

“Oil Refining in SE Europe”

Oil Refining, Storage and Retail in SE Europe

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INSTITUTE OF ENERGY
FOR SOUTH EAST EUROPE



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Description of global refinery capacity (Past)

- **2015** was a year that confirmed the fundamental trends that have beset the global refining industry over the past few years:
 - **non-OECD countries** were again protagonists and it is among these regions that most investments in new refinery capacity are concentrated (about 84%), while a structural crisis persists in the **OECD countries, mostly in Europe**.
 - Although European refining margins increased in 2015 for the first time since 2010, with utilisation rates back to around 83%, compared to 79% in 2014, **many of the problems that afflict the European market remain unsolved**.
 - Since 2008, 24 European refineries have been shut down, equivalent to a loss of more than 2 mb/d of capacity
 - The situation **in the US** is very different, which is expected to **create new capacity by 2020**, where refineries are working at full speed.
 - Investment plans in several **Asian countries** were also revised and timetables were pushed back to after 2019. The same occurred in the countries of the **Middle East**.
- It is worth noting that **the cumulative expansion of the global refining capacities over 2014-2015 approached 3 mb/d to 98.1 mb/d**.

Description of global refinery capacity (Present)

Source	Reference date	mb/d (3)
IEA MTOMR, February 2016 (1)	2015 (2)	97.2
BP Statistical Review, June 2016	2015 (2)	97.2
OPEC World Oil Outlook, November 2016	Jan 2016	97.5
Downstream Business, Hart Energy	Jan 2016	98.0
IHS	Jan 2016	95.9
Oil & Gas Journal, Refinery Survey	Jan 2016	89.5

Notes: (1) Medium-Term Oil Market Report

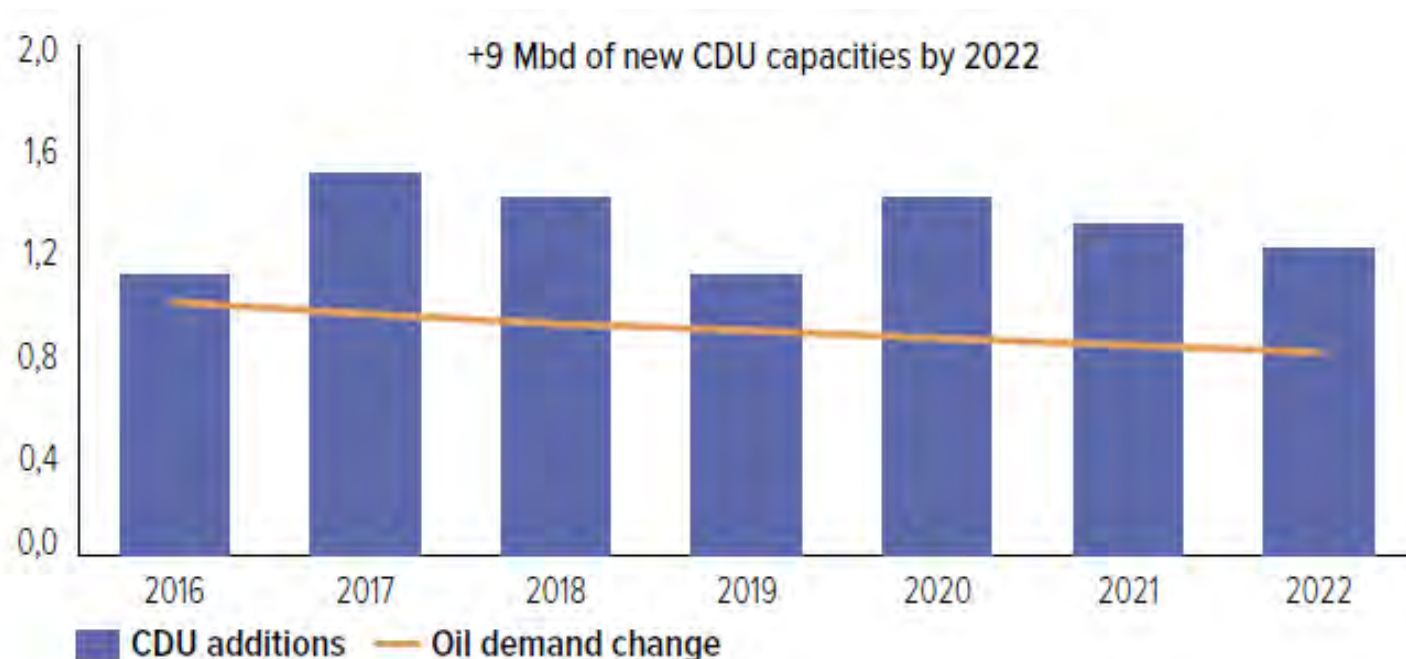
(2) Not stated whether beginning or end of year; presumed end of 2015

(3) Per calendar day

Source: OPEC World Oil Outlook 2016

Description of global refinery capacity (Future)

- Based on estimates of Wood Mackenzie and LUKOIL, **the rate of commissioning of new refining projects will exceed the global oil demand growth over the next five years.**



Source: Oil & Gas Journal, Wood Mackenzie, PJSC LUKOIL

Description of European refinery capacity (Past)

- ❑ **The year 2014 was difficult for the European refining industry.** For instance, UK-based oil refining company Murco Petroleum shut down a refinery in Milford Haven (UK), while Hungarian MOL shut down the Mantova refinery in Italy. **No expansion of capacity was observed in 2014.**
- ❑ By **May 2015**, European crude oil distillation capacity was 14.95 mb/d, which was a sizable decrease from 15.52 mb/d recorded in 2014 and a fall of 1.74 mb/d from 16.69 mb/d reported at the end of 2010.
- ❑ For European refiners, **2015 brought some relief in the form of increased demand for gasoline, but rationalization of capacity continued.**
- ❑ In **2016**, crude throughput in European refineries was down by about 300 kb/d, compared to 2015, when utilization increased by close to 700 kb/d. **This put utilisation above the very low levels of 2014, but accounted for the shift to a more complex marginal configuration and lower margins.**
 - The primary driver of this shift were **imports**. Imports of light product into Europe were up by more than 400 kb/d, with the bulk of the increase coming from the Middle East, a redirection of exports that otherwise would have gone to Asia.

Description of European refinery capacity (Present)

- Nowadays, the European refining sector is characterised by **overcapacity, high OPEX, decreasing supplies of North Sea crudes, underutilization, thin margins, and shifting ownership.**
- With a **crude refining capacity of about 15 mb/d**, the Europe is the world's second largest producer of petroleum products after the US (Europa, 2017).
- Refineries in Europe have been built to **process specific crudes (Brent, Urals, or Middle Eastern), with few plants able to process a broad variety of grades or with the flexibility to exploit market distortions.**
- Northern and Southern European refineries are exposed to different competitive forces:
 - **Southern European refineries** tend to compete directly with the large refineries of the Middle East, while
 - **Northern European refineries** compete with one another and with the refining centers around the Atlantic Basin.
- In Europe, there are **very few oil pipelines** and the most of the oil products move via truck, train, and barge with high transportation costs.

Global oil prices and European refining sector

- Over the last 2 years, developments in the global and regional crude oil markets have reduced the cost of raw material and increased optionality. **International crude oil reference prices fell by more than 50% compared to June 2014 peak.**



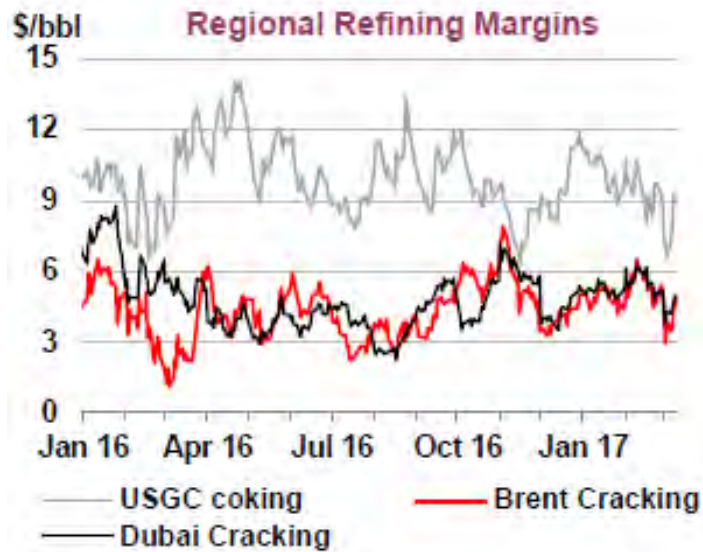
Source: Bloomberg, ICE

European refining margins evolution (I)

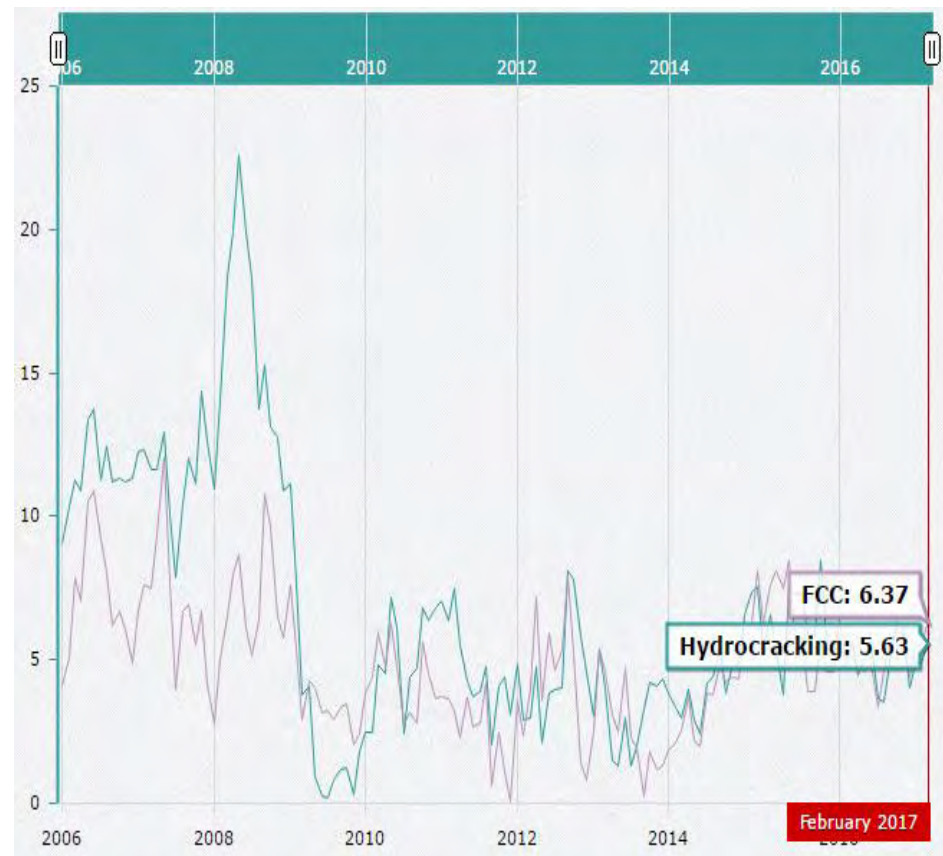
- **European refining margins are affected by global events.**
 - Due to strong demand growth and tight global refining capacity, European margins were robust **during 2004-2008, the so called “golden age of refining”**.
 - The **2008 financial crisis** sharply ended strong margins as global refined product demand rapidly fell. In the aftermath of financial crisis, demand slowly recovered and refining margins improved again until new capacity came online creating excess supply.
 - In **2015**, positive market conditions created momentum for European refining margins through several factors, among others:
 - Low crude oil price
 - Strong global demand for gasoline, particularly in the US and in Asia
 - Solid global demand for naphtha, a feedstock in plastic manufacturing
 - Strong USD/EUR exchange rate
 - The unanticipated rise in refining margins saved several European refineries from closure.
 - However, the refining margins deteriorated once again in **2016**.

European refining margins evolution (II)

- ▣ Chief economist David Fyfe at Gunvor Group, a global commodities trading house in Geneva, recently said that **the refining margins will keep "robust and healthy" for at least the first half of 2017.**



Source: IEA, Oil Market Report, March 15, 2017



Source: HELPE

The SE Europe Area 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

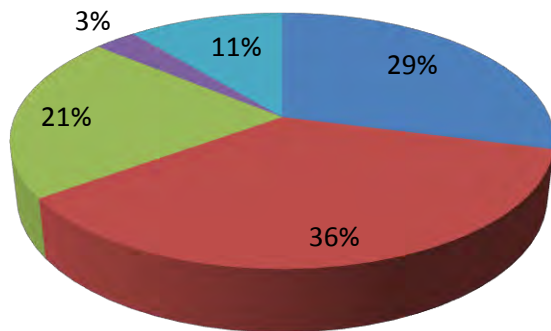


Source: IENE

Energy Mix in SE Europe (Past and Present)

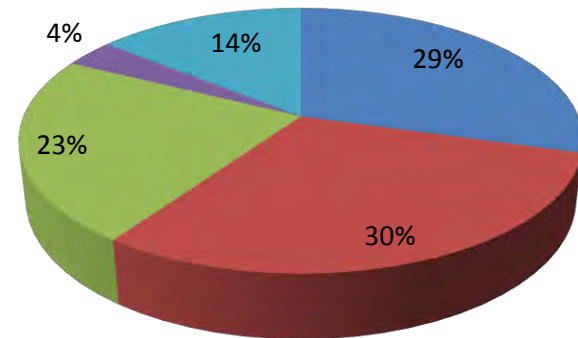
- The region's energy mix, including Turkey, is changing but slowly.
 - There is the same use of coal (lignite), higher penetration of gas, more RES and lesser use of oil in comparison between 2005 and 2015.

Energy Mix (%), including Turkey (2005)



■ Solids ■ Oil ■ Natural gas ■ Nuclear ■ Renewable energy forms

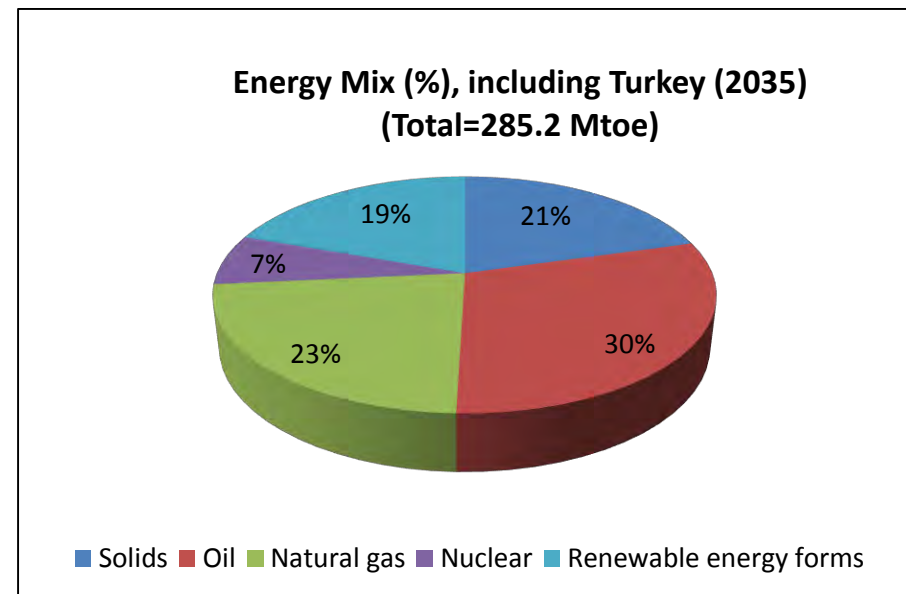
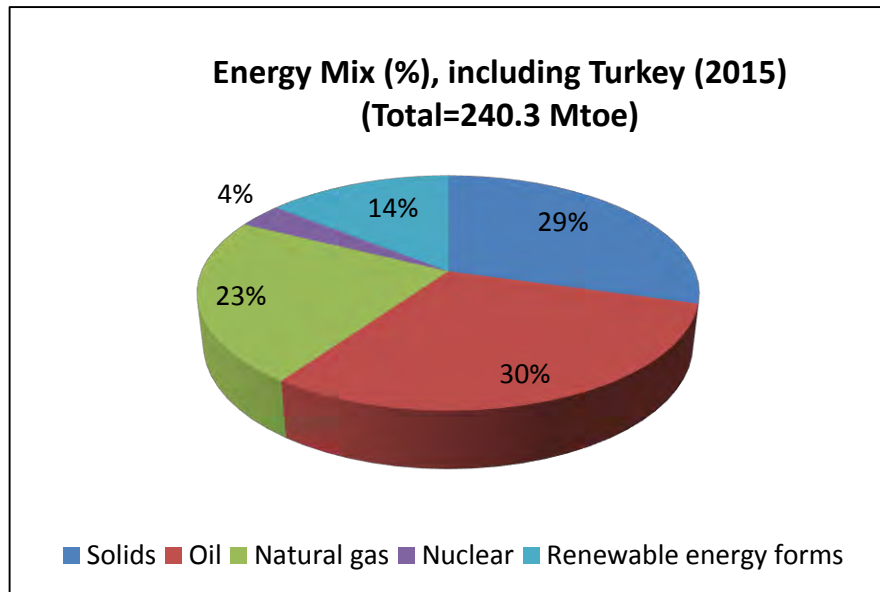
Energy Mix (%), including Turkey (2015)



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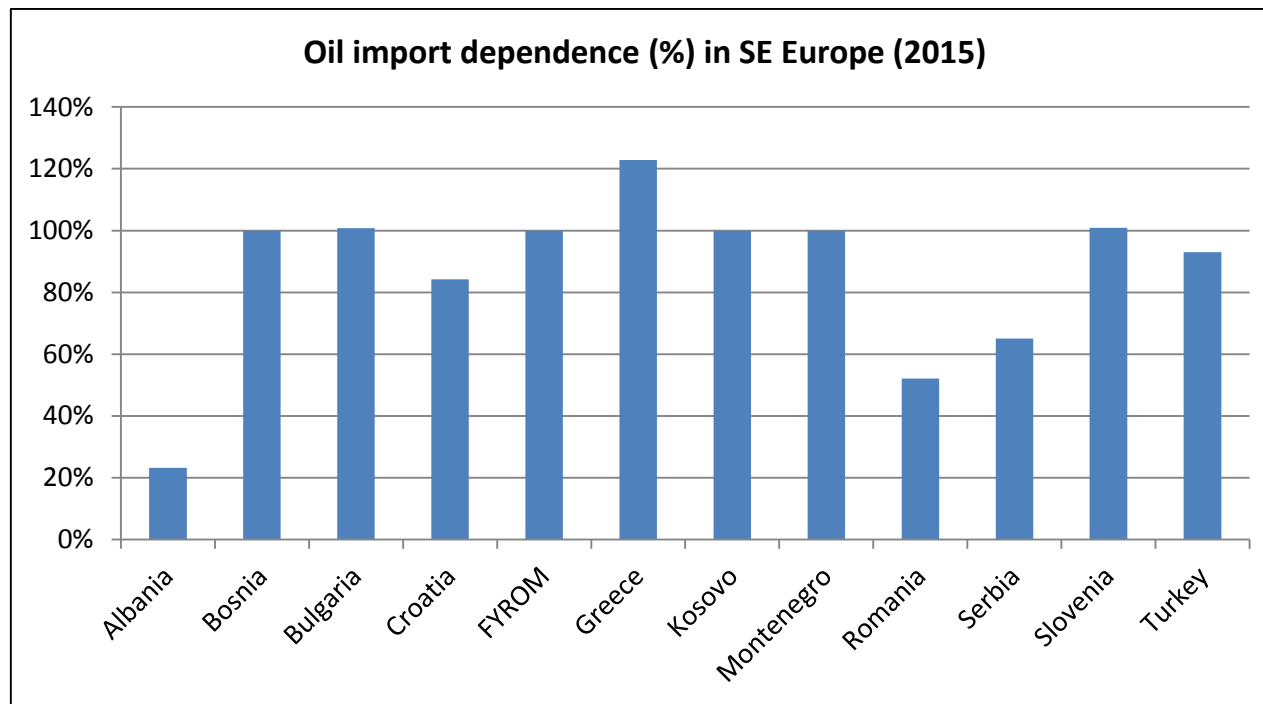
Energy Mix in SE Europe (Present and Future)

- 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.



Crude oil and petroleum products in SE Europe

- SE European countries have very **limited oil supplies** and are largely **net importers of crude oil**. Only 20% of the oil refined in SE European refineries comes from oil fields within the region. This reliance on oil imports is primarily blamed on depletion of existing oil fields and few opportunities for new exploration.



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

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

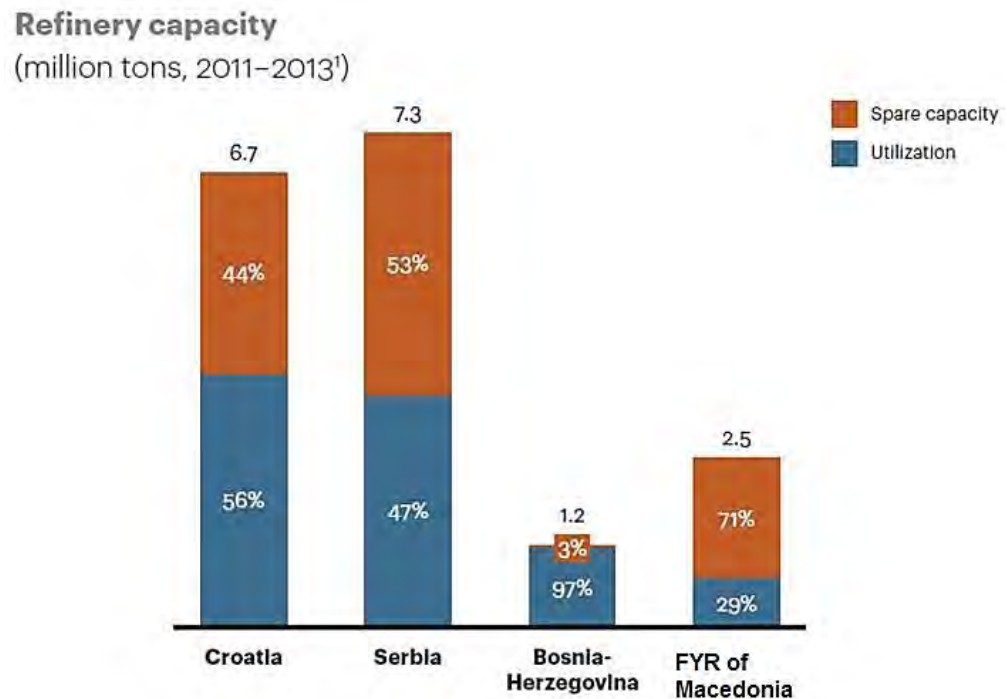
Primary Oil Production and Consumption in SE Europe (2014)

Country	Oil Production (b/d)	Oil Consumption (b/d)
Albania	21,100	24,000
Bosnia and Herzegovina	0,00	33,000
Bulgaria	3,600	90,000
Croatia	18,000	76,000
Cyprus	0,00	53,000
FYR of Macedonia	0,00	18,000
Greece	1,900	285,300
Montenegro	0,00	6,100
Romania	103,000	187,200
Serbia	20,560	76,000
Kosovo	0,00	12,000
Turkey	61,000	719,270
Total	229,160	1,579,870

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

The Refining Sector in SE Europe (I)

- ▣ The **SE European refineries are mostly underutilized**, with the exception of Bosnia. Increasing refinery throughput is difficult as only a small part of the region's crude is directed to petroleum products. Most processed crude goes into gasoline and heating oil derivatives, with the market for these products limited in both size and margins.



The Refining Sector in SE Europe (II)

- ❑ **Operational efficiencies in refineries in the West Balkans are also lacking.** SEE refineries generally have inadequate capabilities in global crude trading and rely heavily on Middle East and Russian oil. These refineries produce limited amounts of value-added petrochemical and lubricant products and do not have the advanced equipment to be found in refineries in neighbouring EU countries.
- ❑ These findings suggest that **within the next 3-5 years, the bulk of the region's major refineries will need to change their operating models, undergo regional consolidation or close down.**

The Refining Sector in SE Europe (III)

- In SE Europe, the refining picture appears to be totally different, compared to the main European refinery scene, with **new units opening up** and plans under way to **revamp and upgrade old installations**, but also expand refining capacity in green-field sites. For instance:
 - Lukoil upgraded its **Bulgarian** refinery in Burgas in 2014 by adding a catalytic cracker
 - NIS in **Serbia** completed in 2016 additional modernisation works at its refinery in the northern town of Pancevo in order to increase further the production of the highest-quality Euro 5 diesel
 - In **Turkey**, a 10 mtpa brand new refinery at the Petkim Aliaga complex near Izmir, known as STAR oil refinery, is currently under construction by Socar/Turcas and it will be operational in 2018
 - In **Albania**, a new refinery for crude oil processing, with a producing capacity of 600 mtpd, is planned in Balldren area of Elbasan city
 - In **Croatia**, INA signed a deal with Spain's Tecnicas Reunidas on the front end engineering design (FEED) for a residue upgrade unit planned at the company's Rijeka-based oil refinery
 - In **Romania**, OMV Petrom announced in February 2017 that it will invest €60 million in a new unit at Petrobrazi refinery, based on polyfuels technology. The new unit, which is expected to become fully operational in 2019, allows the conversion of LPG components into gasoline and middle distillates using a catalytic process

Refineries in SE Europe and their capacity

Country		Refinery	Company	current CDU cap. (kbpd)	current CDU cap. (Mt/y)
Albania	1	Ballsh Refinery	ARMO	20	1.0
Albania	2	Fier Refinery	ARMO	10	0.5
Bosnia & Herzegovina	1	Bosanski Brod	Zarubezhneft	80	1.5
Bosnia & Herzegovina	2	Modrica	NeftegazInKor (75.65%), Nestro Petrol	-	-
Bulgaria	1	Burgas	Lukoil	175	9.5
Croatia	1	Rijeka	INA	90	4.5
Croatia	2	Sisak	INA	85	2.2
FYROM	1	OKTA Skopje	Hellenic Petroleum	50	2.5
Greece	1	Aspropyrgos	Hellenic Petroleum	148	7.5
Greece	2	Elefsis	Hellenic Petroleum	100	5.0
Greece	3	Thessaloniki	Hellenic Petroleum	93	4.5
Greece	4	Corinth	Motor Oil Hellas	180	9.0
Romania	1	Ploiesti	Lukoil	50	2.4
Romania	2	Petrobrazii Ploiesti	OMV (Petrom)	90	4.5
Romania	3	Vega Ploiesti	Rompetrol	20	1.0
Romania	4	Petromidia Constanța / Midia	Rompetrol	100	4.8
Serbia	1	Pancevo	NIS (56% Gazprom)	103	4.8
Serbia	2	Novisad	NIS (56% Gazprom)	52	2.6
Turkey	1	Izmir	Tupras	221	11.0
Turkey	2	Izmit	Tupras	221	11.0
Turkey	3	Kirikkale	Tupras	100	5.0
Turkey	4	Batman	Tupras	22	1.1
Turkey	5	Star Refinery (under construction)	SOCAR/TURCAS	214	10.0

Location of refineries in SE Europe



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

Refinery capacity in selected peripheral countries

- According to the BP Statistical Review of World Energy (June 2016),
 - ❖ *Central Europe*
 - In 2015, **Hungary** had a refinery capacity of **165 kb/d**, a 0.2% share of global total
 - ❖ *South Europe*
 - In 2015, **Italy** had a refinery capacity of **1,915 kb/d**, a 2.0% share of global total
 - ❖ *Africa*
 - In 2015, **Egypt** had a refinery capacity of **840 kb/d**, a 0.9% share of global total
 - ❖ *Middle East*
 - In 2015, **Israel** had a refinery capacity of **301 kb/d**, a 0.3% share of global total

Discussion (+)

- Refining in SE Europe has to be viewed in **broader context**, if we are to understand market sentiment, but also see where things are heading to.
- Refinery operators in SE Europe can access and secure better, more cost-effective crude supplies by **improving their trading capabilities and forming international partnerships or joint ventures**.
- Operators need a **stronger focus on their main priorities** (i.e. advanced refining equipment, investment planning and realization) in order to develop smarter investment strategies.
 - For instance, Slovenia, without a domestic refining capacity, relies heavily on maritime imports of fuel from multinational oil traders. Croatia's refinery operates at 50 to 60% of capacity. One option is for Slovenia and Croatia to pursue cross-border collaboration, and integrate their supply chains, allowing Slovenia to secure some of Croatia's spare refining capacity. Another option is to consolidate within and across borders.

Discussion (+)

- European refining still has a **potential for optimization**.

- **Oil refining sector is crucial to the EU economy.** Fuels Europe, the voice of the European petroleum refining industry, refers that:
 - European refineries create €23 billion a year of value added to local and national economies, and downstream businesses employ 640,000 people.
 - Every year, the EU refining industry contributes €270 billion to the EU economy in excise duties and taxes collected by each country.

- Given the intense competition within the global petroleum product markets, the situation in the European refining industry will in many ways depend on the EU energy policy.

Discussion (-)

- However, **high energy, labor and legislation compliance costs, lower complexity and utilization rates and more expensive feedstock** contribute to the **refinery closure risk in SE Europe**
 - The risk is exacerbated by strong competition from Russia, the Caspian Sea and the Middle East where refineries are located in proximity to crude oil (and gas) production, with much larger economies of scale and access to waterborne transport as well as higher density of demand.
- **Gas competes with petroleum products in transport and stationary use.**
 - In stationary use, gas mostly competes with heavy fuel oil and gas mostly wins due to environmental impacts and the price of heavy fuel oil. Traditional consumers of heavy fuel oil (industry, waterborne transport, district heating) are all switching to gas or RES.
- Thus, refineries in SEE region are under pressure to **decrease the volume of oil residuals in production**. That is feasible by conventional means:
 - increased complexity of refineries
 - increased depth of refining and
 - the use of heavy fuel oil for self-steam and power generation
- **These options are costly.** Over the last few years, all operational refineries emerged as gas consumers.

Discussion (-)

- All oil refineries in SE Europe (with the possible exception of Burgas in Bulgaria) are much **too small to afford complex solutions to gasification of heavy fuel oil, hydrodesulphurization and competitive power and steam generation.**
 - The LUKOIL-operated refinery in **Romania** is experimenting with combustion of residuals in a modern fluidized bed boiler, but steam and power efficiencies are well below international market standards.
 - Refineries in **Romania, Serbia and Croatia** are supported by low royalties for domestic oil and gas production that is effectively a cross subsidy to refining and marketing of liquid fuels.
- It seems that the **combined impacts of gas competition, RES and competition of imported oil products are going to push the majority of regional refineries out of business.**
- Due to oversupply of refinery capacity, many European refineries are **closed, sold or converted into storage facilities.**

SE Europe Energy Outlook 2016-2017: Raison d' Être

- (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 **provide** an outlook for energy supply/demand, consumption and energy mix in the region, covering oil (**including oil refining, storage and retail in SE Europe**), gas, electricity (including solid fuels and nuclear), energy efficiency, co-generation, renewable energy sources.
- (d) 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 East Europe Energy Outlook

2016/7



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