21st National Energy Conference
"Energy & Development 2016"

SE Europe Energy Outlook 2016 – Main Findings

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FOR SOUTH EAST EUROPE

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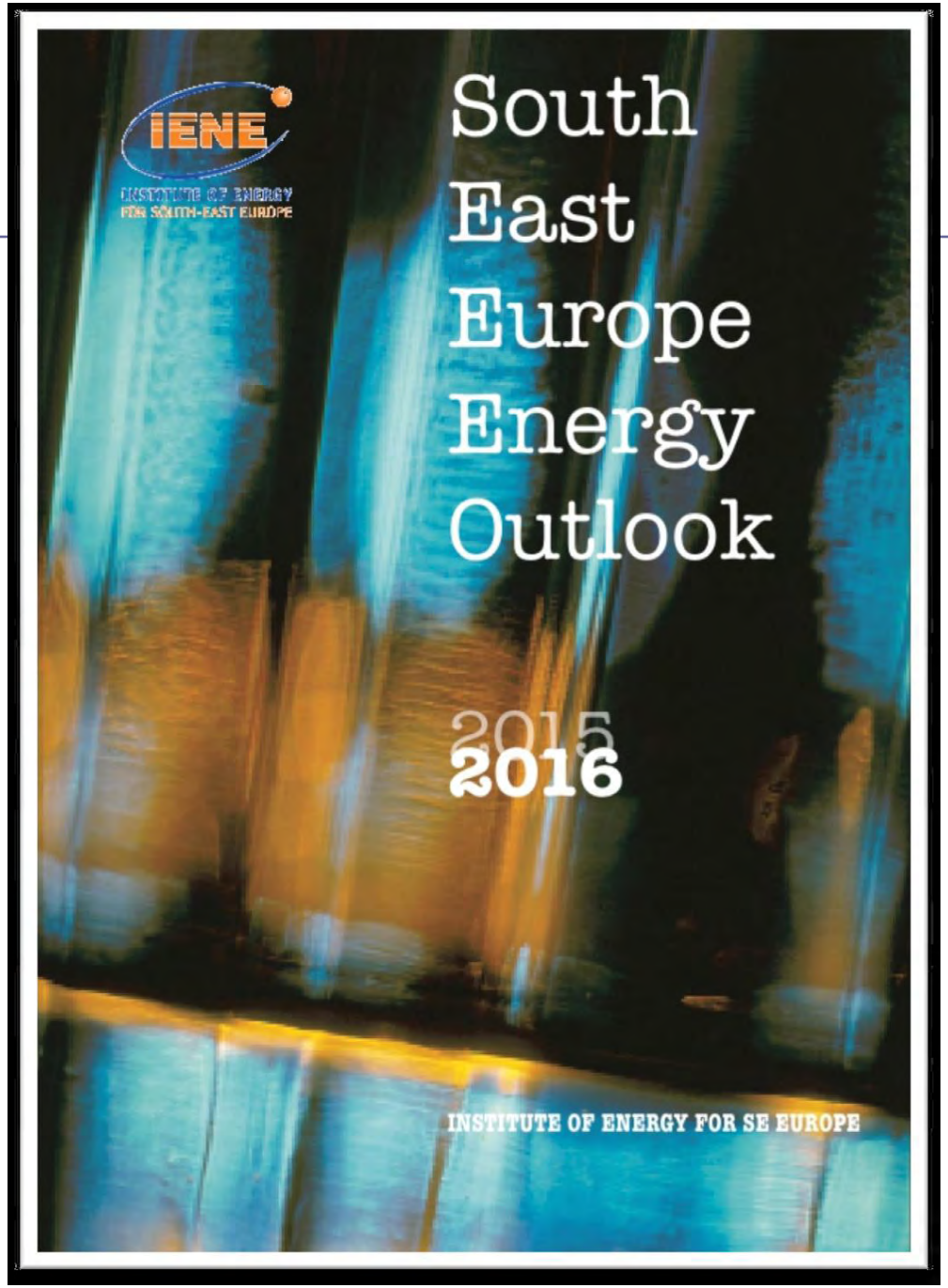
1. Raison d' Etre

(a) IENE's need to understand the geopolitical and geographical sphere within which it operates, but also to define and evaluate in an objective manner the major policy challenges of the energy sector of the region.

(b) To study and analyse the region's energy market structure and associated energy flows.

(c) To identify the important investment and business opportunities across the SE Europe area and assess the region's energy related investment potential.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South
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Europe
Energy
Outlook
2015
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2. The SE Europe Area Defined

- **Core Countries:** Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, FYROM, Greece, Kosovo, Montenegro, Romania, Serbia, Slovenia, Turkey
- **Peripheral Countries:** Ukraine, Moldova, Hungary, Italy, Israel, Lebanon, Syria

3. 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 **analyse 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

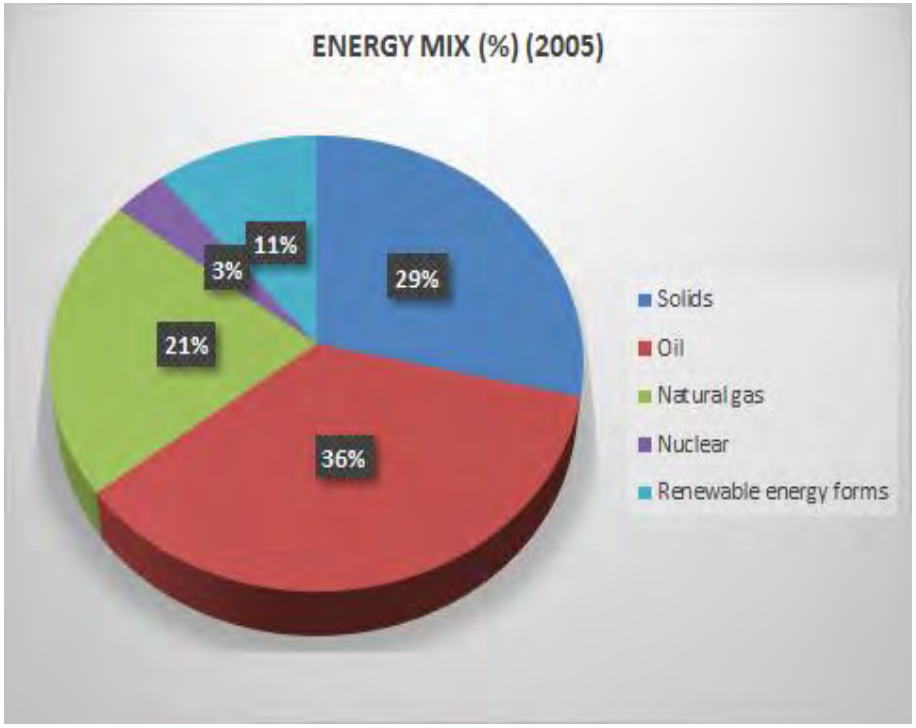
e) Legal and Regulatory environment

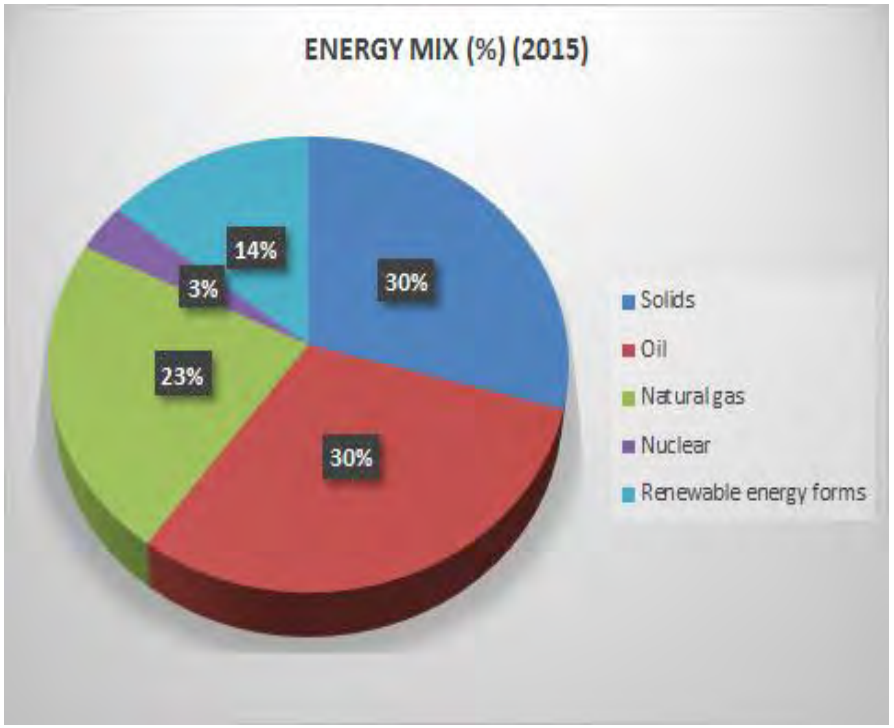
f) Major energy projects (national and transnational)

g) Investment outlook

h) Energy and environmental policy challenges

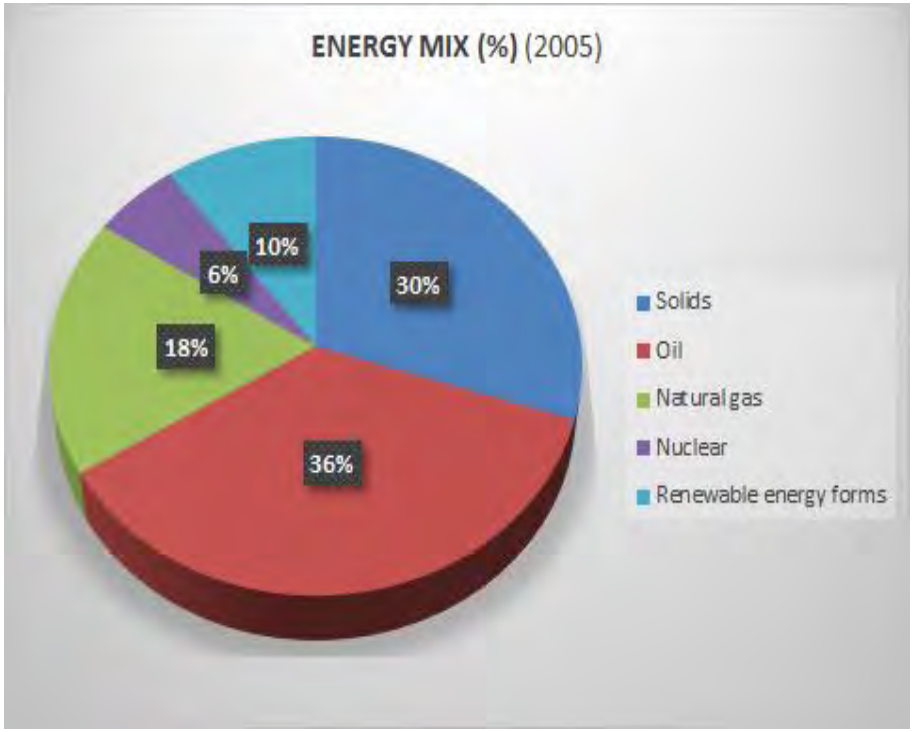
4. SE Europe: Energy Mix (%) by source, including Turkey (2005 and 2015)

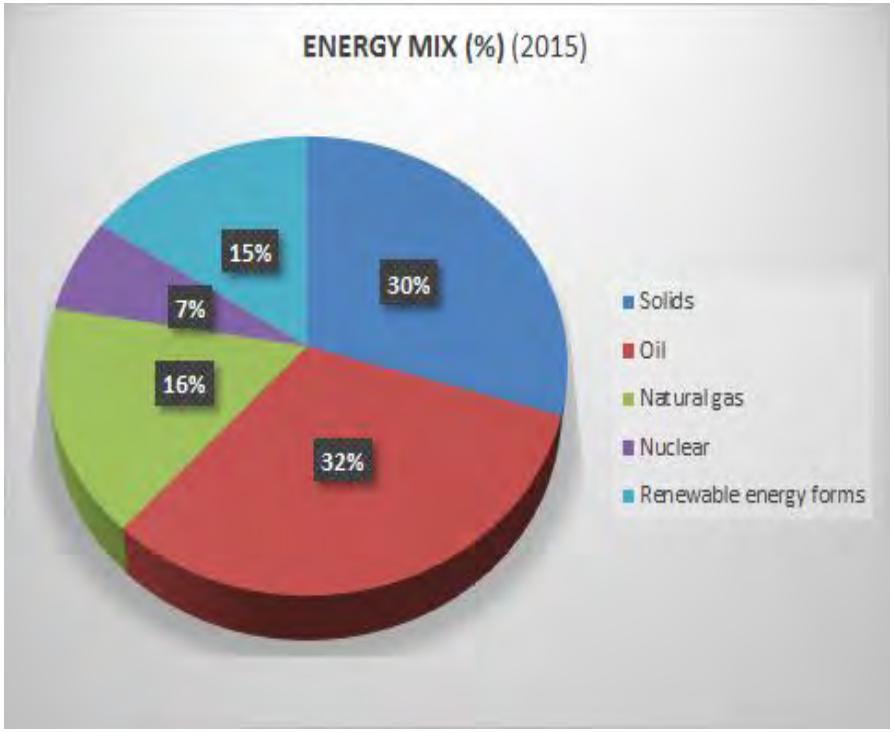




Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

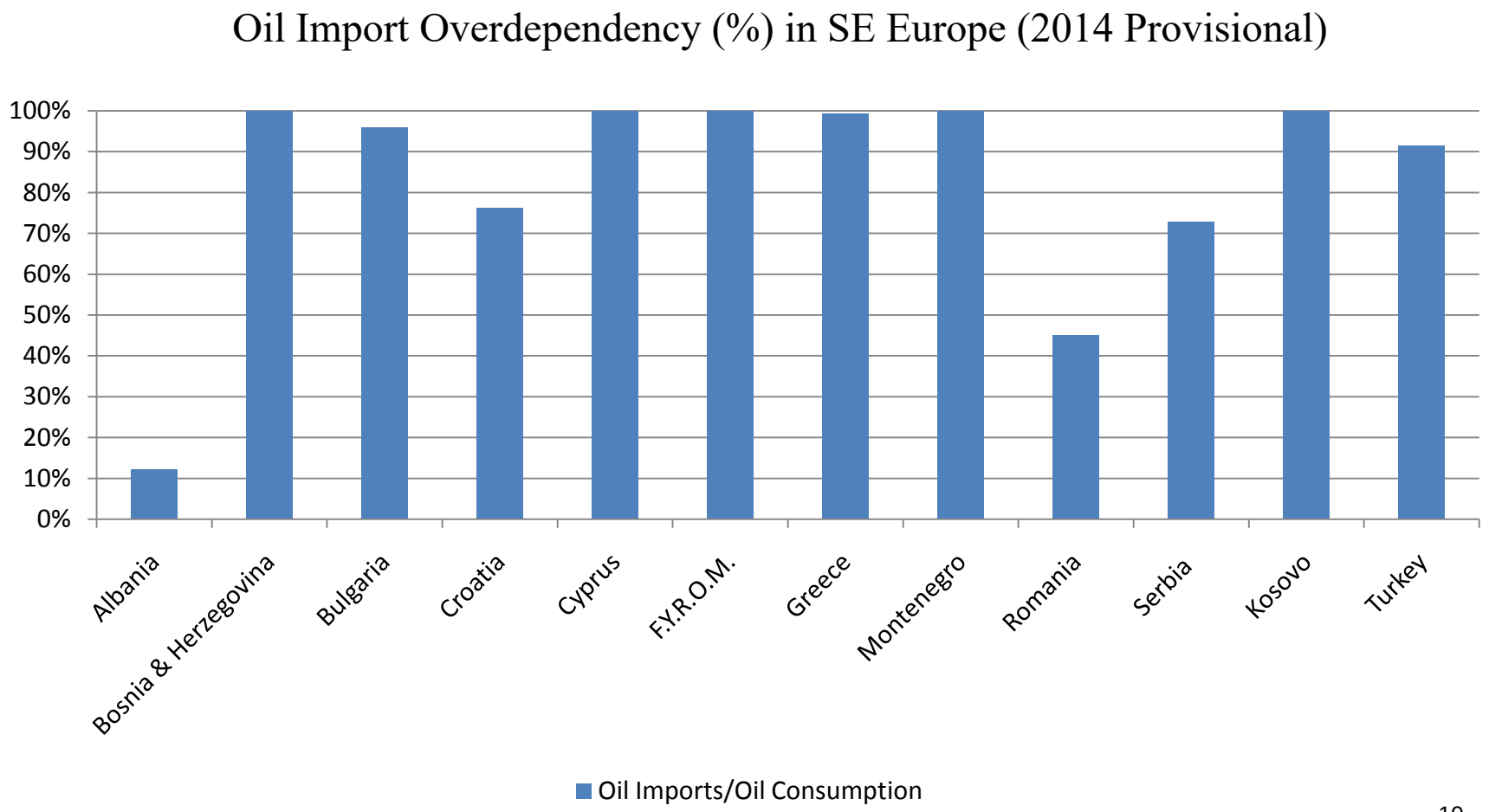
SE Europe: Energy Mix (%) by source, without Turkey (2005 and 2015)



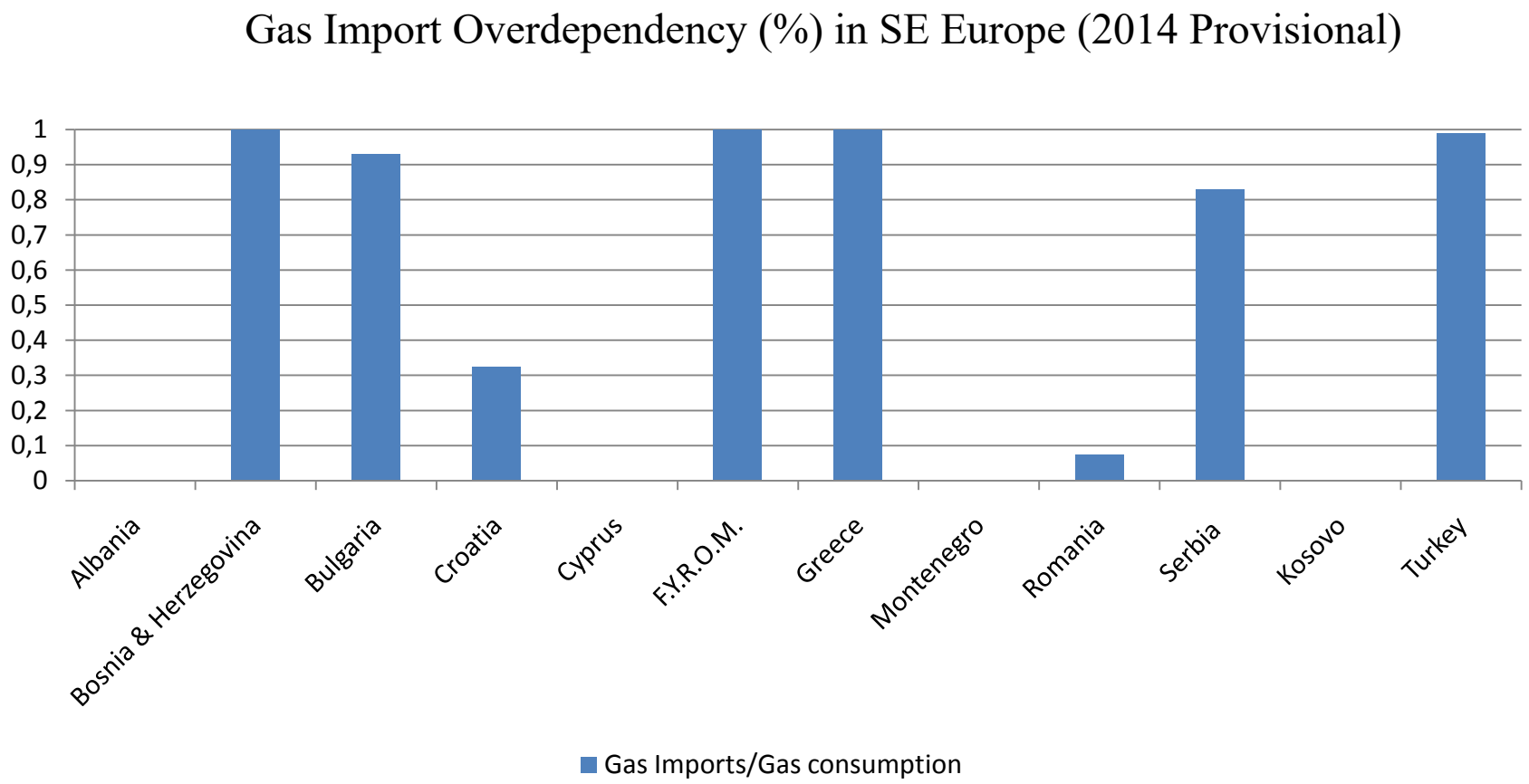


Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

5. Key Regional Energy Issues – Current situation (I)



Key Regional Energy Issues – Current situation (II)



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

Key Regional Energy Issues – Current situation (III)

- Impact of New Oil Price Regime (50% Plunge in oil prices)
  - **Positive** impact on public finances of most countries
  - **Negative** impact on oil and gas exploration activities

- Electricity and gas interconnections
  - **Gas interconnections:** Region lags seriously behind Central and North Europe.
  - **Electricity interconnections:** Following the commencement of SEE CAO, cross-border market coupling and new interconnections (eg. Greece-Turkey), the situation in electricity interconnections has improved considerably.

Key Regional Energy Issues – Current situation (IV)

- The coal predicament of SE Europe – the region's great dependence on coal-fired power generation vs environmental protection
  - In the case of SE Europe, economic development, largely based on the utilization of indigenous lignite/coal resources, will have to be reconciled with COP 21 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 (eg. examine CCS/CCU options) needs to be undertaken before introducing realistic policies for decarbonisation.
- The ascending importance of RES and Energy Efficiency
  - There is high potential of RES in SE Europe, such as **solar, wind, hydro, biomass, and geothermal still remains largely unexploited by many countries.** In the West Balkans, RES remain largely unexploited, but in other countries, such as Romania, Greece and Turkey, RES have advanced considerably over last 10 years.
  - The region is characterized by distinctly different (in terms of structure and operation) and frequently segregated electricity markets. There are great difficulties of advocating common RES strategies most of which are linked to smooth electricity market operation.

Key Regional Energy Issues – Current situation (V)

- The Fukushima accident has reignited discussions on the future of nuclear energy globally and regionally. There appears to be limited interest for new nuclear power plants in the region. Only Romania and Turkey have specific plans.

- There appears to be increased electricity consumption in the SEE region. A total of 493 TWh were produced in 2013, up by 1.6% compared to 2012. Thermal power plants have the biggest share in the region's electricity production. In 2013, their participation was approximately 64%, hydropower plants contributed 25% of total production, while nuclear power plants and RES contributed 6% and 5% respectively in the same year.

- The region's energy mix is changing but slowly.
  - There is higher use of coal (lignite), higher penetration of gas, more RES and lesser use of oil in comparison between 2005 and 2015, as shown previously.

6. Key Regional Energy Issues: What lies ahead? (I)

- Impact of Oil Price Plunge in Oil & Gas Exploration
  - **Short-term:** Noted **improvement** in public finances of most countries and **negative** impact on their exploration activities.
  - **Medium-term:** Cuts in CAPEX will reduce oil supply and thus, there will be a tendency for oil price recovery.

- Electricity and gas interconnections
  - **Gas interconnections:** Positive outlook as several new cross-border interconnections are entering final planning stage.
  - **Electricity interconnections:** In view of current plans by various TSOs, the region's interconnectivity will be improved considerably by 2025 (Italy-Greece and Italy-Montenegro electricity interconnections and Greek Archipelago and Crete connected to mainland).

Key Regional Energy Issues: What lies ahead? (II)

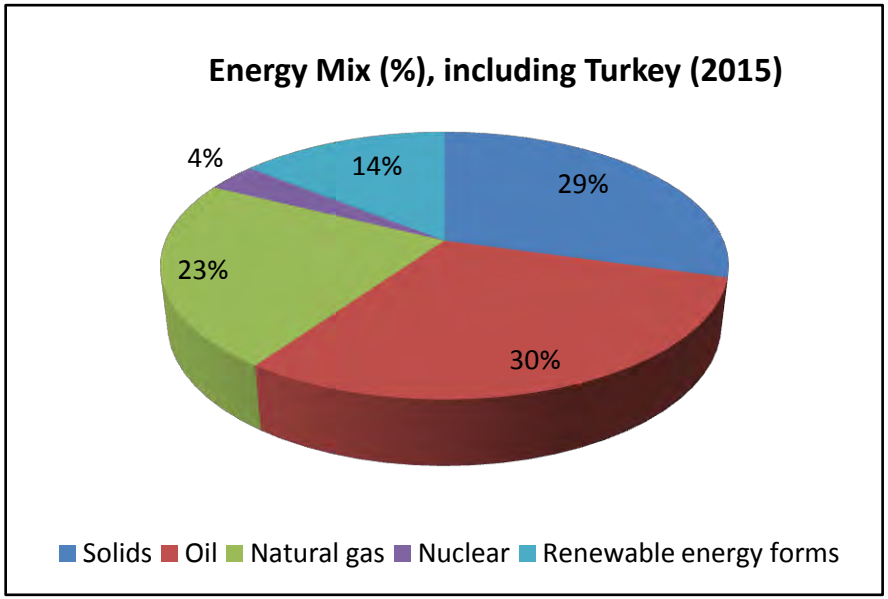
- Indigenous Coal Resources Vs Environmental and Decarbonisation Policies
  - **Lignite** and **coal** will continue to contribute to power generation in SE Europe but with decreasing trends in the long term. However, over the next ten years, the share of solid fuels is anticipated to steadily increase in some countries of the region in order to meet increasing demand at competitive prices (eg. Turkey and Greece).
  - **Gas** will continue to gain share in the energy mix, at least over the next 15 years in Europe and in the SEE region in particular, substituting old and inefficient lignite and coal units, mainly because of **its environmental friendly characteristics** and increased availability, the higher demand for gas-fired electricity and the expected socio-economic development. However, gas will compete with RES (eg. summer period).

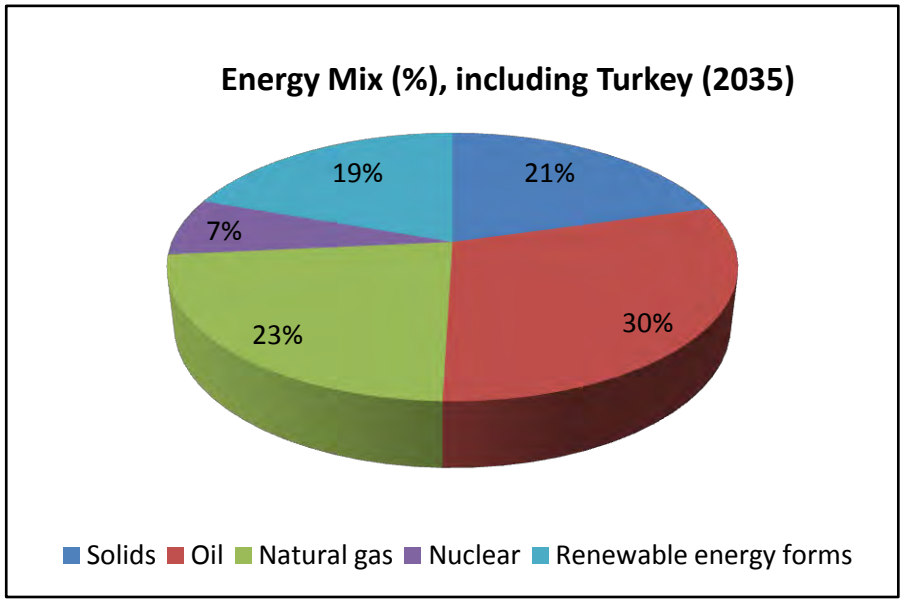
Key Regional Energy Issues: What lies ahead? (III)

- The ascending importance of RES and Energy Efficiency
  - The power generation portfolio in SE Europe (excluding Turkey) **is dominated by coal and hydropower**, generating 47% and 48% of electricity respectively. RES deployment (excluding large and small hydropower) is at a relatively early stage in the region, generating less than 4% of the electricity (2013).
  - A **significant potential** for both wind and solar energy has been identified and capacities are expected to increase in the future. It is worth mentioning that RES applications will continue upward trend from 2017 onwards with emphasis on wind and biomass and rooftop PV.
- Future of regional nuclear energy
  - The region's relative reliance on nuclear power is unlikely to diminish over the next decade. On the contrary, it is anticipated to increase. Neither Bulgaria nor Romania are likely to shut down their power plants as they are aware as they cannot replace nuclear capacity that easily.
  - According to stated plans, we are going to see the addition of at least 11 GW of new nuclear capacity by 2025 in the region.

Key Regional Energy Issues: What lies ahead? (IV)

- The region's changing energy mix (Comparison between 2015 and 2035)
  - Substantial changes are foreseen over next 20 years with lower use of coal (lignite), stable contribution of gas and oil, more RES penetration and higher use of nuclear power.



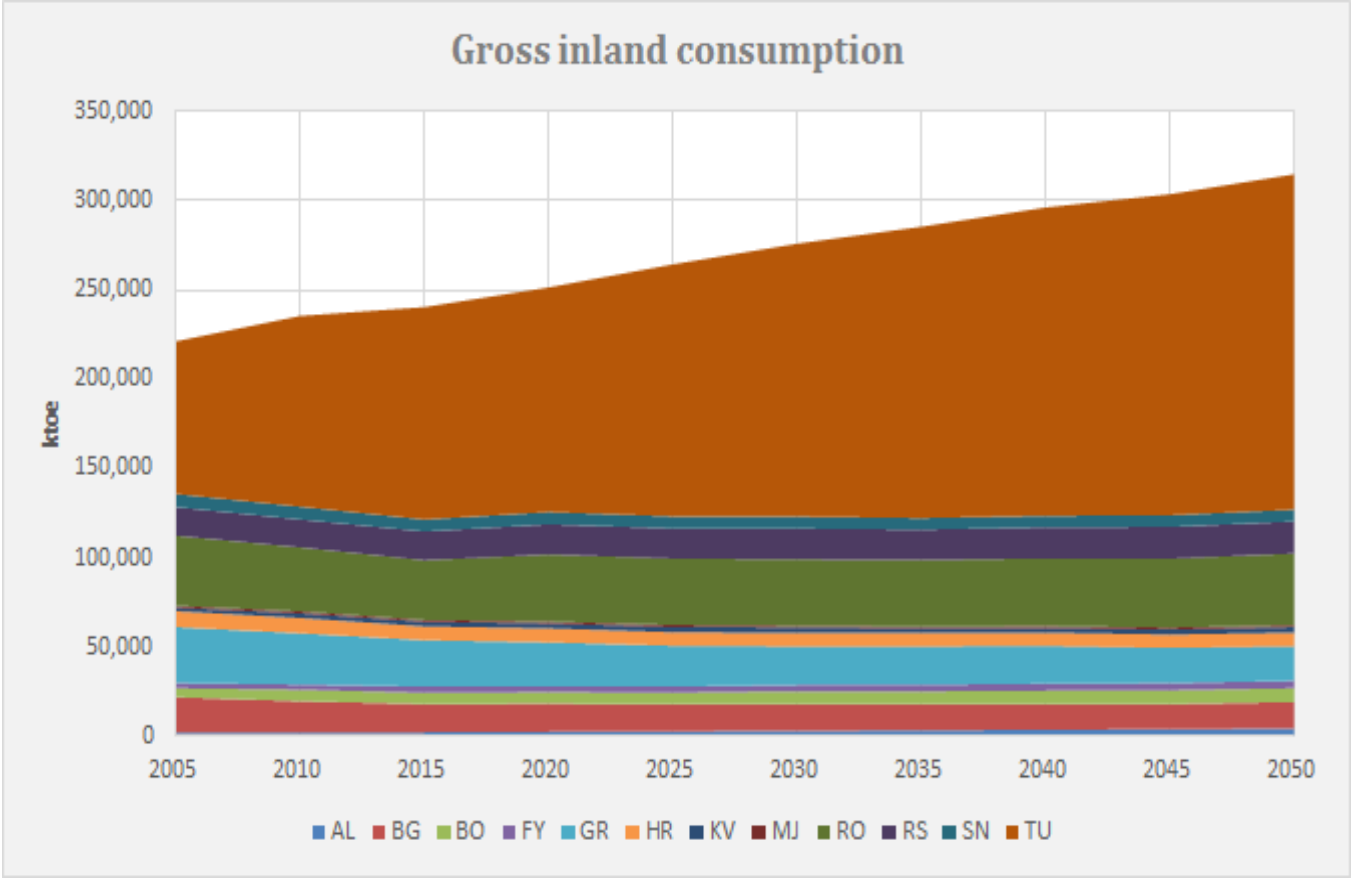


Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

7. Main assumptions for Energy Demand and Supply Projections in SEE

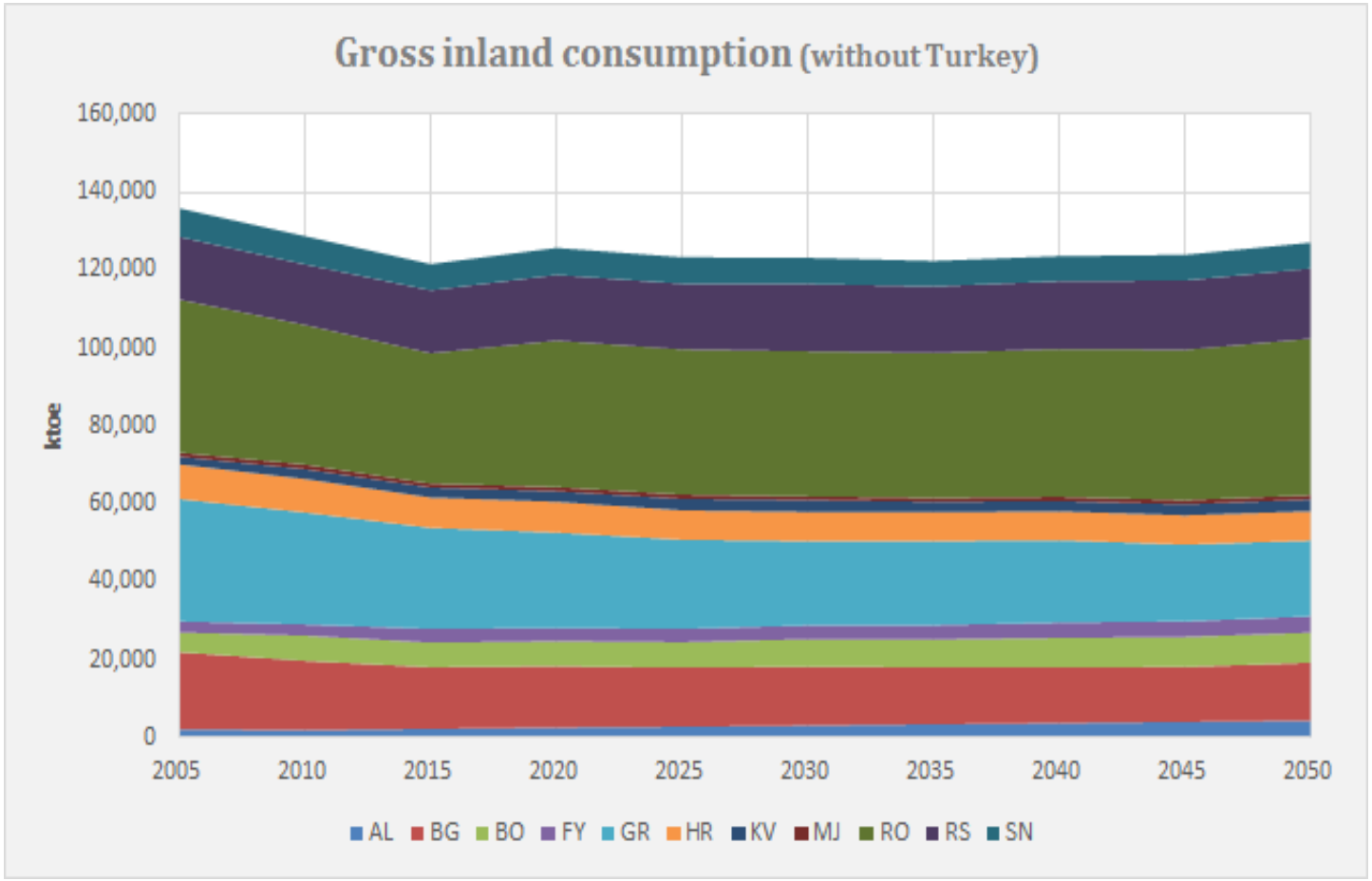
- In order to study energy demand and supply patterns, a scenario approach has been adopted whereby certain assumptions are formulated concerning basic parameters which are likely to govern future energy demand and supply.
- These parameters include primarily **economic**, **demographic** and **energy price information**.
- Given the funding and time constraints of the present "Outlook" study, only one such scenario was possible for elaboration, namely the **"Base" scenario**. In carrying out the scenario work, IENE has collaborated with 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 Kapros**.
- In selecting the Base scenario, a very conscious decision was made by IENE and E3M-Lab in considering the **penetration of new technologies**, notably in power generation and transport, largely based on RES. The penetration of new technologies, leads, among others, to changes in the energy mix, alongside other drivers such as relative prices and costs, policies to promote energy efficiency, RES and new technologies.

8. SE Europe: Gross inland consumption, including Turkey (2005-2050)



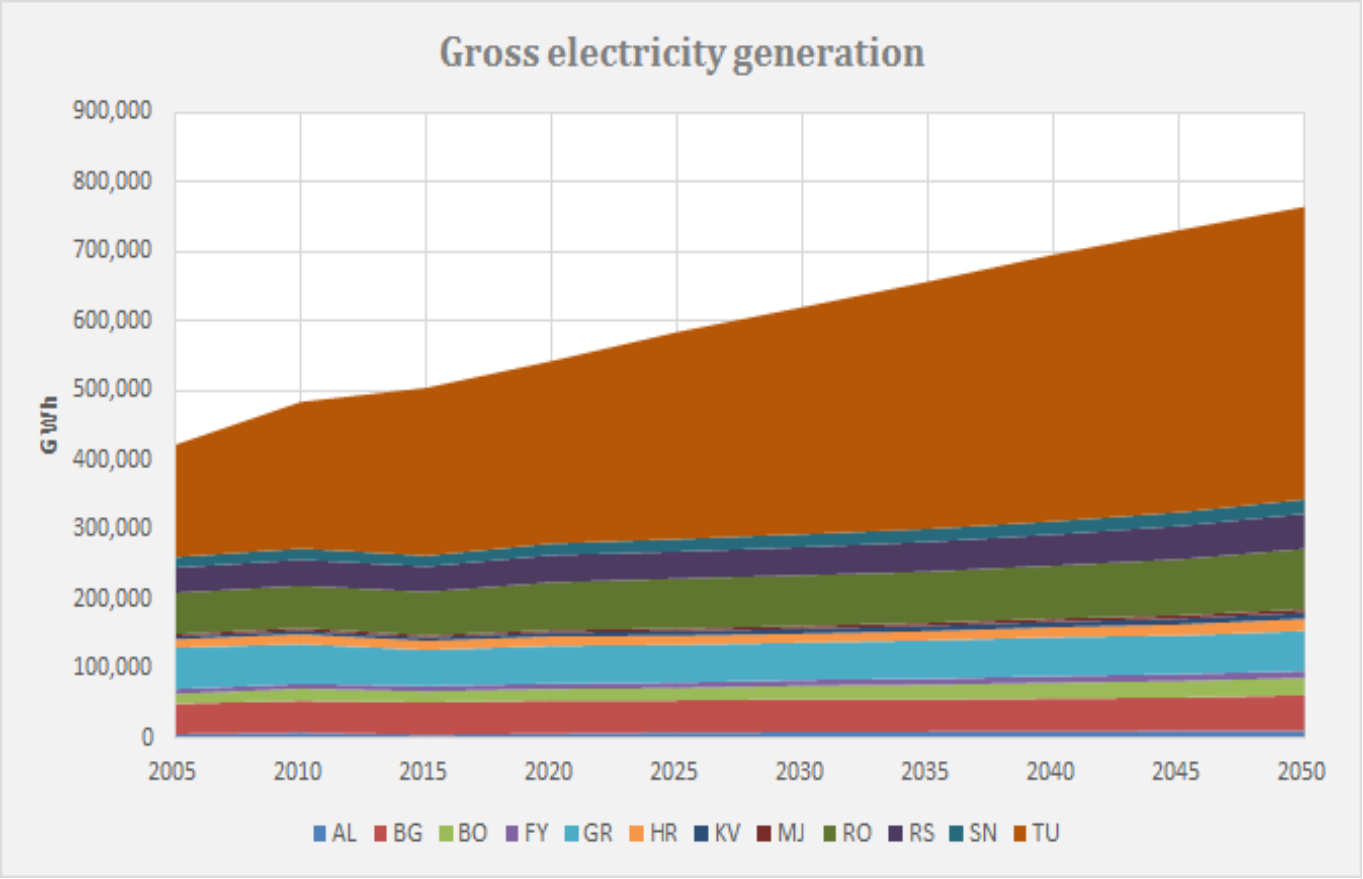
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Gross inland consumption, without Turkey (2005-2050)



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

SE Europe: Gross electricity generation, including Turkey (2005-2050)



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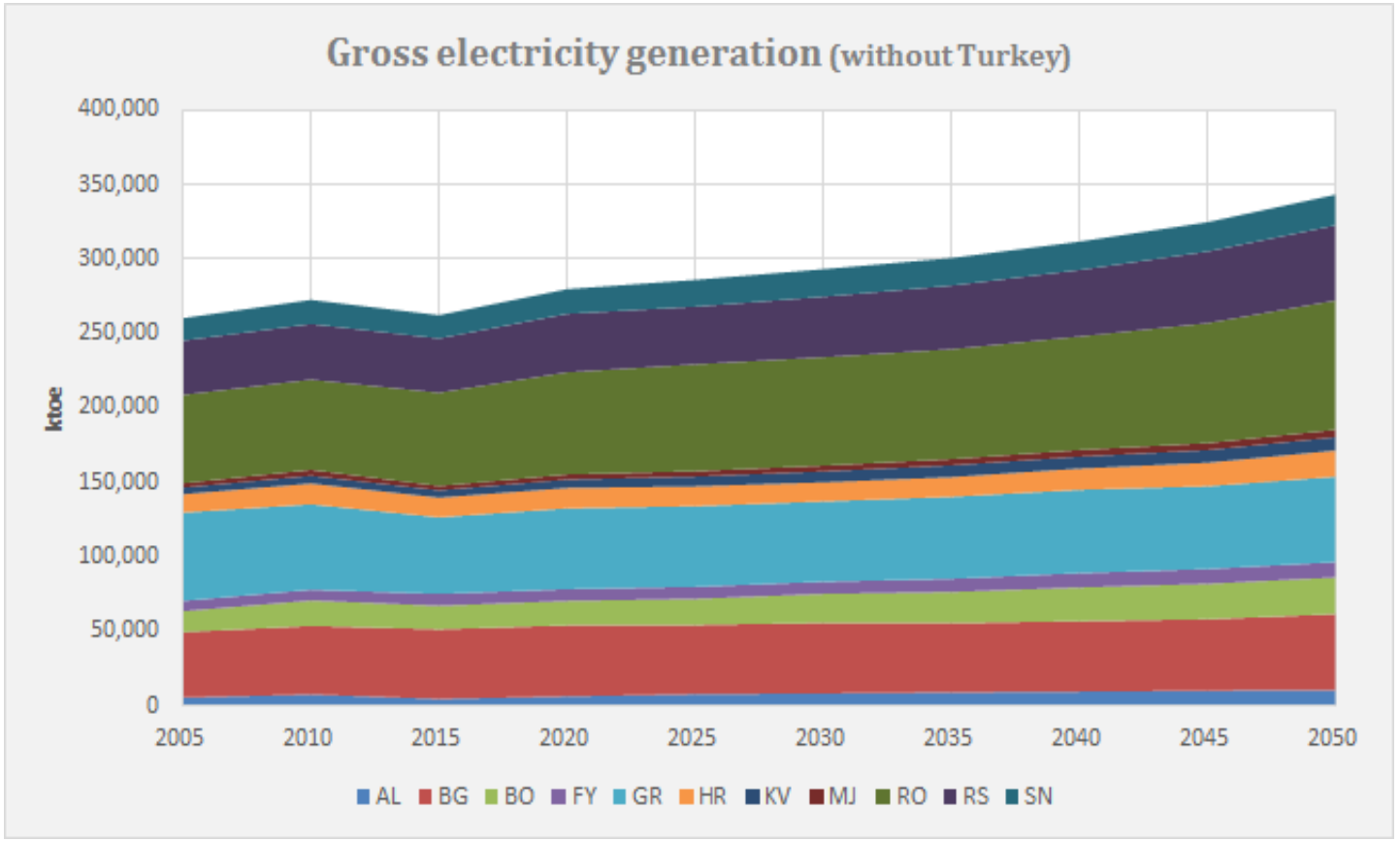
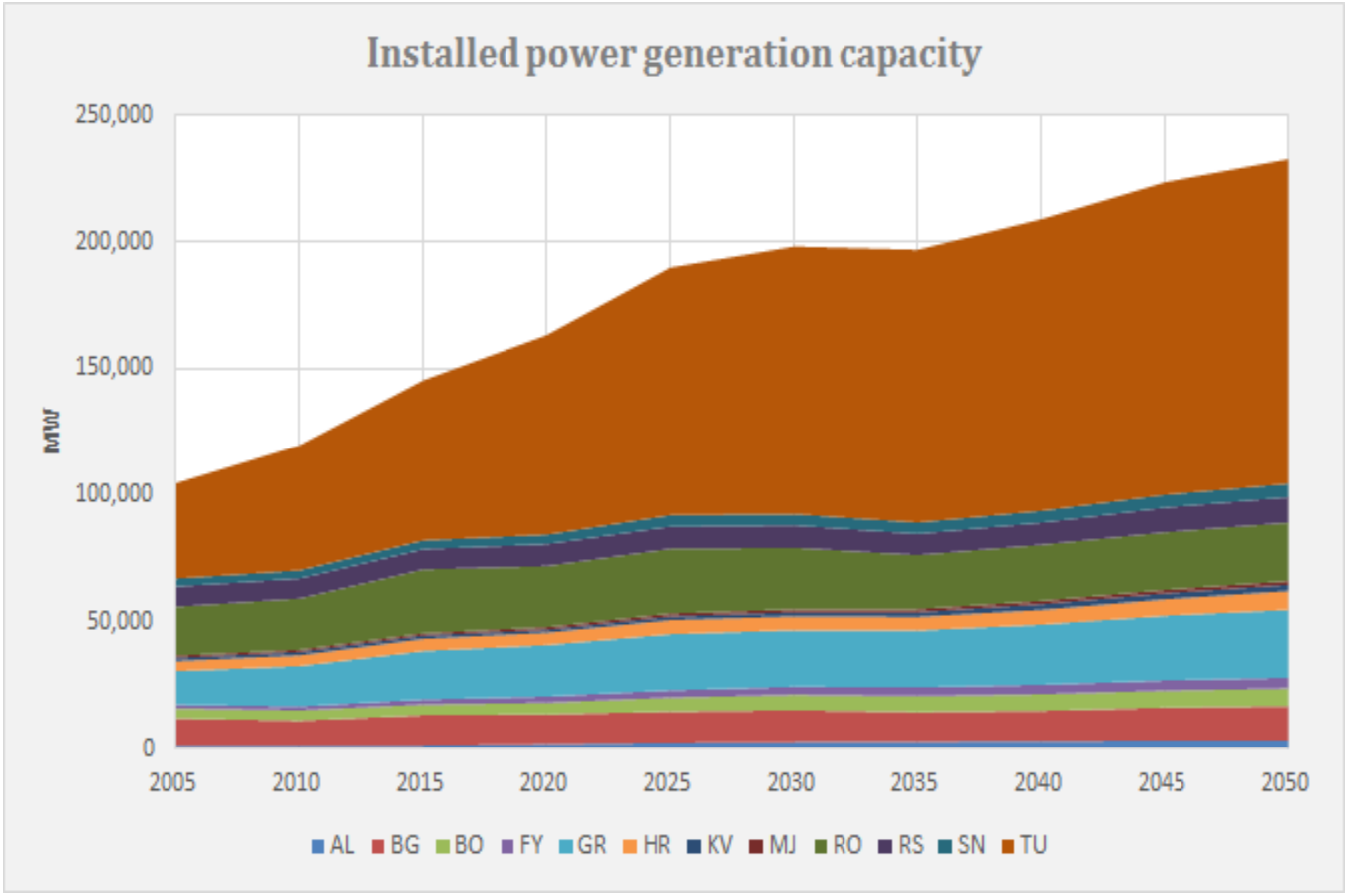
SE Europe: Gross electricity generation, without Turkey (2005-2050)



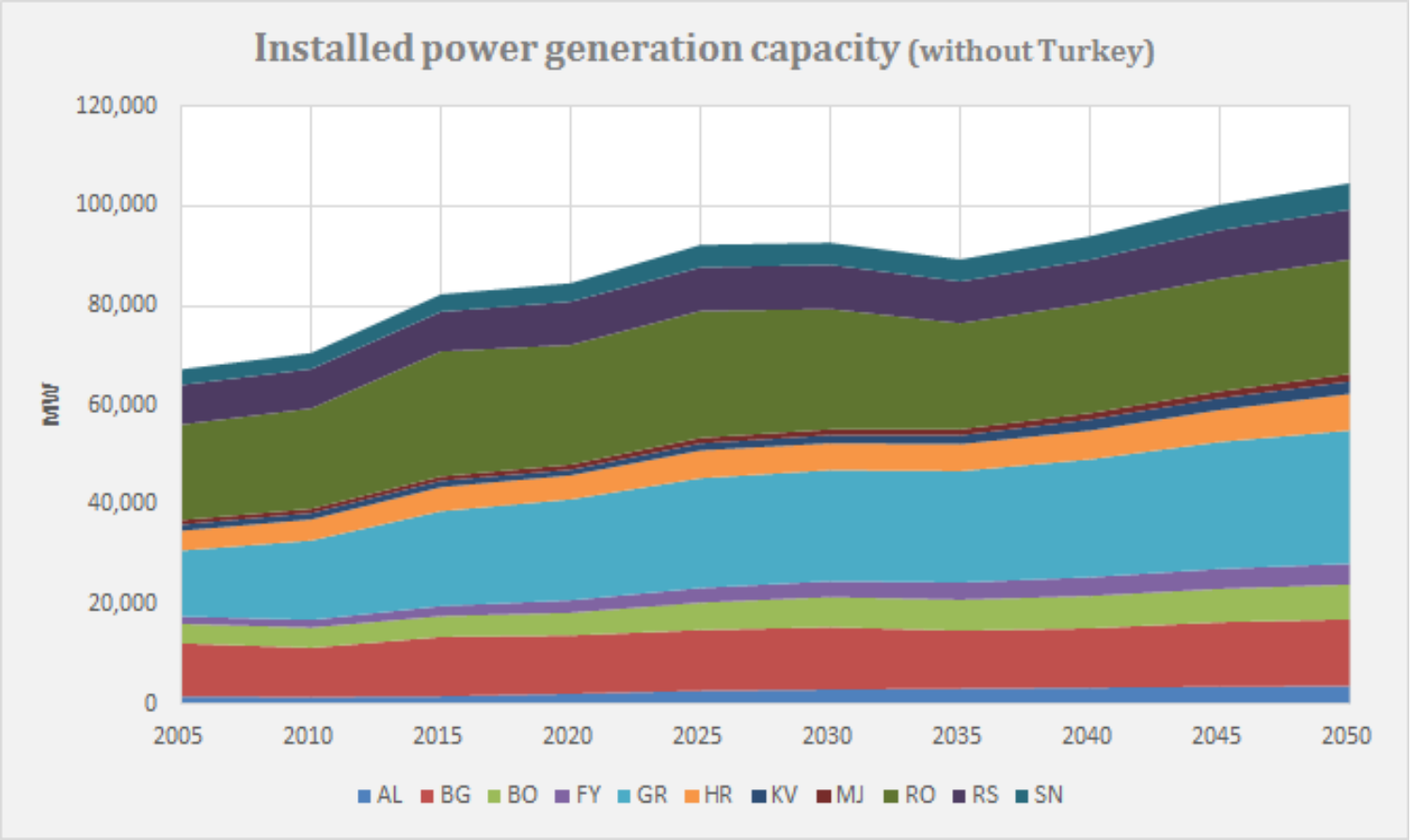
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Installed power generation capacity, including Turkey (2005-2050)



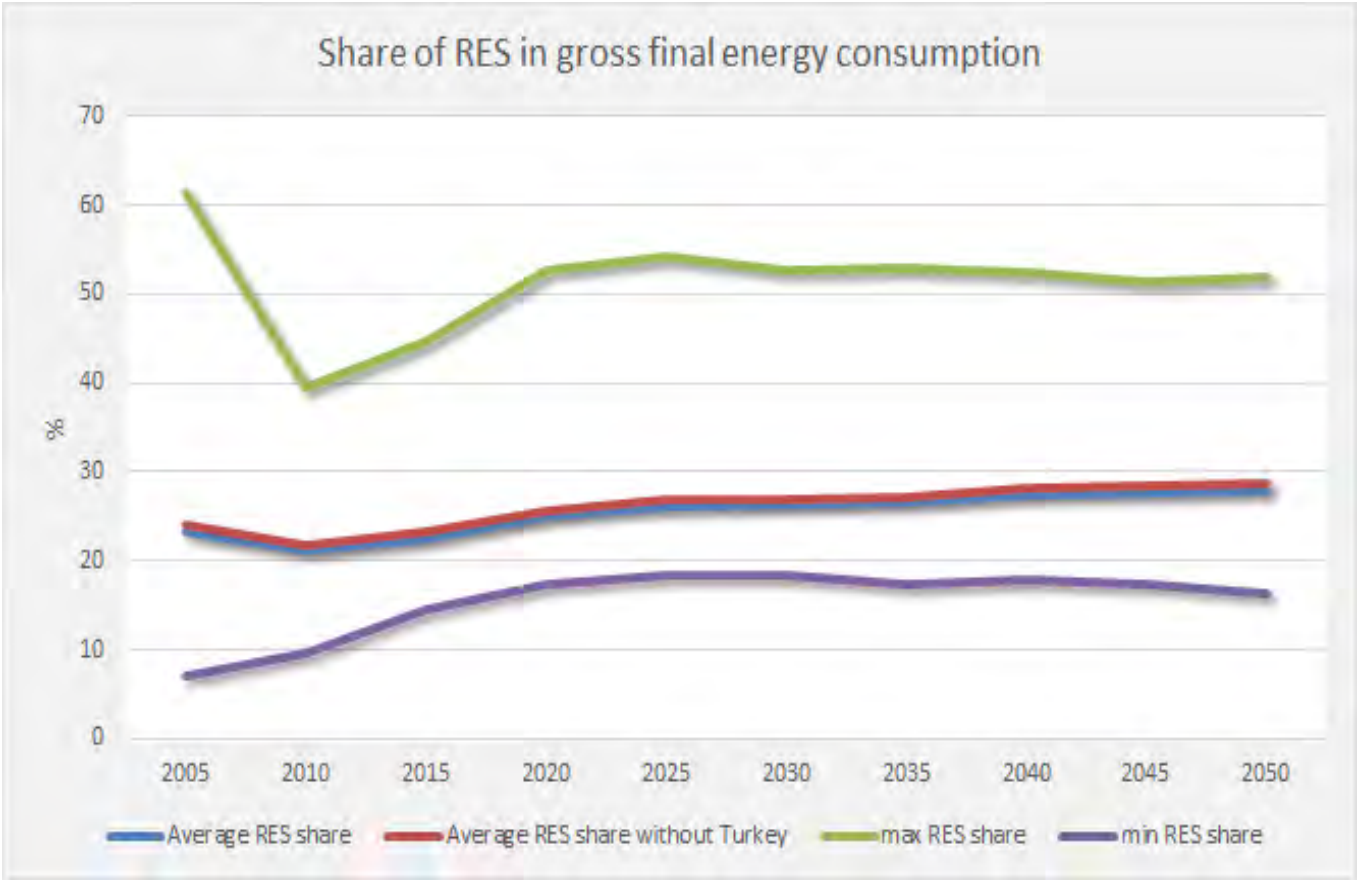
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Installed power generation capacity, without Turkey (2005-2050)



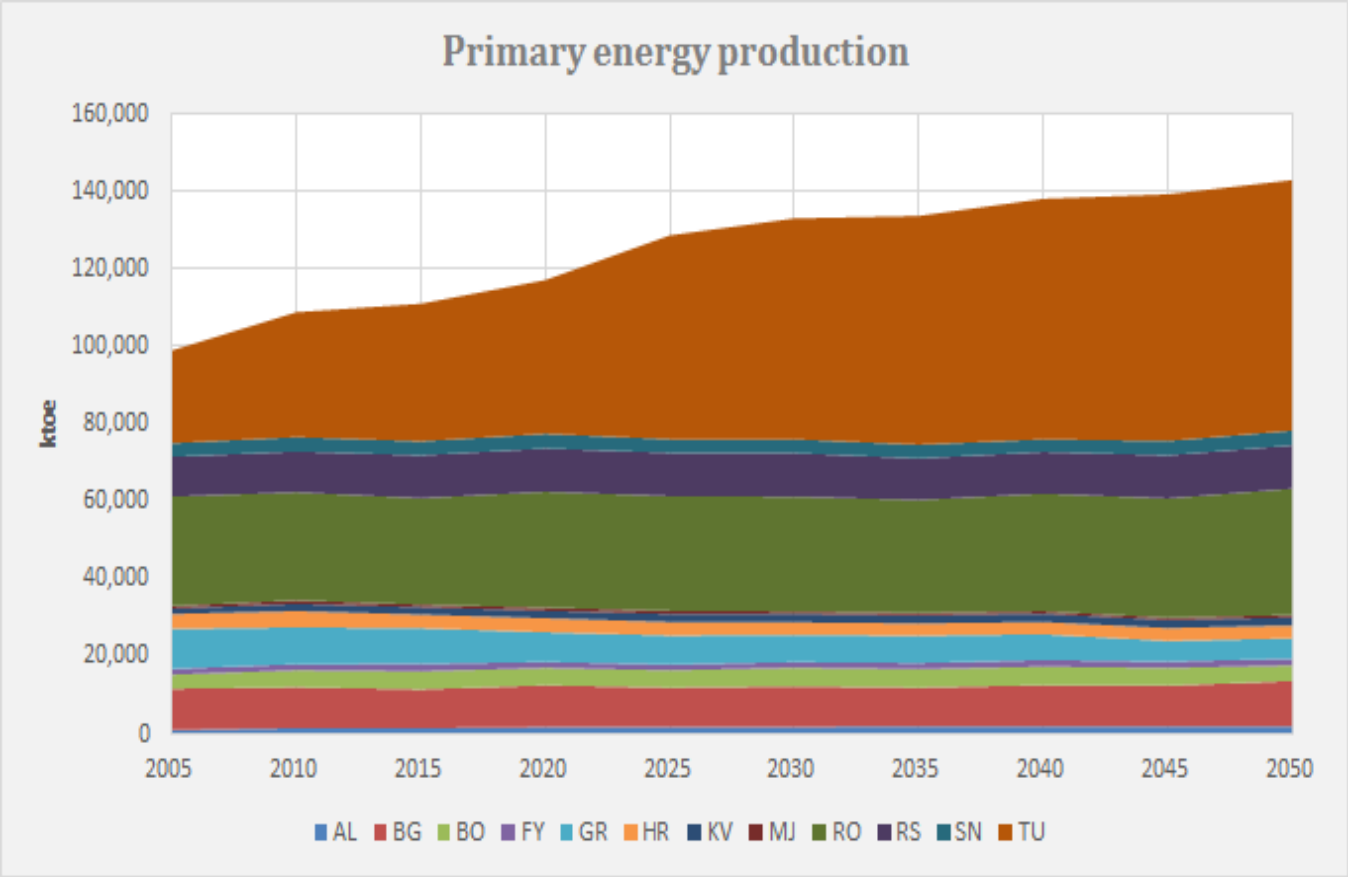
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Share of RES in gross final energy consumption, including Turkey (2005-2050)



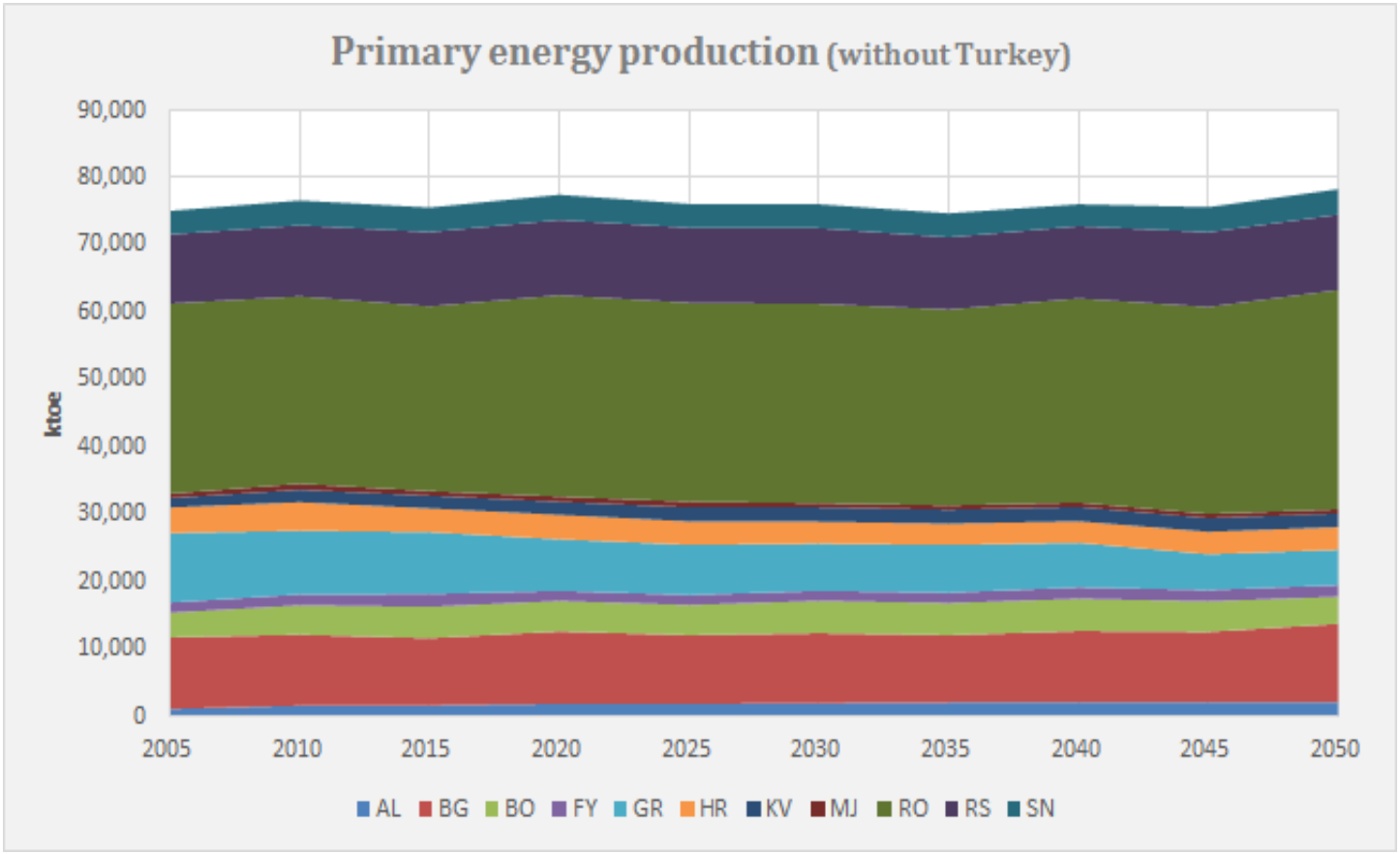
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Primary energy production, including Turkey (2005-2050)



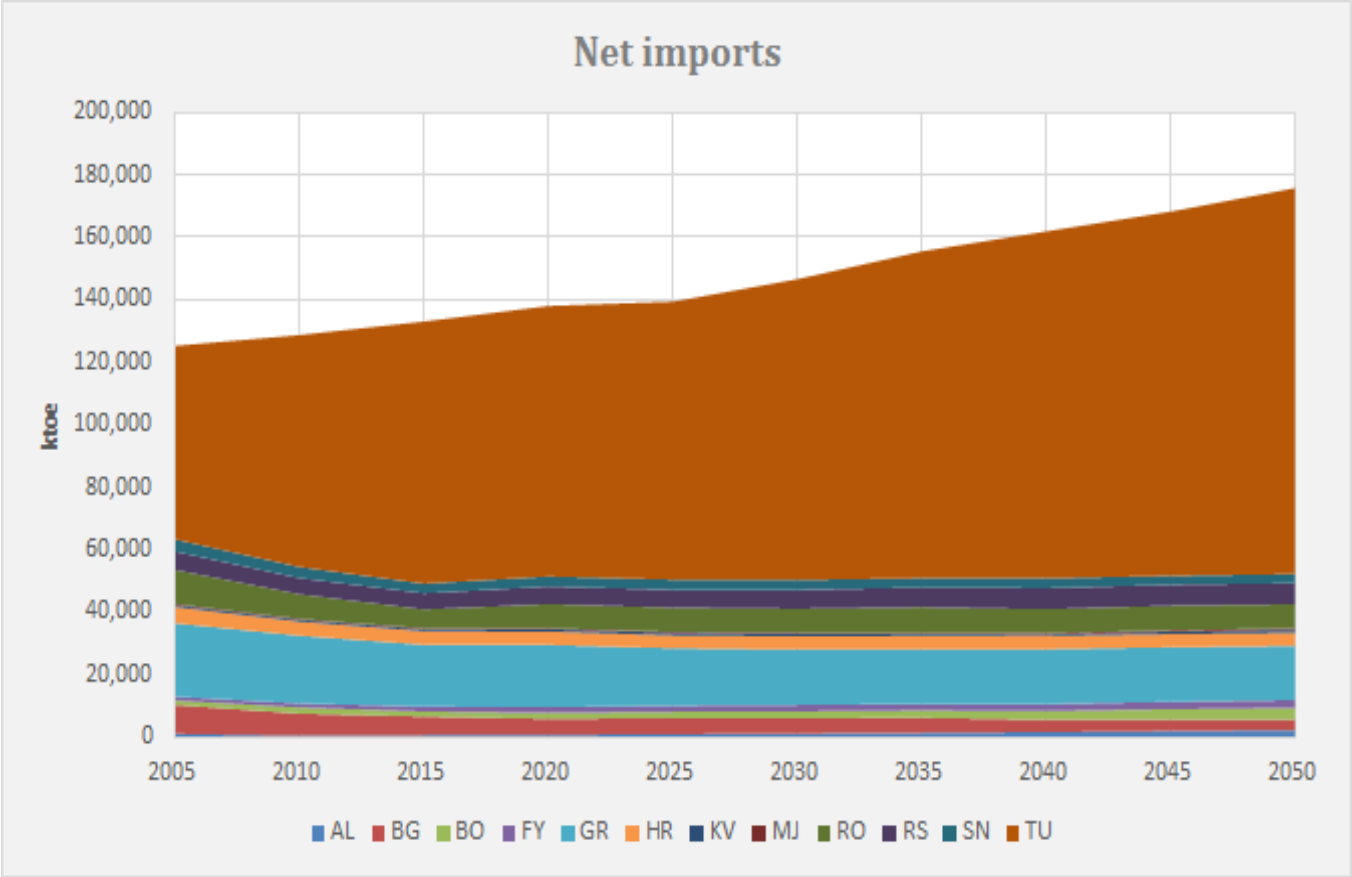
Source: IENE study "South East Europe Energy Outlook 2016", Athens, 2016

SE Europe: Primary energy production, without Turkey (2005-2050)



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

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



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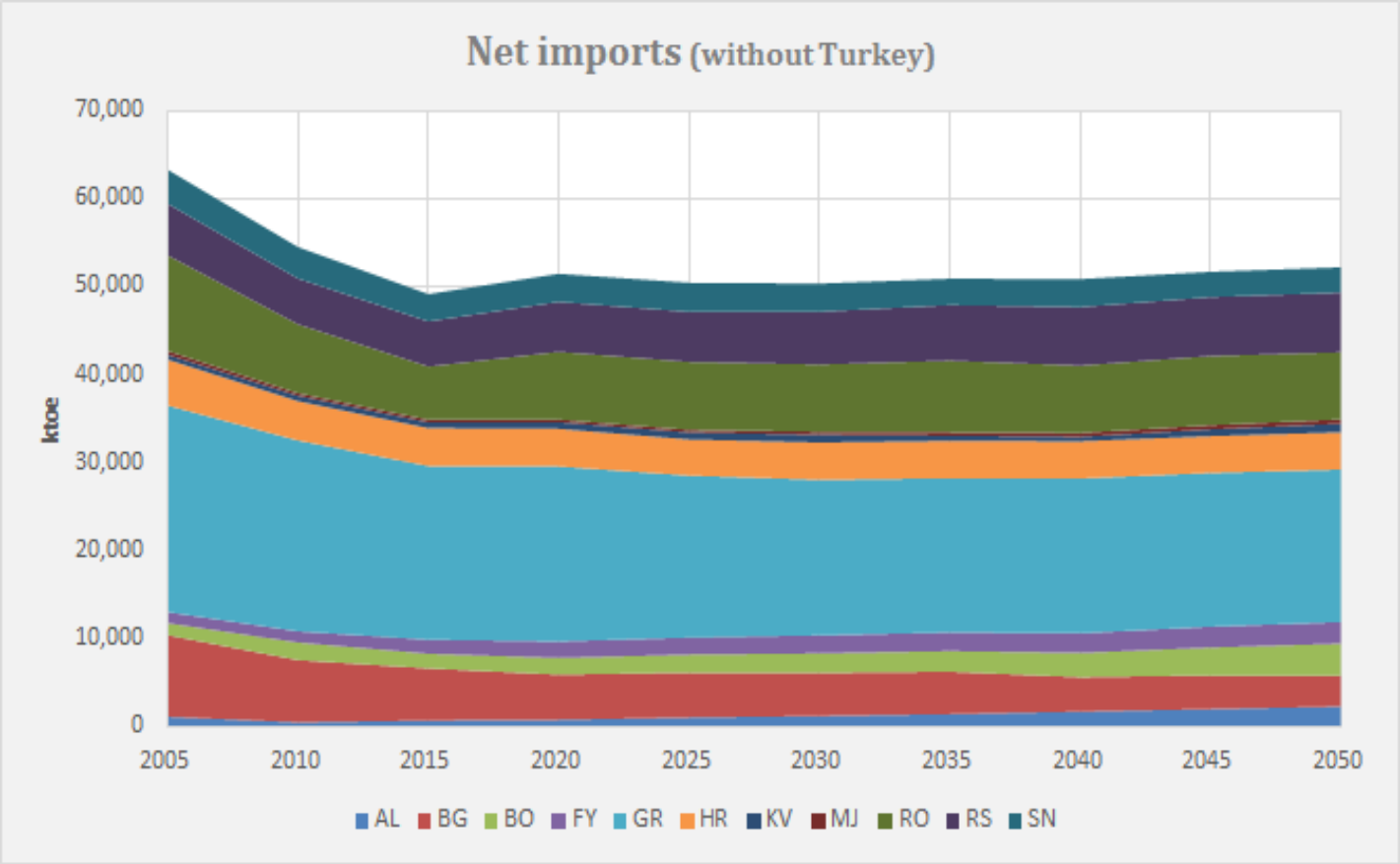
SE Europe: Net imports, without Turkey (2005-2050)



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

9. Energy Investment Outlook 2016-2025 (I)

- 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, we clearly have a multilayered situation as a group of six countries (e.g. 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).

Preliminary Findings of Energy Investment Outlook 2016-2025 per country (II)

SEE Countries	Scenario A: Total Investments (in million euros)	Scenario B: Total Investments (in million euros)
Albania	6,995	7,795
Bosnia & Herzegovina	8,722	10,060
Bulgaria	10,960	12,784
Croatia	8,525	9,178
Cyprus	5,560	6,858
FYROM	5,580	6,831
Greece	17,650	18,446
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	**229,007**	**261,739**

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

Preliminary Findings of Energy Investment Outlook 2016-2025 per sector (IIIa)

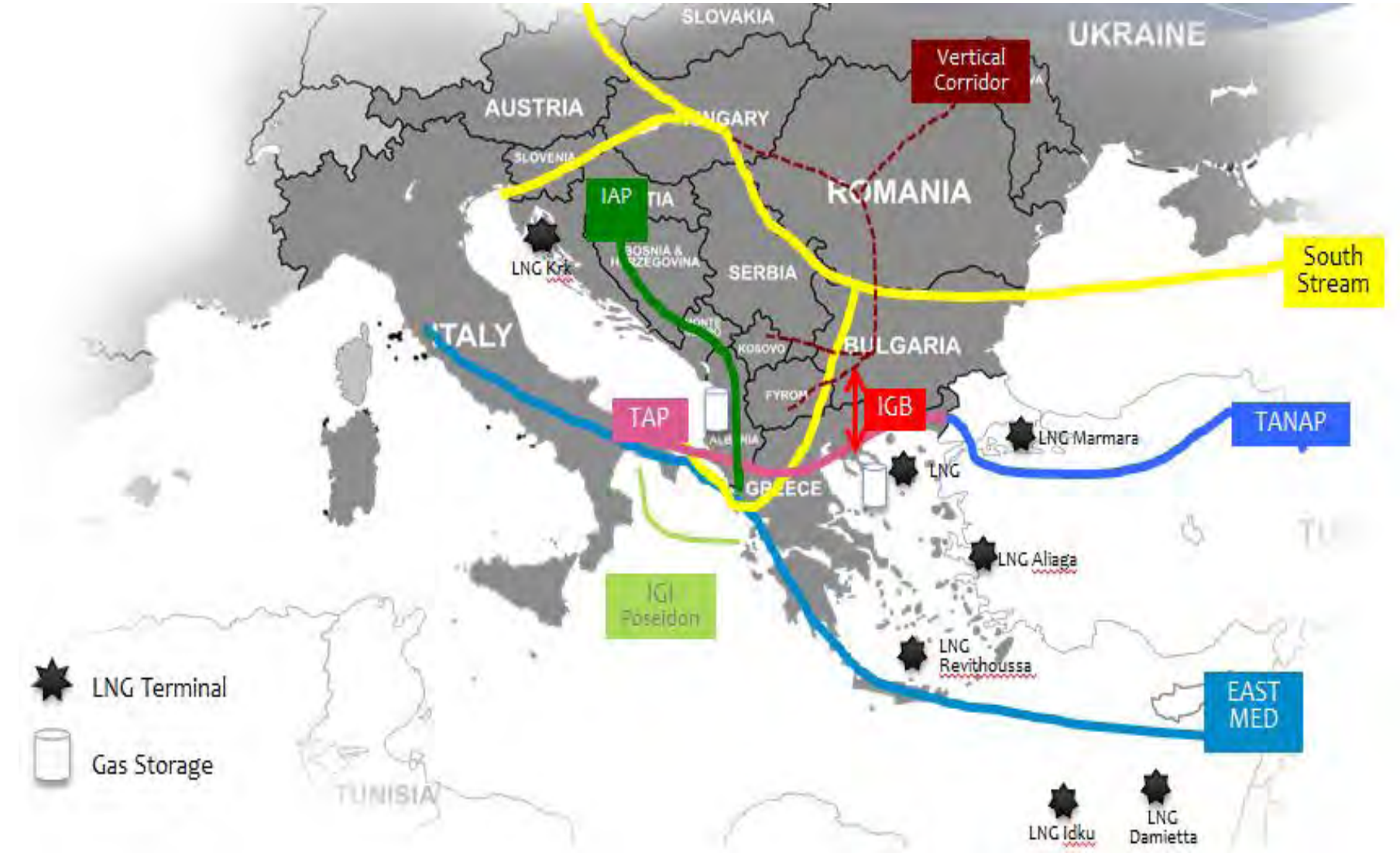
Sector	Total Investment (in million euros)	
	Scenario A	Scenario B
Oil Upstream *(Research, Exploration and Production)*	22,250	28,224
Oil Downstream/Midstream *(incl. liquid biofuels)*	11,845	18,473
Electricity ▪ **Thermal Plants** ▪ **Nuclear Plants** ▪ **Lignite Mine Development** ▪ **Grids - Upgrade and Expansion** ▪ **HV Transmission Lines**	141,418	153,997
Gas ▪ **Main and branch gas pipelines** ▪ **Gas Storage** ▪ **Town grids** ▪ **LNG Terminals and Liquefaction plants**	16,400	18,513

Preliminary Findings of Energy Investment Outlook 2016-2025 per sector (IIIb)

RES *(Wind, PV, Biomass, Mini Hydro, Geothermal)*	37,094	42,532
TOTAL	**229,007**	**261,739**
Intraregional Mega Projects ▪ **Oil Pipelines**	-	1,000
▪ **Gas Pipelines**	33,350	51,361
▪ **Electricity Interconnectors**	4,700	7,150
Grand Total	***267,057***	***321,250***

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

An Expanded South Corridor



10. Key Messages

- Marked divergence between EU and SEE energy strategies
- SEE is more energy security vulnerable than the rest of Europe
- SEE's high hydrocarbon dependence
- Electricity's newcomer gas alters supply balance
- Lack of connectivity prevents gas market development
- The continuing evolvement of SEE's electricity markets helps increase competition
- Coal is and will continue for sometime to be relevant
- SEE's path towards decarbonisation is uncertain
- Nuclear remains a viable option for SEE power generation
- RES' ascendancy secures place in energy mix
- Positive energy investment outlook for SEE

11. Methodology

- **Data Collection**
  - 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, GoGen Europe, EREF). Also from various national statistical organisations and national energy regulatory agencies
  - Contributions by individual energy experts from all different countries of the region focusing on Country Profiles and Sectorial Analysis
- **Analysis**

  Various conventional analytical tools and computer stimulation models are used in analysing quantitative data for macroeconomic and energy demand forecasting. In this respect, IENE is collaborating closely with Professor Pantelis Capros and the EC3 Lab at the National Technical University of Athens (NTUA)
- **Synthesis**

  It is done in-house by IENE's core study team comprising economists, engineers, English language and philosophy majors and experts from all different areas of the energy sector

- The **"SE Europe Energy Outlook 2015-2016"** Study is funded by:

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