

# Lessons Learned and Experiences Gained from Decarbonisation Policies in SE Europe

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A Presentation by **Mr. Costis Stambolis**



INSTITUTE OF ENERGY  
FOR SOUTH EAST EUROPE



## Presentation Outline

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3. Introductory Remarks
4. SE Europe's Energy Mix, With and Without Türkiye
5. SE Europe's Power Generation Mix, With and Without Türkiye
6. Total Installed RES Capacity by Country in SE Europe
7. Renewable Electricity Generation Capacity in SE Europe
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## Raison d' Être

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### ❑ Why a regional approach?

- ✓ Because SE Europe, on the strength of its history, cultural background and current urban and industrial setting, constitutes a region both geographically and geopolitically and it has a strong impact on the rest of Europe and the East Med (see Energy Security).
- ✓ The need to **understand** the geopolitical and geographical sphere within which IENE operates, but also to **define** and **evaluate** in an objective manner the major policy challenges of the energy sector of the region.
- ✓ To **study, analyse** and **understand** the region's energy market structure and associated energy flows.
- ✓ To **identify** the important investment and business opportunities across the SE European area and assess the region's energy related investment potential within the given business climate.
- ✓ It is considered as an Energy Atlas of the region: An in-depth study of the energy prospects and perspectives of a particular geographic region, such as SE Europe, has an impressive cumulative effect, as the **sum often exceeds the value of its constituent parts**. Very much along the lines of Aristotle's logic when he proclaimed the "*The whole is greater than the parts*".

# The SE European Region as Defined by IENE

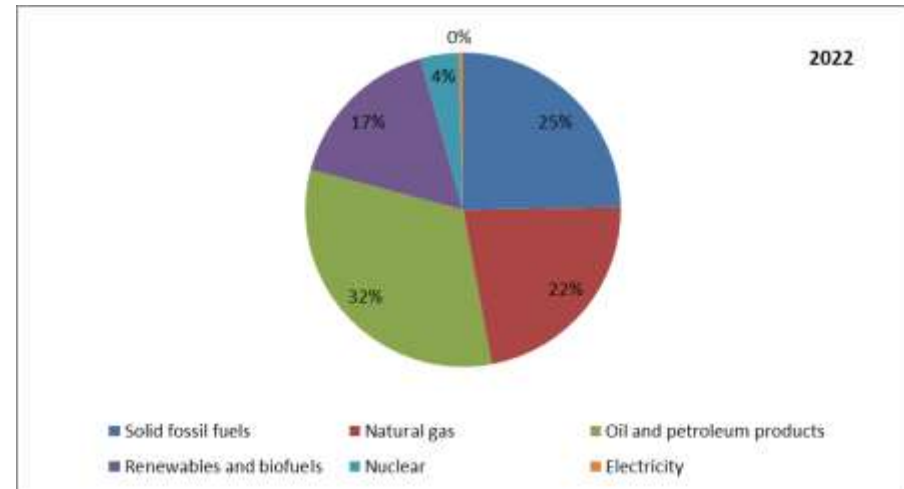
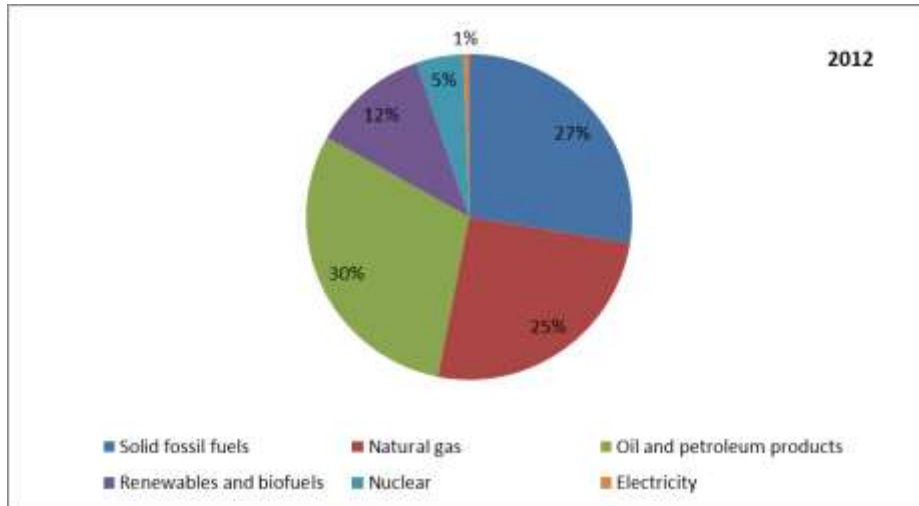


## Introductory Remarks (I)

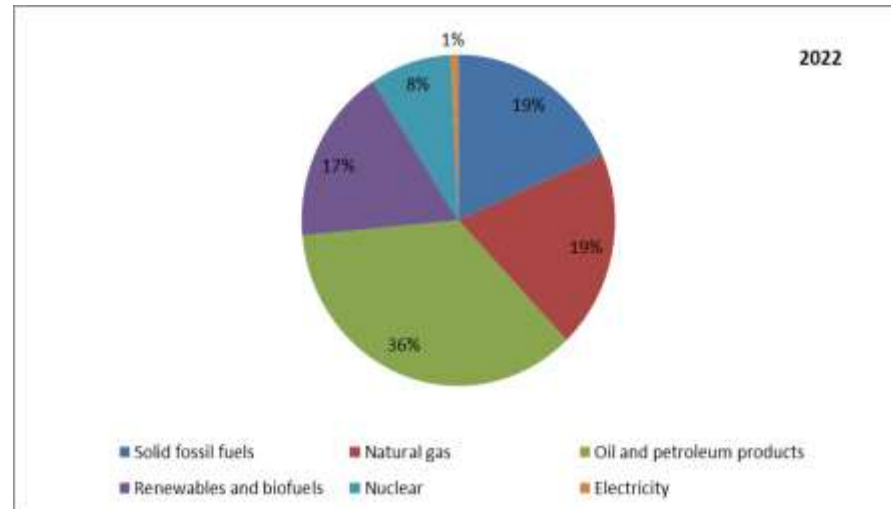
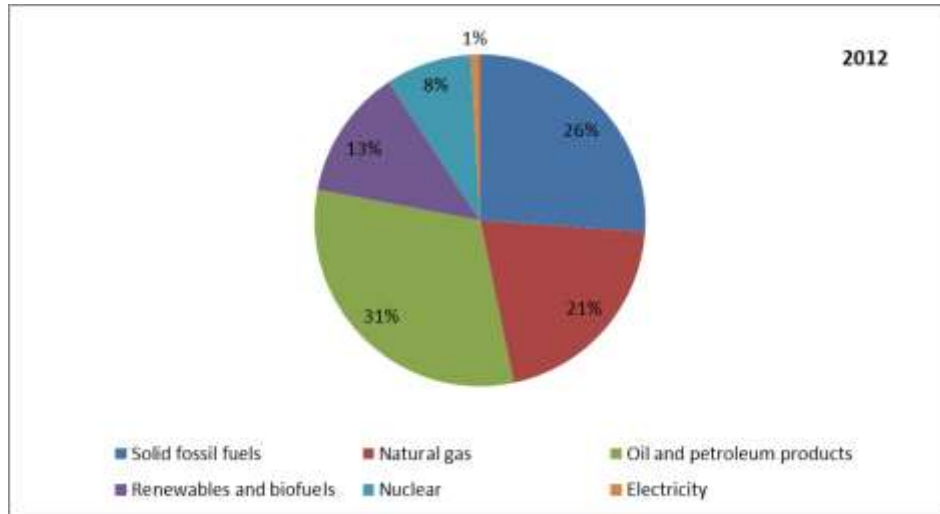
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- ❑ As our part of the world is caught in the grip of a major geopolitical crisis - the war in Ukraine and the Israel-Iran conflict and their broader implications - South East Europe is fast gaining higher strategic importance.
- ❑ Energy security has emerged once again as a critical factor which can affect the uninterrupted, adequate and competitively supply of key fuels, i.e. oil, gas, electricity, in all countries in the region.
- ❑ With energy markets becoming more and more interdependent, as the almost daily cross border energy flows clearly show, it is important to understand the structure and functioning of the energy sector on a regional basis. Hence, our Institute's regional approach.
- ❑ Although the region has supposedly entered a decarbonisation mode, in line with EU's energy transition targets, there is only small differentiation of the overall energy mix over the last 15 years or so.
- ❑ Looking at the energy mix, we observe that contribution of solid fuels has dropped slightly by 2.0%, natural gas has also less participation by 3.0%, oil petroleum products have in fact increased their participation by 2.0%, RES have increased their input by 5.0%, nuclear is contributing 1.0% less and electricity (thanks to increased cross border trade) has decreased its presence by 1.0%.
- ❑ Overall, fossil fuels have decreased their participation in the regional energy mix only by 3.0% in ten years, from 2012 to 2022 (from 82.0% to 79.0%)

# SE Europe's Energy Mix, Including Türkiye, 2012 and 2022 - High Oil and Gas Import Dependence



# SE Europe's Energy Mix, Without Türkiye, 2012 and 2022



## Introductory Remarks (II)

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- ❑ We observe much greater change when it comes to power generation as solid fuels have decreased their input by 5.0%, gas has declined its share by 8.0%, oil products have decreased by 1.0%, nuclear has lost share by 1.0% and Renewables are the clear winners as they have increased their share by 15.0% corresponding to 39.0% of power generation.
- ❑ A number of countries are leading SE Europe in this electricity transformation and these include Türkiye, Romania, Greece and Bulgaria. Admittedly, there is growing interest now from most countries in the region, including Serbia, for a much faster penetration of RES in their power generation mix and the whole scene could be a lot different by 2030.
- ❑ As RES penetration is growing in all countries in the region, a number of problems are surfacing, including curtailment of RES generated electricity, due to a mismatch of demand and supply, lack of storage and poorly managed electricity grids which need serious upgrading and the introduction of modern load management tools, including power electronics.
- ❑ A general observation at this stage is that although the power generation mix of the region is changing fast the overall energy mix, i.e. primary energy production and final energy consumption, is changing very slowly at an almost glacial pace. This is unlikely to change any time soon as the system's demand characteristics are not affected that easily - largely dominated by energy demand for transportation, industry and buildings (see IENE's energy demand scenarios further down the presentation).
- ❑ Obtaining and improving energy security, which will remain a prime concern for all countries in the region, will depend on the rational management of existing and future resources, the securing of base load systems, the wide use of energy efficiency and the attainment of an optimum balance between conventional and new/clean energy sources.

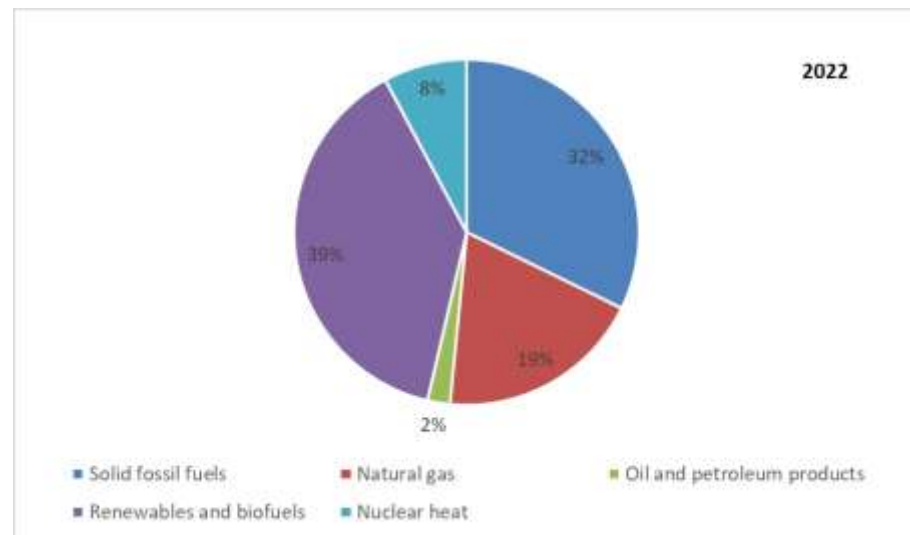
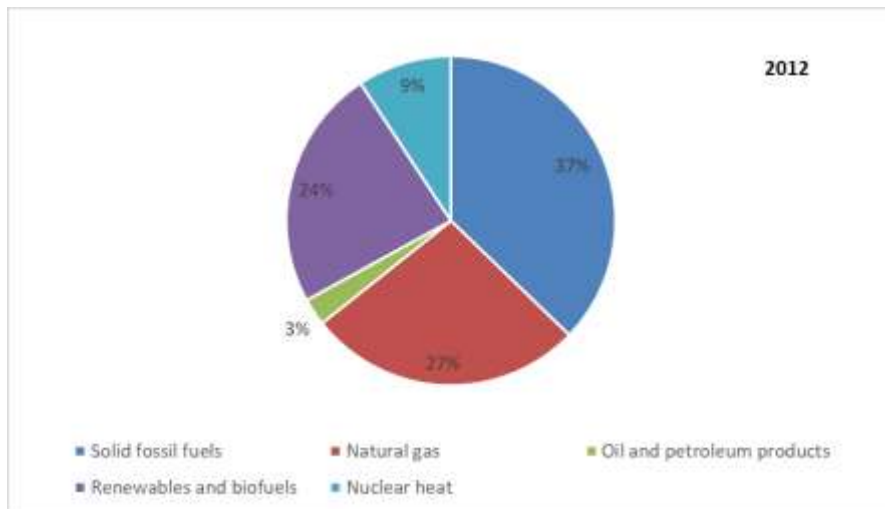


## The Important Role of Türkiye

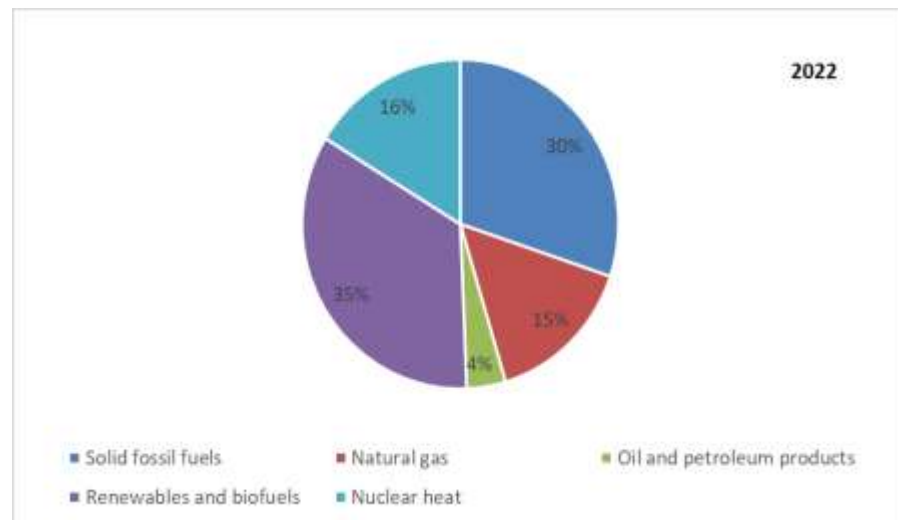
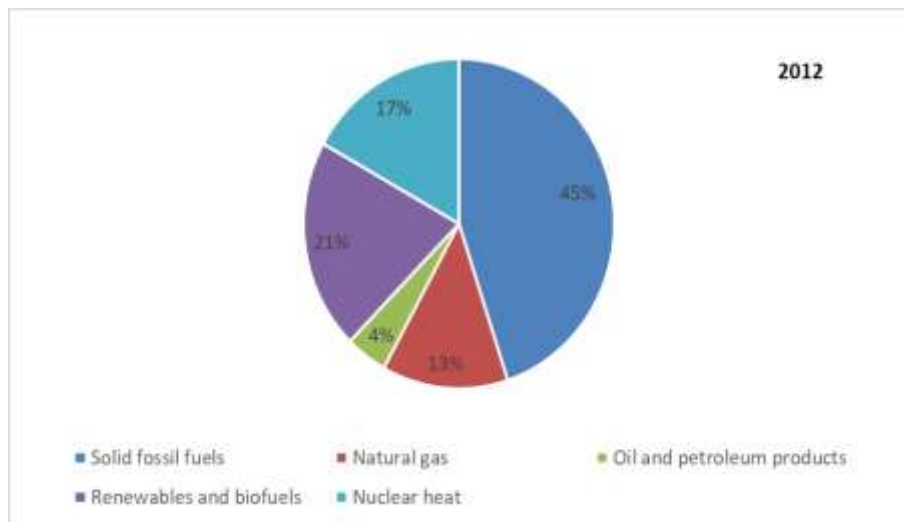
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- ❑ The energy mix for SE Europe as a whole for 2012 and 2022, with and without Türkiye, was presented in the above slides. In our various calculations, a distinction is made as to Türkiye's participation (with and without Türkiye) as the country's size and energy magnitudes are significant in comparison with those of other countries in the region and therefore if seen together with the East and West Balkan region, they tend to distort the overall picture.
- ❑ Drawing comparisons between the energy mixes in SE Europe between 2012 and 2022, either with or without Türkiye, we are forced to admit that there appears to be a strong inertia with regard to change as oil and solid fuels appear to maintain their dominant position throughout the 10-year period.
- ❑ Including Türkiye, solid fuels in SE Europe still correspond to a very strong 25% of gross inland consumption in 2022, as compared to 27% in 2012. Similarly with oil, their use has increased by 2% between 2012 and 2022. Whereas in the case without Türkiye, solid fuels' use has shrunk from 26% in 2012 to 19% in 2022. A logical sequence following EU's strong decarbonisation drive and the imposition of emission costs for coal and lignite power generation.
- ❑ But in the case of oil consumption with the bulk of it used for transportation, and the lack of alternatives, the picture appears almost static. So, in the case of "with Türkiye", oil use corresponded to 30% in 2012, which had increased to 32% in 2022. Whereas in the case of "without Türkiye", the inertia with regard to oil use is even stronger since in 2012 oil consumption corresponded to 31% with this number rising to 36% 10 years later.

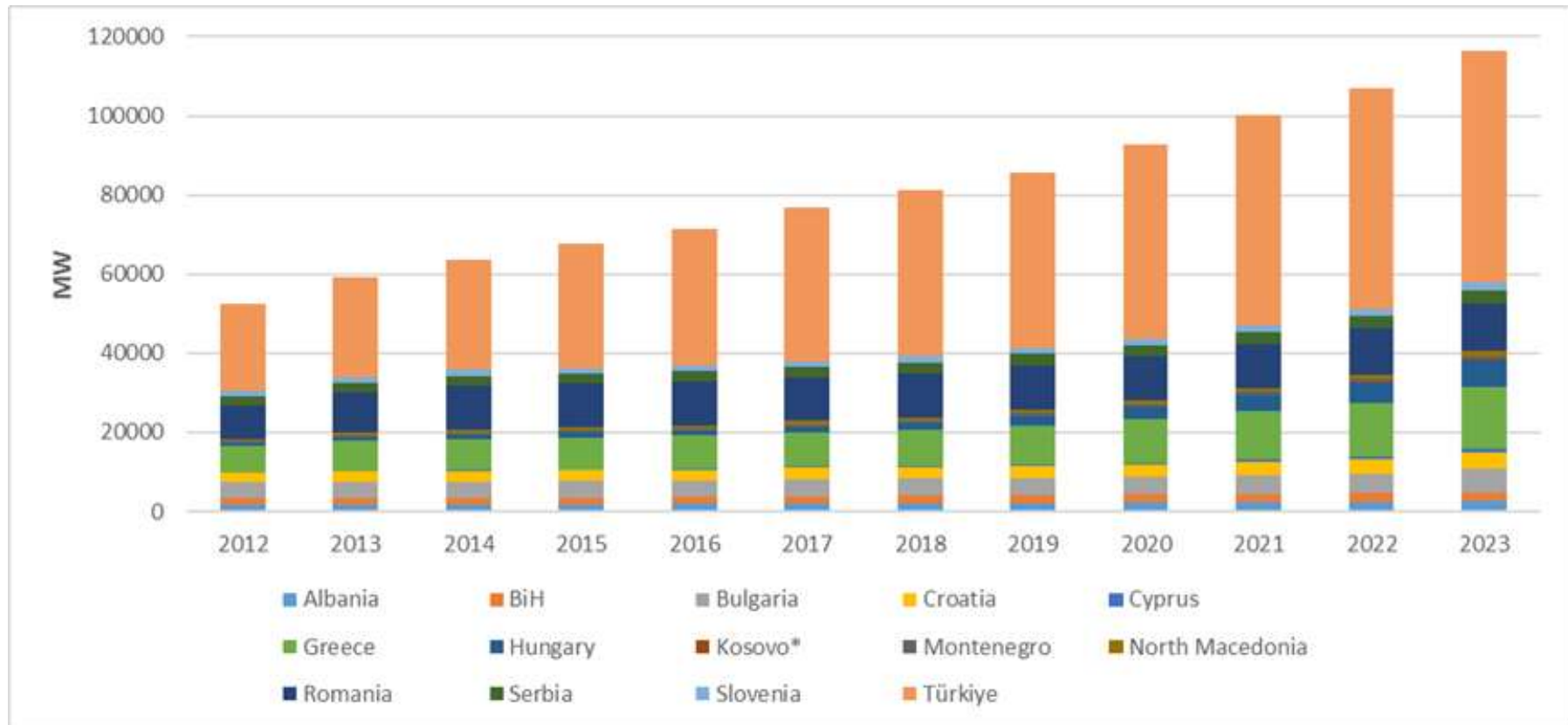
# SE Europe's Power Generation Mix, Including Türkiye, 2012 and 2022



# SE Europe's Power Generation Mix, Without Türkiye, 2012 and 2022



## Total Installed RES Capacity (MW) by Country in SE Europe, 2012-2023

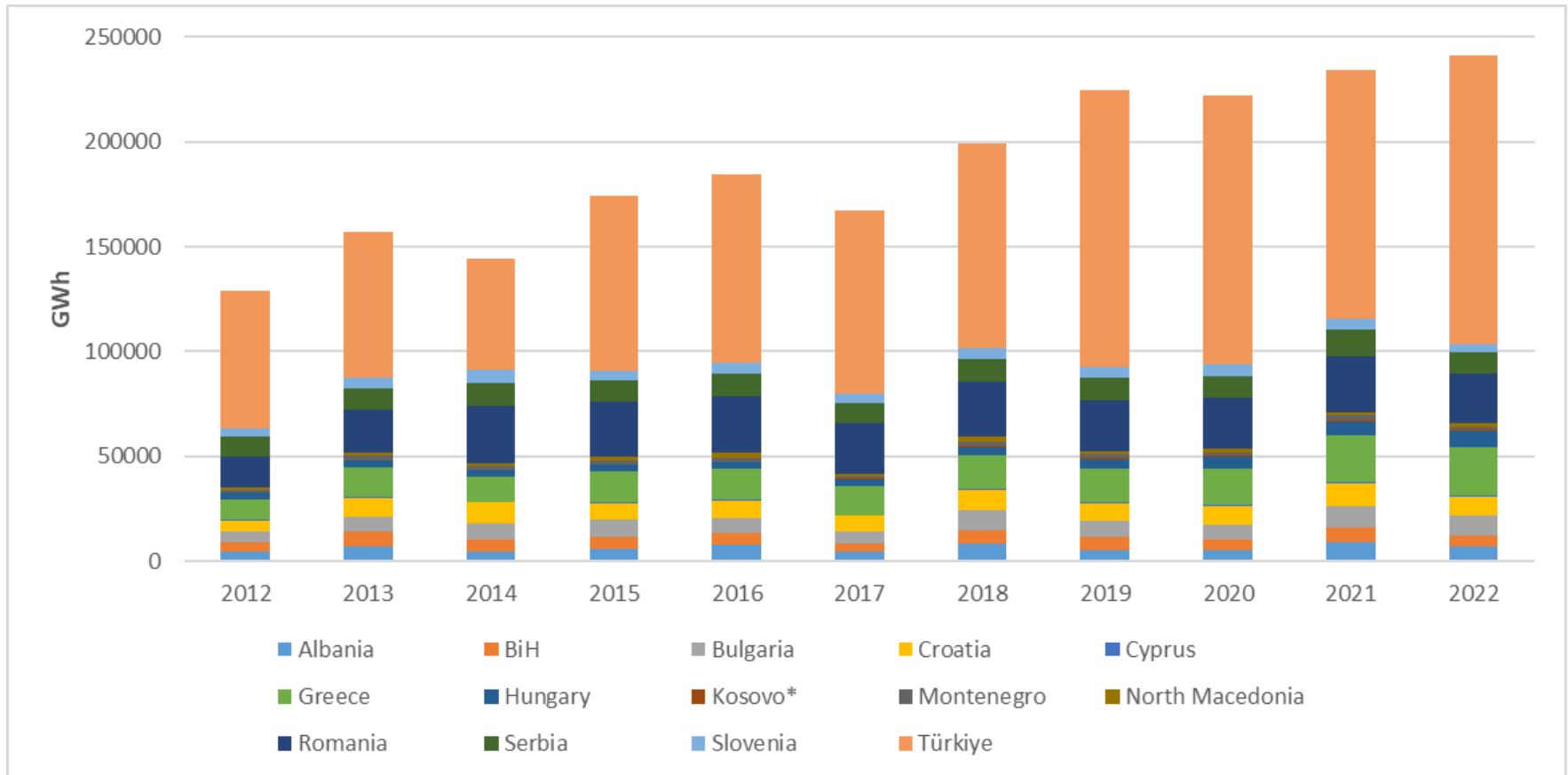


Source: IRENA

## Renewable Electricity Generation Capacity (MW) in SE Europe, 2023

	Hydro	Wind	Solar	Bioenergy	Geothermal	Total
Albania	2493		163	1		<b>2657</b>
Bosnia and Herzegovina	2258	135	132	11		<b>2536</b>
Bulgaria	3390	702	2937	50		<b>7079</b>
Croatia	2206	1143	461	161	10	<b>3981</b>
Cyprus	3427	158	606	14		<b>4205</b>
Greece	3427	5220	7030	128		<b>15805</b>
Hungary	60	324	5835	534	3	<b>6756</b>
Kosovo	110	137	20			<b>267</b>
Montenegro	697	118	42			<b>857</b>
North Macedonia	696	110	535	14		<b>1355</b>
Romania	6666	3087	1917	185		<b>11855</b>
Serbia	3108	511	137	39		<b>3795</b>
Slovenia	1342	3	1034	96		<b>2475</b>
Türkiye	31779	11697	11293	2001	1691	<b>58461</b>
<b>Total</b>	<b>61659</b>	<b>23345</b>	<b>32142</b>	<b>3234</b>	<b>1704</b>	<b>122084</b>

## Renewable Electricity Generation (GWh) in SE Europe, 2012-2022



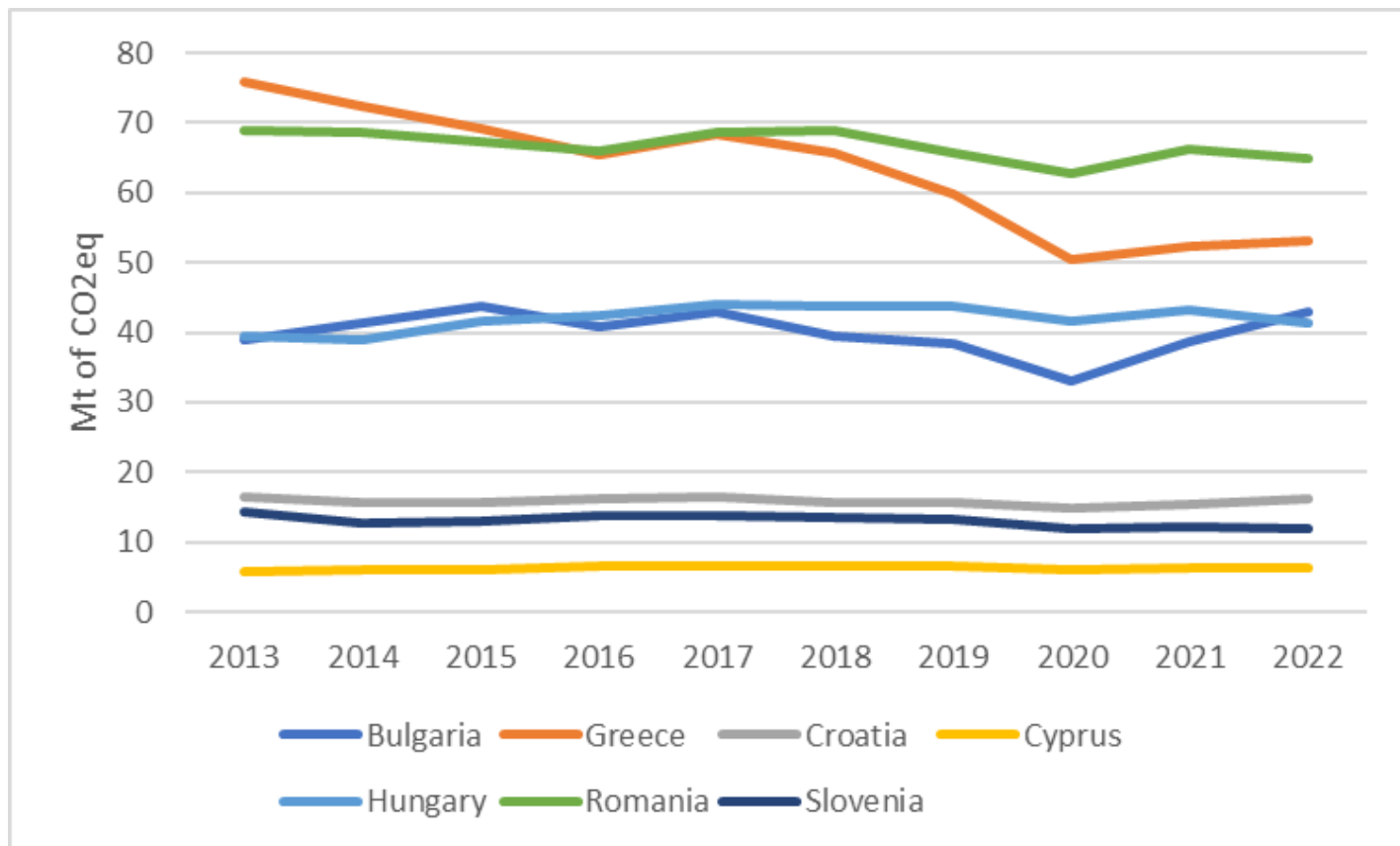
Source: IRENA

## What is the Impact From the Increased Penetration of RES in the Electricity Mix

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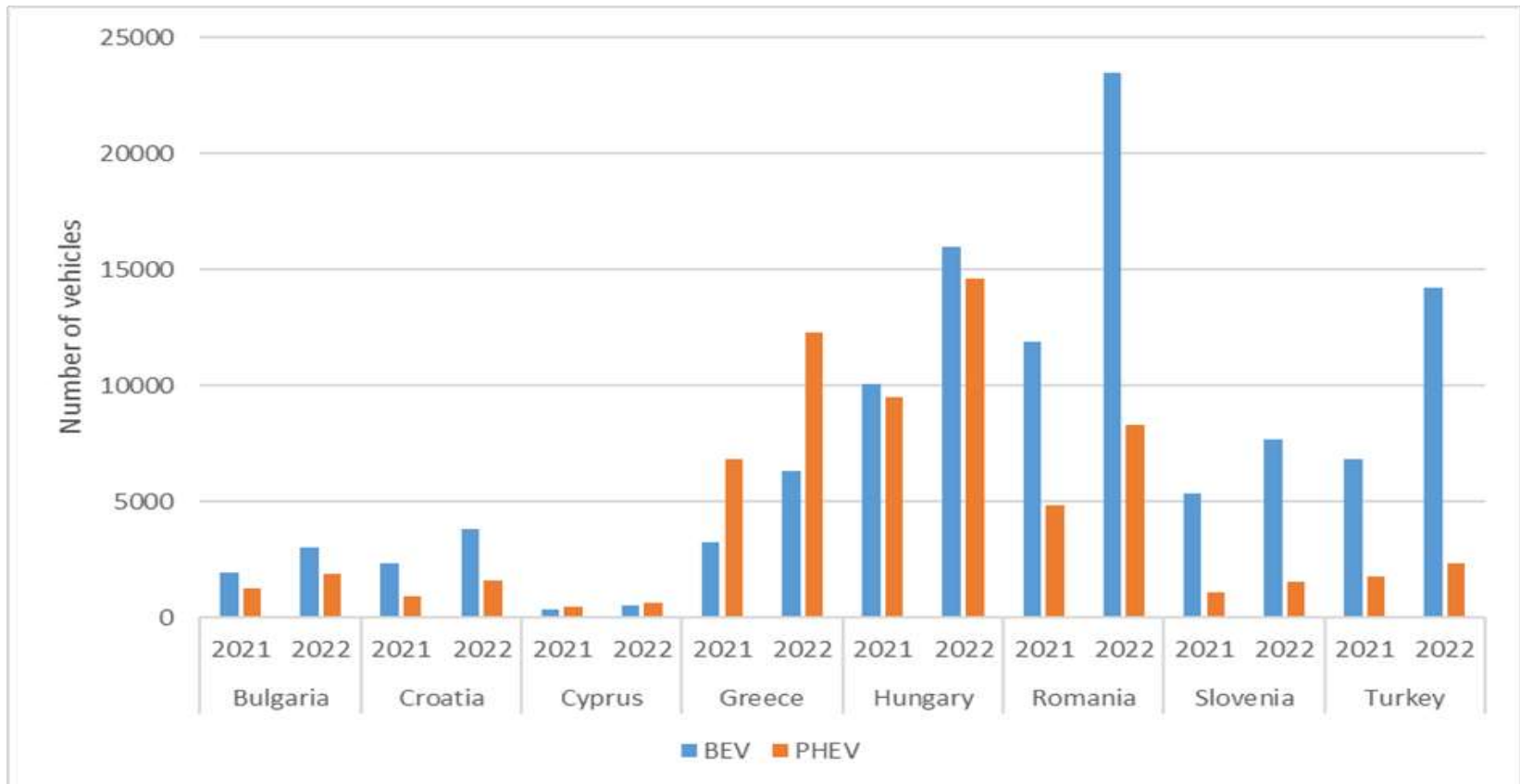
- ❑ Over the last 15 years or so, we have seen a significant rise in the installed capacity of RES installations in almost all countries in the region.
- ❑ From less than 45 GW in 2010, these have now reached near 125 GW with corresponding high electricity generation outputs.
- ❑ Some countries, especially Greece (50%), Romania (35%), Bulgaria (17%) and Türkiye (41%), already cover a substantial part of their electricity mix with Renewables.
- ❑ However, the rapid rise of RES share has led to serious curtailments in some countries of RES input into the electricity grid, which TSOs re-obliged to implement in order to safeguard the stability of the system.
- ❑ Also, the much-increased share of RES in the electricity mix has not resulted in substantial CO<sub>2</sub> reductions, as latest figures show. This is understandable since electricity still corresponds to a small share of the overall gross or final energy use.
- ❑ Furthermore, and contrary to popular belief, the increased use of RES has not led to much-reduced electricity prices which are determined by the Target Model and which continue to fluctuate widely very much depending on gas prices and CO<sub>2</sub> emission costs.

## CO2 Emissions from Energy Activities in Selected SE European Countries, 2013-2022



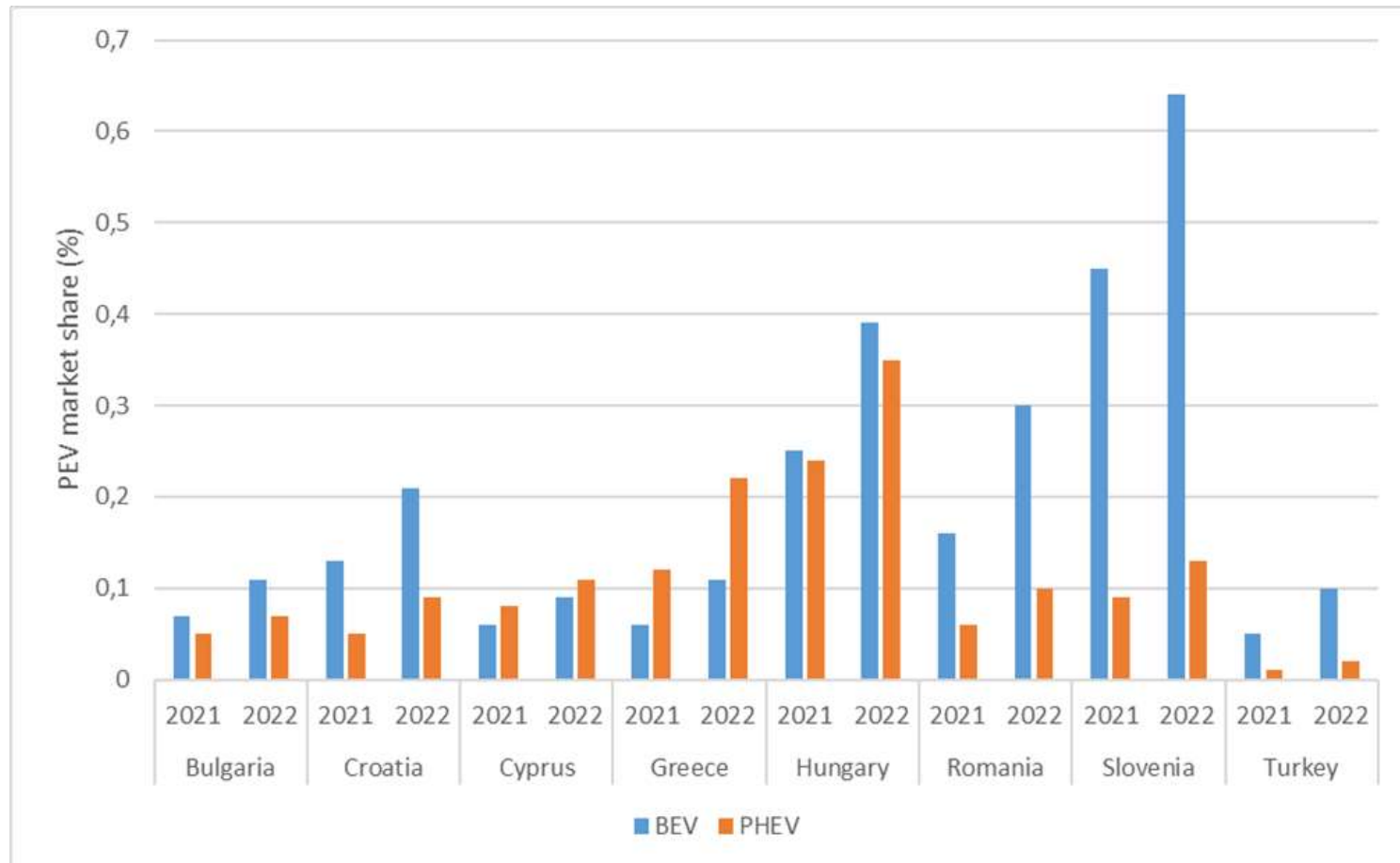


## PEV\* Fleet in Selected SEE Countries, 2021 and 2022



\* The number of Plug-in Electric Vehicles (PEVs) includes Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicle (PHEVs).

## PEV Market Share in Selected SEE Countries, 2021 and 2022



Source: EAFO

## Decarbonisation in SE Europe - Key Observations

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### Challenges and Trends Towards SE Europe's Decarbonisation:

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

## Decarbonisation and Related Technologies

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The road to decarbonisation can be approached at two levels:

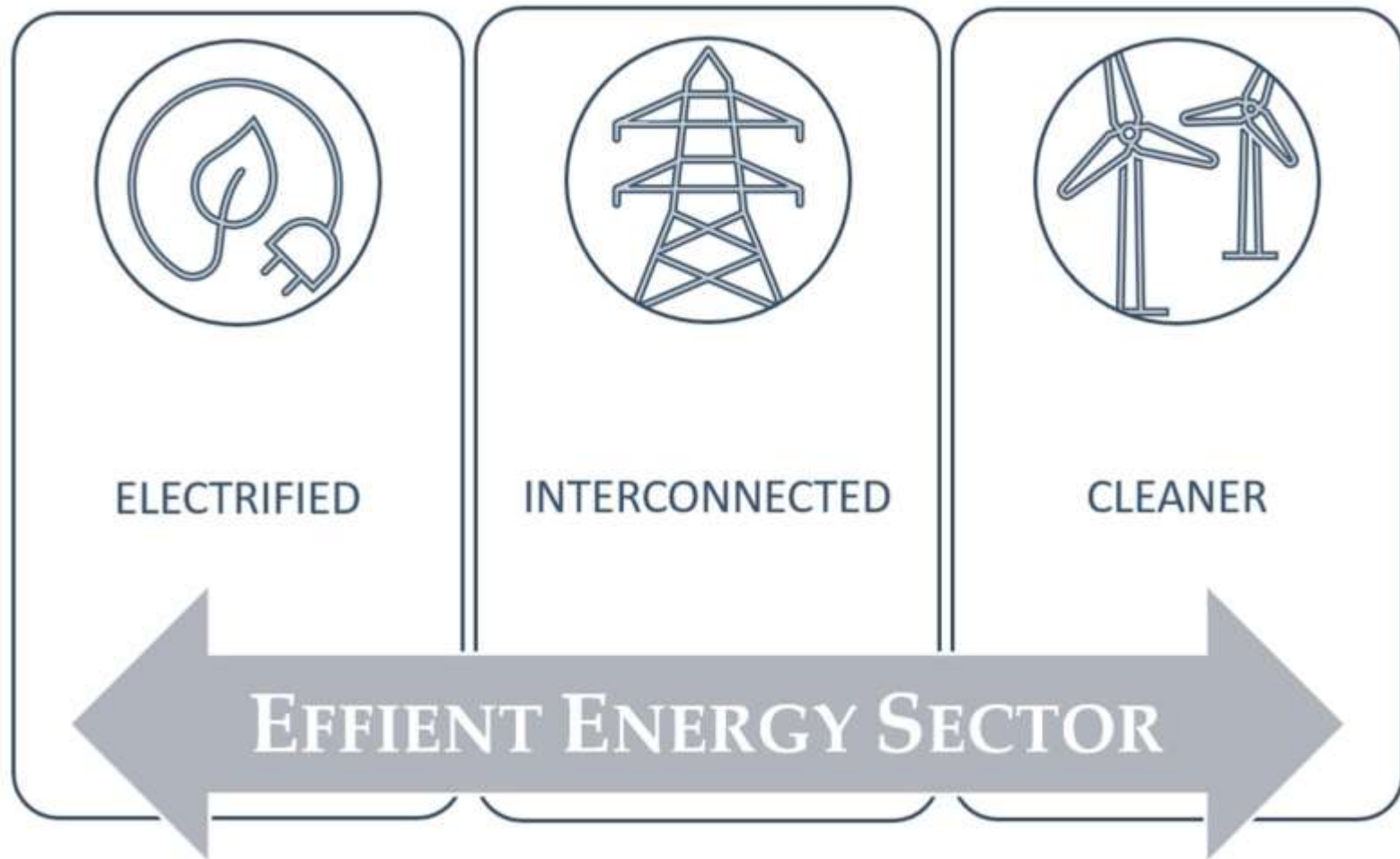
- through **policy**, which incorporates the energy mix issue and economic assessment through which the rate of decarbonization is determined.
  - ❖ The main question arising therefore is **how the rate of decarbonization can be related to economic development and what the investment implications are** and
  
- through **technology**, whose degree of deployment depends on the policies to be implemented and could contribute significantly towards decarbonisation through, for instance, the use of CCS/CCU or dual-fuel power plants.

# The Importance of Electricity Grids

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- ❑ As we move towards greater RES penetration, we are also moving towards greater electrification
- ❑ Greater electrification means (which happens gradually) more expanded electricity grids.
- ❑ More expanded electricity grids means technological upgrading to allow more efficient management of electricity flows
- ❑ Technological upgrading means constant attention to grid requirements and consumer trends and the need for versatility in design, procurement and installation of infrastructure (i.e. power electronics, smart meters, software, interfaces, etc.)
- ❑ All these bring us to the realisation of a totally new operational environment for consumers, transmission operators and autoproducers alike.
- ❑ An environment which is already shaping right now as we talk and will soon come to dominate the energy scene.
- ❑ Hence, the need for consumer and producer adaptation is paramount.
- ❑ As far as our geographical area is concerned in SEE, there are great discrepancies between countries with some more advanced than others.
- ❑ Accelerated electrification, which is the objective in order to accommodate more inputs from a multitude of autoproducers, poses certain key challenges, which range from security of energy supply to management and funding issues.

# Characteristics of the Energy System to Achieve the Decarbonization of the Energy Sector



# The State of Electricity Grids in SE Europe

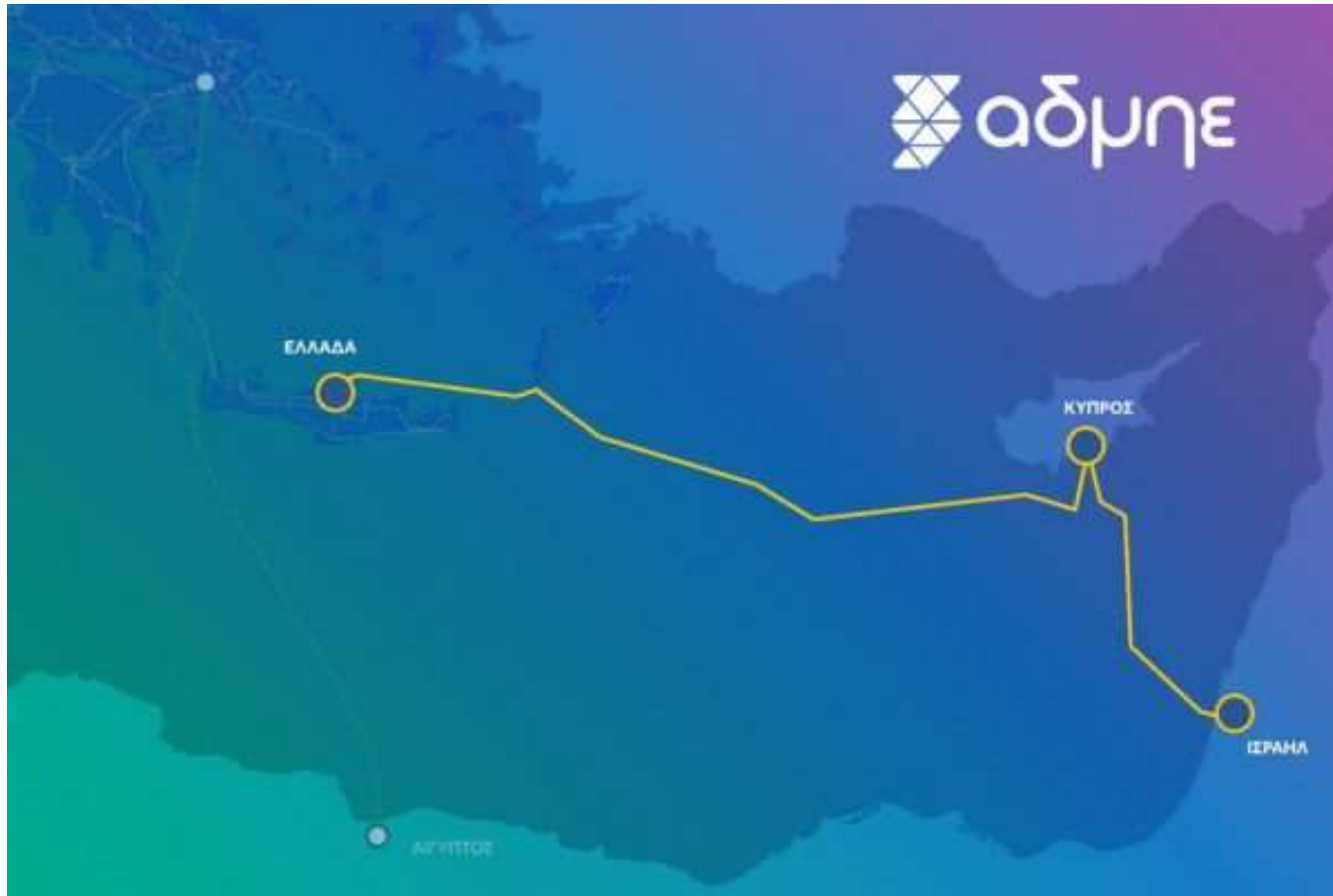
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- ❑ The SEE region is in need of more and better electricity interconnections, something which is especially visible in island regions, such as Greece and Cyprus.
- ❑ Advancing international electricity interconnections, especially between Italy and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



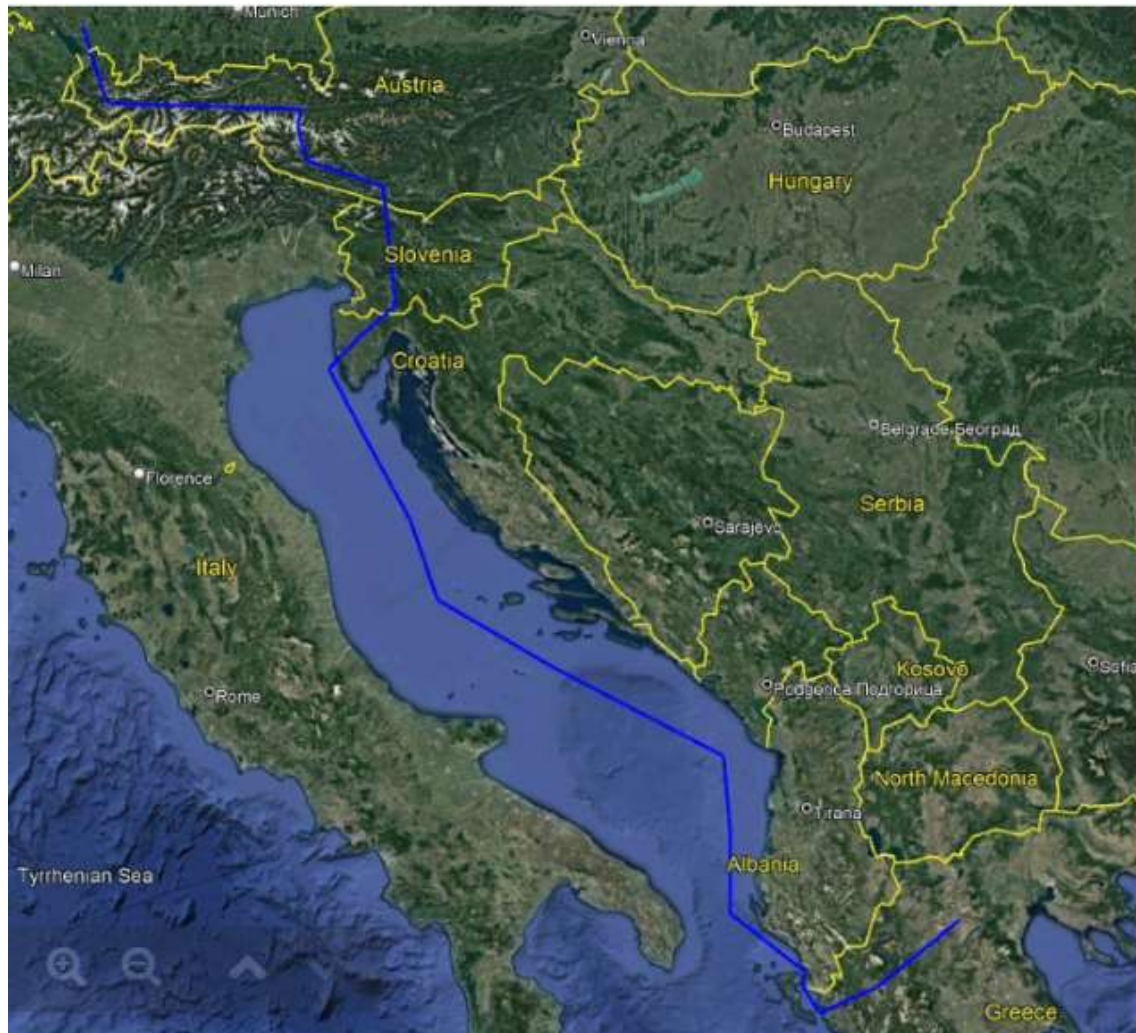


# Great Sea Interconnector



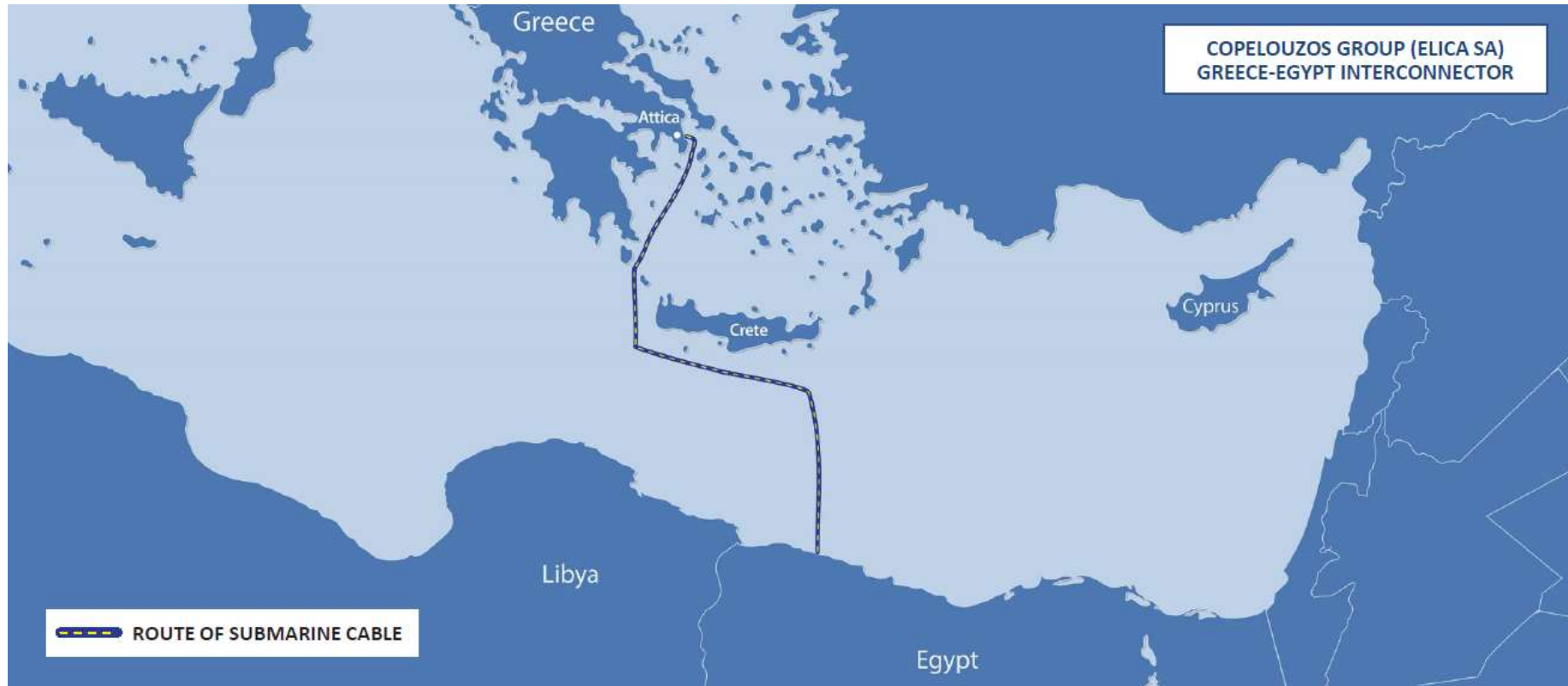
Source: IPTO

# Green Aegean Interconnector



Source: IPTO

# Greece-Egypt Electricity Interconnector



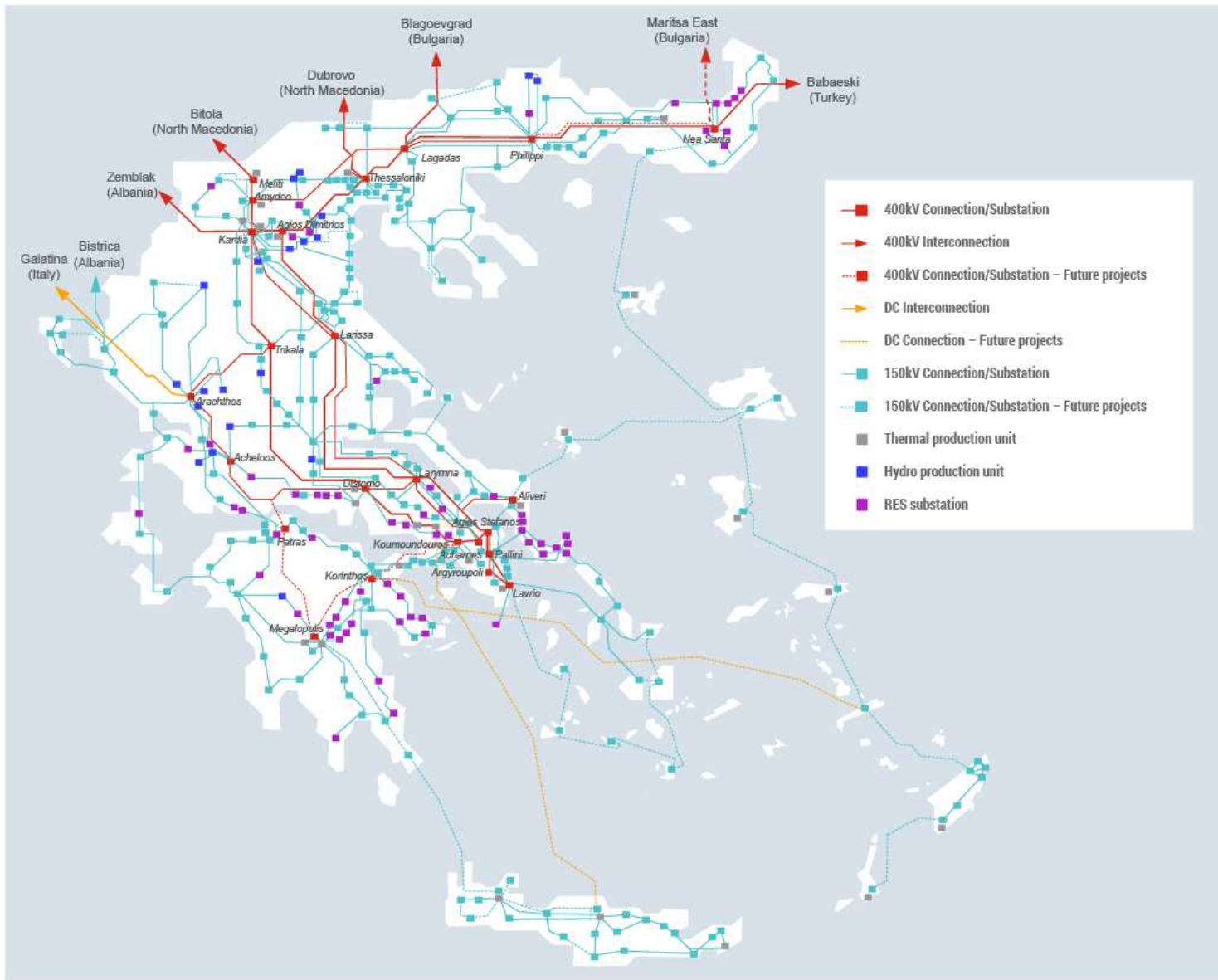
Source: ELICA Group

## Electricity Interconnections and Energy Storage - The Case of Greece

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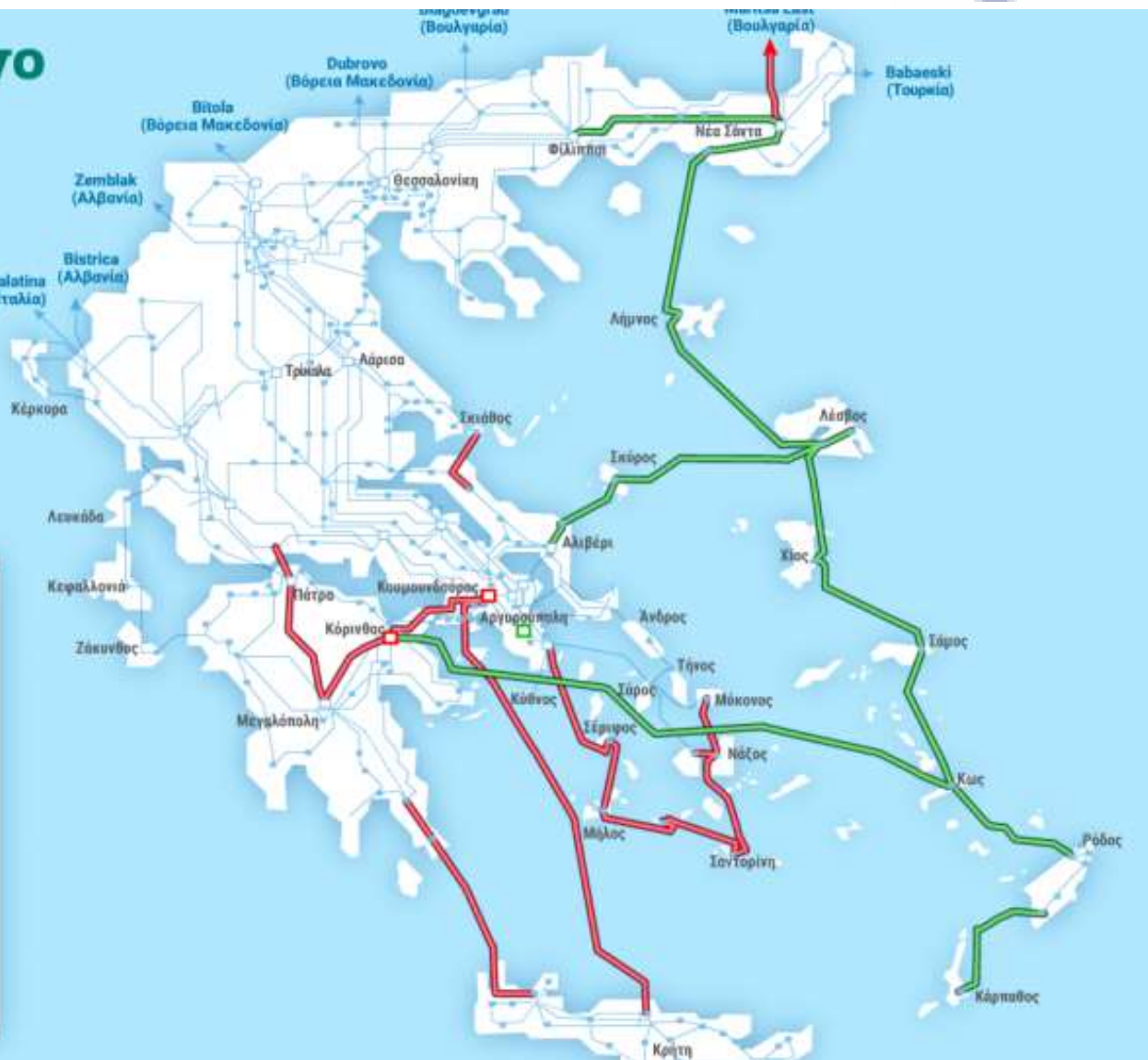
- ❑ As electricity interconnections increase in Greece's mainland and islands, it is estimated that the penetration of renewable energy sources and hence the energy storage needs will rise.
- ❑ In Greece, important electricity interconnection projects are progressing, such as in the Cyclades, the NE Aegean and the Dodecanese, while the most important project is the interconnection of the mainland with Crete, which is being carried out in two phases: (a) the small interconnection of Crete-Peloponnese (completed) and (b) the large interconnection of Crete-Attica, which is expected to be completed in the first half of 2023.
- ❑ Despite the extensive electricity interconnections in the islands, there will be 40 non-interconnected small islands for many years to come. These are suitable for the installation of integrated clean electricity systems, using batteries and RES, with the possibility of ensuring energy autonomy of 95%.

# Domestic and Cross Border Electricity Interconnections in Greece



## Διασυνδεδεμένο Σύστημα Ηλεκτρικής Ενέργειας του ΑΔΜΗΕ έως το 2030

- Υφιστάμενη Γραμμή Μεταφοράς
- Σημαντικά έργα που θα κατασκευαστούν έως το 2024
  - Διασυνδέσεις Κρήτης
  - Διασύνδεση Βορείων Κυκλάδων
  - Διασύνδεση Νοτίων & Δυτικών Κυκλάδων
  - Διασύνδεση Εύβοιας-Σικιόθου
  - 2η διασύνδεση Ελλάδας-Βουλγαρίας
  - Επέκταση Συστήματος 400 kV στην Πελοπόννησο
  - Ανακατασκευή ΚΥΤ Κουμουνδούρου
- Σημαντικά έργα που σχεδιάζονται έως το 2030
  - Διασύνδεση Δωδεκανήσων
  - Διασύνδεση Βορειοανατολικού Αιγαίου
  - Νέα ΓΜ 400 kV Φιλίππων- Νέας Σάντας
  - ΚΥΤ Αργυρούπολης



## Huge RES Momentum in Greece

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**70% RES prior to 2030**

**1.5 GW storage by  
2025**

**2.5 GW Off-shore Wind**

**Auctions: RES,  
Storage, Hybrid**

**Green Pool**

**Net-metering**

**Hydrogen Initiation**

**Doubling**

**XB interconnections**

**LNG > 20 bcm**

**Revamping Networks**

**Green Funding**

**22 bn € :**

**RRF / RePowerEU +  
ESPA+ Islands Fund+  
Modernization Fund**

**Licensing Simplified**

**Guarantees**

**Fair incentives**

**Energy companies:**

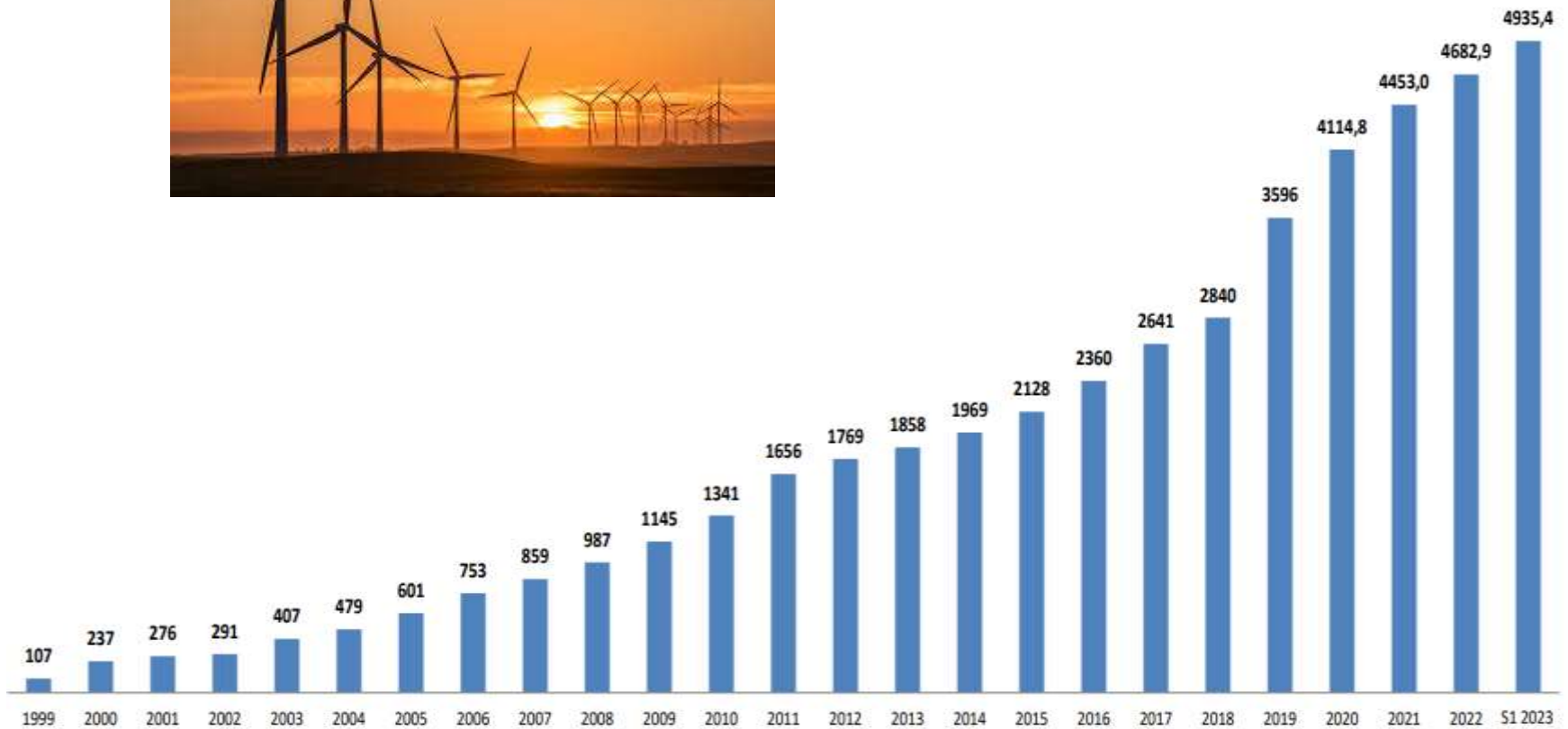
**Profound and fast  
green transformation**

# Areas with High RES Penetration in Greece's Interconnected System

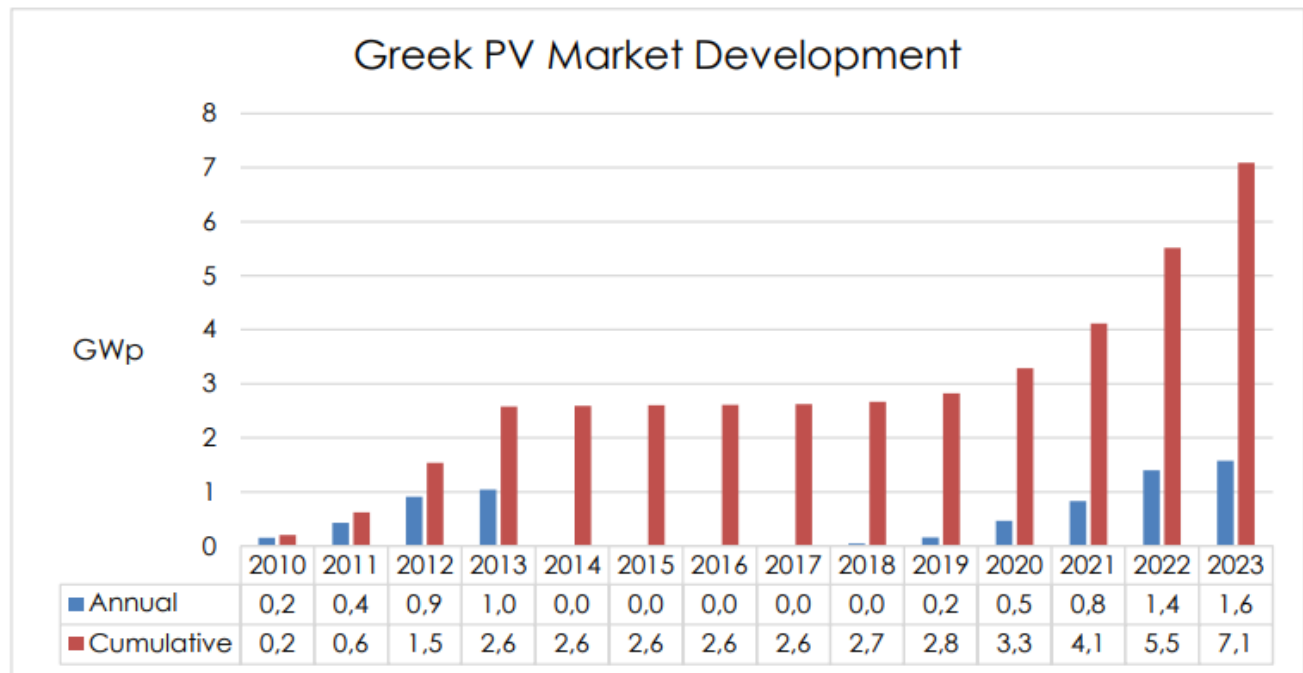




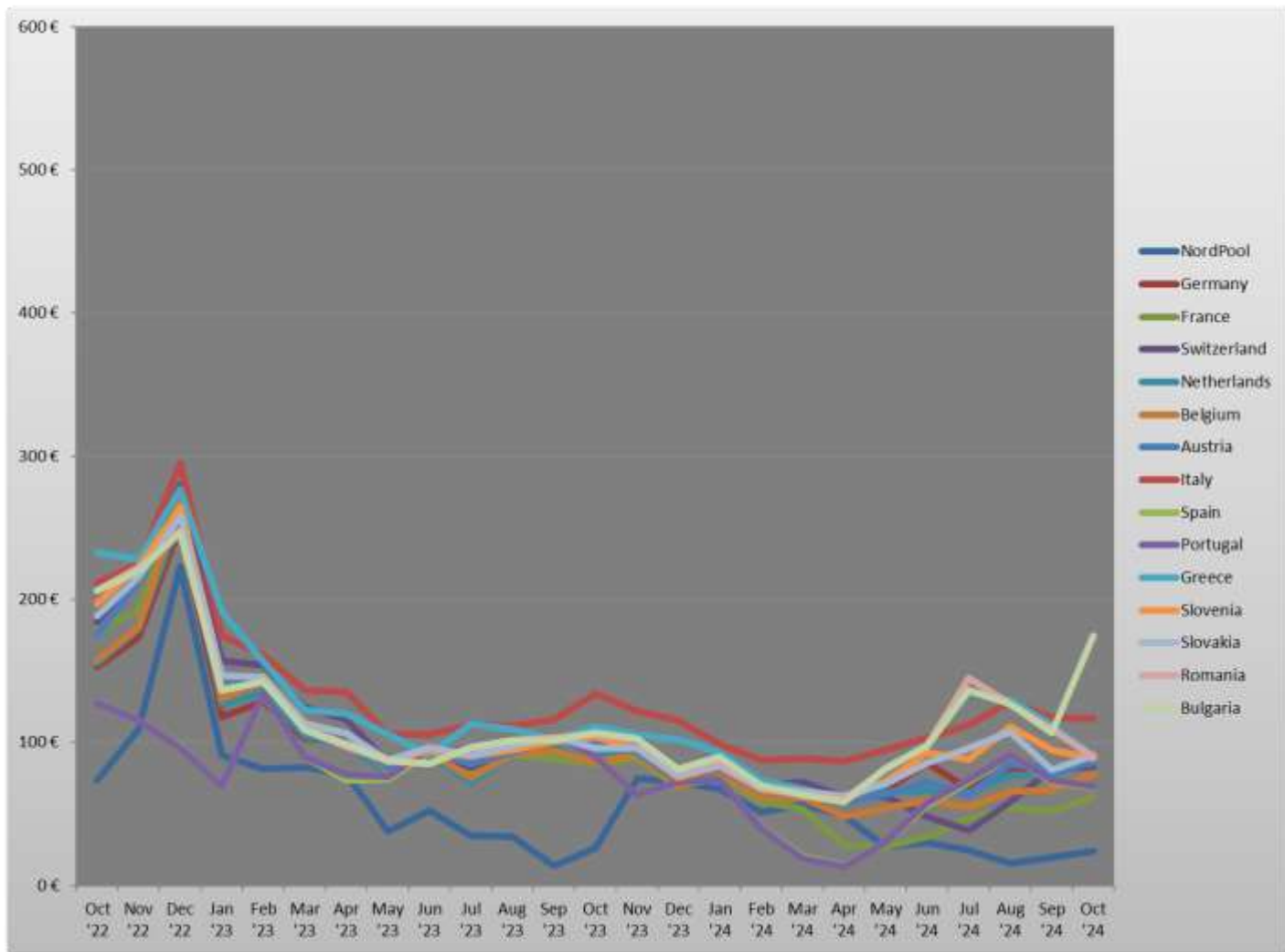
# Total Installed Wind Capacity (MW) to Greece's Grid, 1999-S1 2023



# Total Installed Solar PV Capacity (GWp) to Greece's Grid, 2010-2023



## Variation of European Wholesale Electricity Prices (October 2022 – October 2024)



Source: Data from power exchanges websites

## A Total Approach is Necessary in Decarbonising the Energy Mix

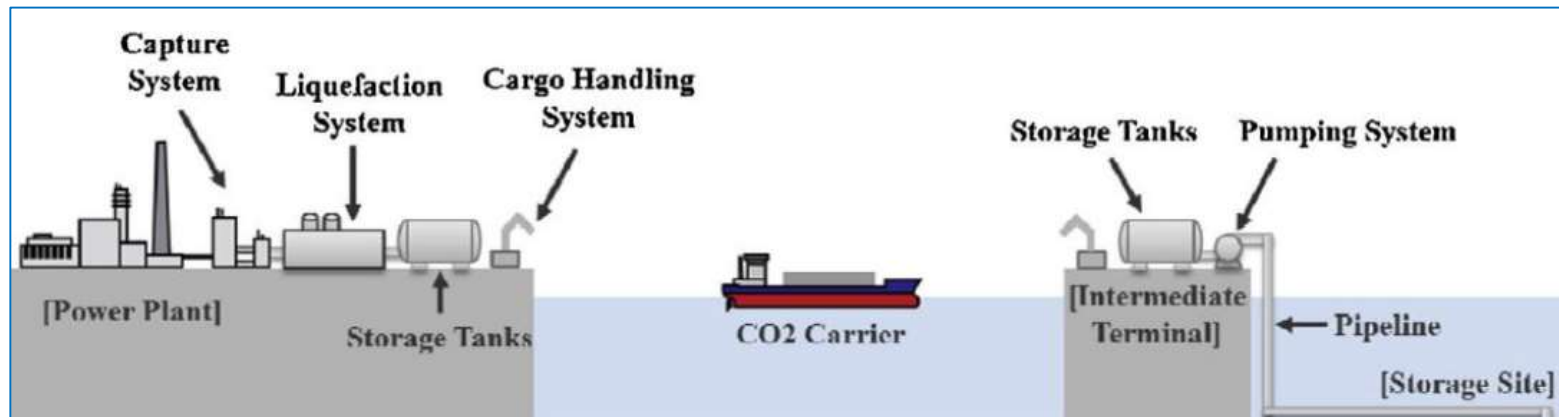
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- ❑ In addition to Renewables, one must consider a variety of technologies, including the further use of nuclear power, the introduction of CCUS systems for power generation and industry and more intense application of energy efficiency measures (particularly in the building sector) and electromobility, especially in cities.
- ❑ A basic network of nuclear facilities, already exists and is spread in 5 countries in the region with good prospects for further expansion, especially through the introduction of SMRs. Nuclear power is comparable with increased RES use since it provides much needed base load and ensures steady prices in the long term.
- ❑ CCUS applications are starting to attract interest in the region, with Greece at the forefront through the development of CCUS industry-oriented hubs.
- ❑ In the area of Energy Efficiency, there are several large-scale programmes running in most countries, with EU and state help which are helping transform the energy environment by cultivating new consumer attitudes and approaches to everyday life. These programmes normally have a multiplying effect and it is no exaggeration to state that they help improve overall efficiency in a country's energy system. This is already reflected to a certain degree in the decelerating energy demand growth.

# Nuclear Power Plants in SE Europe



# Concept of Ship-based CCUS Hub



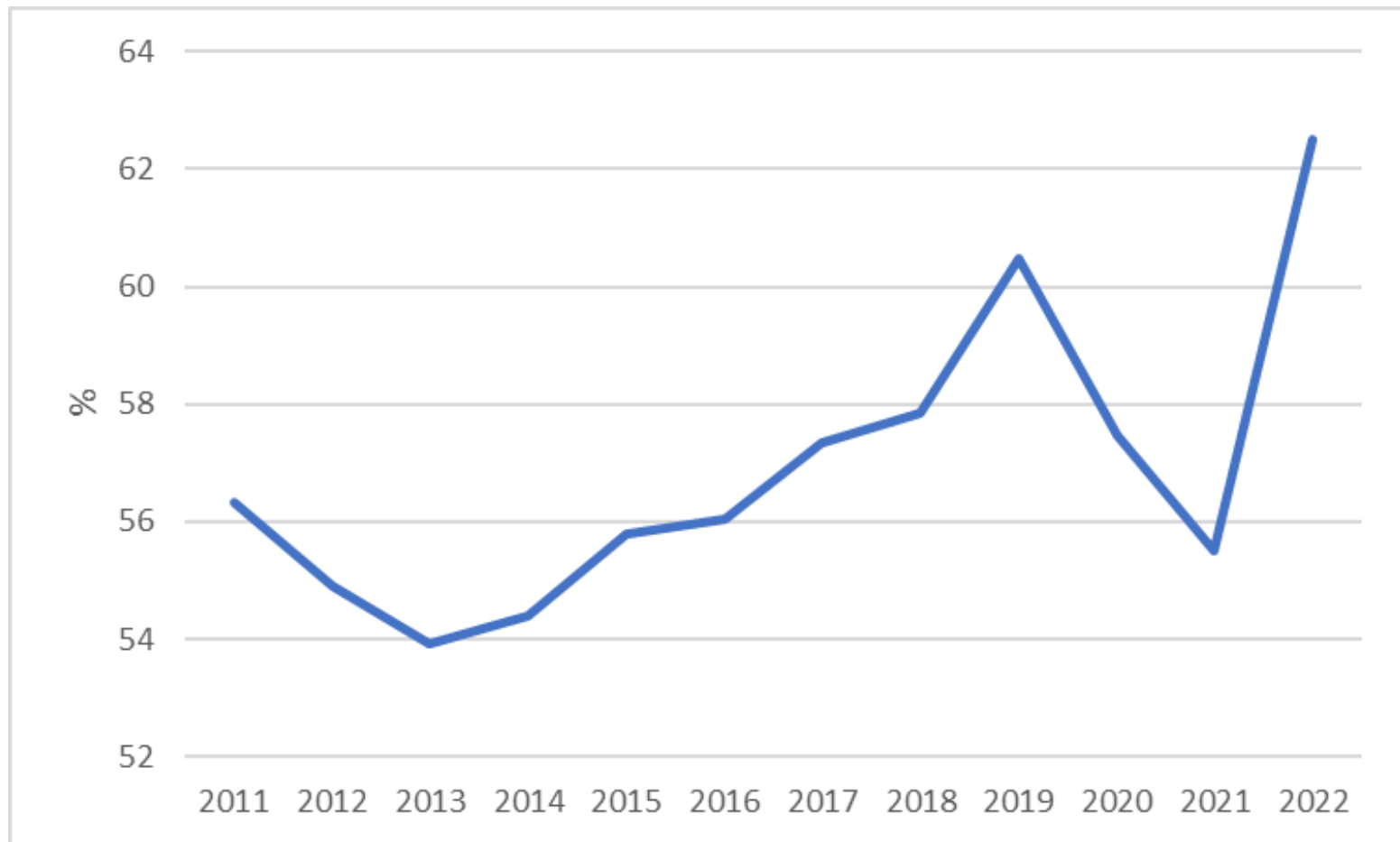
Source: IENE

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

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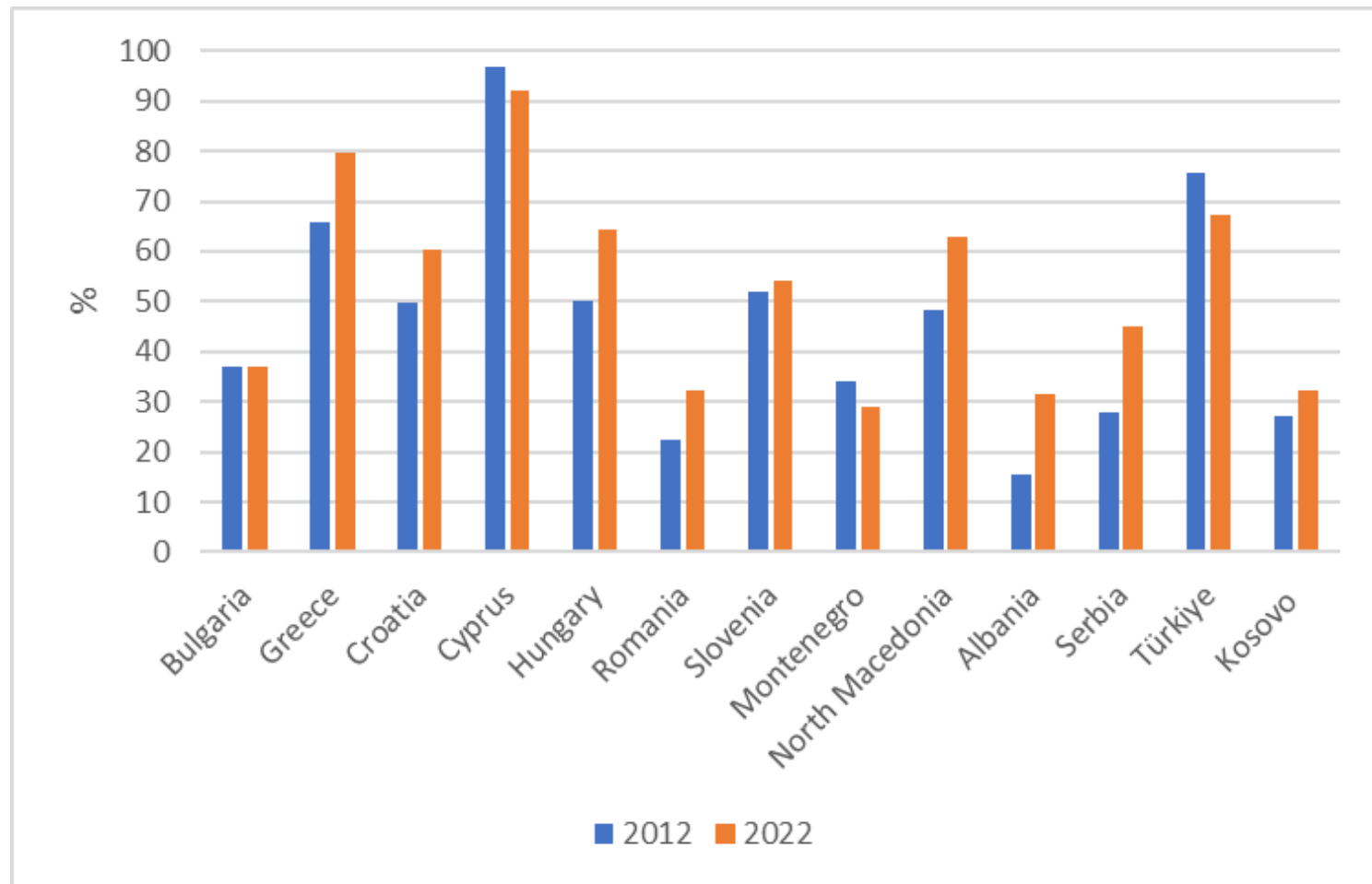
- **Energy security is a complex issue** and as such cannot be considered in isolation.  
SE Europe, because of its geography, its proximity to high-risk conflict zones (i.e. Syria, Iraq, Ukraine), refugee flow from the Middle East and North Africa and the location of some of its countries (i.e. Turkey, Greece, Romania) at vital energy supply entry points, faces **higher energy security threats** than the rest of Europe.
- **Decarbonisation policies in SE Europe have a clear impact on energy security and therefore there is a need to strengthen available mechanisms**
  - (a) 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.
  - (b) The achievement of a **balanced energy mix** provides the best long-term option in enhancing energy security both at country and regional level.
- Security of **supply/demand** and **differentiation of supply sources**  
In the case of gas, it is becoming more important and pressing compared to other fuel sources, such as electricity, oil, coal and possibly uranium.  
Gas is a primary area of concern largely because of its rather inflexible transmission method, mainly by means of pipelines.

## Energy Dependence (%) in Europe, 2011-2022





## Energy Dependence (%) in SE Europe, 2012-2022



## Energy Security in SE Europe (II)

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### Security of **transportation**, shipment of **oil and gas**

Gas deliveries were twice disrupted (i.e. 2006 and 2009) with the shipment of Russian gas, through Ukraine, to Europe but also from Turkey and Greece (i.e. 2011 and 2016).

### **Smooth supply of electricity** and urgent need to connect various island groups to the mainland grid

Mitigation of possible power supply failures and shortfalls and minimization of environmental impact through the retirement of fuel oil or diesel powered electricity generators on several islands.

### **Effective protection of energy infrastructure**

Mitigation of terrorist threats and advanced level of safety against of physical hazards (e.g. hurricanes, floods, earthquakes) and cyber threats (*IENE organised an Ad hoc meeting for energy security on March 15, 2017*).

The various vulnerable key energy infrastructure locations in SE Europe constitute **potential energy security hot spots** and as such should be properly identified, while also crisis management plans must be prepared in order to meet any emergencies (e.g. physical hazards, large-scale industrial accidents or terrorist actions).

## Energy Security in SE Europe (III)

### - Towards a Redefinition of the South Corridor

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- Meanwhile, several gas exploration projects are in the development stage in the **East Mediterranean** region, with important gas discoveries such as the Leviathan and Tamar fields in Israel, Zohr in Egypt and Aphrodite (which borders with Zohr), Zeus and Cronos in Cyprus's EEZ.
- A number of alternative plans are under discussion for channeling this gas to Greece and Turkey, for local consumption, but also to Europe proper for transit to the continent's main gas markets. These plans include gas pipelines, liquefaction plants for LNG export and FSRU terminals to be tied up into the TANAP-TAP system.
- Another option apart of TAP – TANAP system is the **East Med Pipeline** which again, due to the significant technical challenges, could also accommodate limited quantities of gas in the regions of 8.0 to 12.0 BCM's per year. Meanwhile, EC is actively exploring the possibility of massively increasing the member countries' LNG capabilities as part of Energy Union priorities, despite the recent negative stance from the US.

# 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. 44

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

# 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 2<sup>nd</sup> 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

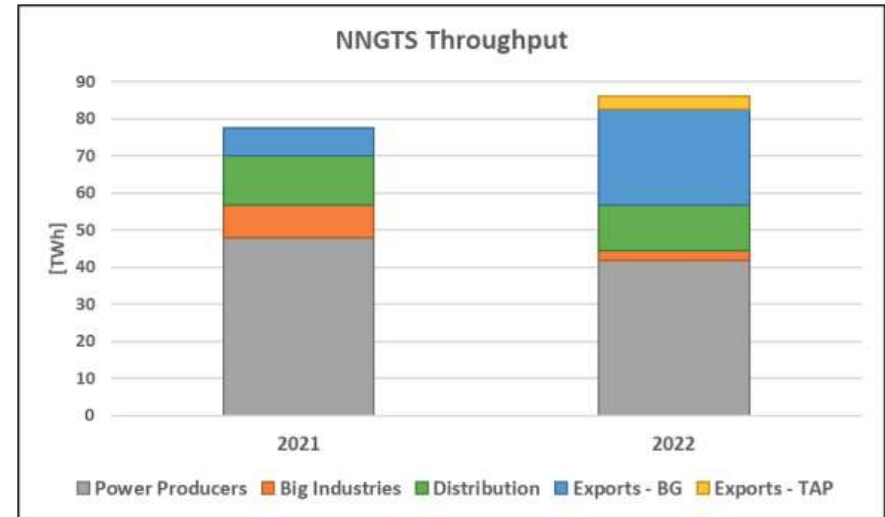
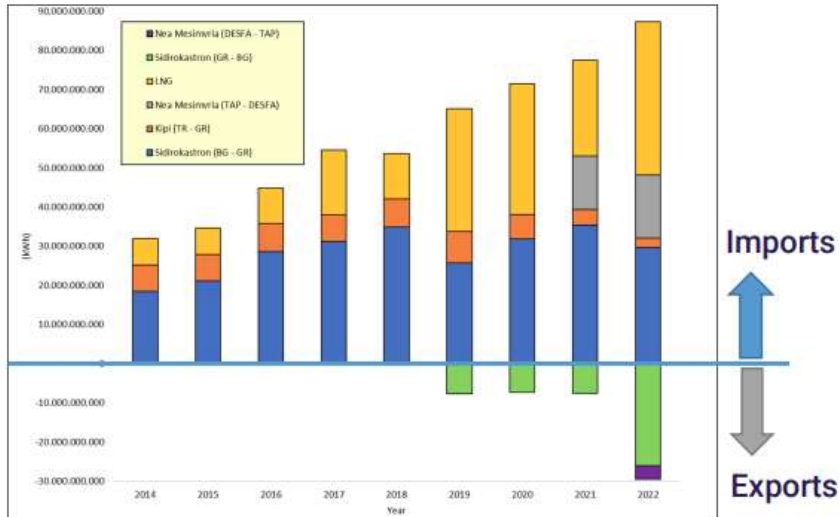
## Turkey

- ✓ Most diversified gas supply portfolio in the region & Important transit country, largest connection to the Transbalkan pipeline
- ✓ 4 LNG Terminals in operation and a 5<sup>th</sup> 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

# The Vertical Corridor



# The Gas Landscape is Changing with Greece Becoming an Exporting Country



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

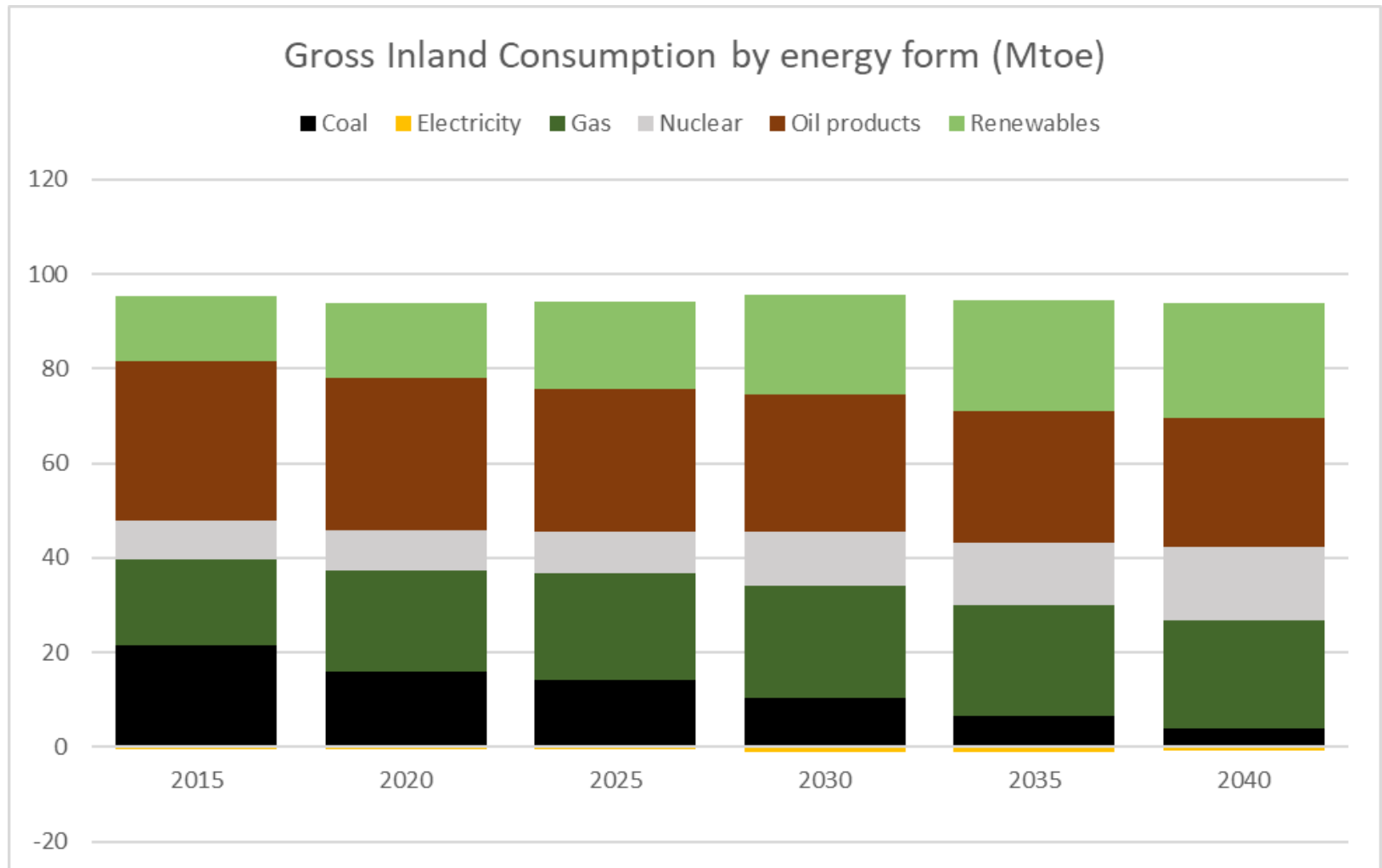
Source: DESFA

## Energy Trends per Group of Countries – A Scenario Approach

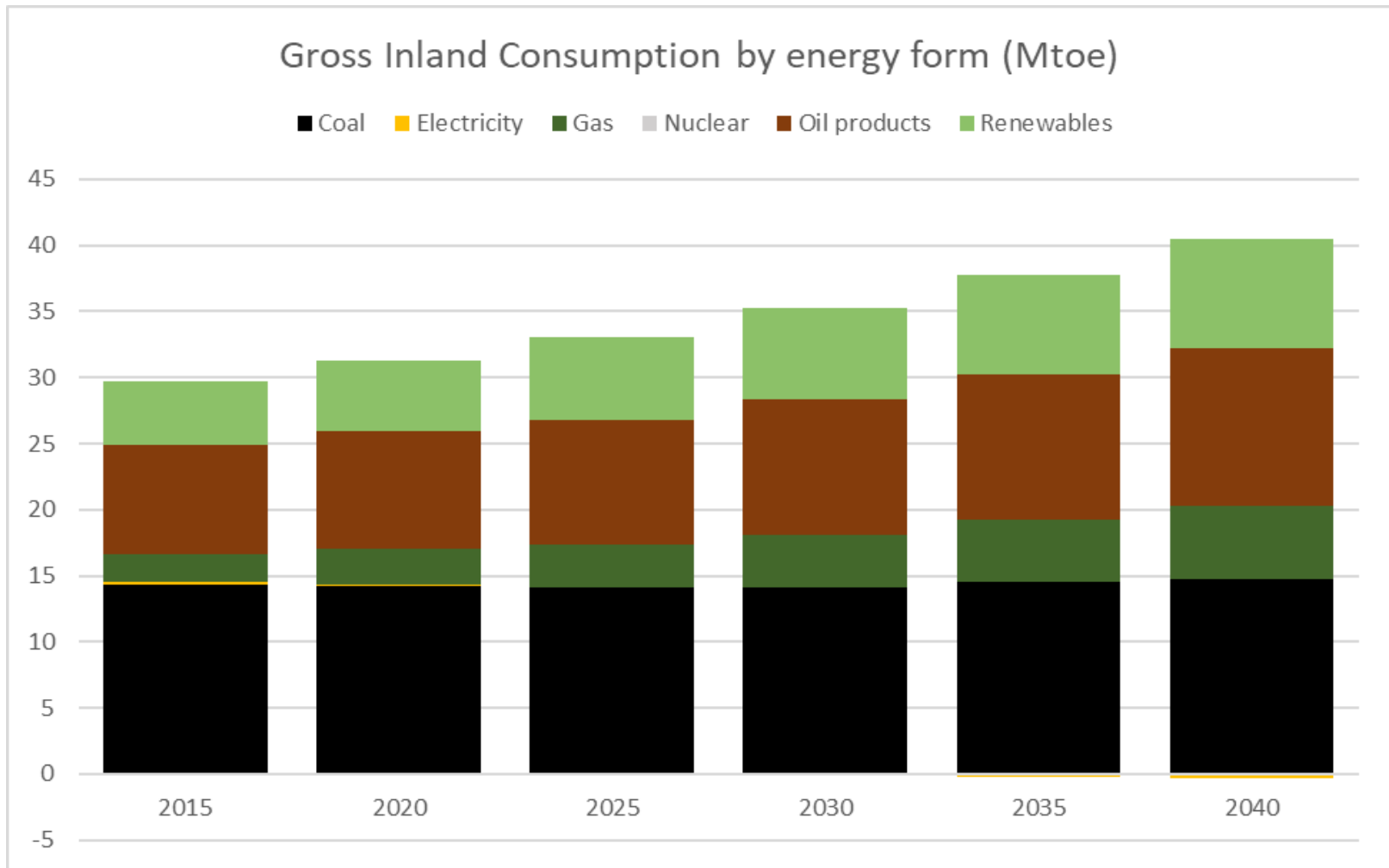
- ❑ **Results are presented per Group of Countries - EU Member States, West Balkans and Türkiye**
- ❑ Looking at the projection of the gross inland consumption in the **EU member states of the SEE region** (Bulgaria, Croatia, Cyprus, Greece, Romania, Slovenia), the overall tendency shows a stabilisation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



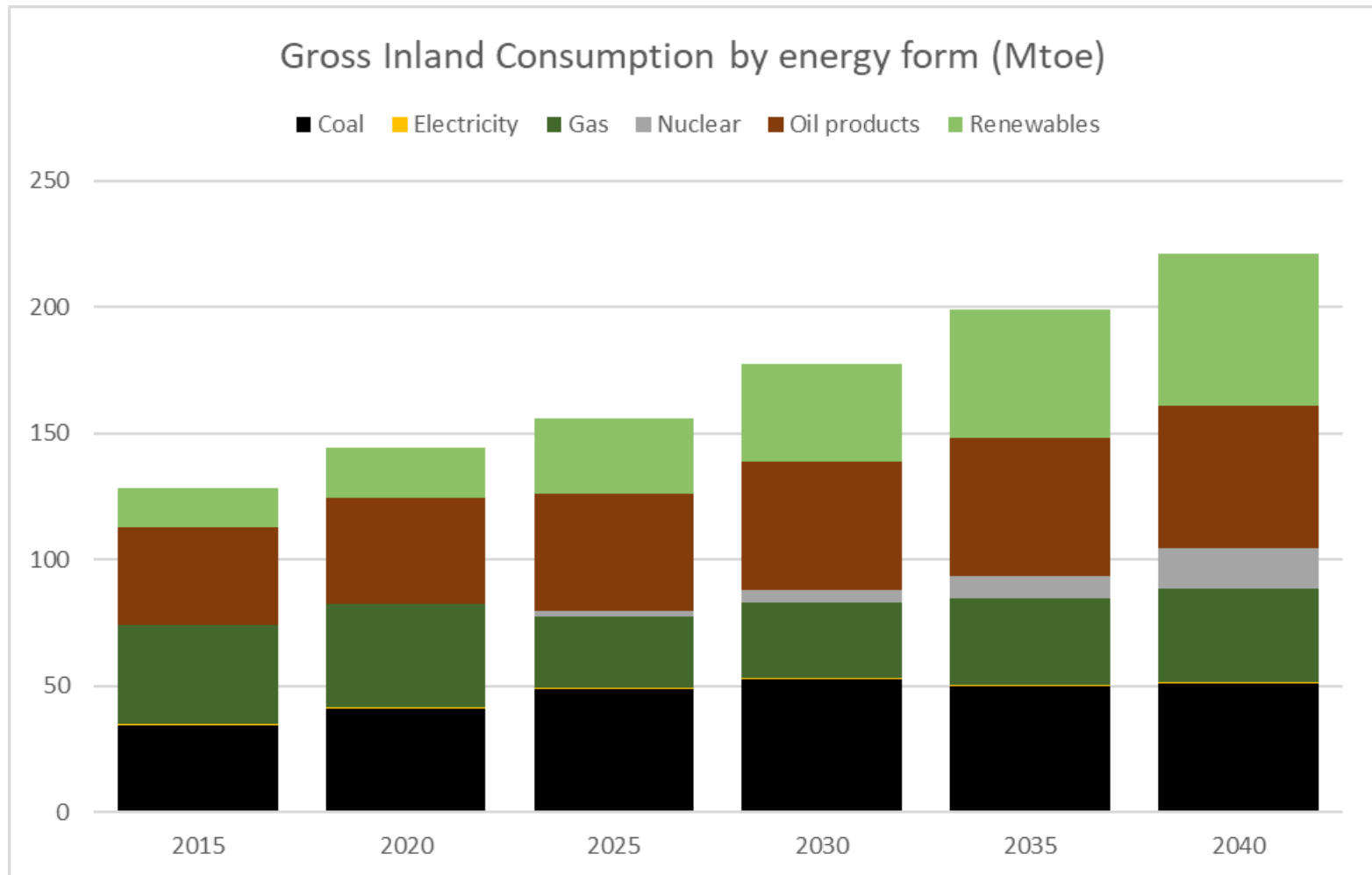
# EU Member States in SE Europe: Gross Inland Consumption (2015-2040)



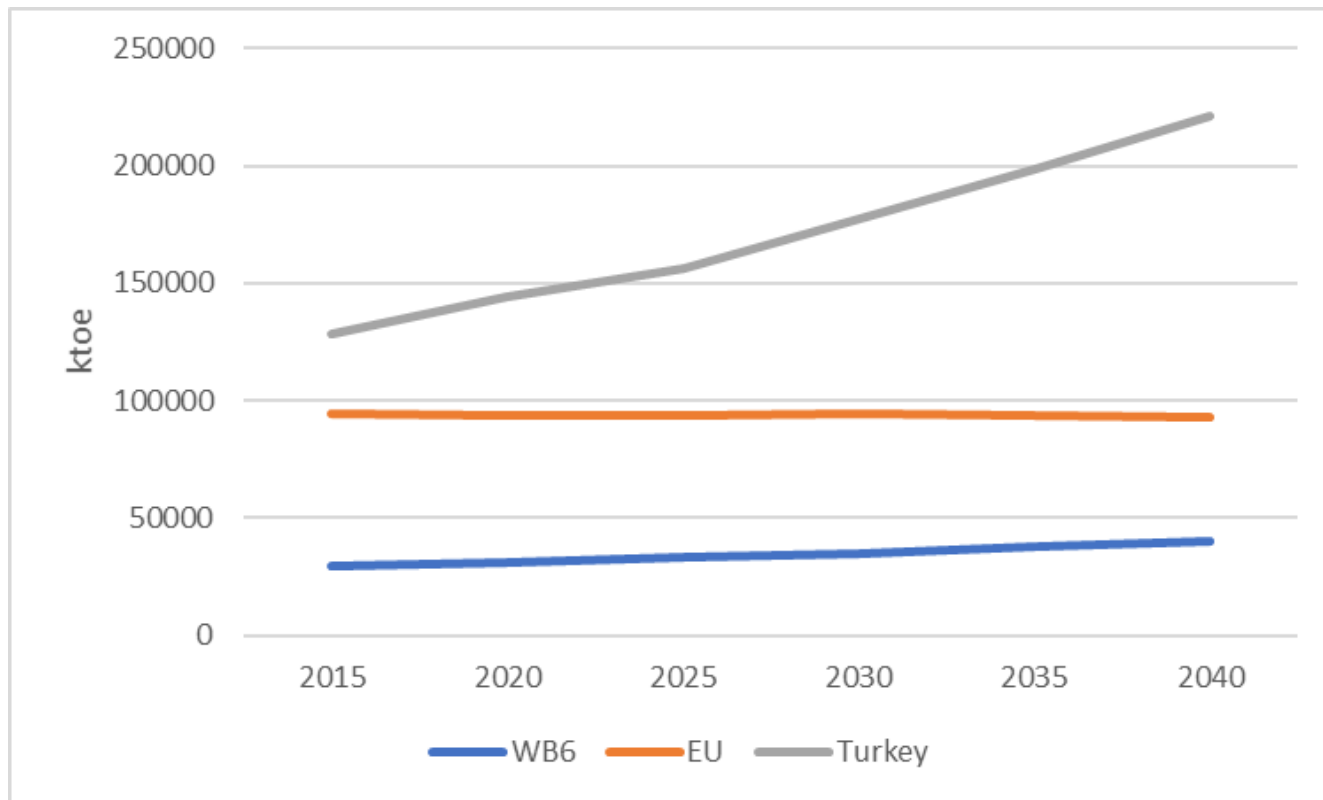
# Western Balkan Countries: Gross Inland Consumption (2015-2040)



## Türkiye: Gross Inland Consumption (2015-2040)



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



## 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
Türkiye	130,000	124,935	9.0	3.3
<b>TOTAL</b>	<b>436,900</b>	<b>234,822</b>		

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

# SEE Energy Investment Outlook Per Sector (2021-2030)



	Project sector	Description	2021 Investment estimate (€ mn)	2017 Investment estimate (€ mn)*
<b>OIL</b>	Upstream	<ul style="list-style-type: none"> <li>Field Exploration</li> <li>Development of new oil and gas wells</li> </ul>	63,000	38,790
	Downstream	<ul style="list-style-type: none"> <li>Refining (upgrading)</li> <li>Loading Terminals</li> <li>Storage facilities</li> <li>Crude / Product Pipeline(s)</li> </ul>		
<b>GAS</b>	Country Gas Network	<ul style="list-style-type: none"> <li>Grid development</li> <li>Main intra country pipeline(s)</li> <li>Storage facilities</li> <li>FSRU and LNG Terminals</li> </ul>	25,150	16,550
<b>ELECTRICITY</b>	Power Generation	<ul style="list-style-type: none"> <li>Lignite</li> <li>Coal</li> <li>Gas (including CHP)</li> <li>Nuclear</li> <li>Large Hydro</li> </ul>	150,150	139,550
	Electricity Grid	<ul style="list-style-type: none"> <li>New H/V transmission lines</li> <li>Upgrading and expansion of existing grid</li> </ul>		
	RES	<ul style="list-style-type: none"> <li>Small Hydro</li> <li>Wind farms</li> <li>Photovoltaics</li> <li>Concentrating Solar Power</li> <li>Biomass (including liquid biofuels)</li> <li>Geothermal</li> </ul>	109,900	40,009
<b>ENERGY EFFICIENCY</b>		<ul style="list-style-type: none"> <li>Buildings</li> <li>Industry</li> <li>Electric vehicles</li> </ul>	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
	<b>Grand Total</b>		<b>468,643</b>	<b>272,872</b>

\*(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.

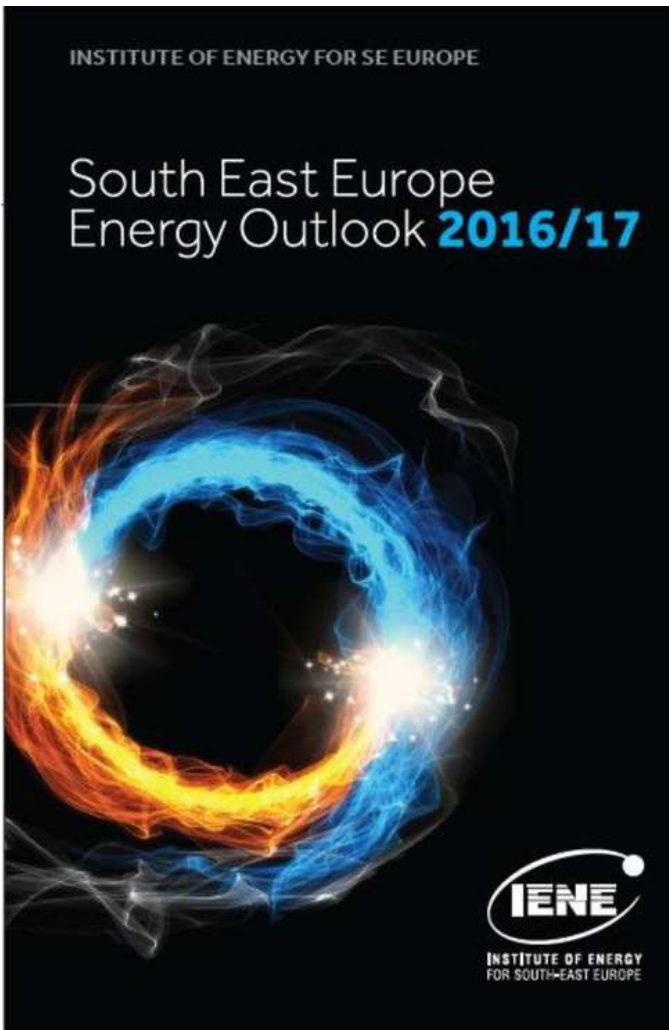


## Concluding Remarks

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- ❑ Decarbonisation policies in SE Europe need urgent revision if they are to lead to much lower CO2 emissions.
- ❑ In this context, there is also a clear need for more effective cross-border policies and joint action.
- ❑ There is a misplaced emphasis on higher RES investments at a time when most countries in the region face huge problems with the management of their electricity grids.
- ❑ Hence, a new direction must be given so that more cross-border interconnections are build, transmission systems expanded, distribution systems strengthened and more efficient management techniques for electricity grids are introduced with the use of power electronics.
- ❑ In short, a holistic approach is required in order to ensure a continuous drop in CO2 emissions through the promotion of clean energy technologies.


## Covers of IENE's Reference Study "SE Europe Energy Outlook"







INSTITUTE OF ENERGY  
FOR SOUTH-EAST EUROPE

The background of the slide is a dark blue image of a globe. Overlaid on the globe are numerous glowing blue lines that represent energy transmission or a network. These lines are curved and intersect, creating a complex web of connections across the globe's surface.

*Thank you  
for your attention!*

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