Energy Security in SE Europe

with special reference to SE Europe Energy Outlook 2016/2017

Sabanci University Karaköy Minerva Palace, Istanbul,
November 15, 2017

A Presentation by Mr. **Costis Stambolis**,
Executive Director
Institute of Energy for S.E. Europe (IENE), Athens

INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE

Presentation Outline

- About IENE
- SE Europe Energy Outlook 2016/2017
- Defining Energy Security
- Energy Security Insights
- Energy Security in SE Europe
- Toward a Redefinition of the South Corridor
- The Role of Greece and Turkey in European Energy Security
- Discussion

About IENE

- Established in 2003 as a **non-profit** and **non-governmental organization** by a small group of energy professionals active in the broad energy field
- Headquarters: Athens, Greece
- Active in all 13 countries of SE Europe, but also covering peripheral countries
- Areas of Interest
  - Energy Policy and Geopolitics
  - Production, transmission and distribution of electricity
  - Hydrocarbons (upstream, midstream and downstream)
  - Electricity (solid fuels, hydroelectricity and nuclear energy)
  - Renewable Energy Sources (RES)
  - Energy Efficiency (transport, industry, buildings)
  - Hydrogen as a fuel
  - Energy and transport
  - Energy and the environment ("greenhouse" effect, climate change, CO2 emissions)
  - Bioclimatic applications and energy conservation in the building sector
  - Solid waste and sewage management for heat and power generation
  - Clean coal technologies for electricity generation

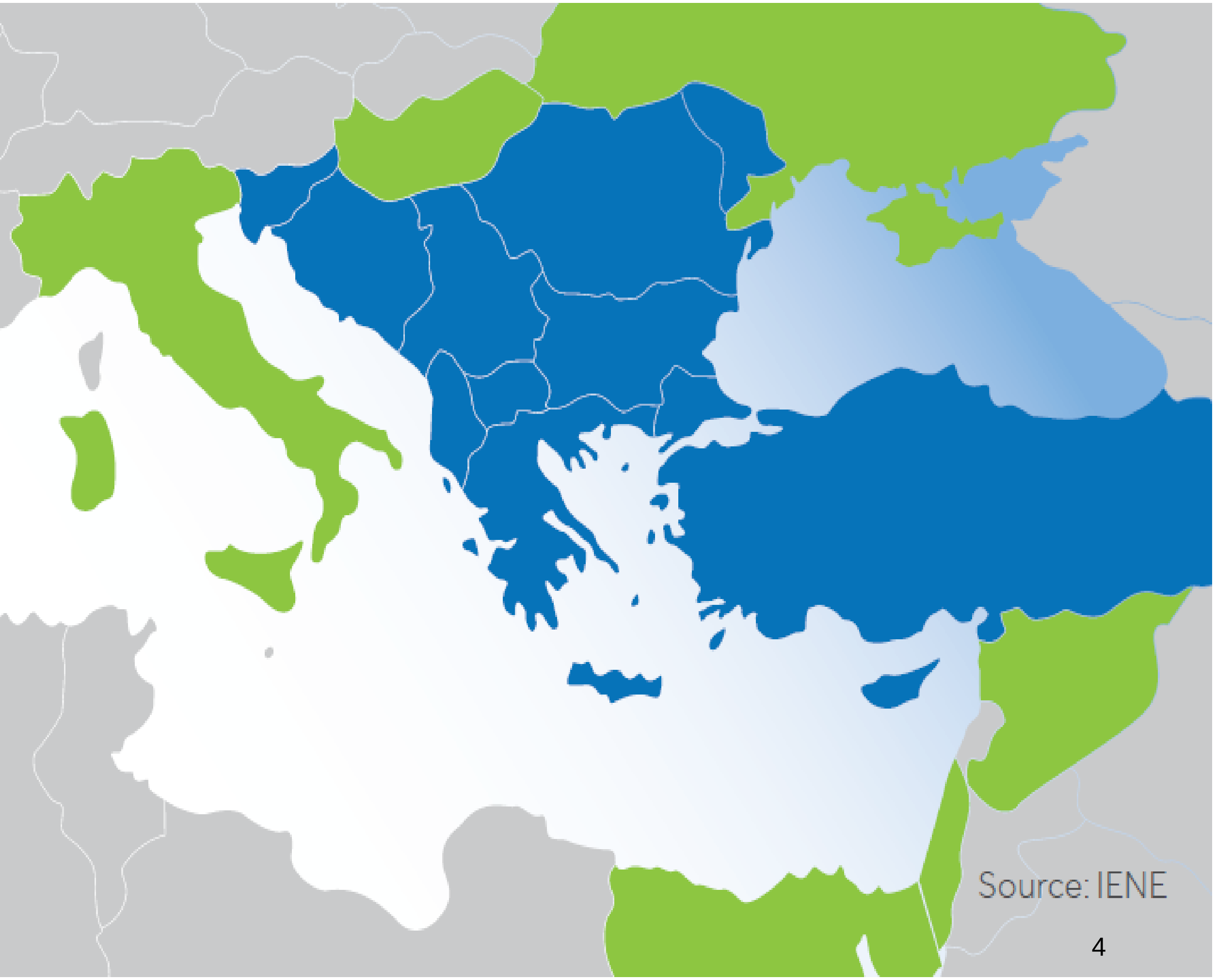
The SE European Region Defined

Core Countries

- Albania
- BiH
- Bulgaria
- Croatia
- Cyprus
- FYROM
- Greece
- Kosovo
- Montenegro
- Romania
- Serbia
- Slovenia
- Turkey

Peripheral Countries

- Egypt
- Hungary
- Israel
- Italy
- Lebanon
- Moldova
- Syria
- Ukraine



Source: IENE

IENE’s Mission and Vision

- IENE’s **mission** is:
  - To promote a broader understanding of the key energy and environmental issues in the region
  - To provide a permanent forum and a suitable platform for the exchange of views and information
  - To be open to professionals, companies and stakeholders who are actively involved in the energy sector

- IENE’s **vision** is to establish itself as the leading energy think tank in the region and at the same time develop a highly credible and worthwhile range of services covering information provision, research, assessment studies, sectorial surveys, educational activities, event organisation and networking
  - These services are offered primarily to its members, but also to government and industry and energy professionals at large

Newsletters


Issue No 119 - January 2014
SOUTH-EAST EUROPE ENERGY BRIEF
Market Insight
Published by the Institute of Energy for South East Europe
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Market Forces


Issue No 117 - January 2014
SOUTH-EAST EUROPE ENERGY BRIEF
Market Watch
Published by the Institute of Energy for South East Europe
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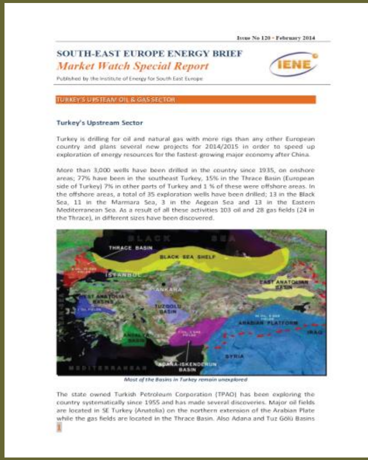
Issue No 120 - February 2014
SOUTH-EAST EUROPE ENERGY BRIEF
Market Watch Special Report
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TURKEY'S UPSTREAM OIL & GAS SECTOR
Turkey's Upstream Sector


Issue No 118 - January 2014
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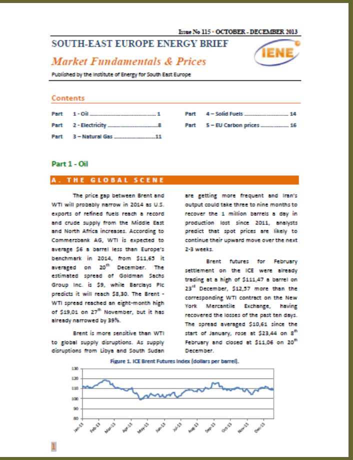
Published by the Institute of Energy for South East Europe
The Pivotal Role of Greece in Azerbaijan's Gas Exports Outreach to Europe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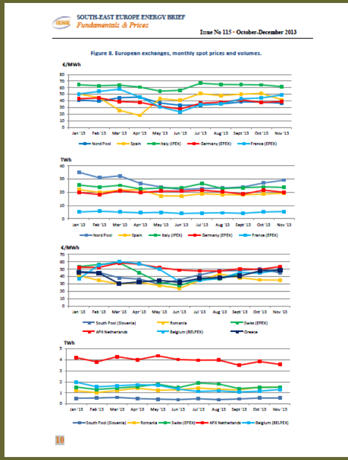
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Fundamentals & Prices
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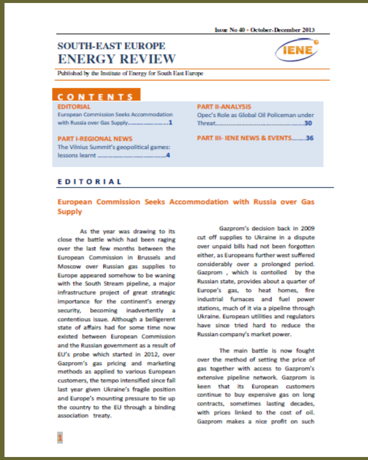
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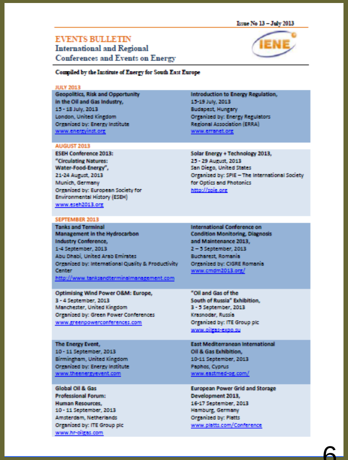
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EVENTS BULLETIN
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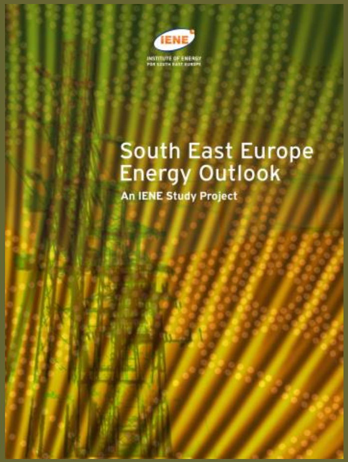
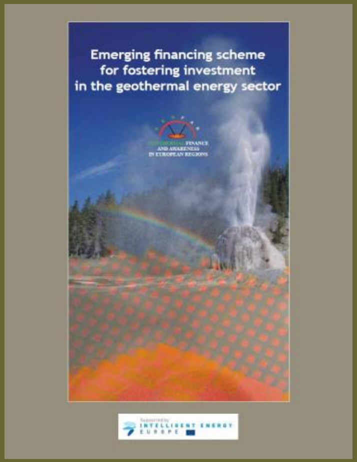
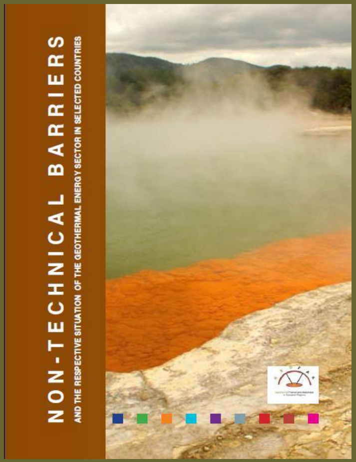
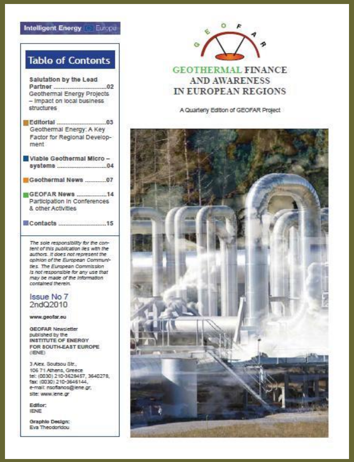
Compiled by the Institute of Energy for South East Europe

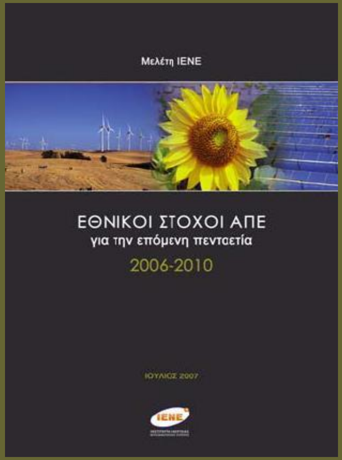
Major Studies and Working Papers

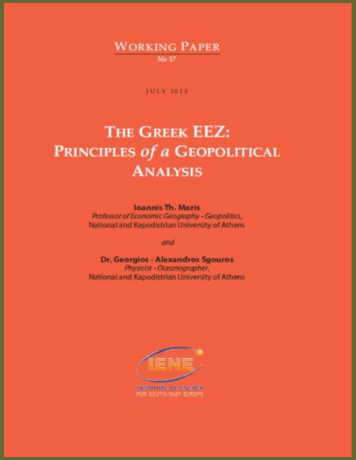












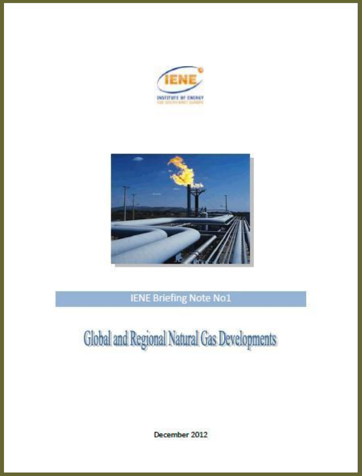
Studies, Research Notes and Briefing Notes

IENE Briefing Note No2

Revised Edition

An Overview of the South Corridor Gas Pipeline Projects

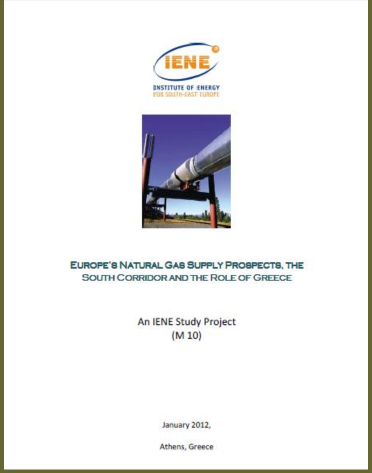
July 2013



IENE Briefing Note No1

Global and Regional Natural Gas Developments

December 2012



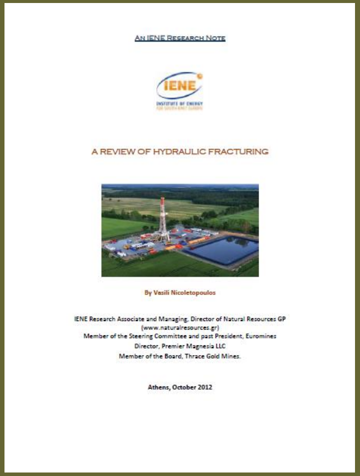
INSTITUTE OF ENERGY FOR SOUTH-EAST EUROPE

EUROPE'S NATURAL GAS SUPPLY PROSPECTS, THE SOUTH CORRIDOR AND THE ROLE OF GREECE

An IENE Study Project (M 10)

January 2012,

Athens, Greece



An IENE Research Note

A REVIEW OF HYDRAULIC FRACTURING

By Vasili Nicoletopoulos

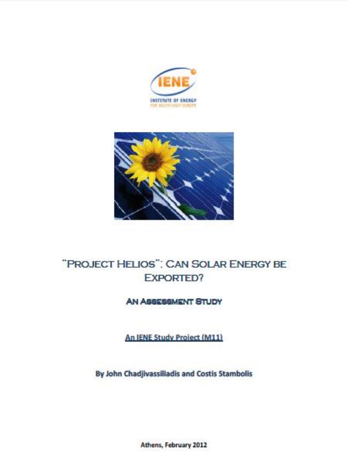
IENE Research Associate and Managing, Director of Natural Resources GP (www.naturalresources.gr)

Member of the Steering Committee and past President, Euromines

Director, Premier Magnesia LLC

Member of the Board, Thrace Gold Mines.

Athens, October 2012



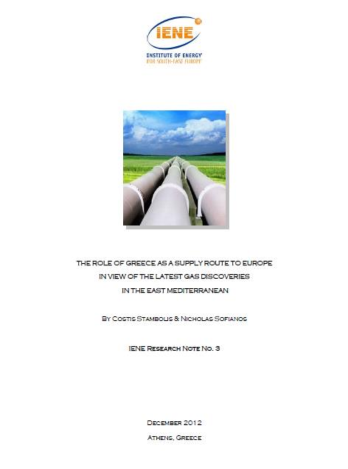
"PROJECT HELIOS": CAN SOLAR ENERGY BE EXPORTED?

AN ASSESSMENT STUDY

An IENE Study Project (M11)

By John Chadjivassiliadis and Costis Stambolis

Athens, February 2012



THE ROLE OF GREECE AS A SUPPLY ROUTE TO EUROPE IN VIEW OF THE LATEST GAS DISCOVERIES IN THE EAST MEDITERRANEAN

BY COSTIS STAMBOLIS & NICHOLAS SOFIANOS

IENE RESEARCH NOTE NO. 3

DECEMBER 2012

ATHENS, GREECE

AN IENE RESEARCH NOTE

THE CASPIAN BASIN

THE SUCCESS STORY OF AZERBAIJAN: PRESENT SITUATION AND FUTURE PERSPECTIVES IN THE OIL AND GAS EXPLORATION

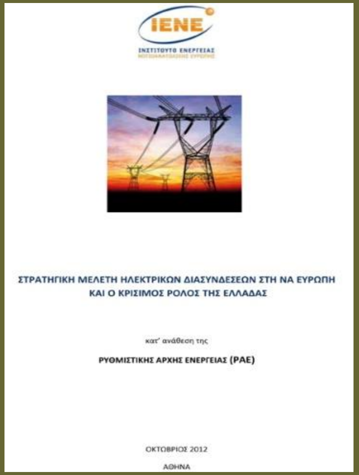
A CASE STUDY

by Marika Karayianni

Caspian Energy Expert Demokriteion University of Thrace, Dpt of History, Language and Civilization of the Black Sea countries.

IENE Research Note No.1

Athens, July 2012



ΣΤΡΑΤΗΓΙΚΗ ΜΕΛΕΤΗ ΗΛΕΚΤΡΙΚΩΝ ΔΙΑΣΥΝΔΕΣΕΩΝ ΣΤΗ ΝΑ ΕΥΡΩΠΗ ΚΑΙ Ο ΚΡΙΣΙΜΟΣ ΡΟΛΟΣ ΤΗΣ ΕΛΛΑΔΑΣ

κατ' ανάθεση της

ΡΥΘΜΙΣΤΙΚΗΣ ΑΡΧΗΣ ΕΝΕΡΓΕΙΑΣ (ΡΑΕ)

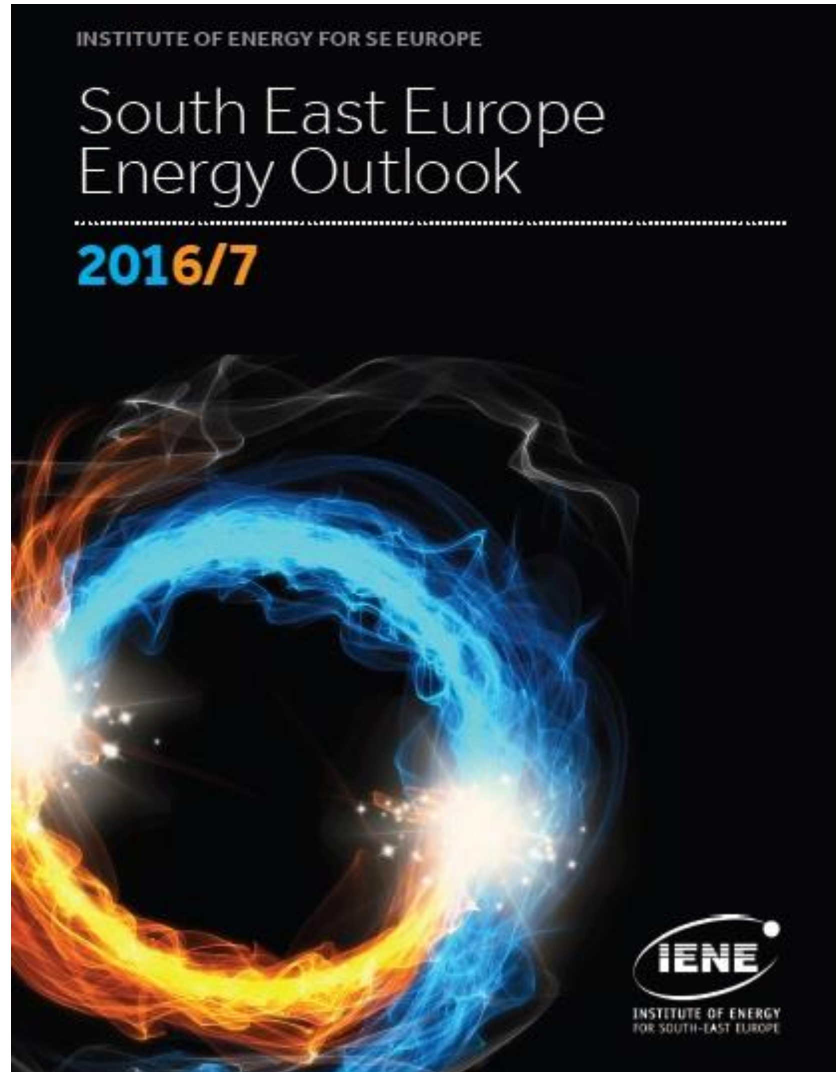
ΟΚΤΩΒΡΙΟΣ 2012

ΑΘΗΝΑ

IENE's Role in SE Europe

- Promotion of an Energy Dialogue in South East Europe (**already 10 SEE Energy Dialogues have been organised**)
- Networking and Co-operation
- Active contribution to policy formulation
- Elaboration of specific actions and formulation of policy proposals
- Development of co-operative projects and programmes at SE European Level
- Provide a bridge for energy communication between professionals and organizations, active in all countries of South East Europe.

SE Europe Energy Outlook Study



Editors and Contributors of SEEEO 2016/2017

Editors and Contributors

Editor: Costis Stambolis

Assistant Editor: Nicholaos Sofianos

Contributors

Prof. Vesna Borozan
Prof. Pantelis Capros
John Chadjivassiliadis
Andreas Christofides
Dr. Stavri Dhima
Eugenia Gusilov
Solon Kassinis
Kyriacos Kourtellos
Dr. Michael Loufir
Anastasios Mastrapas
Dimitrios Mezartasoglou
Mihailo Mihailovic

Aleksandar Mijuskovic
Slavtcho Neykov
Gus J. Papamichalopoulos
Costas Stamatiou
Costis Stambolis
Nikolaos Sofianos
Nenad Stefanović
Konstantinos Theofylaktos
Dr. Michael Thomadakis
Gokhan Yardım
SEE Legal Group

Contents of SEEEO 2016/2017 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 Europe 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”*.

Methodology

- **Data acquisition and analysis from various regional conferences and workshops organised by IENE between 2013 and 2016**
  - 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 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 stimulation models were used in analysing quantitative data for macroeconomic and energy demand forecasting. In this respect, IENE was collaborating closely with Professor **Pantelis Capros** and the E3M Lab at the National Technical University of Athens (NTUA)
- **Synthesis**

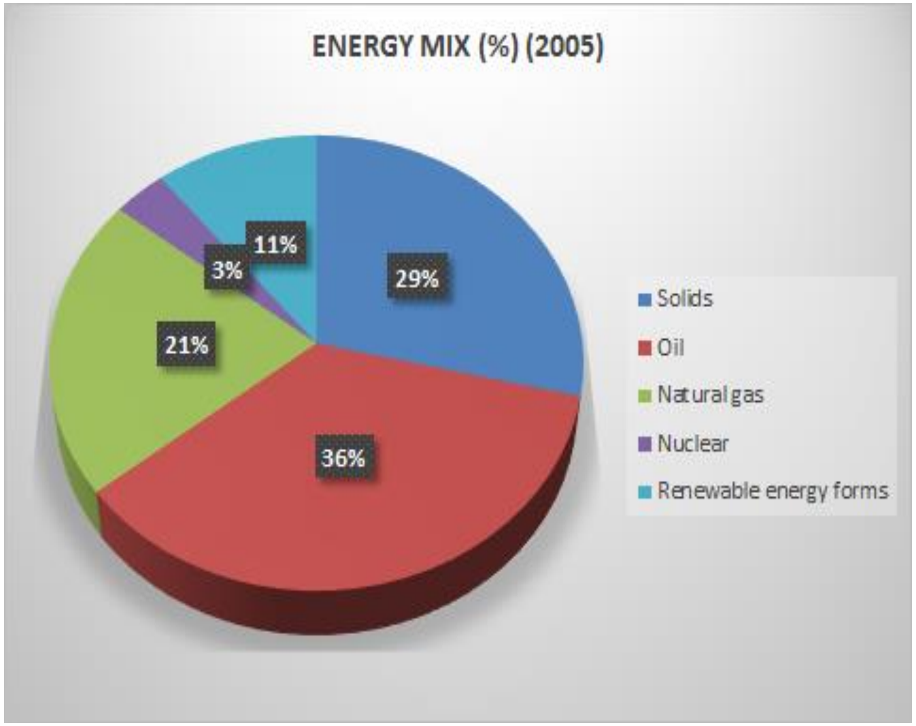
  Undertaken in-house by IENE's core study team comprising economists, engineers, political scientists, history and strategy majors and experts from all different areas of the energy sector

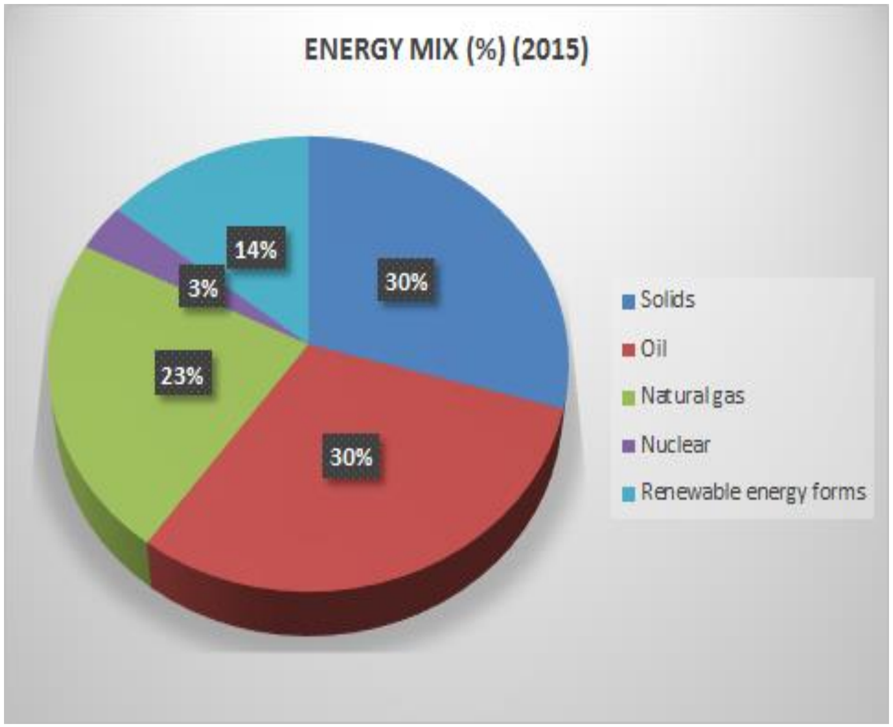
2015 Basic Energy Data for SE Europe

Region	Oil Consumption (b/d)	Gas consumption (bcm/y)	Electricity consumption (TWh)
SE Europe	1,579,870 (≈13.9% of EU-28)	67.00 (≈16.8% of EU-28)	504.2 (≈18.4% of EU-28)
EU-28	11,376,680	397.7	2,745

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

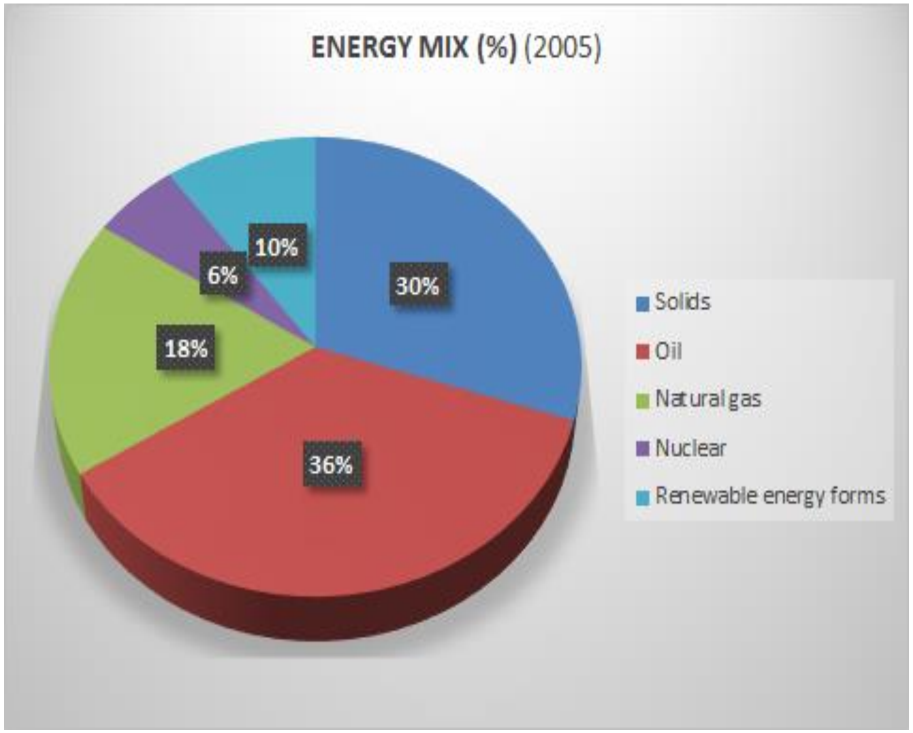
SE Europe: Gross Inland Consumption by Source, **Including Turkey** (2005 and 2015)

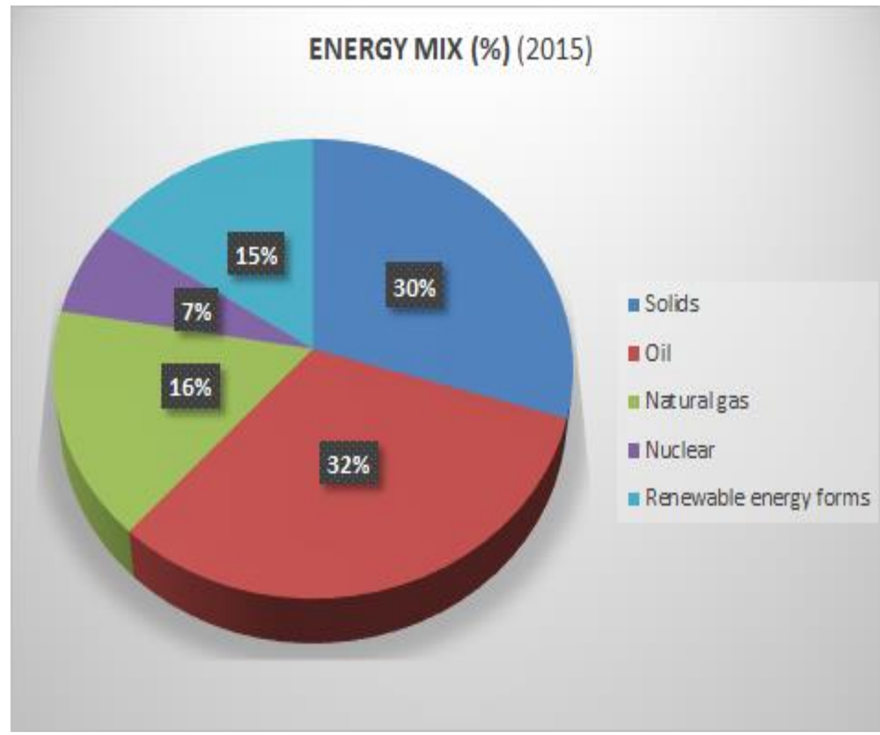




Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

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





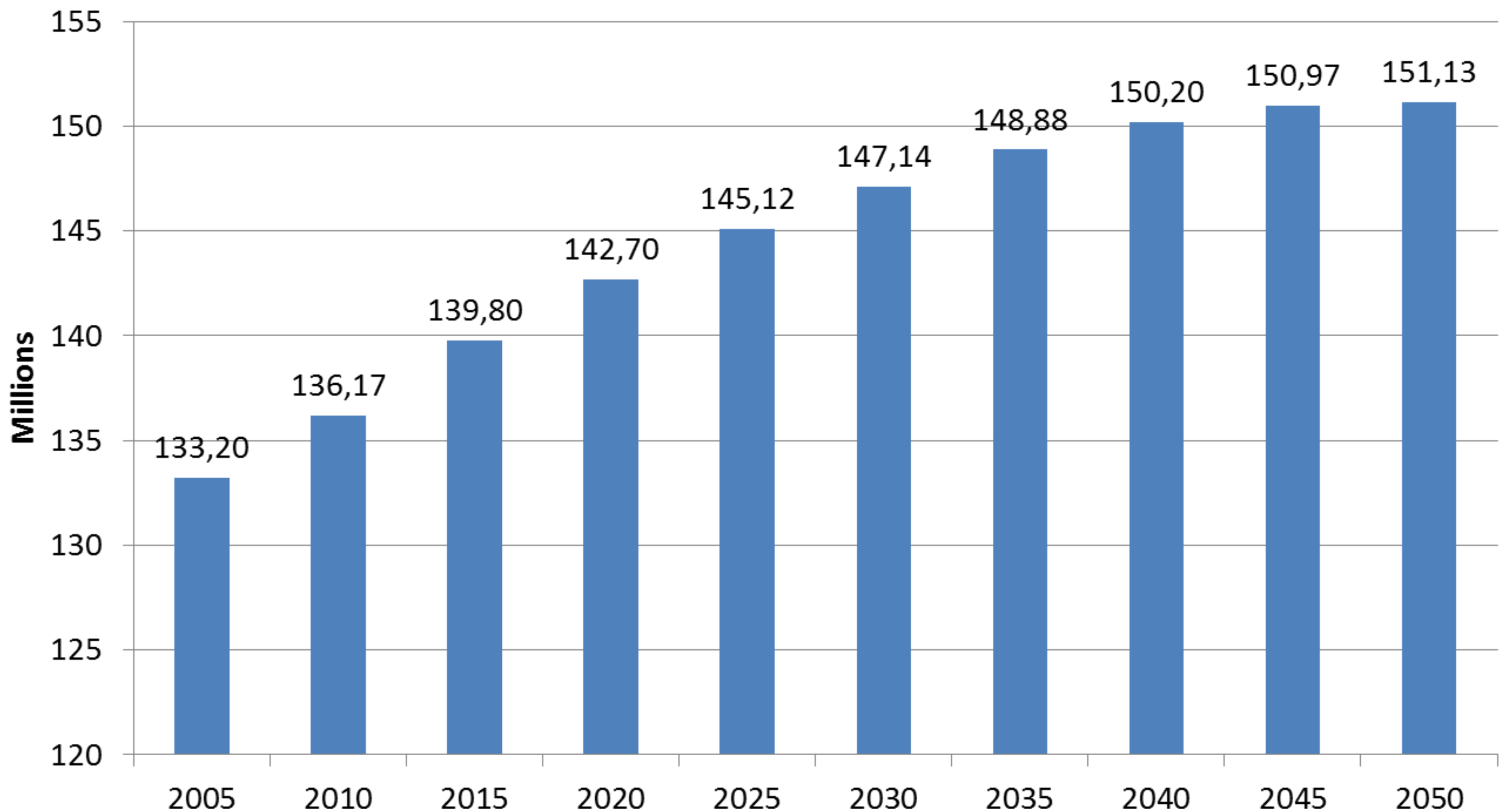
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Energy Demand and Supply Projections in SEE (I)

Base Scenario Assumptions

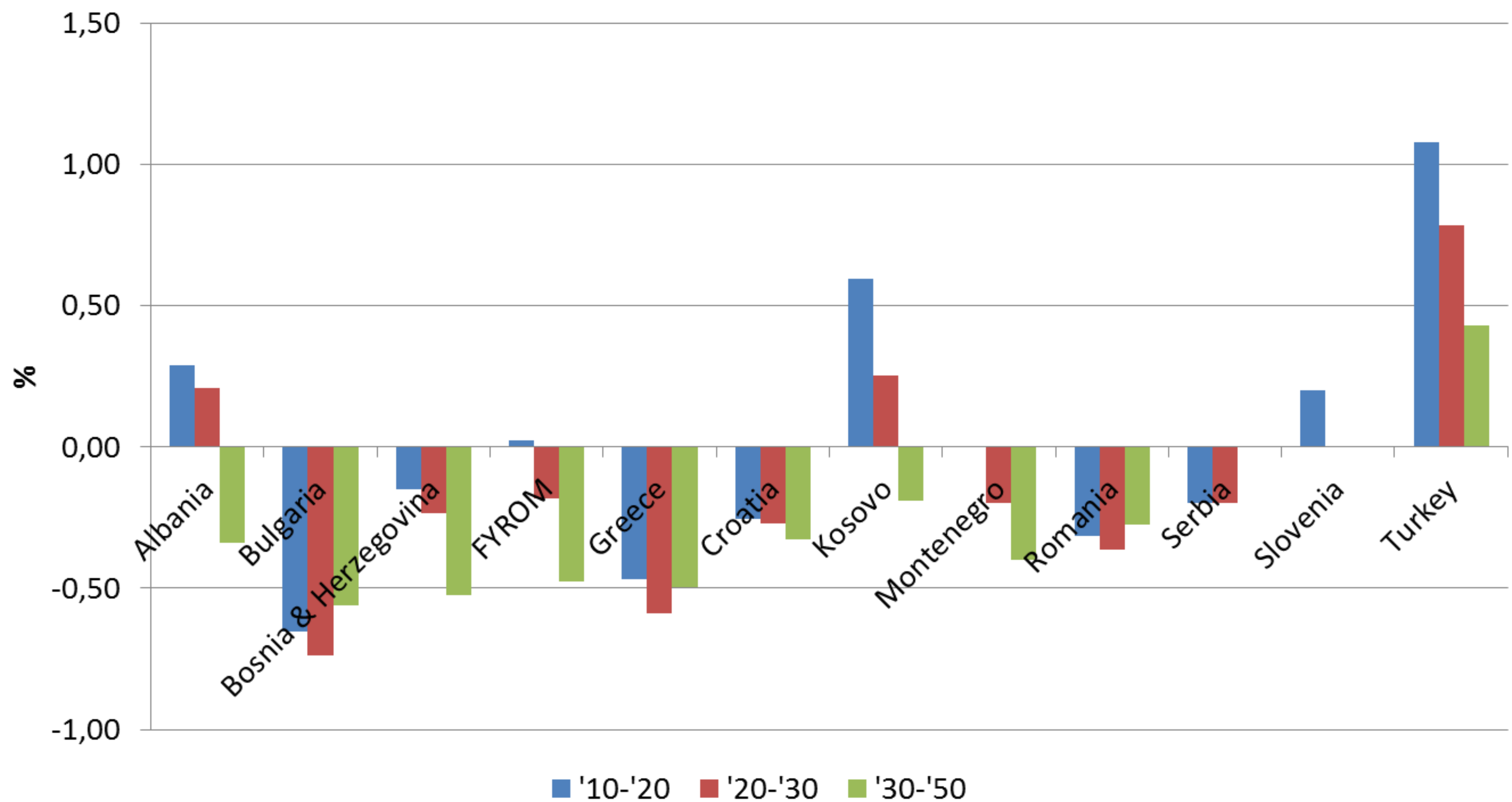
- One scenario, namely the **“Base” scenario**, was developed by the **E3M-Lab of the National Technical University of Athens (NTUA)**, which has a long-established track record and considerable in-house expertise in energy modeling work under the supervision of professor **Pantelis Capros**.
- Certain assumptions were formulated in the Base scenario concerning basic parameters which are likely to govern future energy demand and supply:
  - **Macroeconomic** and **demographic information**
    - Current trends on regional population and economic development, including latest statistics by EUROSTAT and most recent projections by international organisations of GDP growth in SE Europe
  - **Technological progress**
    - **Penetration of new technologies**, notably in power generation and transport, largely based on RES.
  - **Policy information**
    - Reflects current policies in the SEE countries as already adopted
      - **Does not include** policies which may be enacted in the future
    - For the non-EU countries, the projection assumes a moderate adjustment of the energy mix, notably for RES, towards EU’s aspirations.
    - For the EU countries, the Base scenario includes all binding targets set out in EU legislation regarding development of RES and reductions of GHG emissions, as well as the latest legislation promoting energy efficiency.
    - The Copenhagen-Cancun pledges are expected to be respected through carbon prices as well as dedicated policies and measures.
      - **Does not include** the Paris 2015 commitment in this scenario as the corresponding policies have not yet been adopted.

Population in SE Europe, per five-year periods (2005-2050)



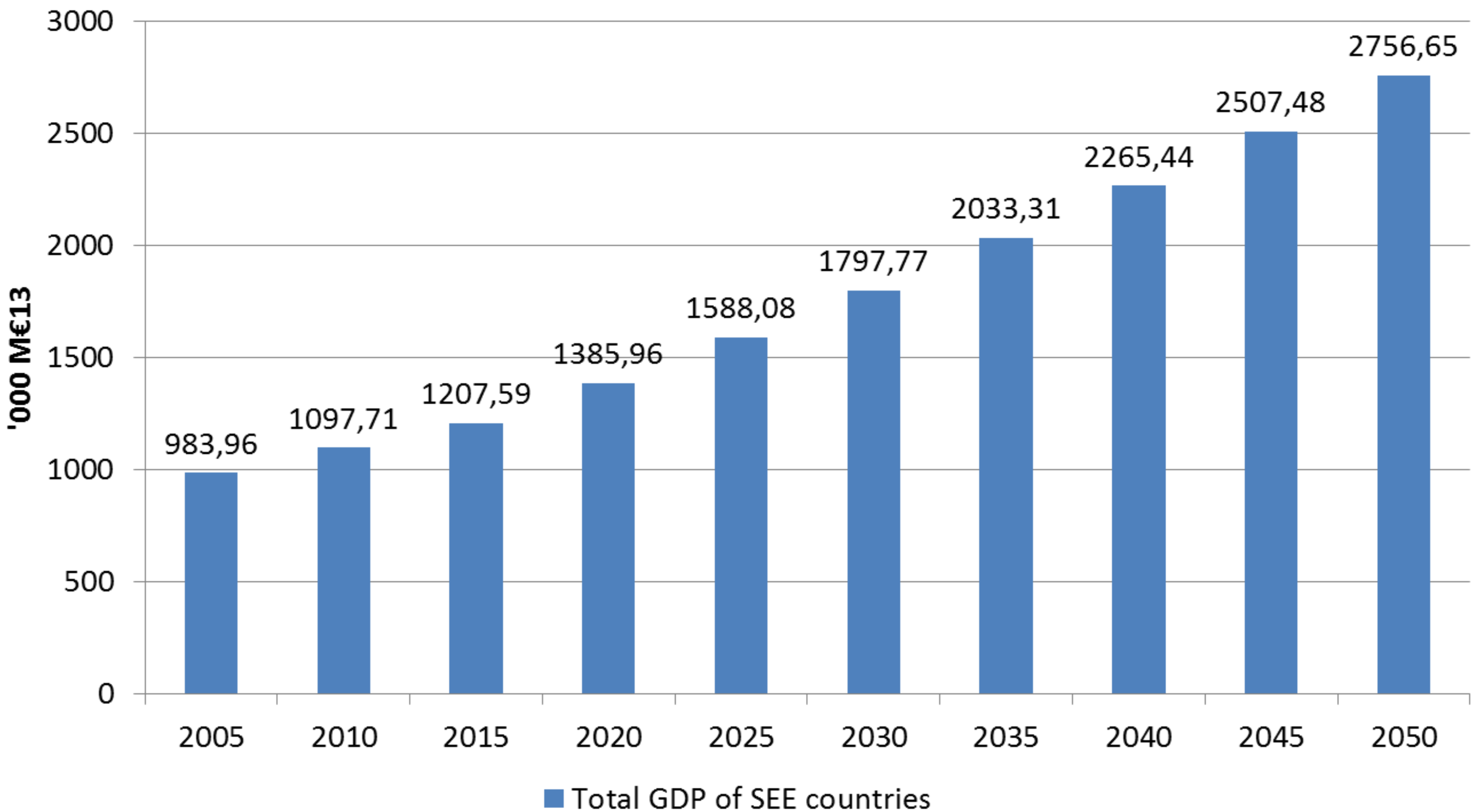
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Annual % Change in the population of SE Europe, per decades (2010-2050)



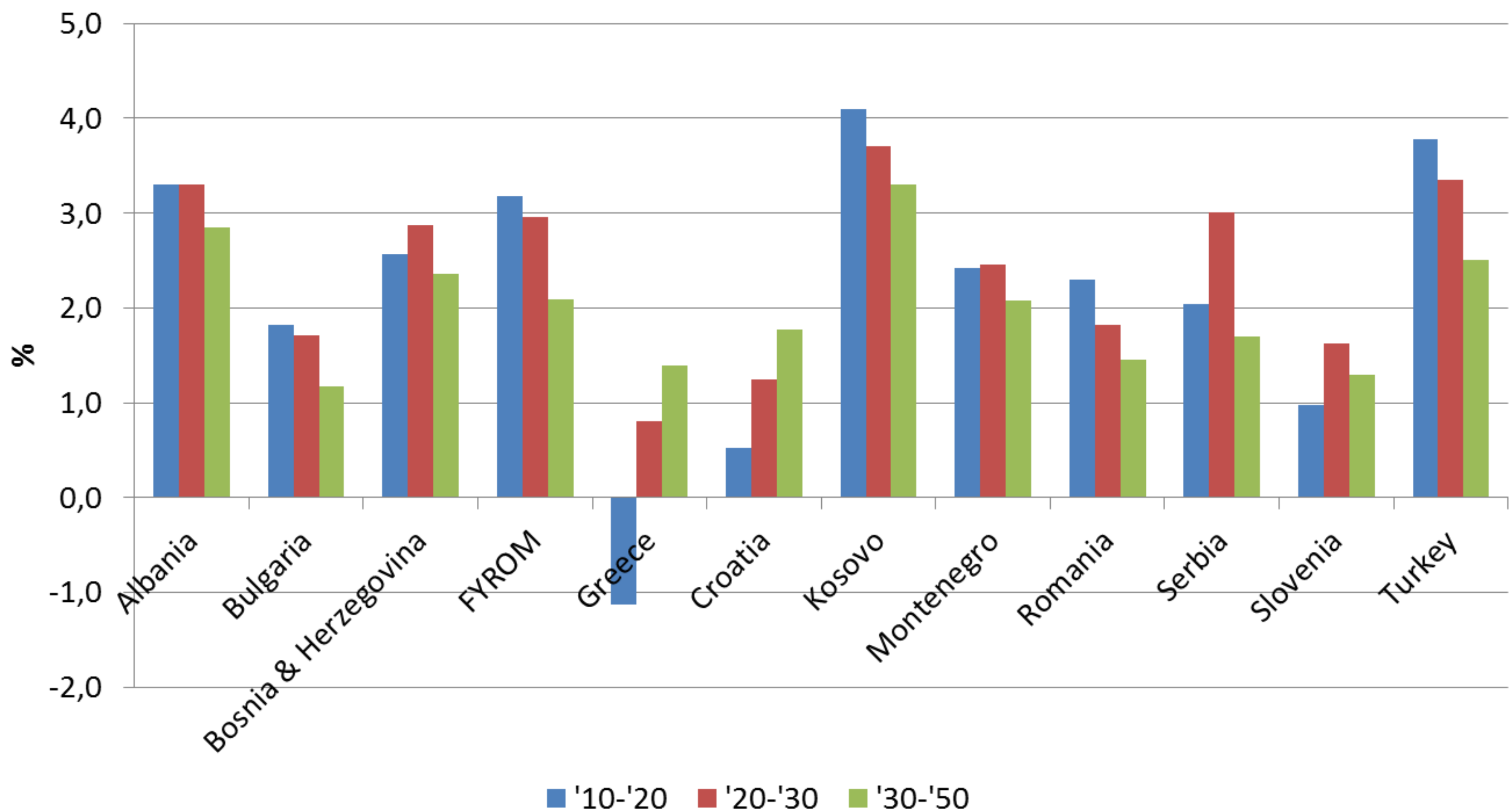
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

GDP Trend of SEE countries (2005-2050)



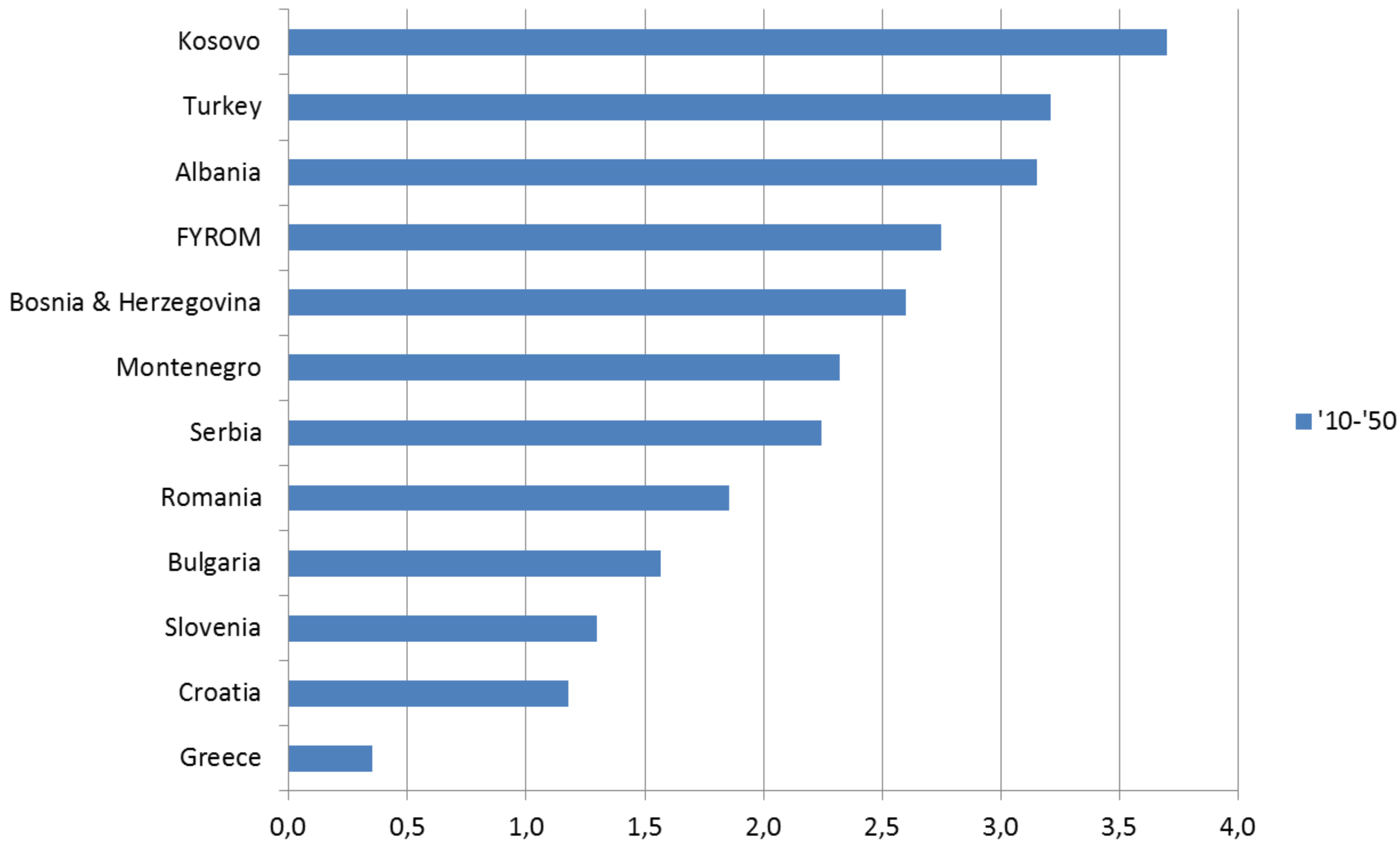
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Annual % Change in the GDP of SE Europe, per decades (2010-2050)



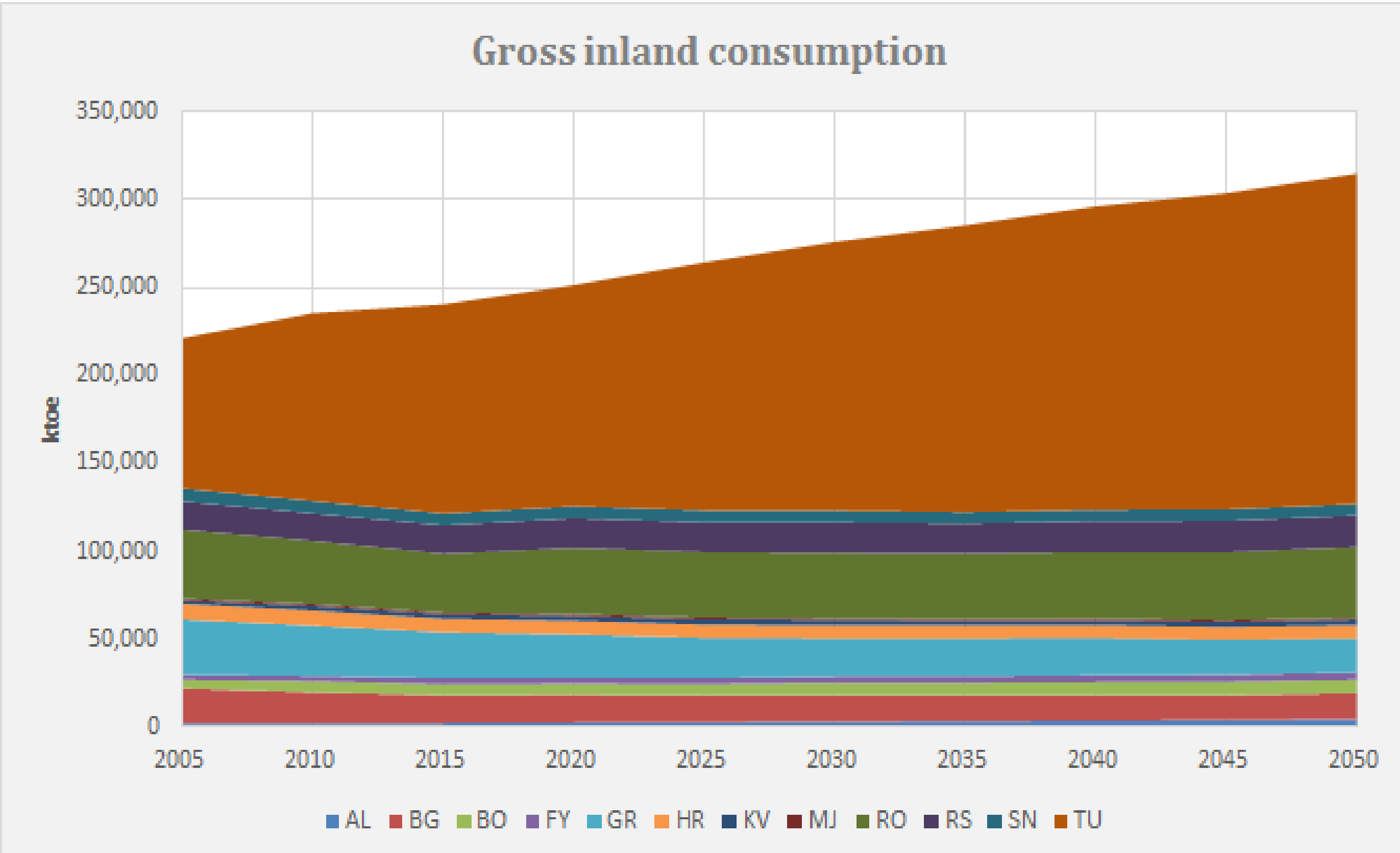
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Average annual growth rate (%) of GDP per capita in SE Europe over 2010-2050



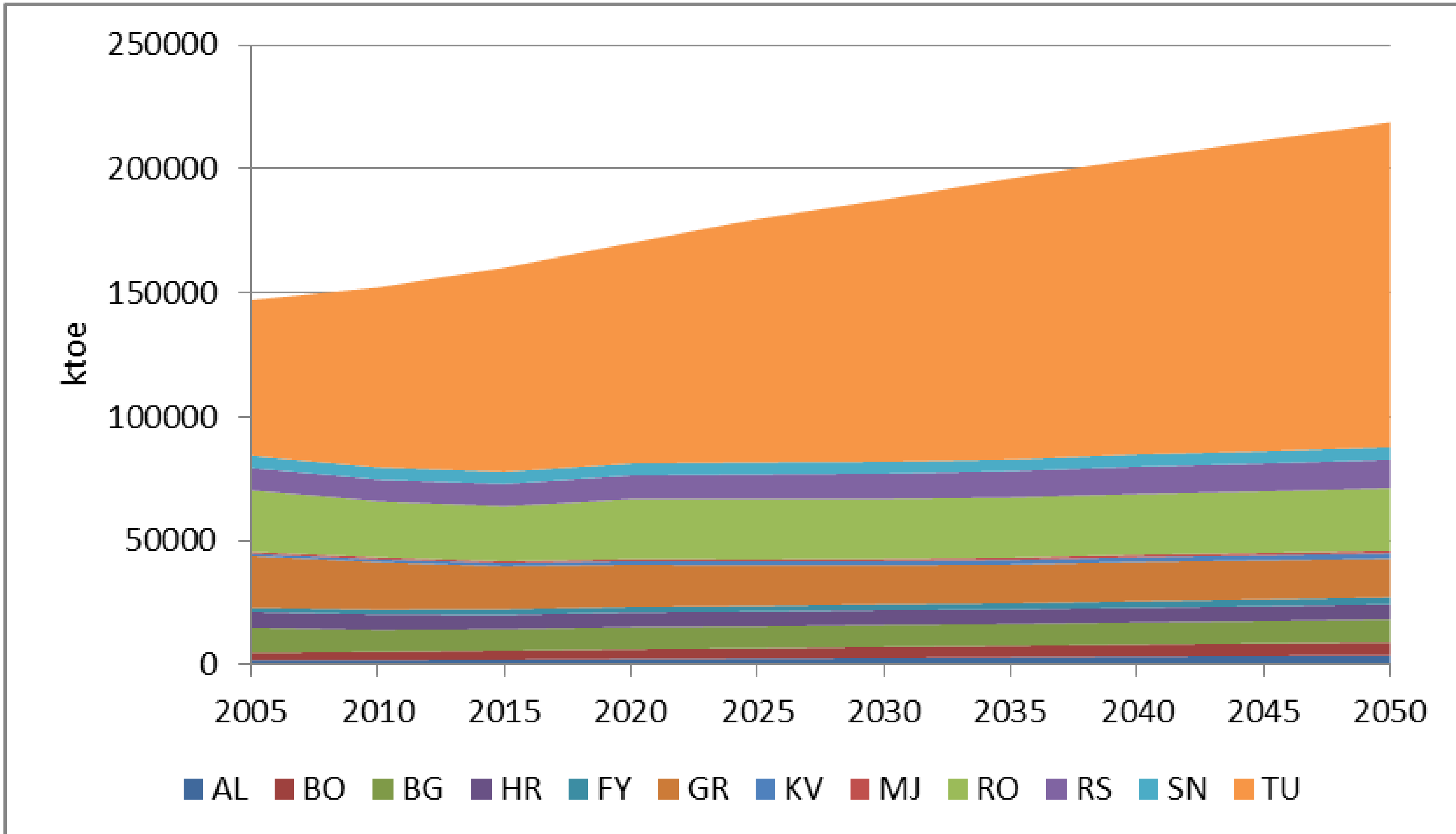
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

SE Europe: Gross Inland Consumption, **including Turkey** (2005-2050)



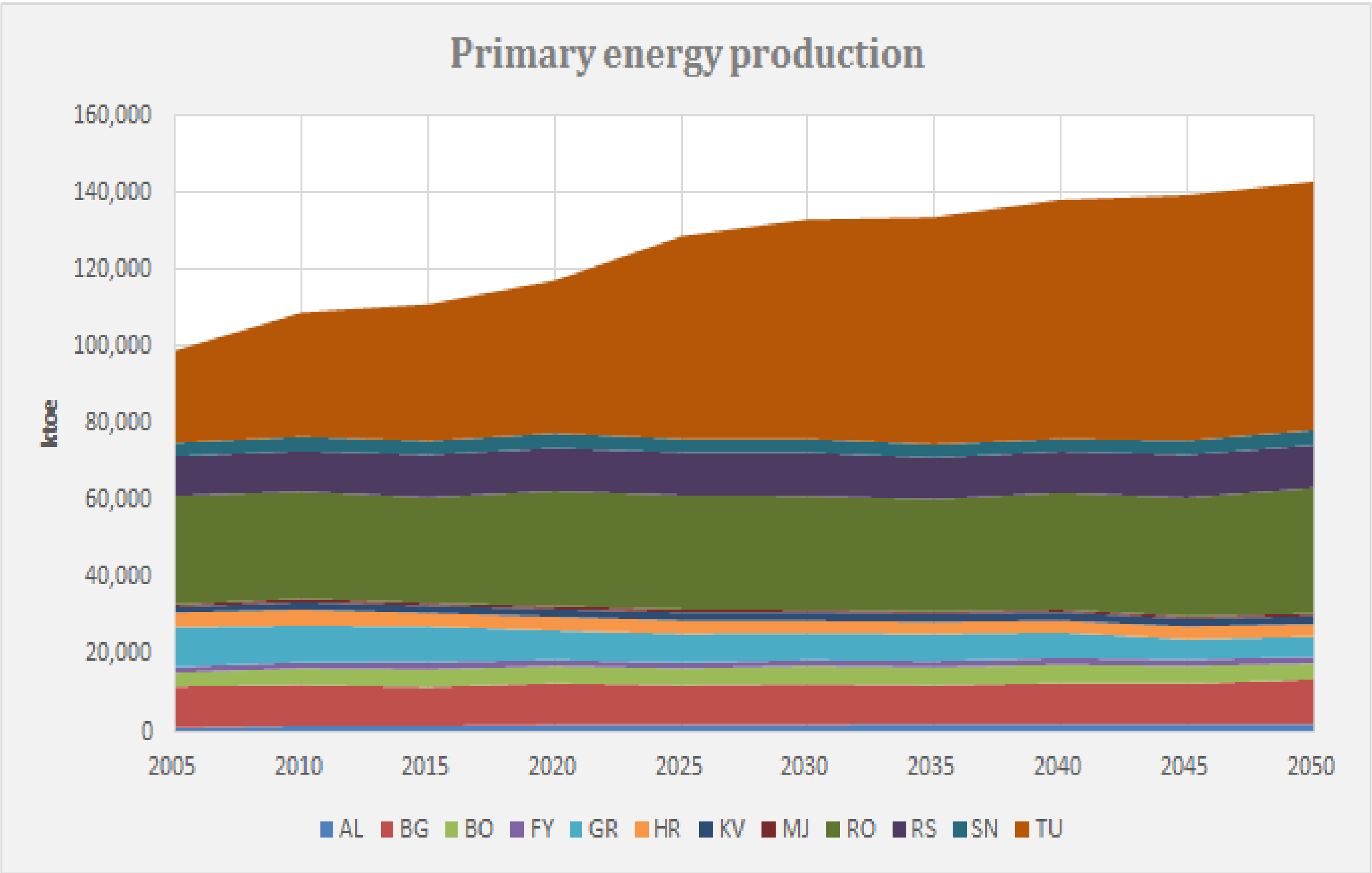
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

SE Europe: Final Energy Demand, **including Turkey** (2005-2050)



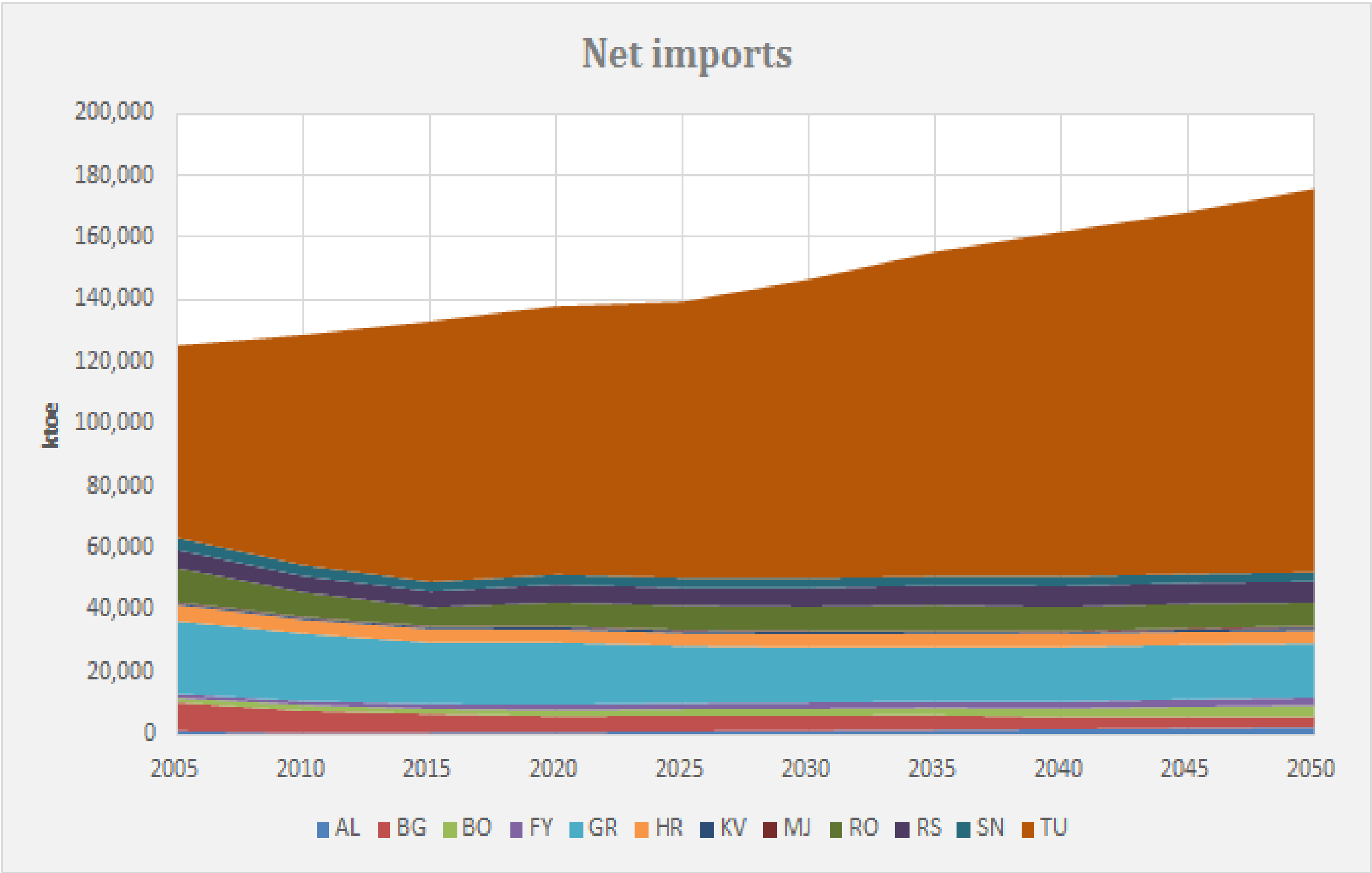
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

SE Europe: Primary Energy Production, **including Turkey** (2005-2050)



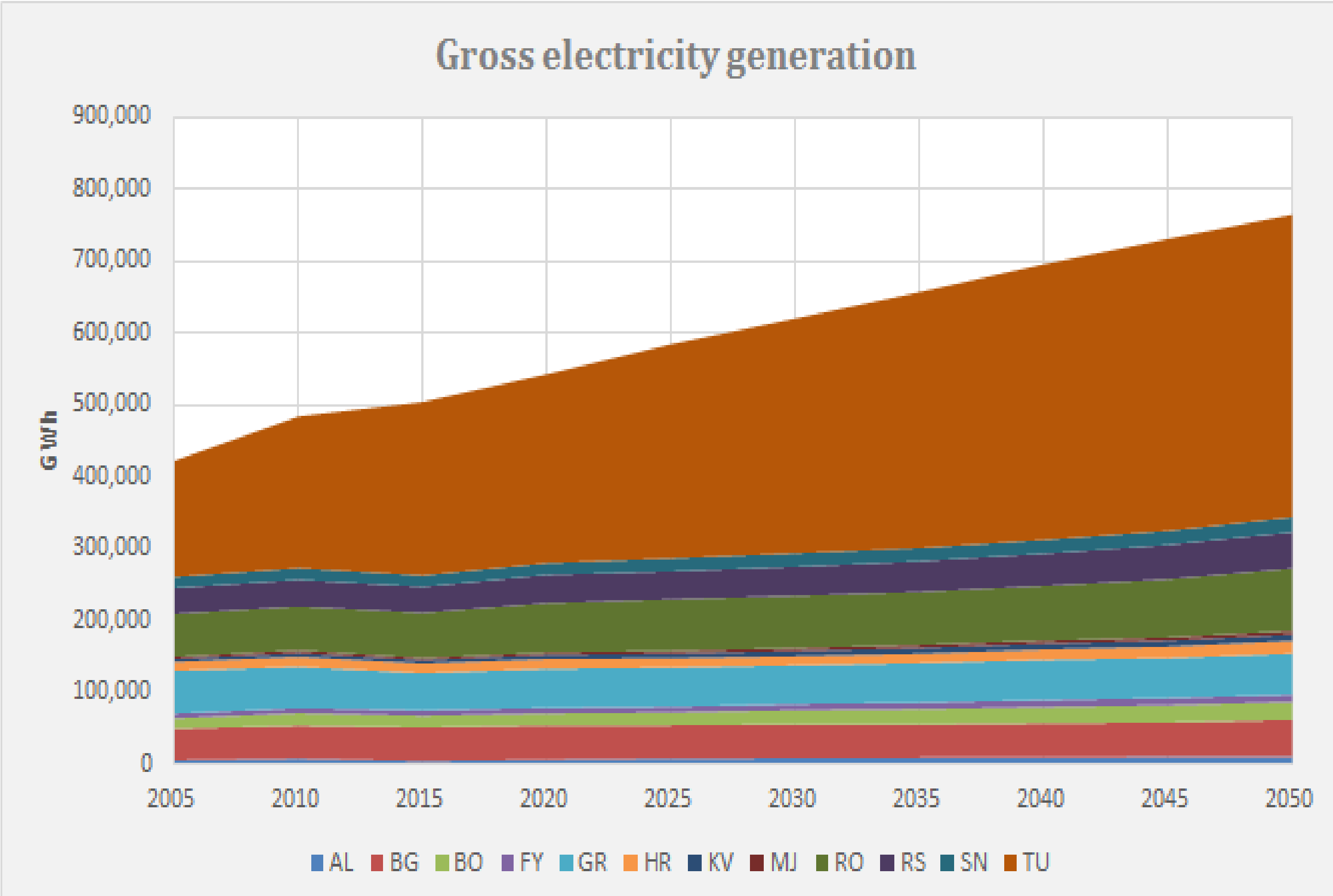
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

SE Europe: Net Imports, **including Turkey** (2005-2050)



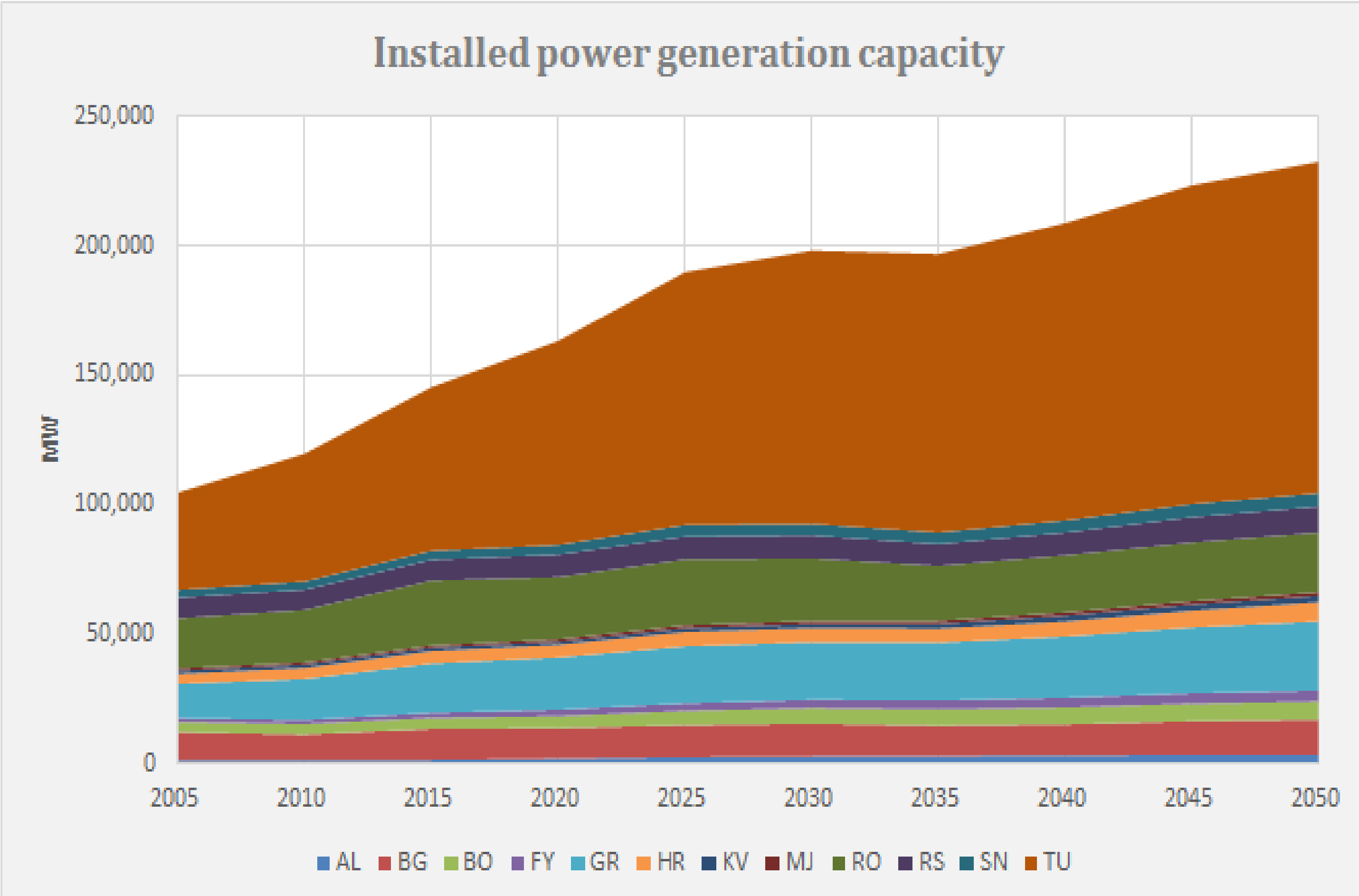
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

SE Europe: Gross Electricity Generation, **including Turkey** (2005-2050)



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

SE Europe: Installed Power Generation Capacity, **including Turkey** (2005-2050)



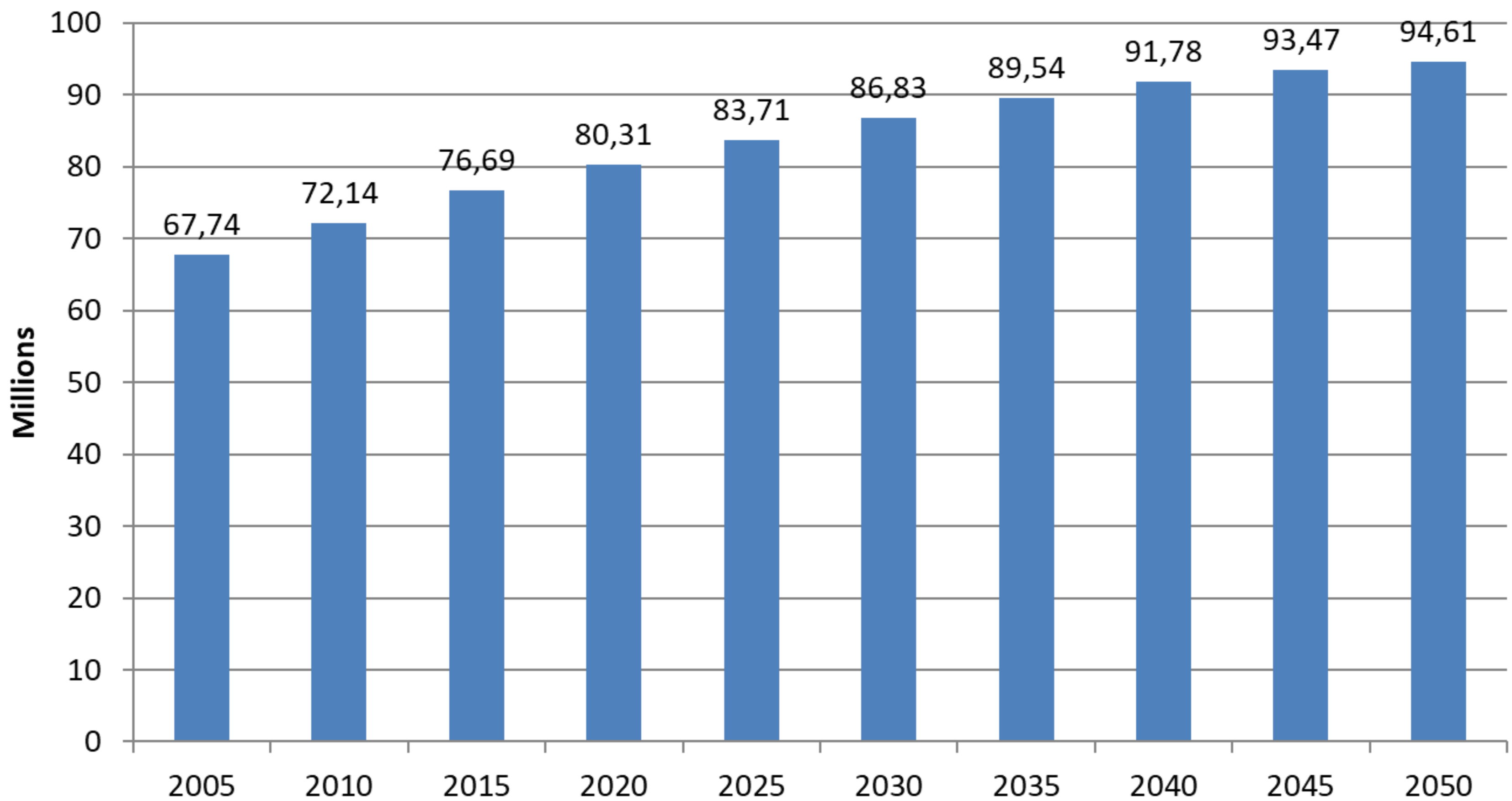
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Country Profile of Turkey

Country Information	
Capital	Ankara
Official language	Turkish
Government	Unitary Parliamentary Constitutional Republic
President	Recep Tayyip Erdoğan
Prime Minister	Binali Yıldırım
Area	783,562 km2
Population	79,815,000
2016 GDP (current prices)	$863.390 billion
2016 GDP per capita (current prices)	$10,817
2016 Inflation (average consumer prices)	7.8%
2016 Unemployment rate (% of total labor force)	10.9%

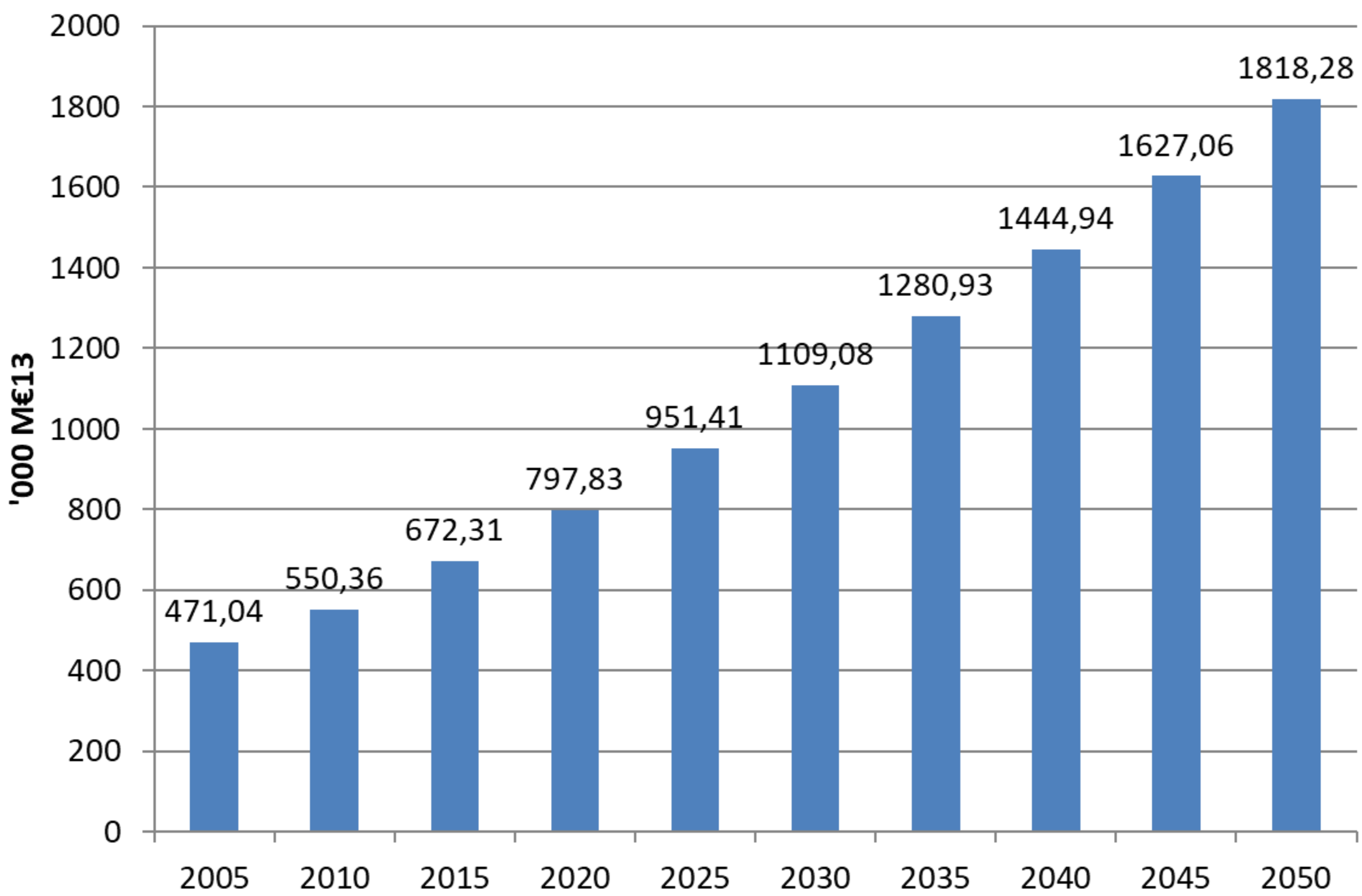
Source: IMF World Economic Outlook Database, October 2017

Population in Turkey, per five-year periods (2005-2050)



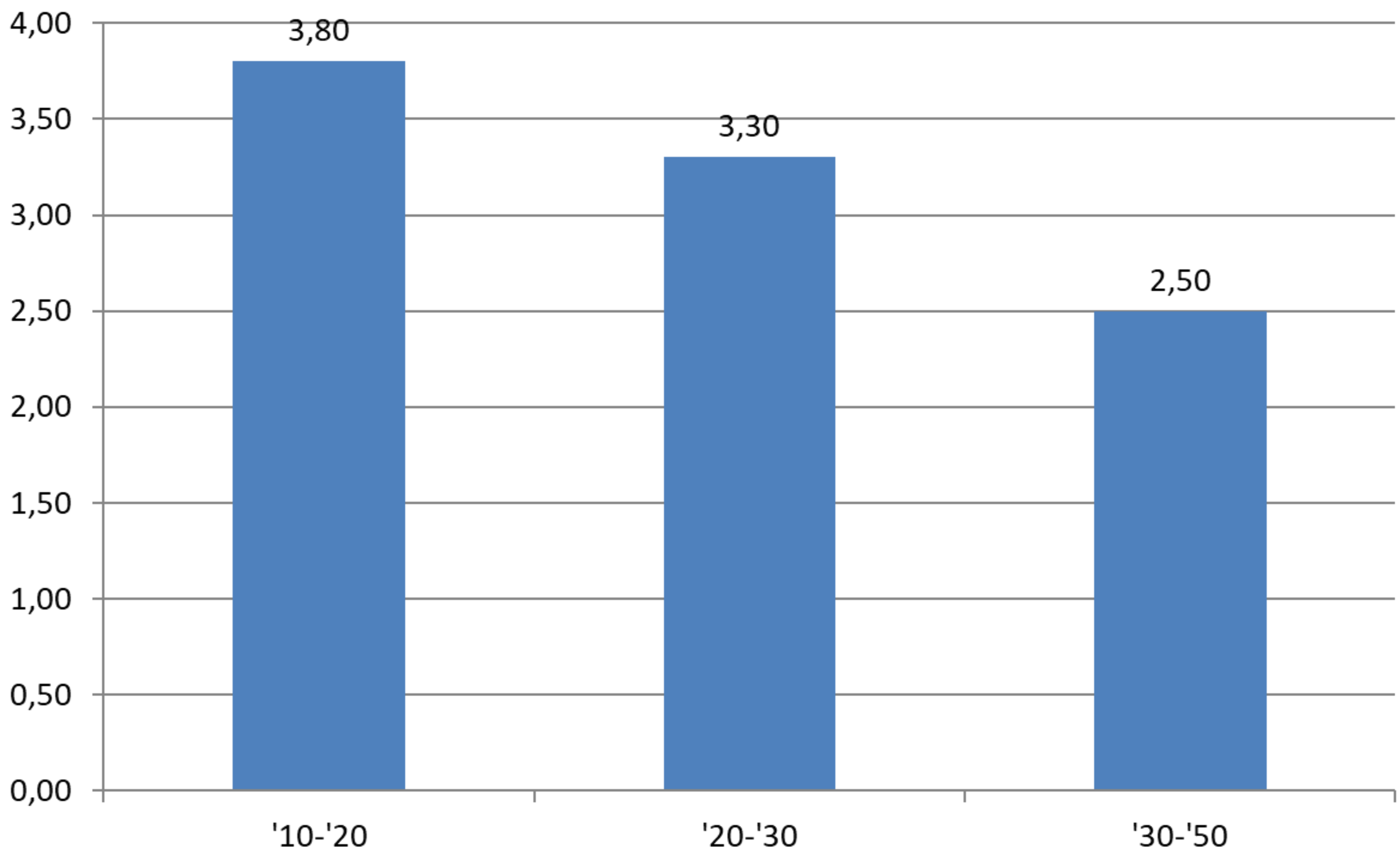
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Turkey's GDP Trend (2005-2050)



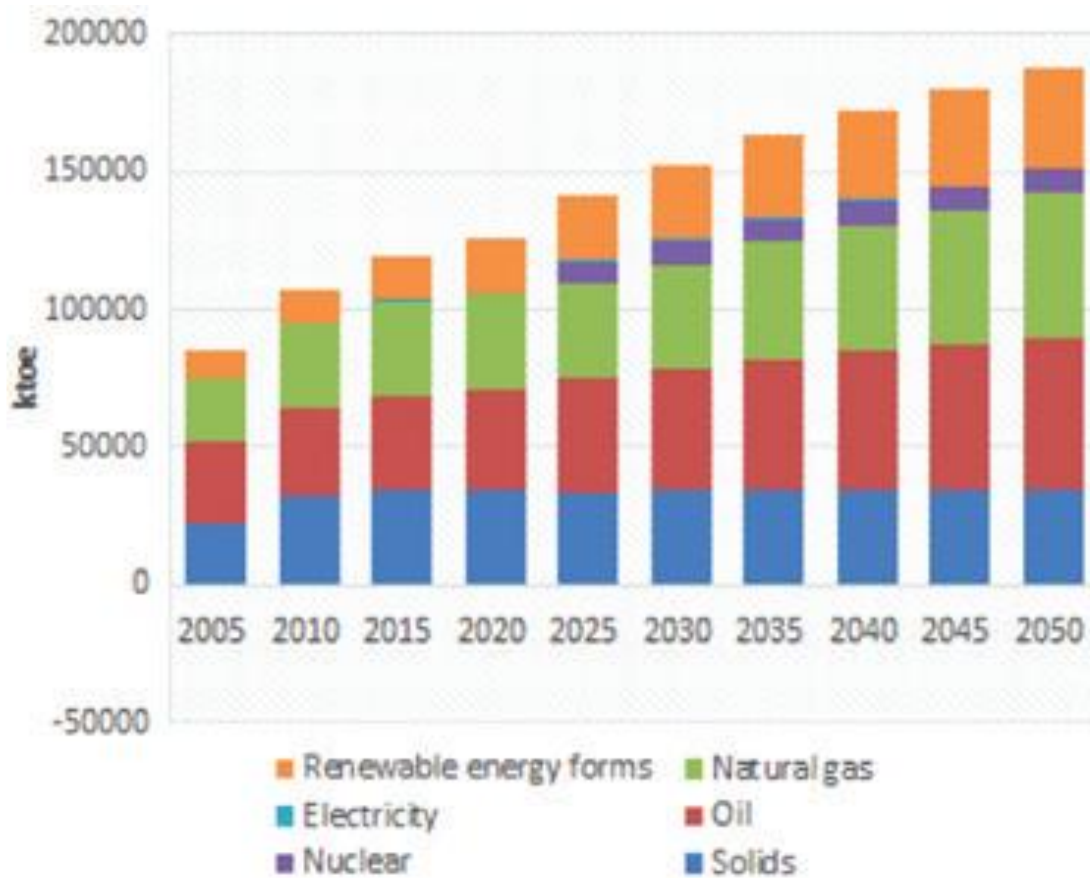
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Average annual growth rate (%) of GDP in Turkey over 2010-2050



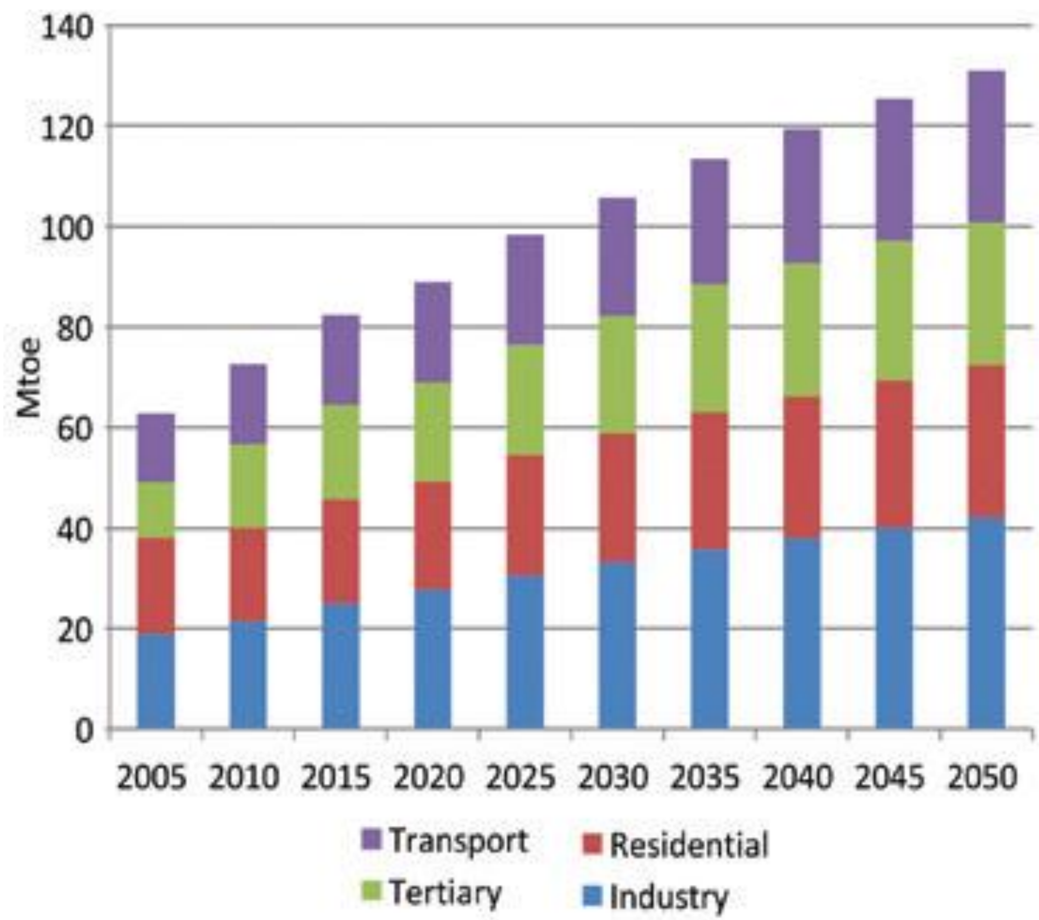
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Turkey: Gross Inland Consumption (2005-2050)



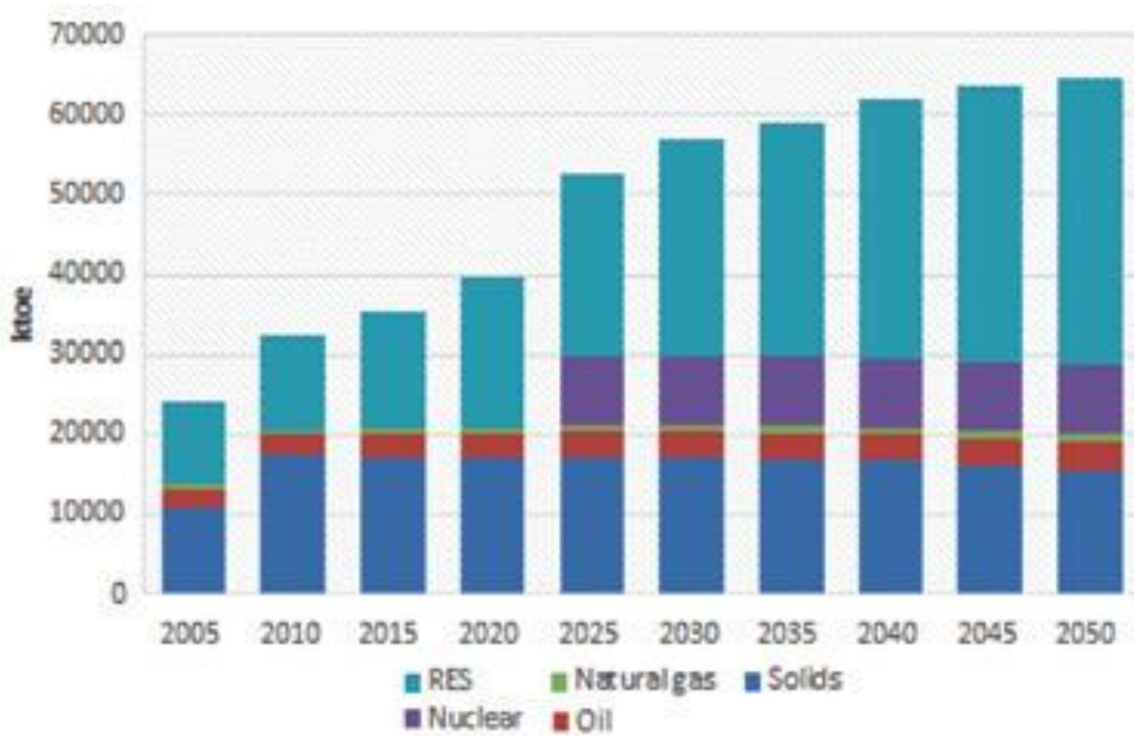
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

Turkey: Final Energy Demand by Sector (2005-2050)



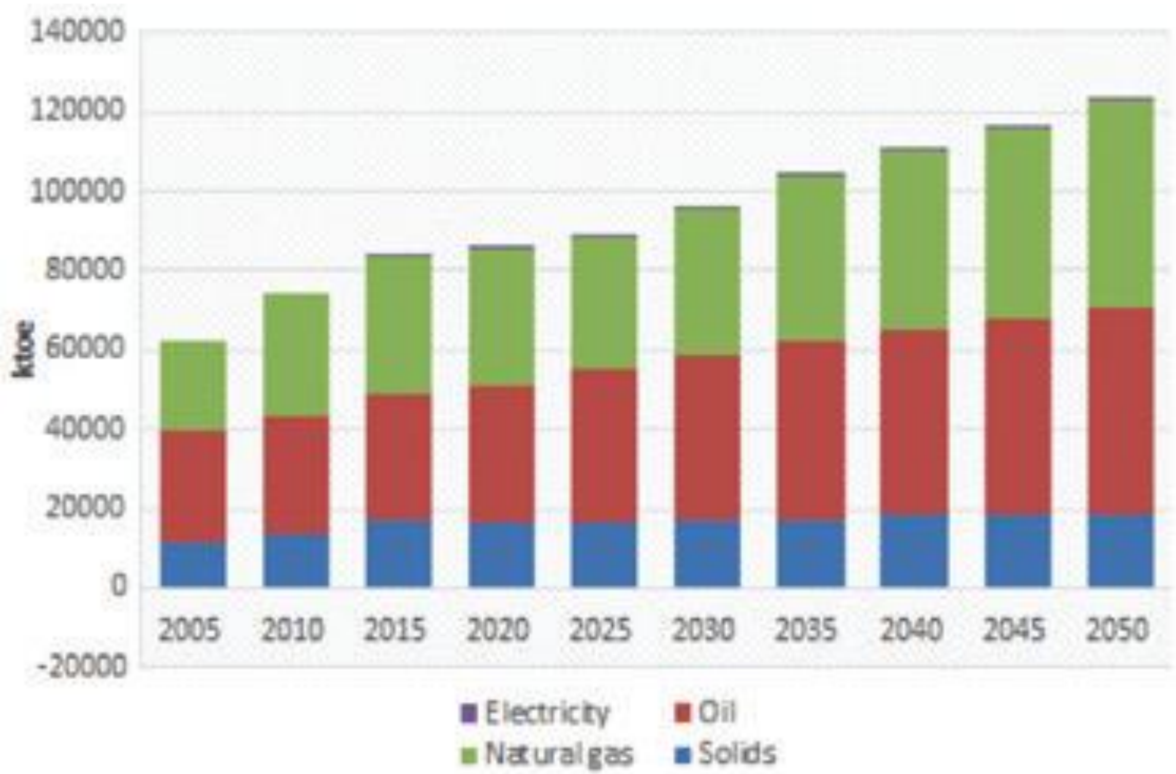
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

Turkey: Primary Energy Production (2005-2050)



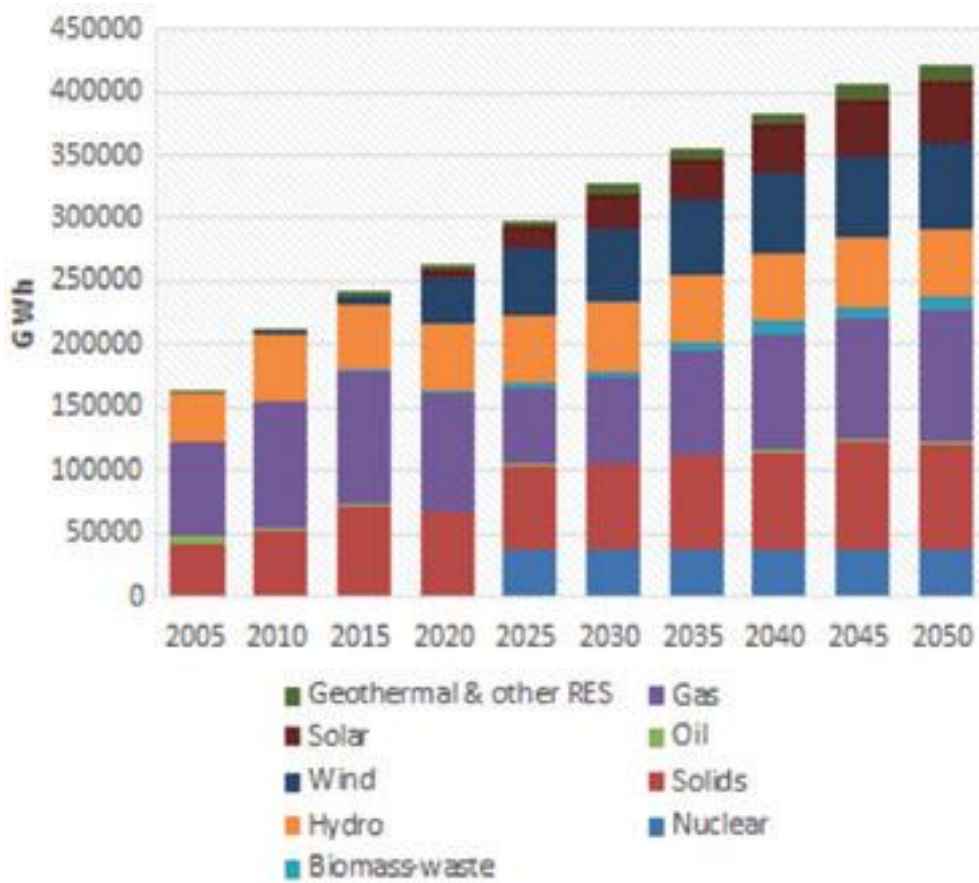
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

Turkey: Net Imports (2005-2050)



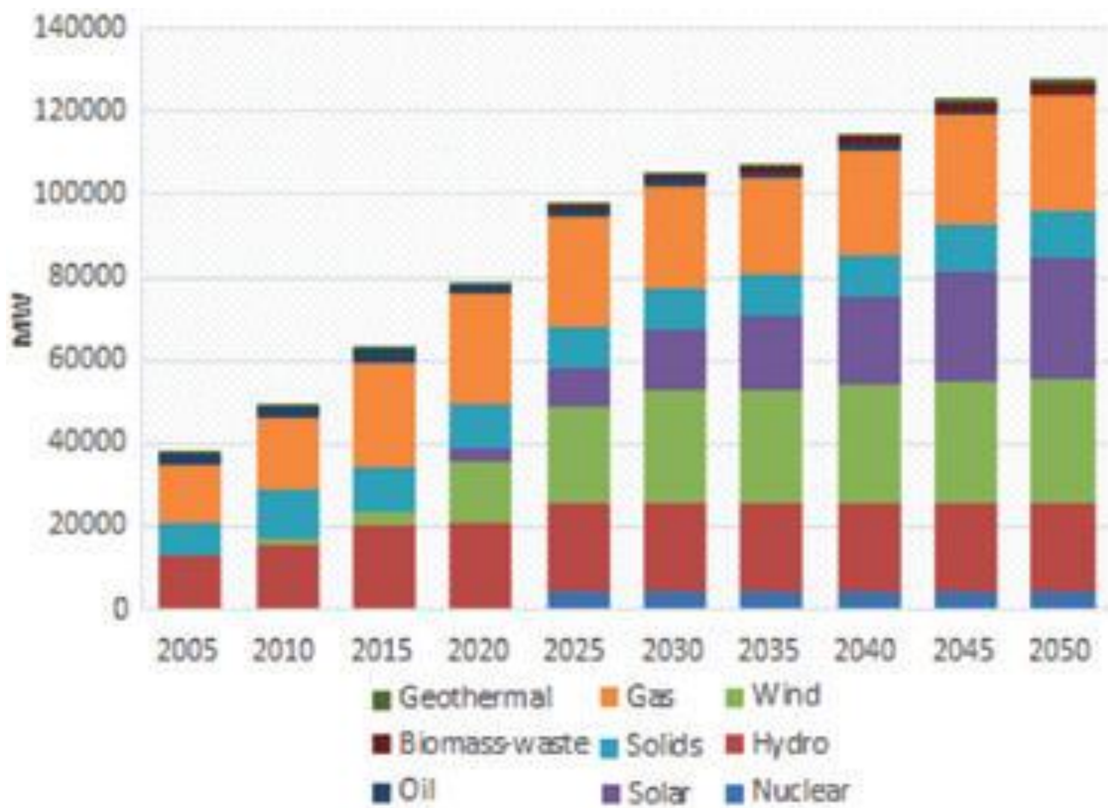
Source: IENE study “South East Europe Energy Outlook 2016/2017”, Athens, 2017

Turkey: Gross Electricity Generation (2005-2050)



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

Turkey: Net Generation Capacity (2005-2050)



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

Defining Energy Security

- Energy security is normally defined as the uninterrupted supply of energy at affordable prices, with a more modern definition augmenting it with "while addressing environmental concerns".

- **Short-term energy security** focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance, while **long-term energy security** is linked to timely investments in energy supply and infrastructure.

- 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.

Energy Security in SE Europe: Key Issues (I)

- 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.
- Security of **transportation** for the shipment of oil or gas
  - Interrupted deliveries twice (i.e. 2006 and 2009) with the shipment of Russian gas, through Ukraine, to Europe but also from Turkey and Greece (i.e. 2011).
- **Smooth supply of electricity and gas** 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).

Energy Security in SE Europe: Key Issues (II)

- A number of measures are proposed in order to strengthen the 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.
- 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).

Legal and Institutional Framework for Energy Security

Legal and Institutional Framework

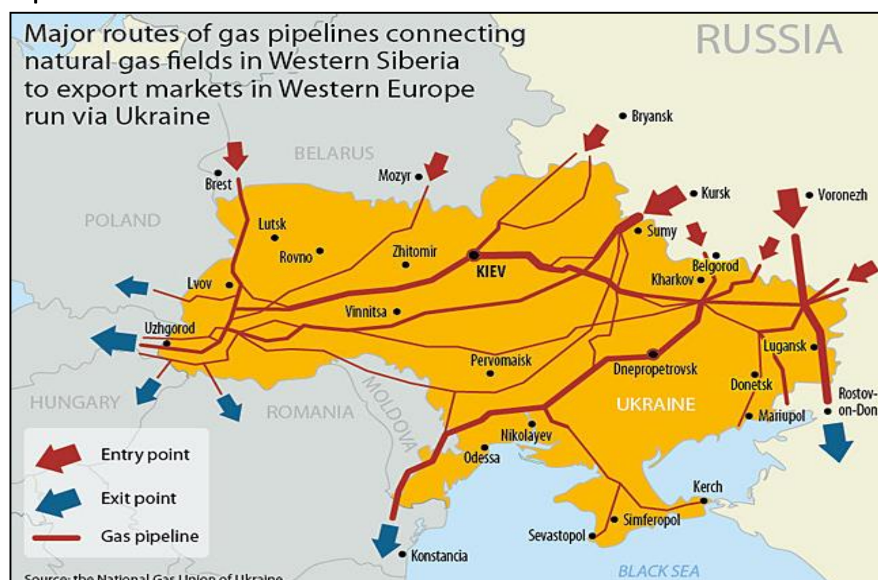
- Third package (Directive 2009/73, Regulation 715/2009)
- Directive 2004/67 on security of supply - binding acquis (from 31.12.2009); the ECS will contribute to public consultation on the Regulation 994/2010 revision
- EU's Gas Coordination Group
- Energy Community Treaty (safeguard measures, mutual assistance)

Stress Tests

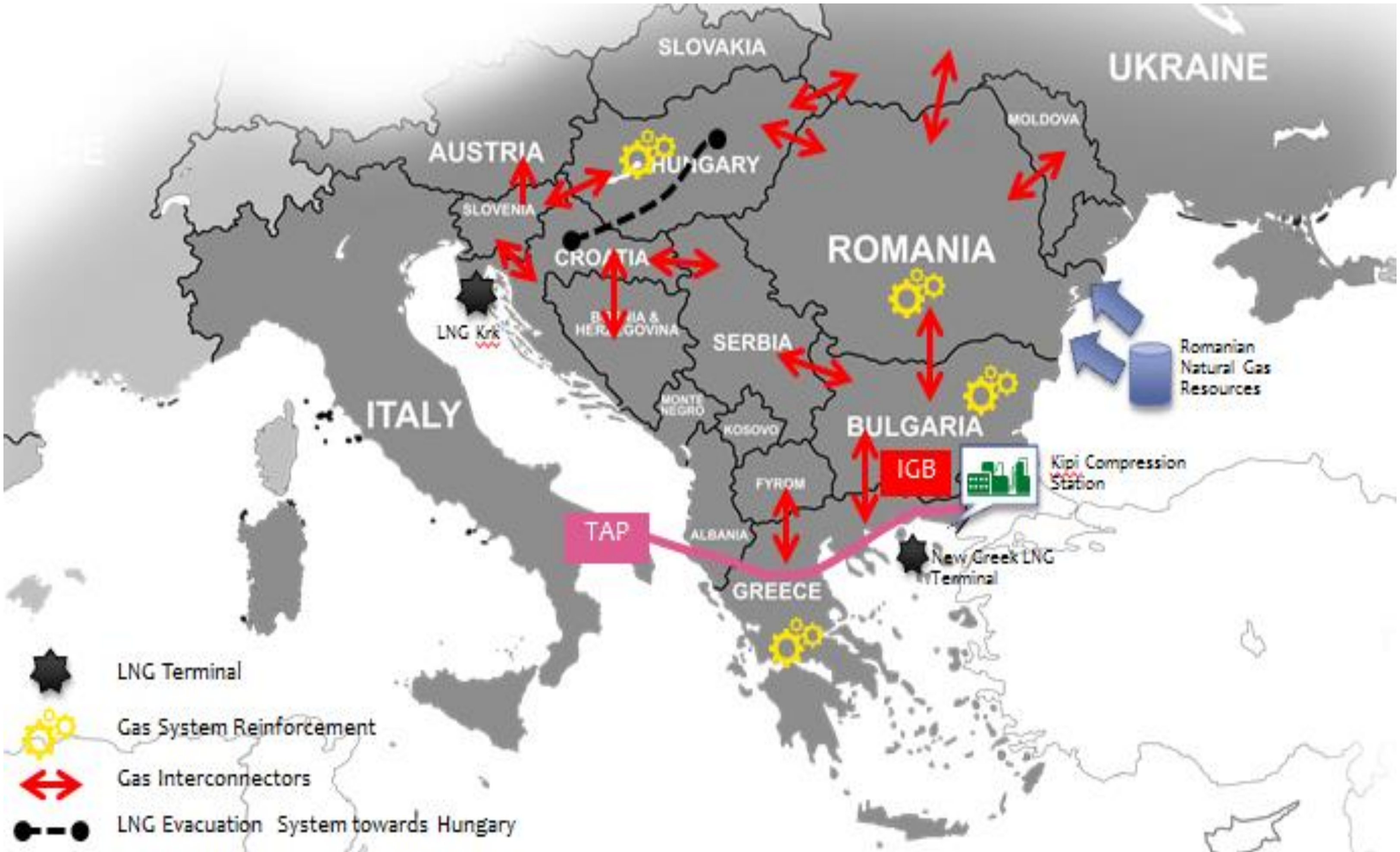
- 38 European countries, including all EU countries, carried out energy security stress tests in 2014. They simulated two energy supply disruption scenarios for a period of one or six months:
  - a complete halt of Russian gas imports to the EU
  - a disruption of Russian gas imports through the Ukrainian transit route

Results:

1. A prolonged supply disruption would have a **substantial impact on the EU**
1. Eastern EU and Energy Community countries would be particularly affected
1. If all countries cooperate each other, consumers would remain supplied even in the event of a six month gas disruption



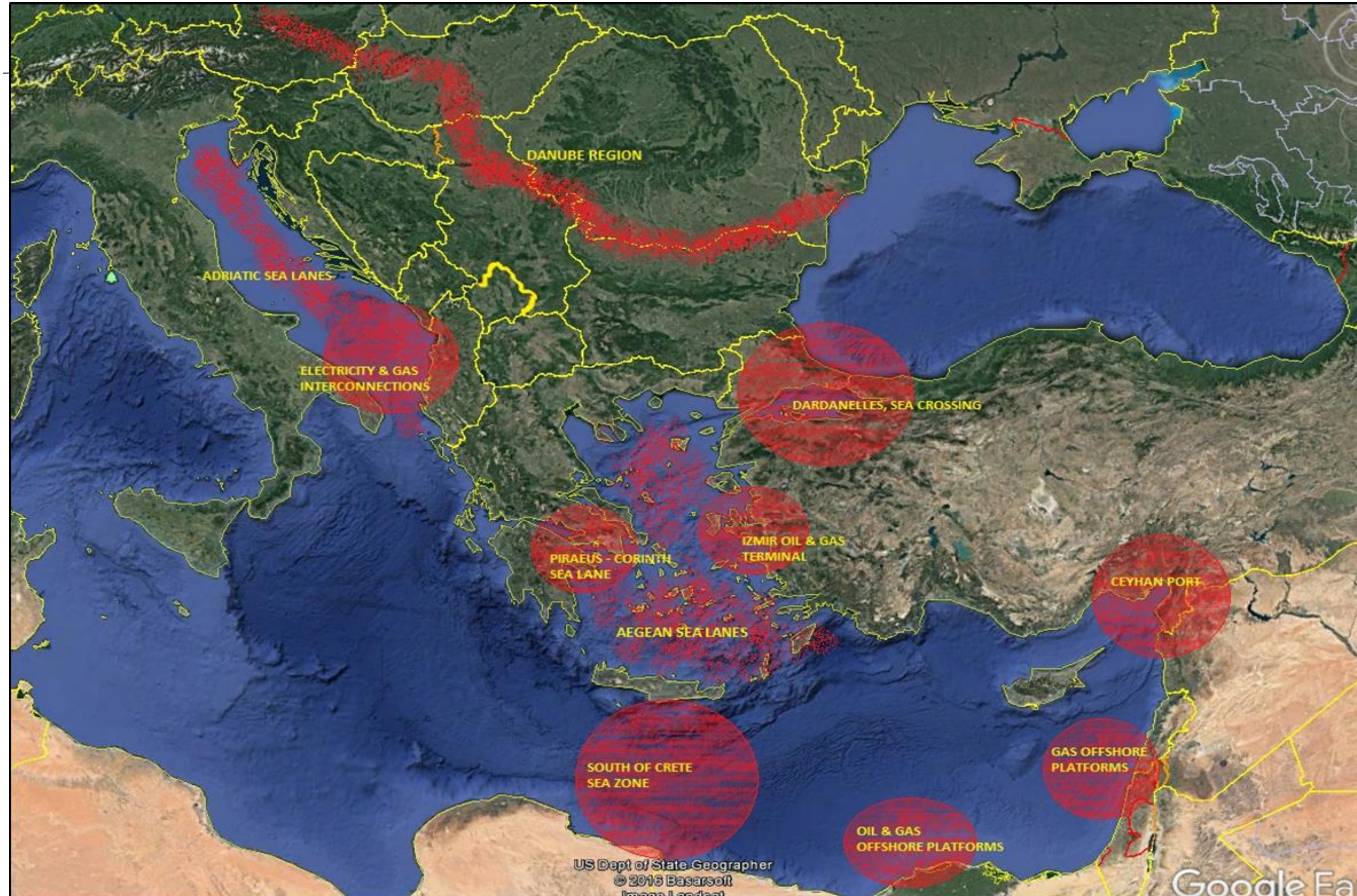
Energy Security for Gas Supply: CESEC* Priority Projects



***Central and South Eastern Europe Gas Connectivity (CESEC) initiative** is to enhance political support for the identification and implementation of crucial gas infrastructure projects in CS European region.

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

Energy Security Hot Spots in SE Europe



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

Energy Security - EU Gas Supply and the South Corridor

- As European energy demand is set to grow over the next few years, there will be a need for increased imports as indigenous oil and gas production has reached its limits and is already declining. **Today, EU-28 is more than 53% energy import** dependent, with this figure set to increase as in addition to oil and gas there is going to be a further decrease in locally produced coal and lignite in view of stringent environmental considerations.

- **The South Corridor** will play a pivotal role as an alternative entry gate for gas which will help Europe diversify both its **energy supplies** and its **energy routes**. It should be stressed that the South Corridor could strengthen the **security of energy routes.**

- **TANAP-TAP gas pipeline system**, which is now under construction, is the foundation of the South Corridor. However, the TANAP-TAP pipeline system is only capable of transporting limited gas volumes to Europe (i.e. 10 bcm per year by 2020/21, plus 6 bcm which will be routed to Turkey) and 20 bcm in phase two.

Gas Supply in the East Mediterranean Region

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

- A number of alternative plans are under discussion for channeling this gas to Turkey, for local consumption, but also to Europe proper for transit to the continent's main gas markets. These plans include 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 to 12 bcm per year. At the same time, EC is actively exploring the possibility of massively increasing the member countries' LNG capabilities as part of Energy Union priorities.

Toward a Redefinition of the South Corridor (I)

- The now defunct **South Stream,** and its under construction successor, the **Turkish Stream**, should also be considered as a potentially vital gas supply route.

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

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

Toward a Redefinition of the South Corridor (II)

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

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

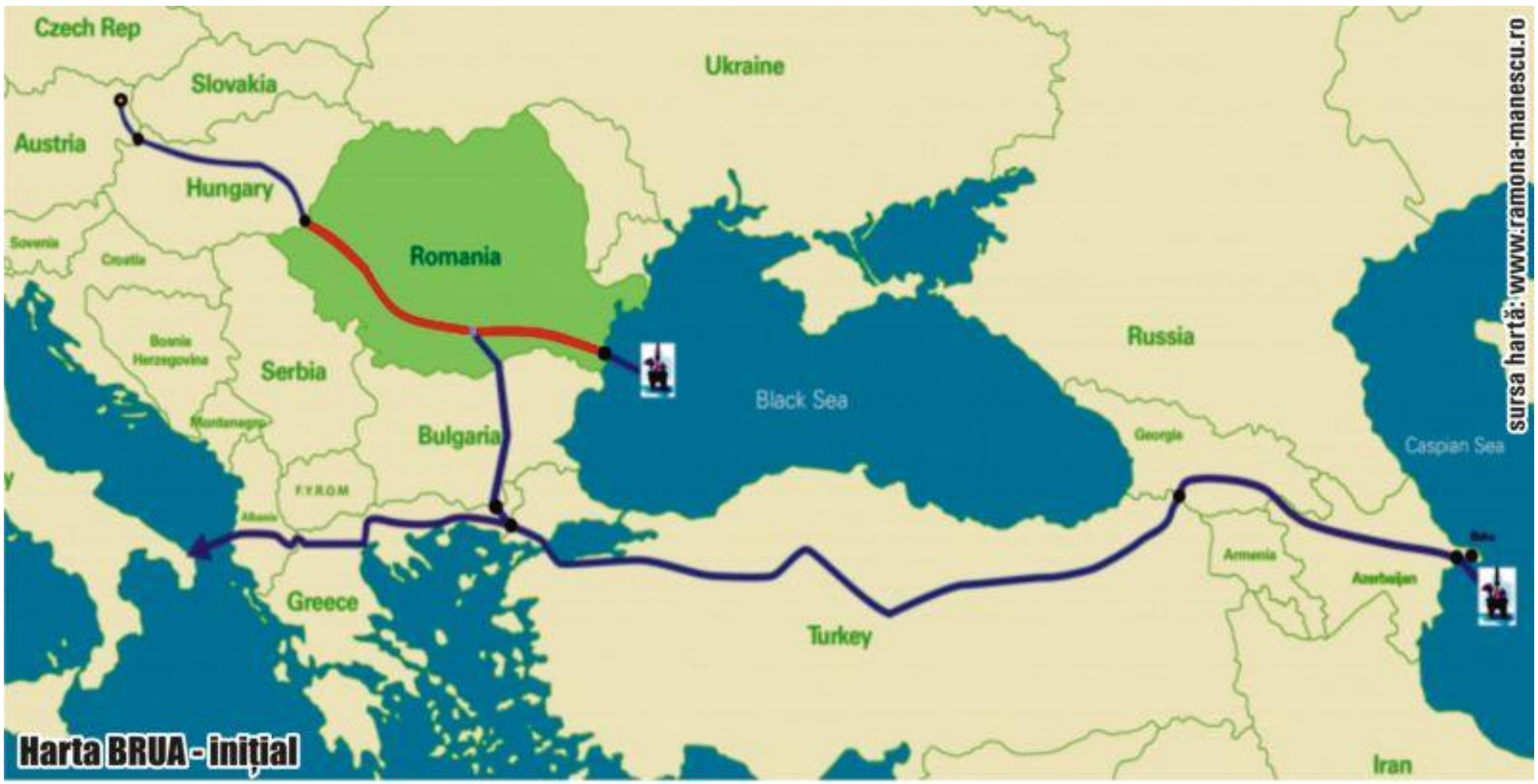
- Finally, an expanded South Corridor with its multiple gas entry points and linked underground gas storage and LNG facilities will provide the necessary background for the operation of **regional gas trading hubs** as IENE has already proposed in its relevant study “The Outlook for a Natural Gas Trading Hub in SE Europe” (IENE Study Project No. M19, September 2014).

An Expanded Southern Gas Corridor

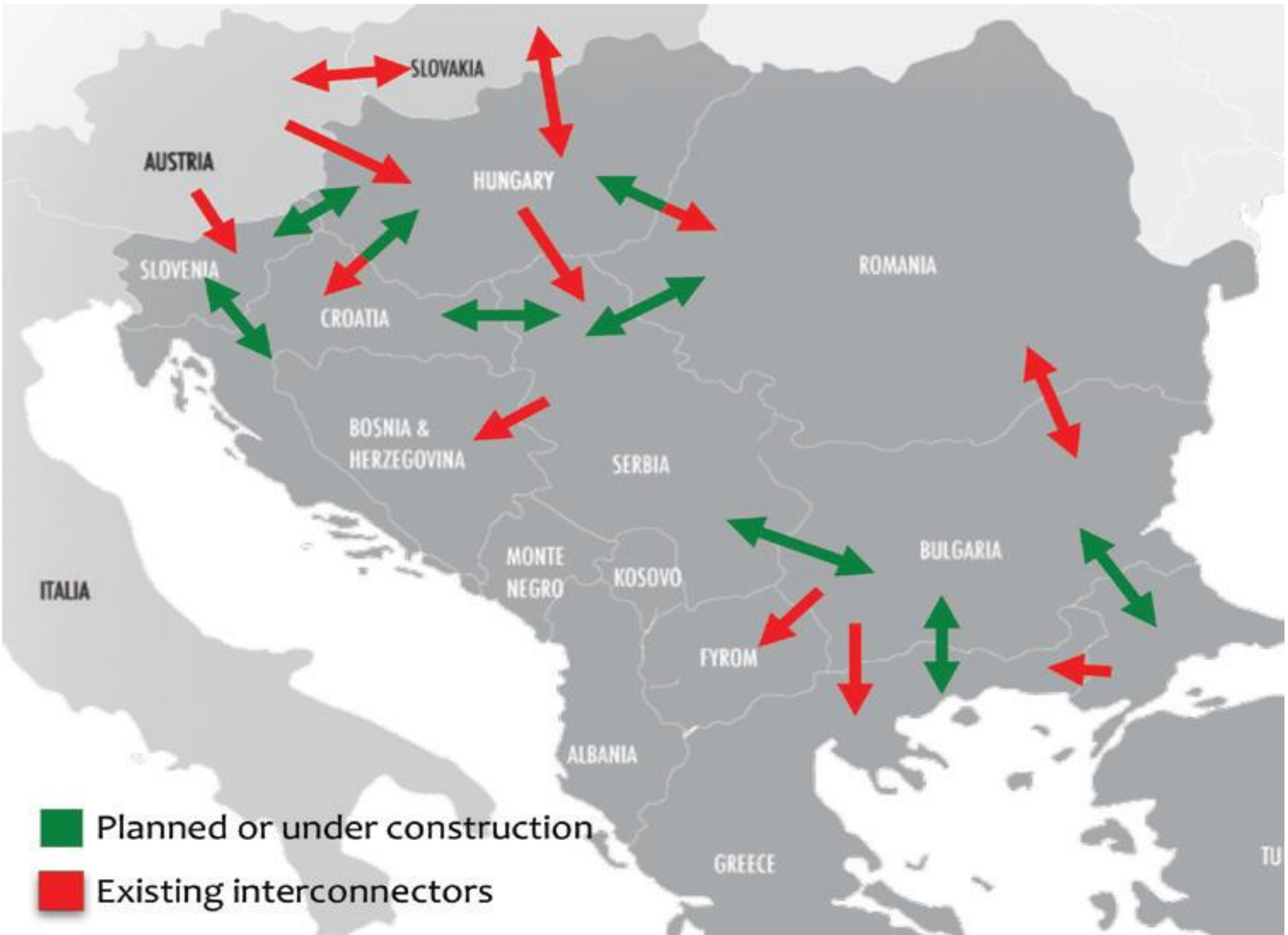
NB.: The TANAP and TAP gas pipelines as well as Turkish Stream are under construction, with IGB at an advanced planning stage with FID already taken. The IAP, the IGI Poseidon in connection with East Med pipeline and the Vertical Corridor are still in the study phase.

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

The Vertical Corridor and the BRUA Pipeline



Gas Interconnections in SE Europe



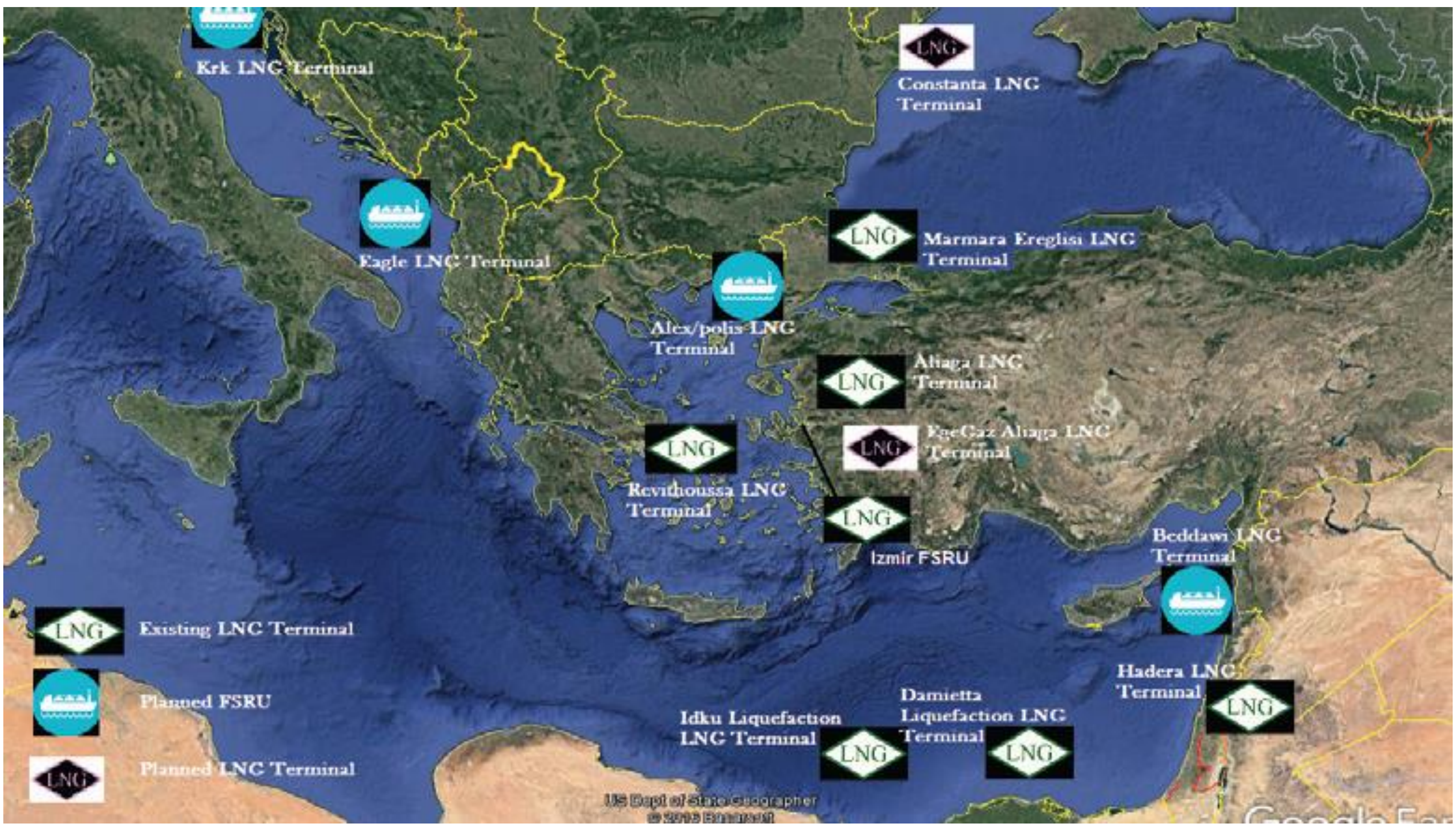
Source: IENE study "South East Europe Energy Outlook 2016/2017", Athens, 2017

The Growing Importance of LNG in SE Europe

- Today, there are **5 LNG importing terminals in operation** across SE Europe:
  - 2 land based and 1 FSRU in Turkey
  - 1 FSRU in Israel
  - 1 land based in Greece (Revithoussa)

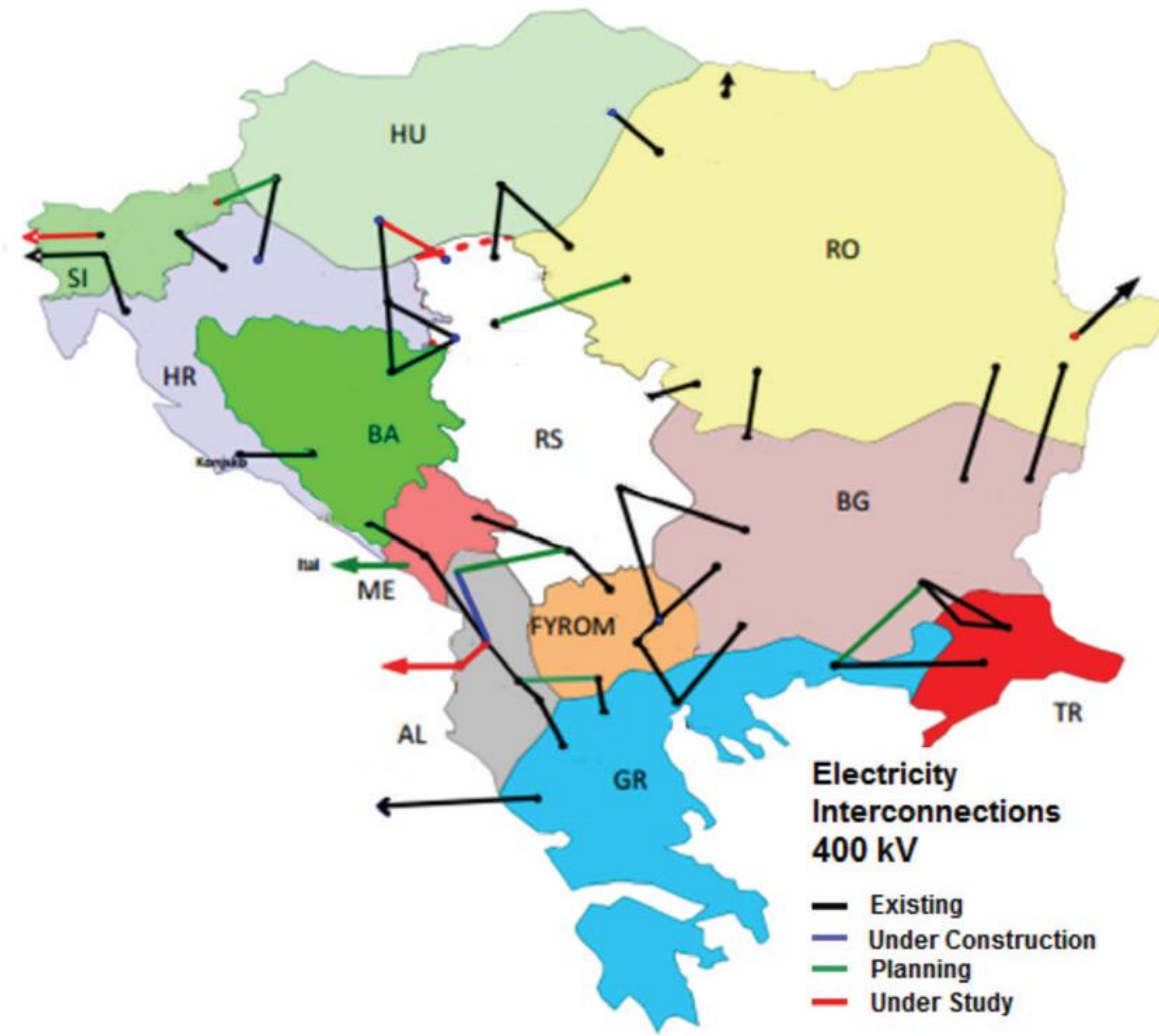
- By 2020, a number of **new LNG terminals** will be added:
  - 2 FSRU in Turkey (Izmir, Gulf of Saros)
  - 1 FSRU in Greece (Alexandroupolis)
  - 1 FSRU in Croatia (Krk Island)
  - 1 FSRU in Cyprus (Vassilikos)

LNG Terminals in SE Europe



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

Electricity Interconnections in SE Europe



Source: IPTO’s Ten Year Network Development Plan 2017-2026

The Role of Turkey in European Energy Security (I)

- Turkey holds an **obvious** and **unique geostrategic significance** for the Euro-Atlantic community, and as an influential player located at the intersection of the Black and Mediterranean Seas, the Middle East, the Balkans, the Caucasus region, and the Greater Caspian Sea (GCS) region, is at the center of the Western attention.
- After the annexation of Crimea by Russia in 2014, the EU has tried to bring Turkey - as a major energy interconnector - out to the international stage in terms of its increasing role in the energy sector.
  - Turkey can be a reliable **transit country** and can potentially build a mutually beneficial relationship with the EU through the rational use of energy resources transported by alternative pipelines in various regions.
  - The EU has understood that there cannot exist a **direct open gateway to Middle East energy resources** without Turkey's involvement. The latter, as the main energy bridge, is much closer to the Middle Eastern countries, not only in terms of geographical proximity but also due to **traditional sociocultural ties** between them. The havoc that had spread in Syria, Libya, Iraq and other regional nations, demonstrated the EU's inability to handle the problems in this region, much to the detriment of the EU's credibility in this region.
- **Turkey is already playing a crucial role in European energy security since it is at the crossroads between East and West, and North and South. Hereby, it can be stated that Turkey's energy policy is to a large extent shaped with its transit and energy hub potential in mind (i.e. East-West energy trade between GCS region, the Middle East, North Africa and Europe).**

The Role of Turkey in European Energy Security (II)

The role of Turkey as an energy bridge/energy hub can be better understood if we consider the following:

(i) Almost 3% of global oil trade flows through the Bosporus straits which offer a unique gate for Russian and Kazaki oil.

(ii) The Ceyhan oil hub also handles some 2% of global oil trade facilitating Iraqi, Azeri and Kazaki oil exports.

(iii) Some 5% of global oil supplies are channelled daily through Turkey.

(iv) Turkey's existing gas interconnections (i.e. Azerbaijan, Georgia, Iran, Greece) already provide small but significant (up to 1 bcm per year) gas imports into the European gas system.

(v) Forthcoming TANAP-TAP system and Turkish Stream gas pipeline will cement Turkey's key role as an important gas transit and supplier to Europe.

(vi) Anticipated power generating overcapacity (after 2023/2024 nuclear plant commissioning) will further enhance Turkey's role as regional energy supplier.

(vii) Continuing improvements and upgrades of Turkey's oil and gas infrastructure and latest LNG land based and FSRU terminal additions help strengthen the country's energy security and inter alia its role as regional energy supplier (see Turkish gas basket).

Existing Oil and Gas Pipelines in Turkey

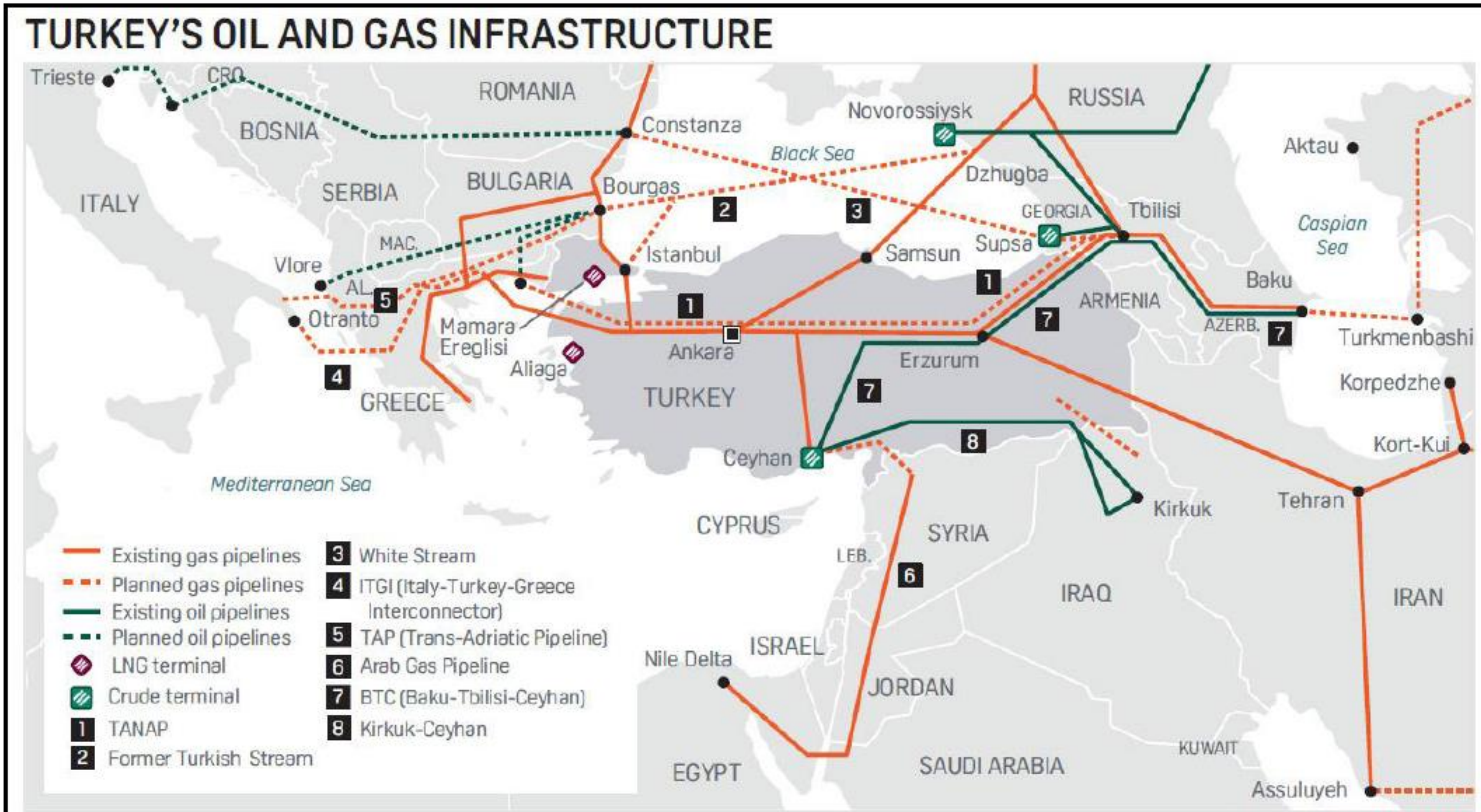
Existing oil pipelines

- The **Baku–Tbilisi–Ceyhan (BTC)** Oil Pipeline which transports oil from the offshore Azeri-Chirag-Guneshli oil field via Georgia to the Turkish port of Ceyhan for export. That pipeline started operation in 2007.
- The **Iraq–Turkey (Kirkuk–Ceyhan)** Oil Pipeline which is Turkey's oldest pipeline. It has been in operation since 1977 carrying oil from Kirkuk in Northern Iraq to Ceyhan in Turkey. This 970 km long pipeline has a capacity of approximately 19.9 million tonnes of oil per year
- The **Trans-Anatolian (Samsun–Ceyhan)** Oil Pipeline Project which is under construction and will be operated by the Trans-Anatolian Pipeline Company (TAPCO). This 550 km pipeline will stretch across Turkish territory from the Black Sea (Samsun) to the Mediterranean Sea (Ceyhan) and will carry Russian and Kazakh crude oil

Existing gas pipelines

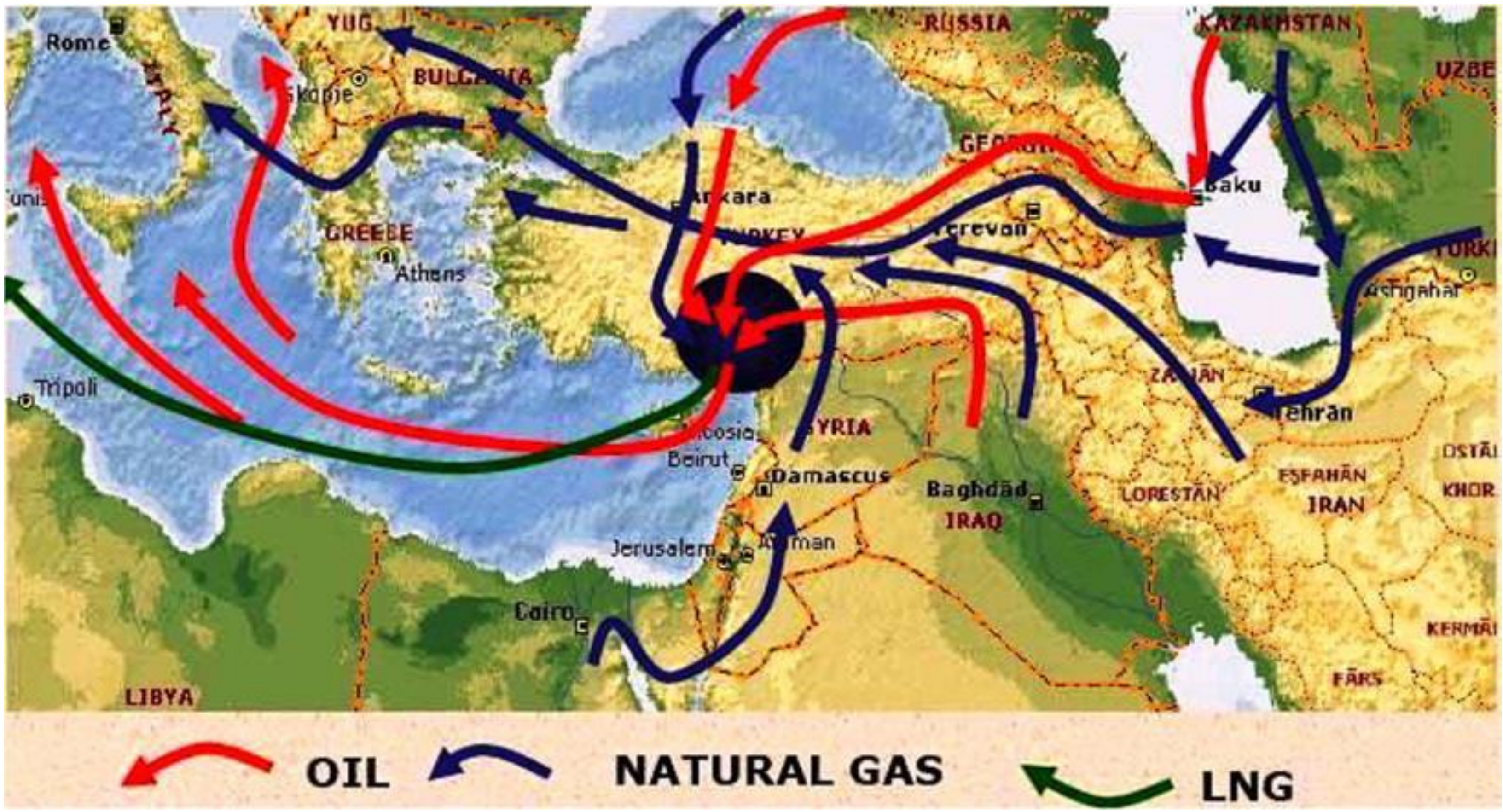
- The **Baku–Tbilisi–Erzurum (BTE)** Gas Pipeline also called South Caucasus gas pipeline, transports natural gas from the Sangachal terminal in Baku to Turkey via Georgia. First deliveries through the pipeline commenced on September 2006.
- The **Iran–Turkey** Natural Gas Pipeline started deliveries of gas in 2001, with a capacity of 10 billion m3 of natural gas per year from Tabriz (Iran) to Erzerum (Turkey).
- The **Blue Stream** Gas sub-sea Pipeline was constructed to deliver gas from Stavropol Krai in Russia, under the Black Sea, to the Durusu terminal in Turkey. With a length of 1,213 km, its full capacity is 16 billion m3 of Russian gas per year. It came on stream in 2005

Turkey's Oil and Gas Infrastructure



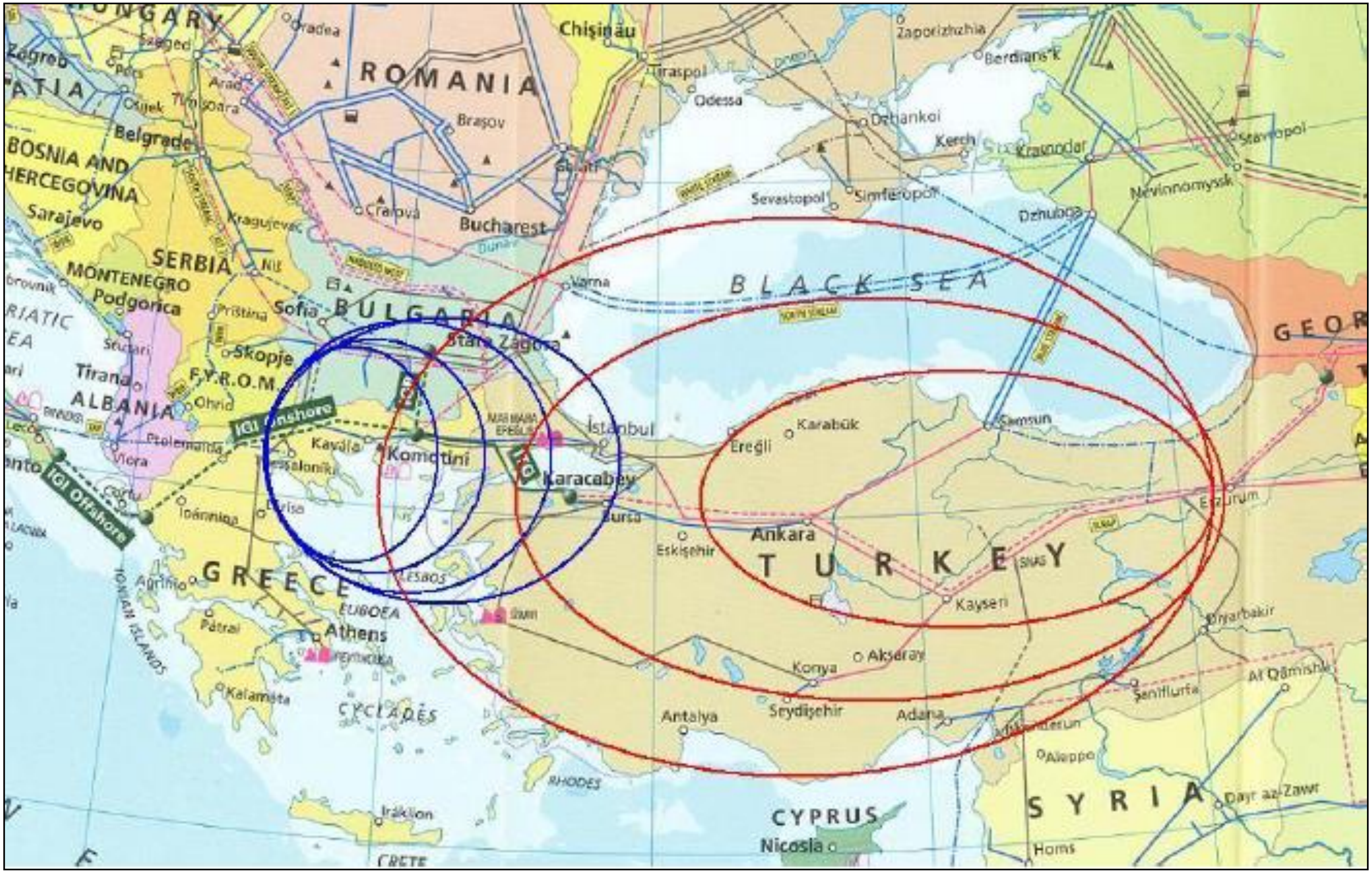
Source: Platts (2016)

Turkey as a Regional Oil and Gas Hub



Source: IENE

Gas Hubs in Greece and Turkey Can Coexist



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

INSTITUTE OF ENERGY FOR SOUTH-EAST EUROPE

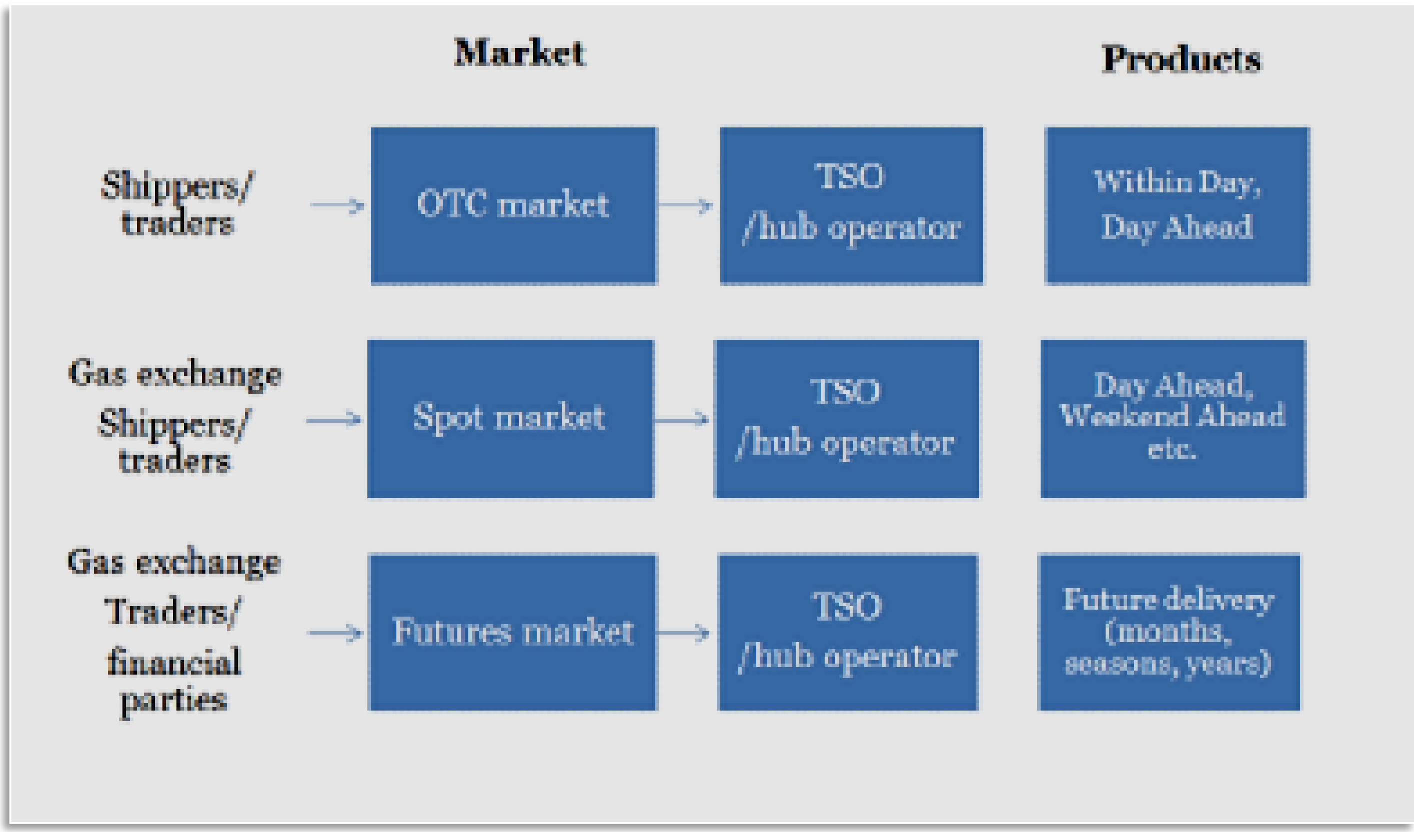
THE OUTLOOK FOR A NATURAL GAS TRADING HUB IN SE EUROPE

An IENE Study Project (M19)

September 2014

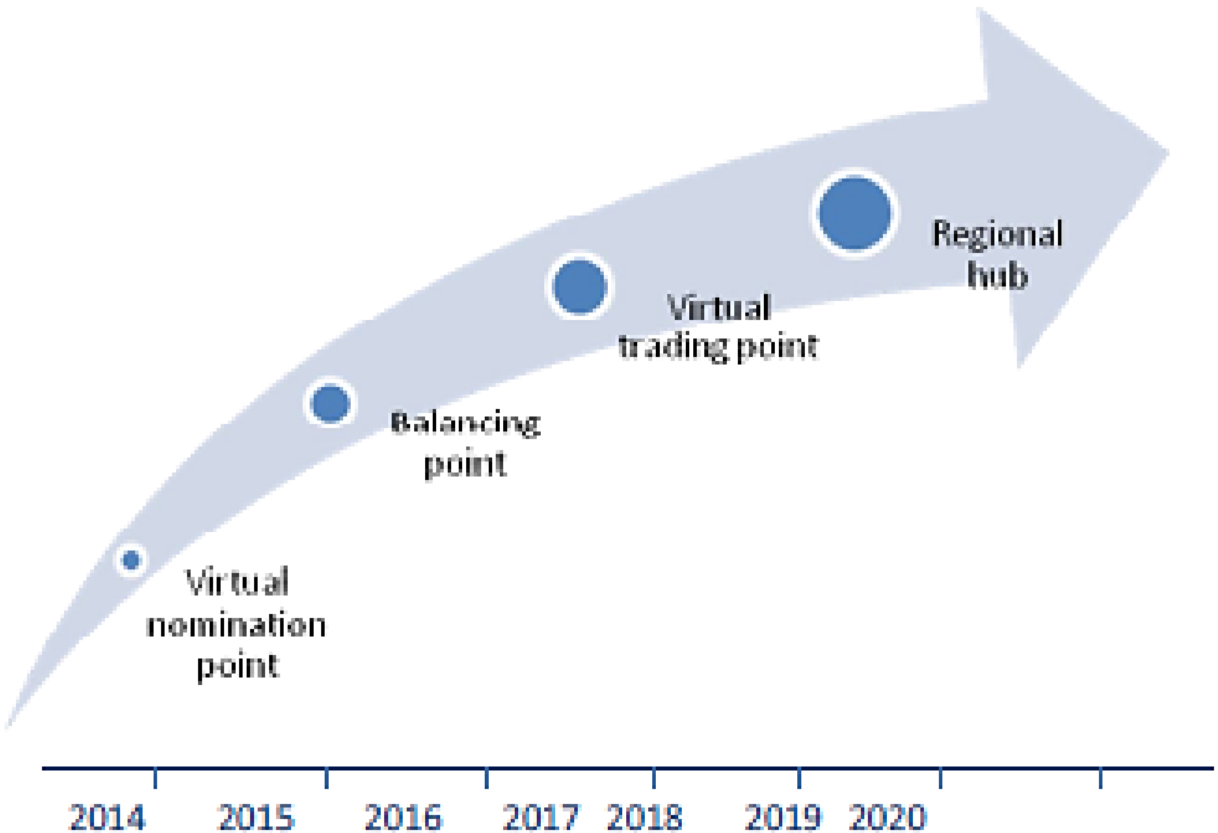
Athens, Greece

Proposed Hub Design



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

Proposed Road Map for the Development of a Natural Gas Hub Based in Greece



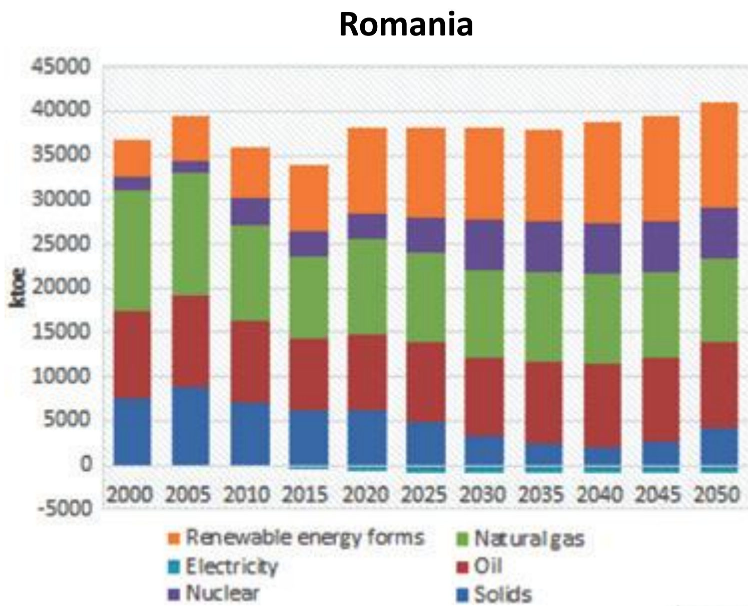
Source: IENE study, "The Outlook For a Natural Gas Trading Hub in SE Europe", (M19), Athens, September 2014

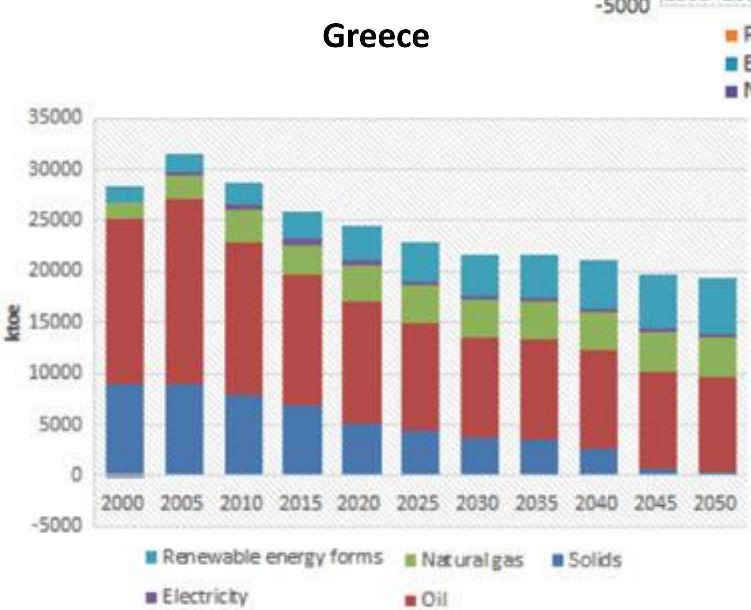
Major Gas Projects in Greece

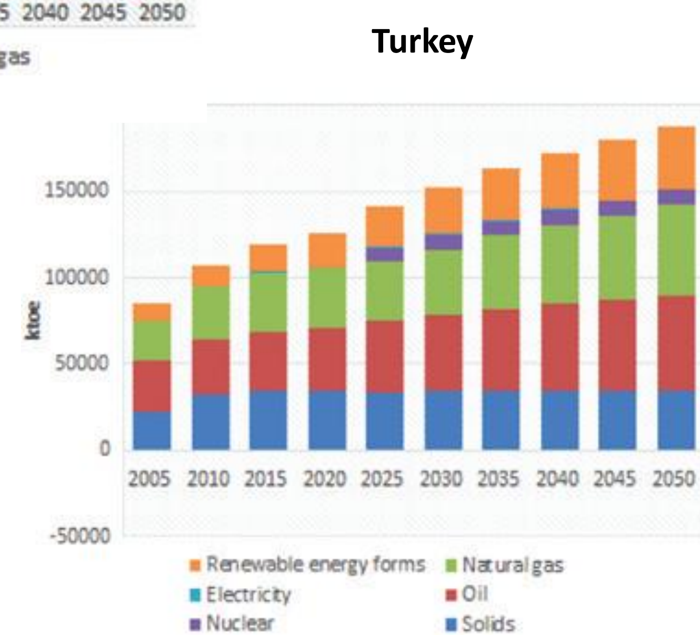
Discussion (I)

- In view of growing supply uncertainties combined with external (and quite predictable) price volatility, a **country may achieve a relatively secure energy flow by ensuring that its energy balance and particularly its power generation is not dominated by a single one fuel**.
  - For instance, Romania, which enjoys a strong indigenous energy supply (i.e. oil and gas) and uses a variety of fuels for its electricity production (i.e. solid fuels, hydro, RES and nuclear), has a **much healthier and safer energy mix** compared to Albania, for example, which although rich in terms of local energy resources (i.e. oil and hydro) lacks a balanced electricity supply mix.
- **A well-balanced energy mix can offer adequate protection against potential oil and gas flow disruptions**.
  - For instance, in the summer of 2015 serious energy security threats became apparent in Greece as the country's major oil, gas and electricity companies faced considerable problems in meeting their obligations to supplies in paying for energy imports. Greece's energy mix, much improved to what was back in the mid 1990's, was able to withstand the looming supply gap and hence consumers did not suffer a single hour of disruption of basic energy provisions (i.e. oil, gas, electricity).

Energy Mix in Romania, Greece and Turkey







Discussion (II)

- Turkey right now is in the process of constructing a significant network of oil and gas pipelines connecting it to the major energy producers in the Caspian, the Middle East and Russia, with completed pipelines such as BTC, BTE, South Caucasus, Blue Stream, the Kirkuk–Ceyhan oil pipeline and the Tabriz–Erzurum gas pipeline, and pending projects like TAP, TANAP, the Persian natural gas pipeline, the Arab natural gas pipeline and the Trans-Anatolian oil pipeline.
- Turkey's current energy policy also favours the construction of alternative routes bypassing the Dardanelles for oil and natural gas volumes which move across the country. In addition, it is expanding the necessary infrastructure in its Mediterranean port of Ceyhan transforming it into major energy and shipping hub. It is apparent that, the pursued energy strategy is aiming towards the emergence of Turkey as the region's key energy player securing essential transit routes for oil and gas to Europe and energy distribution centres of global significance. In that sense, Turkey has already achieved the greatest part of its energy goals.
- Nevertheless, with the possible exception of the Dardanelles Strait a direct link to Europe is still missing. The implementation of the TANAP pipeline in conjunction with the TAP pipeline will no doubt change this situation, and will enable Turkey to become a main South East-West energy corridor to Europe. Apart from the spectre of social instability that Turkey potentially faces, mainly as a result of terrorist activity, the present turmoil in the Middle East, especially in Iraq, Syria and Egypt, as well as Iran's nuclear ambitions, the Nagorno-Karabakh conflict and lately Saudi Arabia's expansionary policies, all contribute to rising regional instability which could help undermine the certainty and security of the energy corridors that originate or pass through Turkey.

SEE Energy Investment Outlook 2016-2025

- 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. This analysis involves **two scenarios:**
  - An **optimistic one** (with an average real GDP growth of 3% over 2016-2025 and maximum investments) and
  - A **reference one** (with an average real GDP growth of 1% over 2016-2025 and substantial part of investments).

Findings of SEE Energy Investment Outlook 2016-2025 per country

SEE Countries	Scenario A: Total Investments (in million euros)	Scenario B: Total Investments (in million euros)
Albania	7,460	8,258
Bosnia & Herzegovina	8,722	10,060
Bulgaria	11,050	12,663
Croatia	8,525	9,178
Cyprus	7,350	8,769
FYROM	3,400	4,373
Greece	23,300	30,192
Kosovo	2,605	3,377
Montenegro	2,400	3,653
Romania	20,630	22,716
Serbia	11,260	13,527
Slovenia	3,185	4,891
Turkey	124,935	141,623
TOTAL	**234,822**	**273,280**

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

Findings of SEE Energy Investment Outlook 2016-2025 per sector

Sector	Total Investment (in million euros)	
	Scenario A	Scenario B
Oil Upstream (Research, Exploration and Production)	25,450	32,288
Oil Downstream/Midstream (incl. liquid biofuels)	13,340	18,757
Electricity		
Thermal Plants	139,473	146,369
Nuclear Plants		
Lignite Mine Development		
Grids - Upgrade and Expansion		
HV Transmission Lines		
Gas		
Main and branch gas pipelines	16,550	26,460
Gas Storage		
Town grids		
LNG Terminals and Liquefaction plants		
RES (Wind, PV, Biomass, Mini Hydro, Geothermal)	40,009	49,406
TOTAL	**234,822**	**273,280**
Intraregional Mega Projects		
Oil Pipelines	-	1,000
Gas Pipelines	33,350	51,361
Electricity Interconnectors	4,700	7,150
Grand Total	**272,872**	**332,791**

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

Funding for **"SE Europe Energy Outlook 2016/2017"** came from a number of companies and IENE's budget

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