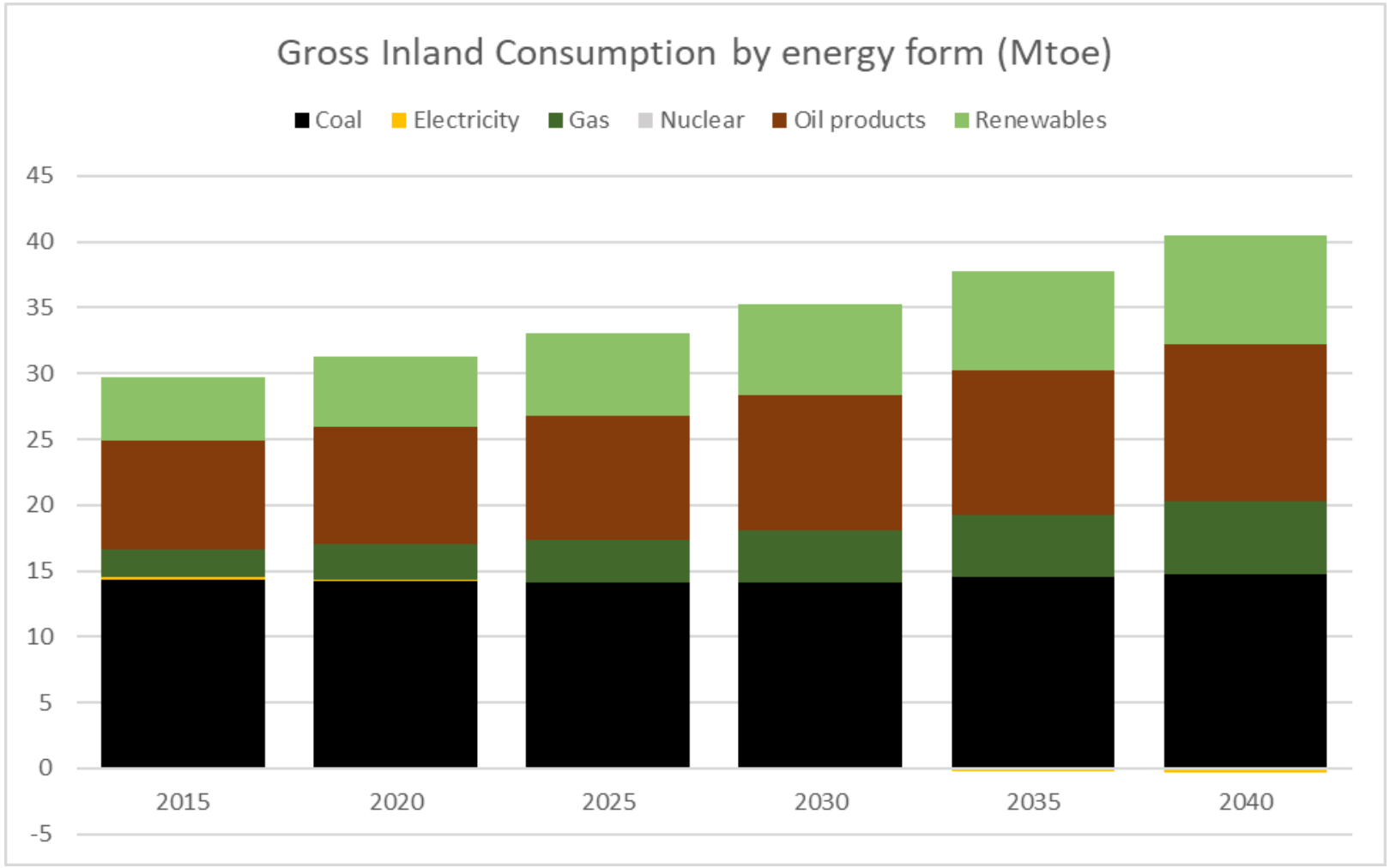
- The projection of Gross Inland Consumption in the **six Western Balkan countries** (WB6: Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia) presents a rather different story from that of the EU member states in the region.

- **Turkey** is a case by itself as 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.

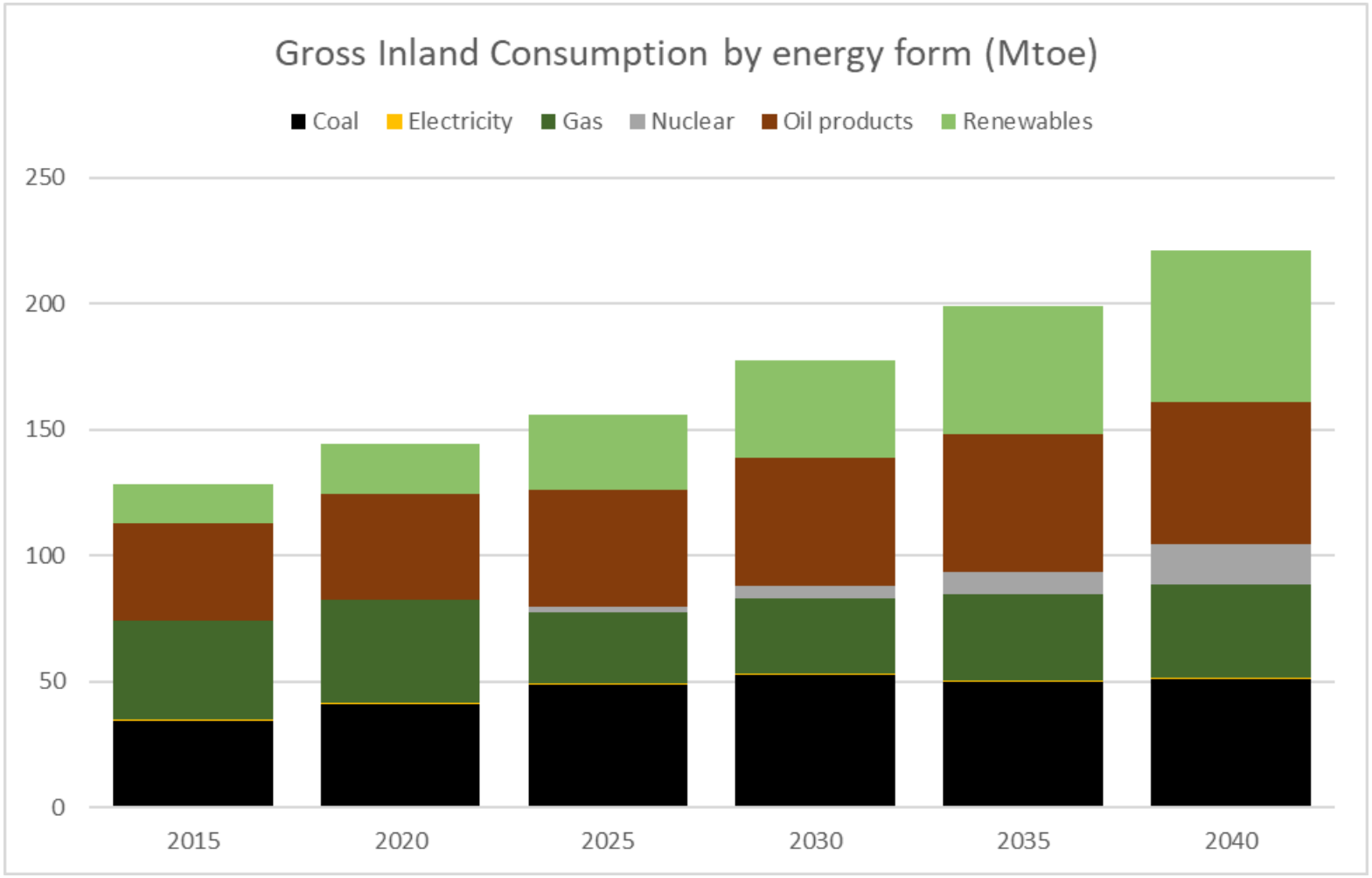
# EU Member States in SE Europe: Gross Inland Consumption (2015-2040)



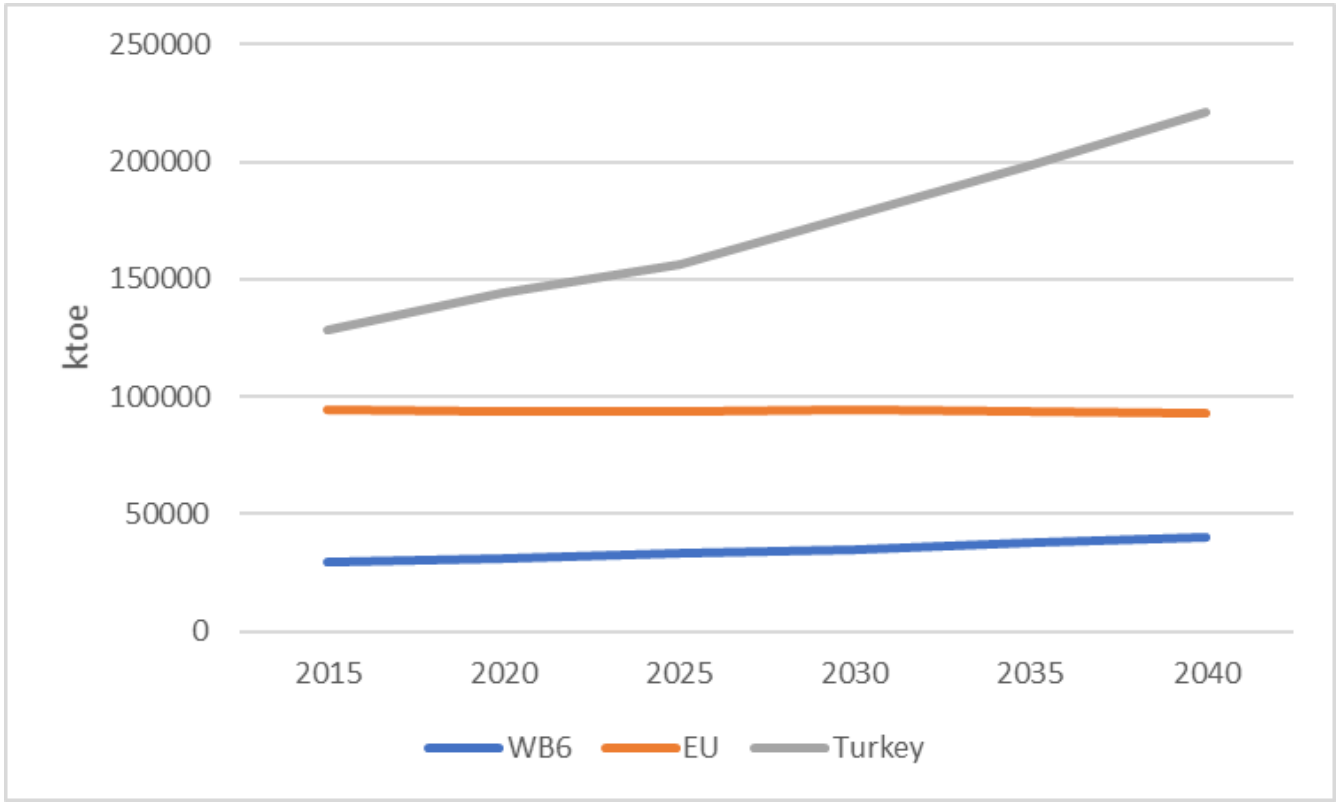
# Western Balkan Countries: Gross Inland Consumption (2015-2040)



# Turkey: Gross Inland Consumption (2015-2040)



# Gross Inland Consumption in SE Europe per Group of Countries (2015-2040)



# SEE Energy Investment Outlook 2021-2030

- As economic conditions appear stabilised across SEE with growth prospects in the horizon, something which is reflected in anticipated energy demand growth for most countries, investment outlook appears **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<br>• Development of new oil and gas wells | 63,000 | 38,790 |
| | Downstream | • Refining (upgrading)<br>• Loading Terminals<br>• Storage facilities<br>• Crude / Product Pipeline(s) | | |
| **GAS** | Country Gas Network | • Grid development<br>• Main intra country pipeline(s)<br>• Storage facilities<br>• FSRU and LNG Terminals | 25,150 | 16,550 |
| **ELECTRICITY** | Power Generation | • Lignite<br>• Coal<br>• Gas (including CHP)<br>• Nuclear<br>• Large Hydro | 150,150 | 139,550 |
| | Electricity Grid | • New H/V transmission lines<br>• Upgrading and expansion of existing grid | | |
| | RES | • Small Hydro<br>• Wind farms<br>• Photovoltaics<br>• Concentrating Solar Power<br>• Biomass (including liquid biofuels)<br>• Geothermal | 109,900 | 40,009 |
| **ENERGY EFFICIENCY** | | • Buildings<br>• Industry<br>• 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.

# Findings of Energy Investment Outlook Per Sector in **Greece** (2022-2031)

| | Project sector | Description | Investment estimate (€ mn) |
|---|---|---|---|
| **OIL** | Upstream | • Field exploration, new oil and gas drillings, construction of onshore and offshore infrastructure*1 | 9,000 |
| | Downstream | • Upgrading and modernization of refining facilities | |
| **GAS** | Pipelines, Natural Gas Networks and Other Infrastructure | • Development of urban and regional networks<br>• Cross-border pipelines*2<br>• Underground gas storage facility in South Kavala<br>• LNG terminals and FSRUs*3 | 3,950 |
| **ELECTRICITY** | Electricity Generation (New Plants) | • Completion of PPC's lignite-fired power plant (including CHP) and resumption of mines<br>• Natural gas units (CCGT)*4<br>• Energy storage (including batteries and pumped storage projects) | 8,950 |
| | Electricity Grid | • Oil-fired power plants on the islands (including Crete and Rhodes)<br>• Upgrade and expansion of the existing network and interconnection of islands (including new high-voltage transmission lines) | |
| | RES | • Small hydropower plants<br>• Wind (onshore and offshore)<br>• Solar PV*5<br>• Concentrating Solar Power<br>• Biomass (including liquid biofuels)<br>• Geothermal (high and low enthalpy)<br>• Green hydrogen/CCUS | 27,000 |
| **ENERGY EFFICIENCY** | Energy Efficiency | • Energy upgrade of buildings (private and public commercial buildings), energy savings in businesses and industry<br>• Electromobility | 14,500 |
| **DOMESTIC AND COMMERCIAL SOLAR THERMAL APPLICATIONS** | Domestic and Commercial Solar Thermal Applications | • Solar thermal systems in hotels, industry, residences, maintenance, replacement, etc. | 1,500 |
| **RESEARCH AND INNOVATION** | Research and Innovation | • Research and innovative energy applications | 1,100 |
| | | **Total anticipated investments by 2031** | **66,000** |

**Note:** *[1]The total investment cost is an IENE estimate and is based on planned 8-10 exploration and production drillings, *[2]The Greece-North Macedonia interconnection pipeline is included. The East Med gas pipeline is not included, *[3]The FSRUs in Alexandroupolis (INGS Alexandroupolis and INGS Thrace) of Gastrade, Thessaloniki of Elpedison, Dioriga Gas of Motor Oil and Volos (INGS Argo) of Mediterranean Gas, as well as complementary projects at the Revithoussa LNG terminal are included, *[4]The new CCGTs of (a) GEK TERNA-Motor Oil, (b) PPC-DEPA Commercial-Damco Energy, (c) Elpedison and (d) Mytilineos Group are included, *[5] Central self-generating units, rooftop PV installations and electricity storage systems are included.

# Sources of Finance

- There appear to be a **variety of investment sources** especially for medium to large infrastructure projects and energy market expansion:
  - Government/own resources
  - International Financial Institutions (IFIs)
    - European Commission
    - European Bank for Reconstruction and Development (EBRD)
    - European Investment Bank (EIB)
    - World Bank
    - German government-owned development bank KfW
    - European Western Balkans Joint Fund (EWBJF)
    - International Development Association (IDA)
  - Commercial banks/private investors
  - Financial facilities for investments in energy efficiency and renewable energy

# Oil Infrastructure and Refinery Capacity in Greece, 2021


| Refinery | Owner | Capacity, kb/d |
|---|---|---|
| Korinthos | Motor Oil | 245.0 |
| Aspropyrgos | HELPE | 201.4 |
| Elefsina | HELPE | 145.3 |
| Thessaloniki | HELPE | 77.9 |
| **Total capacity** | | **669.6** |

Source: IEA

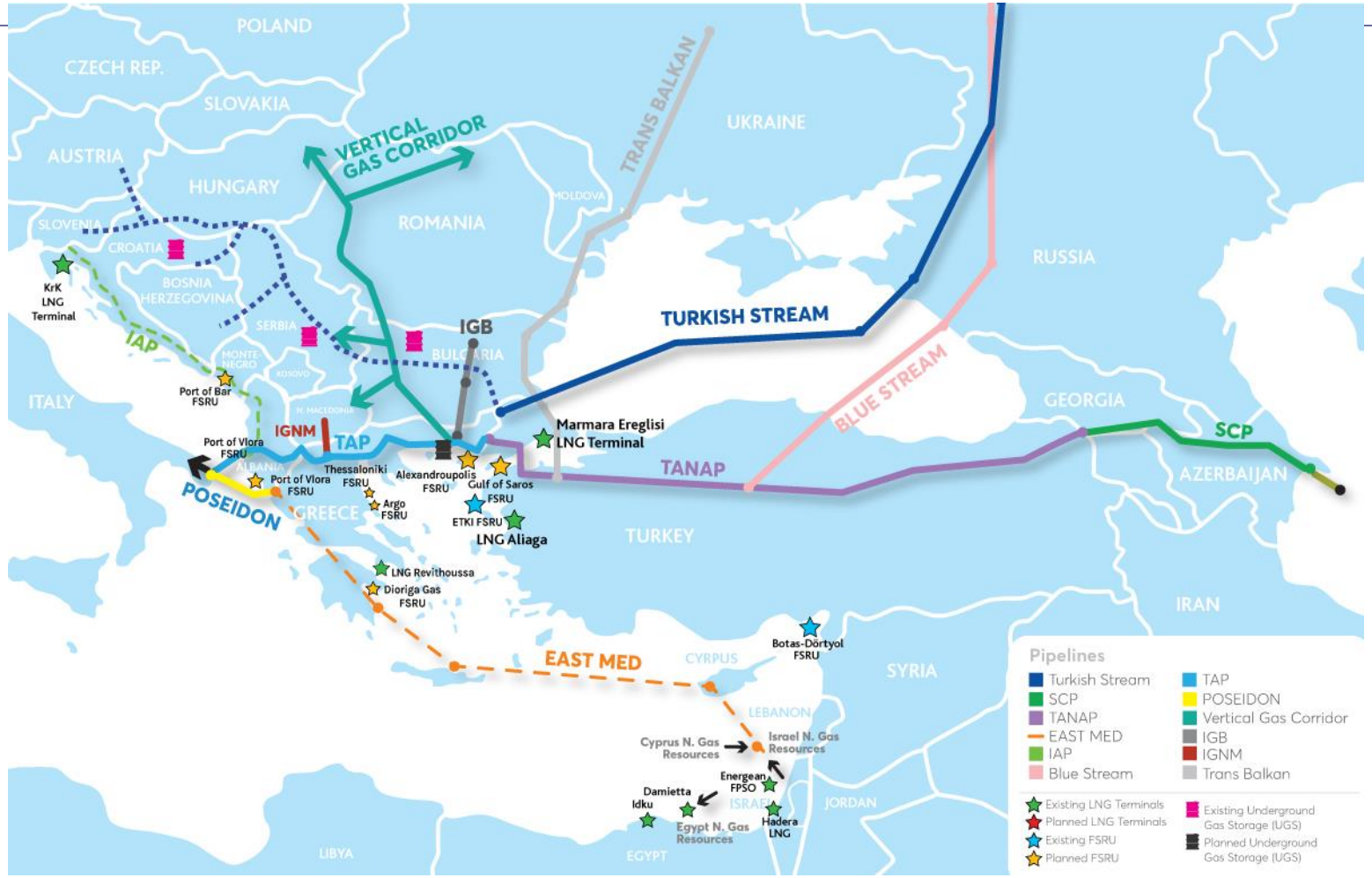
# Gas Infrastructure in Greece, 2021


Revythoussa LNG terminal

TAP pipeline

Source: IEA

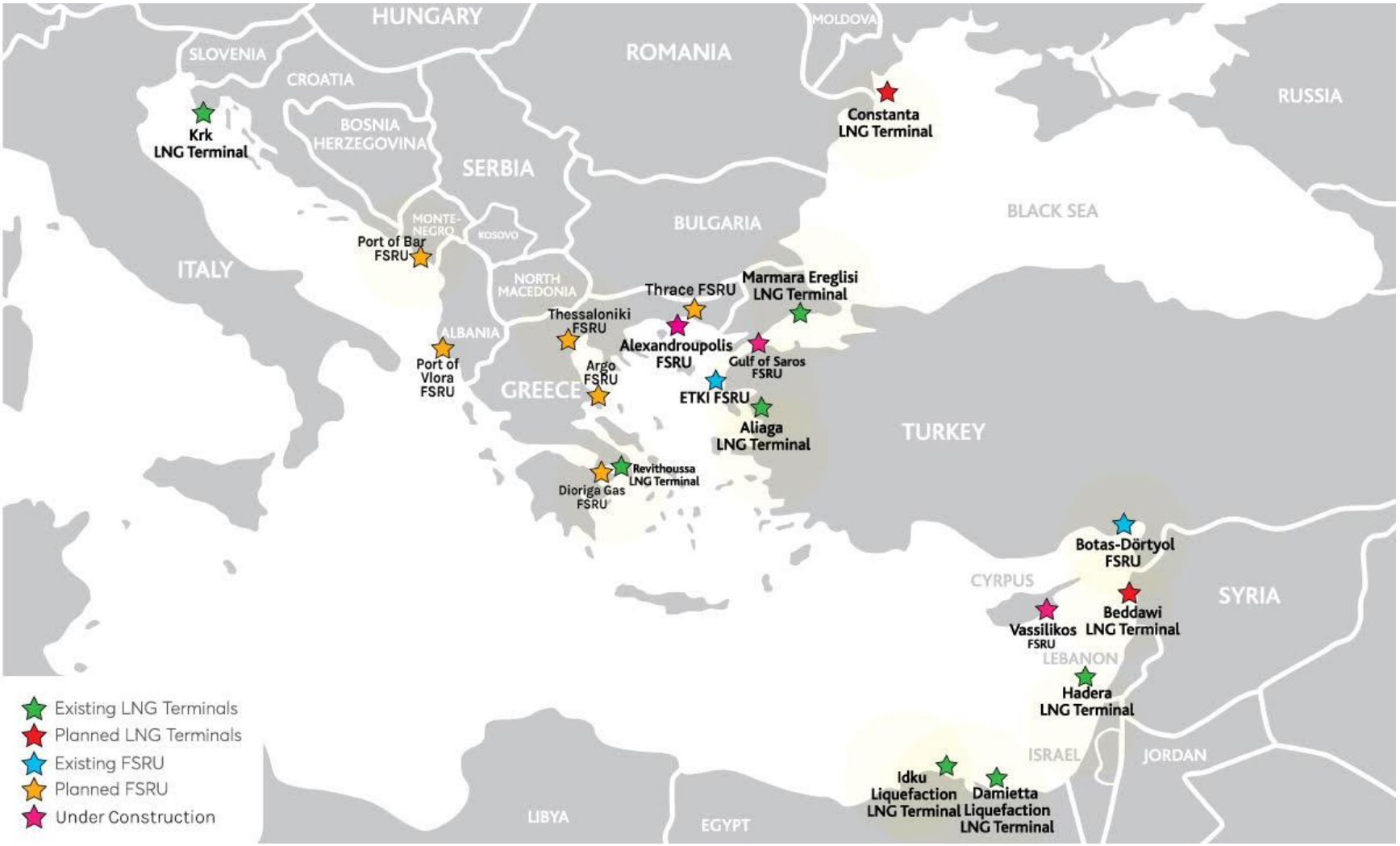
# An Expanded South Gas Corridor




**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

# LNG Terminals in SE Europe




Source: IENE

# Existing and Under Construction LNG Terminals in SE Europe

| | Country | Terminal or Phase Name | Start Year | Nameplate Receiving Capacity (MTPA) | Owners | Concept |
|---|---|---|---|---|---|---|
| Existing | Turkey | Marmara Ereglisi | 1994 | 5.9 | Botas (100%) | Onshore |
| | | Aliaga Izmir LNG | 2006 | 4.4 | EgeGaz (100%) | Onshore |
| | | Dortyol - MOL FSRU Challenger | 2018 | 4.1 | Botas (100%) | FSRU |
| | | Etki LNG terminal - Turquoise | 2019 | 5.7 | Terminal: Etki Liman (100%), FSRU: Kolin Construction (100%) | FSRU |
| | Greece | Revithoussa | 2000 | 4.6 | DEPA (100%) | Onshore |
| | Croatia | Krk - Golar FSRU | 2021 | 1.9 | Terminal: HEP (85%), Plinacro (15%), FSRU: Golar (100%) | FSRU |
| Under Construction | Turkey | Gulf of Saros terminal – Ertugrul Gazi | 2022 | 7.5 | Botas (100%) | FSRU |
| | Greece | Alexandroupolis FSRU | 2022 | 4.0 | DESFA (20%), Kopelouzos Group (20%), DEPA Commerce (20%), GasLog Cyprus Investments Ltd. (20%), Bulgartransgaz EAD (20%) | FSRU |
| | Cyprus | Vassilikos FSRU | 2022 | 0.6 | DEFA (100%) | FSRU |

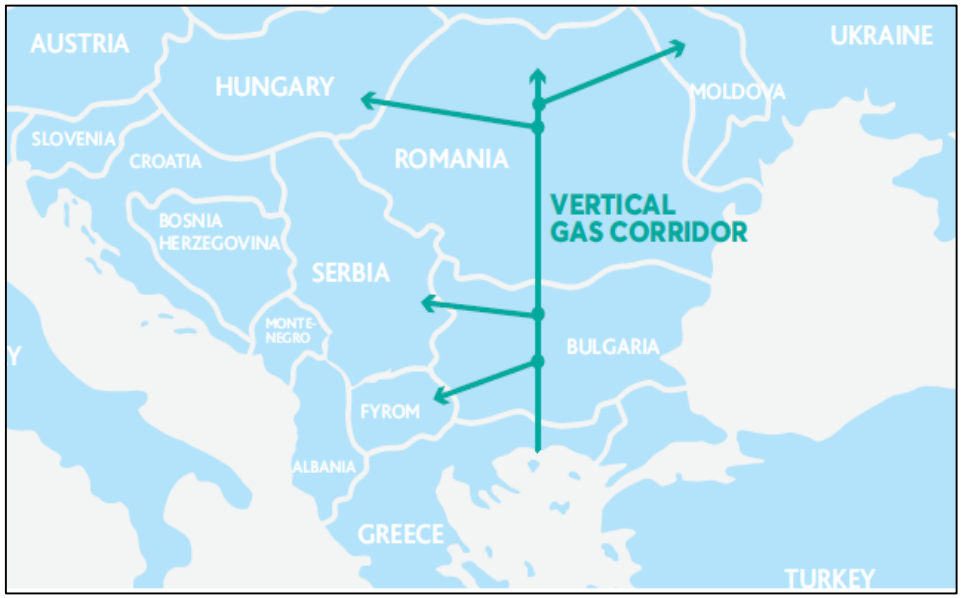
Sources: IGU, IENE

# Alexandroupolis FSRU

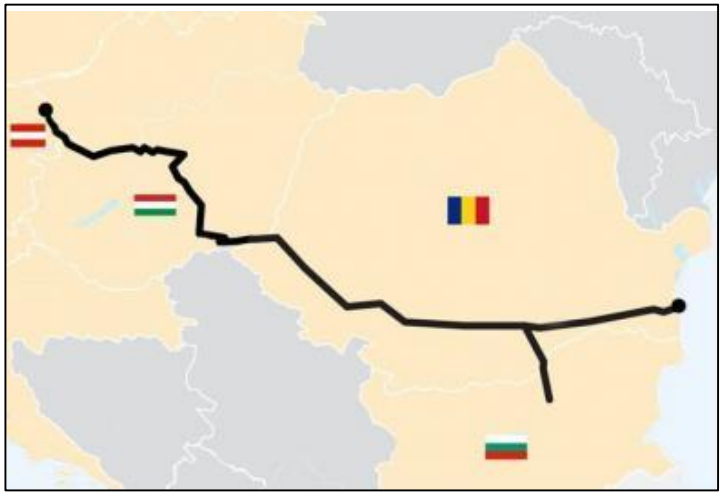


Source: IENE

# 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 |

# Various Gas Pipelines in the Balkans


Source: OIES

# Major Gas Pipelines in SE Europe (bcm)

| ← | Out to west | Through | ← | In from east | ← |
|---|---|---|---|---|---|
| 20 | Trans-Balkan | Trans-Anatolian | 16 | TurkStream | 32 |
| 16 | Balkan Stream | | | Blue Stream | 16 |
| 10 | Trans Adriatic | | | South Caucasus | 24 |
| | | | | Tabriz Ankara | 14 |

Source: OIES

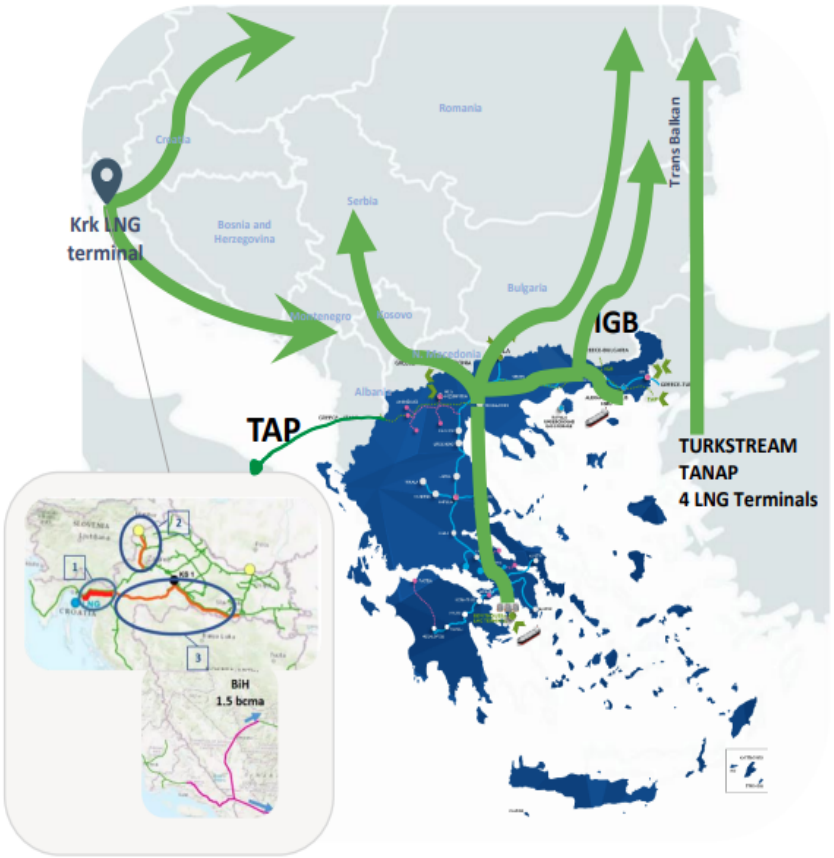
**Inauguration of the Bulgaria-Serbia gas interconnector**

# Gas Interconnections Between Bulgaria and Turkey




Source: ENTSO-G

# 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**

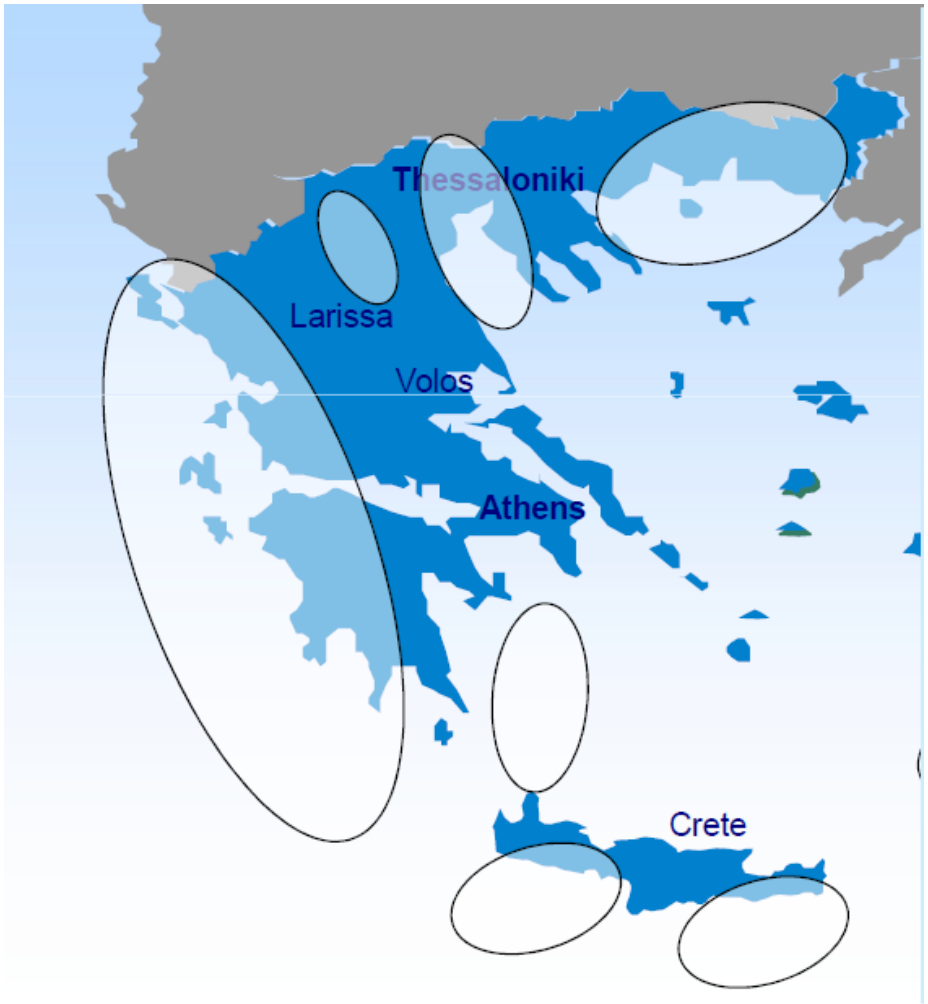
- ✓ Most diversified gas supply portfolio in the region & Important transit country, largest connection to the Transbalkan pipeline
- ✓ 4 LNG Terminals in operation and a 5th in planning phase
- ✓ Large consumer with modern Energy Exchange in operation
- ✓ EU is hoping for gas from Turkey;
- — Large 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

# Gas Export Capacity Potential and the Vital Role of Greece

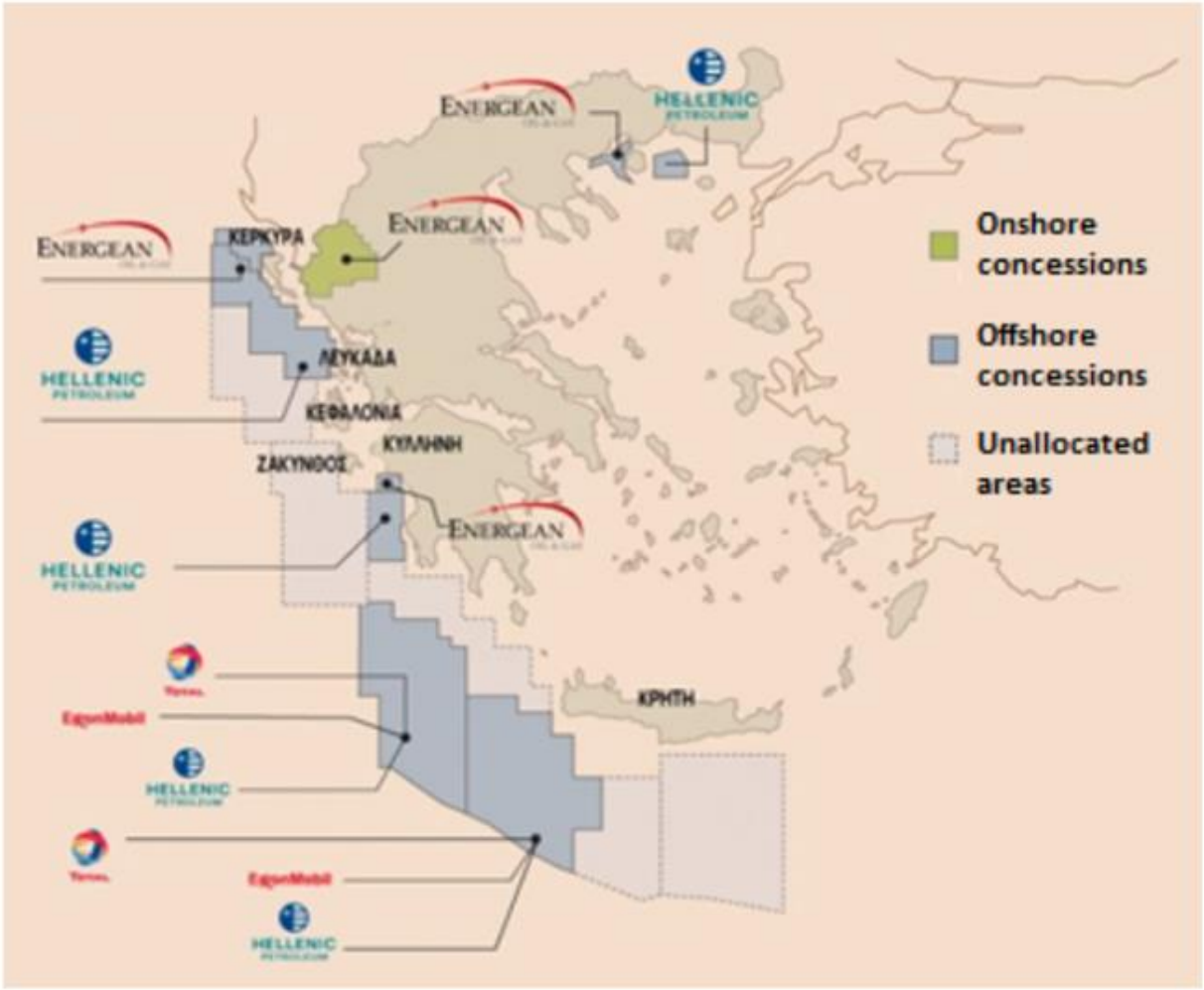

Source: DESFA

# Unexplored Areas and Geological Targets in Greece




Source: HELLENIQ ENERGY

# Current Concession Areas in Greece




Source: HEREMA

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