ASHRAE Hellenic Chapter

SATURDAY

NOVEMBER 15, 2025

INTERNATIONAL CONFERENCE

ENERGY IN BUILDINGS ATHENS 2025

ΥΠΟ ΤΗΝ ΑΙΓΙΔΑ ΤΟΥ ΤΕΕ

- DECARBONIZATION & ENERGY SECURITY
- SUSTAINABILITY & GREEN TRANSITION
- ARTIFICIAL & BUILDING INTELLIGENCE
- ENERGY SAVING IN COMMERCIAL & INDUSTRIAL APPLICATIONS

09:00-18:00 | @ DIVANI CARAVEL HOTEL, ATHENS

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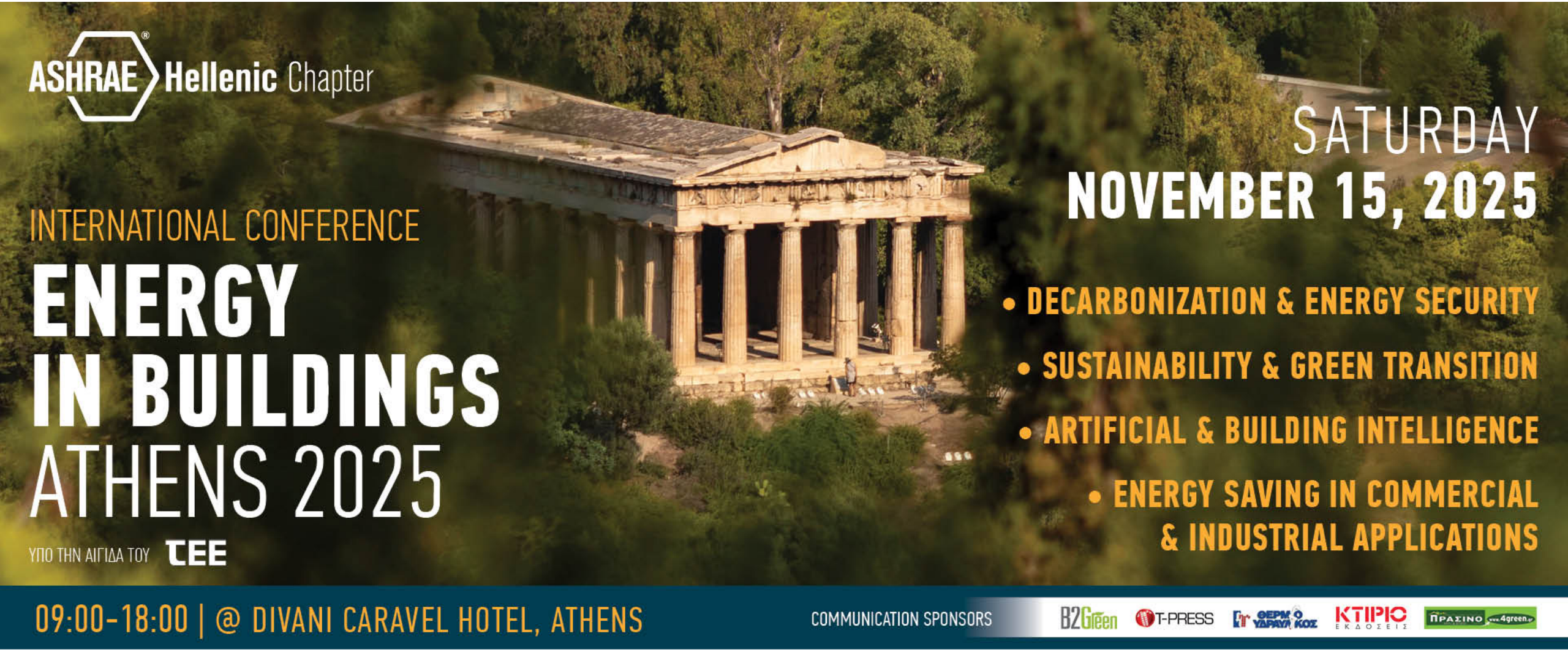


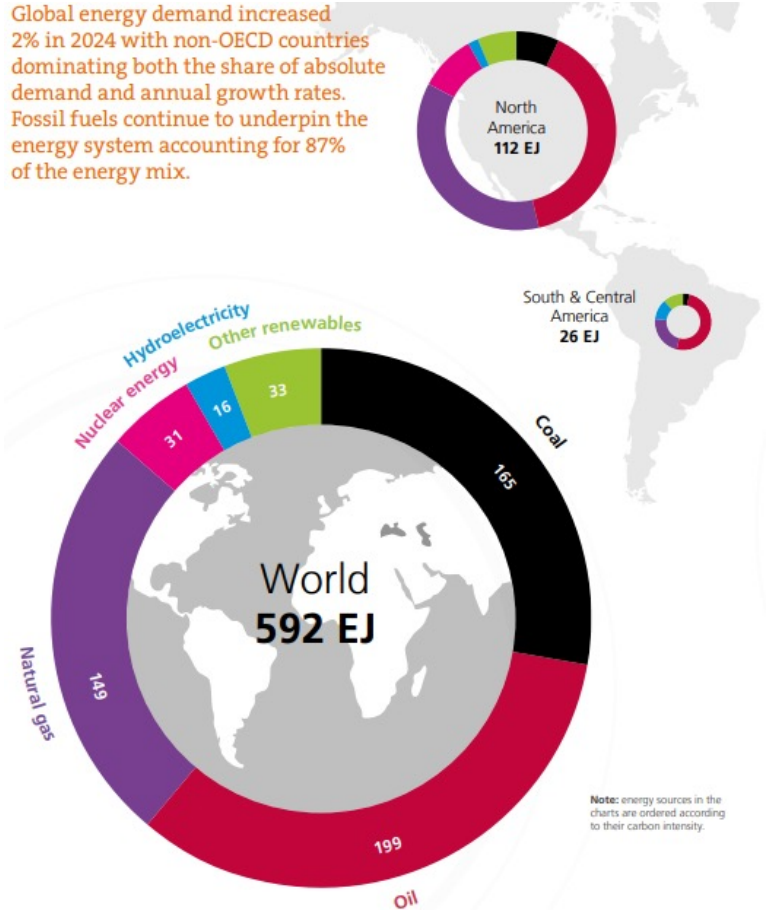
Energy Demand, Energy Efficiency and Energy Security in SE Europe

Costis Stambolis - Chairman and Executive Director, IENE

Introduction

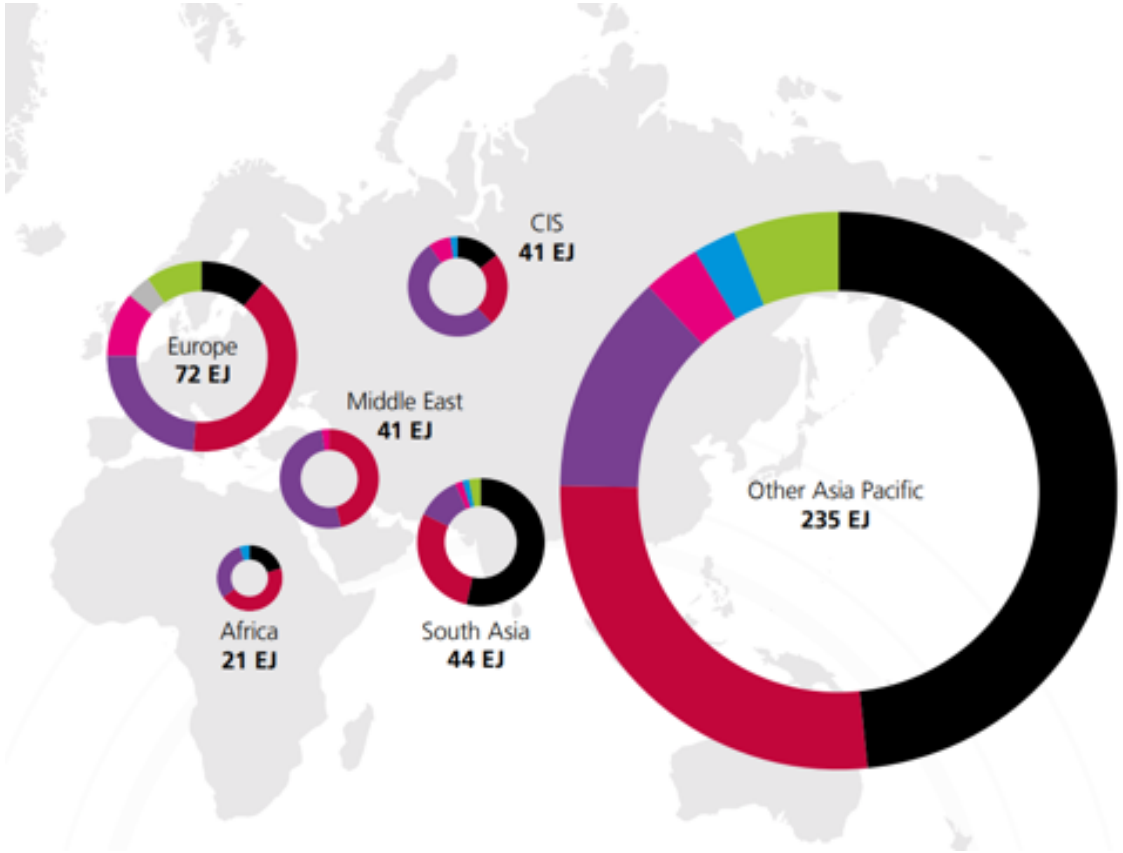
- Understanding energy demand is crucial in our effort to design more efficient, resilient and adaptive energy systems, whether these concern entire regions, cities or building complexes, condominiums or single houses.
- Total energy demand increased across all regions, but the growth was far from evenly distributed, reflecting stark regional variations shaped by uneven economic development, climate conditions and energy policy.
- Fossil fuels continue to underpin the energy system accounting for 87% of the energy mix, just 3% lower than in 1973. Which means that energy transition is not really happening in spite of more than $10 trillion spend over the last ten years or so. The main reason is that global energy demand continues to rise relentlessly.
- Total energy demand globally rose 2% in 2024 and was roughly at the same level in the past decade, indicating strong global economic growth, which was approx. 3.2% last year, according to the IMF.
- In turn, global economic growth remained in a positive trajectory supported by strong demographics (in 2024, we saw a rise of about 70 million people, compared to 2023) and escape from poverty for approx. 45 million of people.
- Escaping from poverty implies much greater use of energy (read motor vehicles, house heating/cooling, lighting, electric appliances, etc.).
- In this context, it is important to point out that global electricity demand growth in 2024 continued to outpace total energy demand growth at 4.3%.
- Meanwhile, carbon emissions increased around 1% in 2024, exceeding the record level set the previous year to reach 40.8 GtCO2e, but rising at a slower pace than in previous years.
- Since 2010, the world has avoided using 1,371 EJ of fossil fuels and emitting 110 GtCO2e through renewables and nuclear.

Global Energy Demand by Source and Region, 2024 (I)



Source: Energy Institute's Statistical Review of World Energy 2025

Global Energy Demand by Source and Region, 2024 (II)

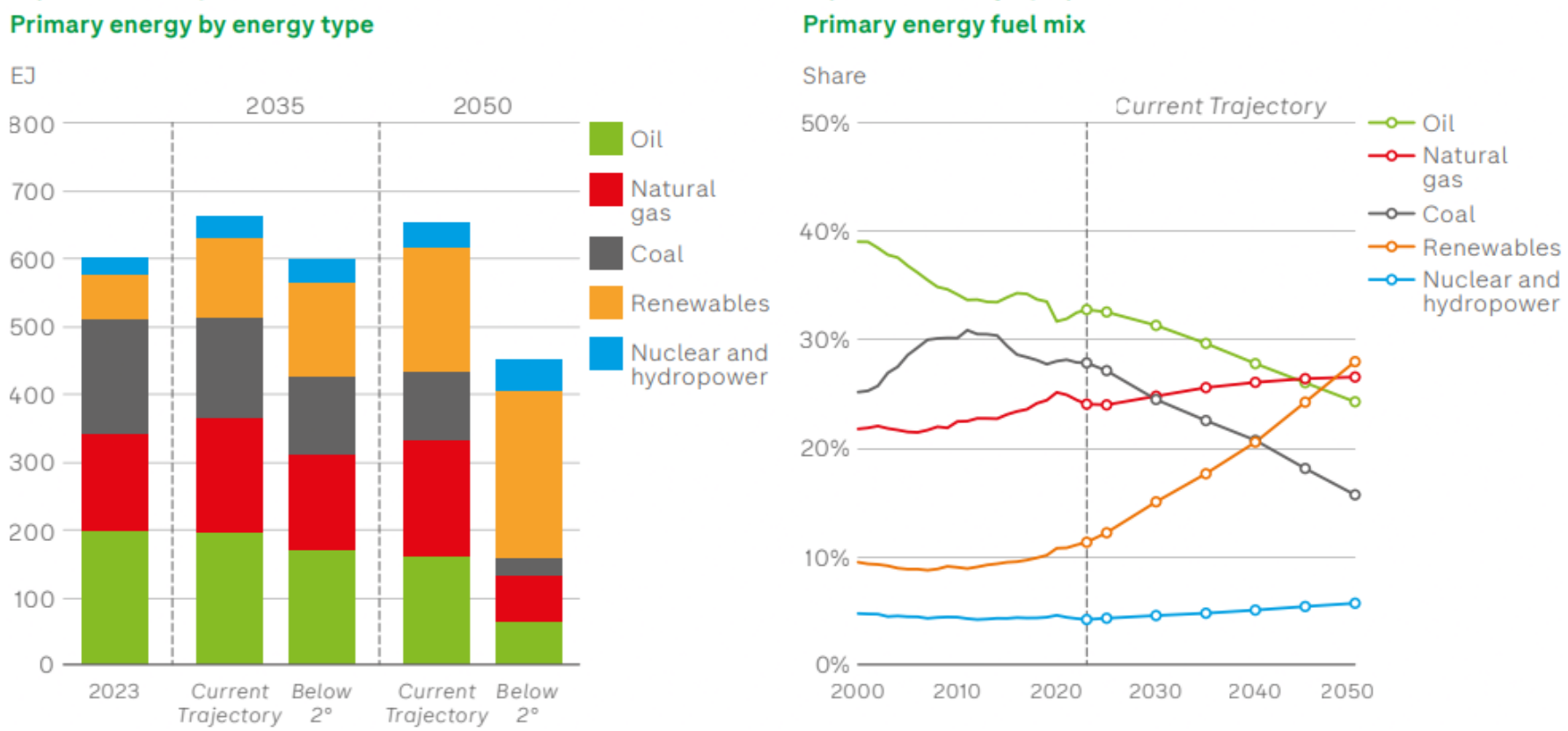


Source: Energy Institute's Statistical Review of World Energy 2025

Latest Developments

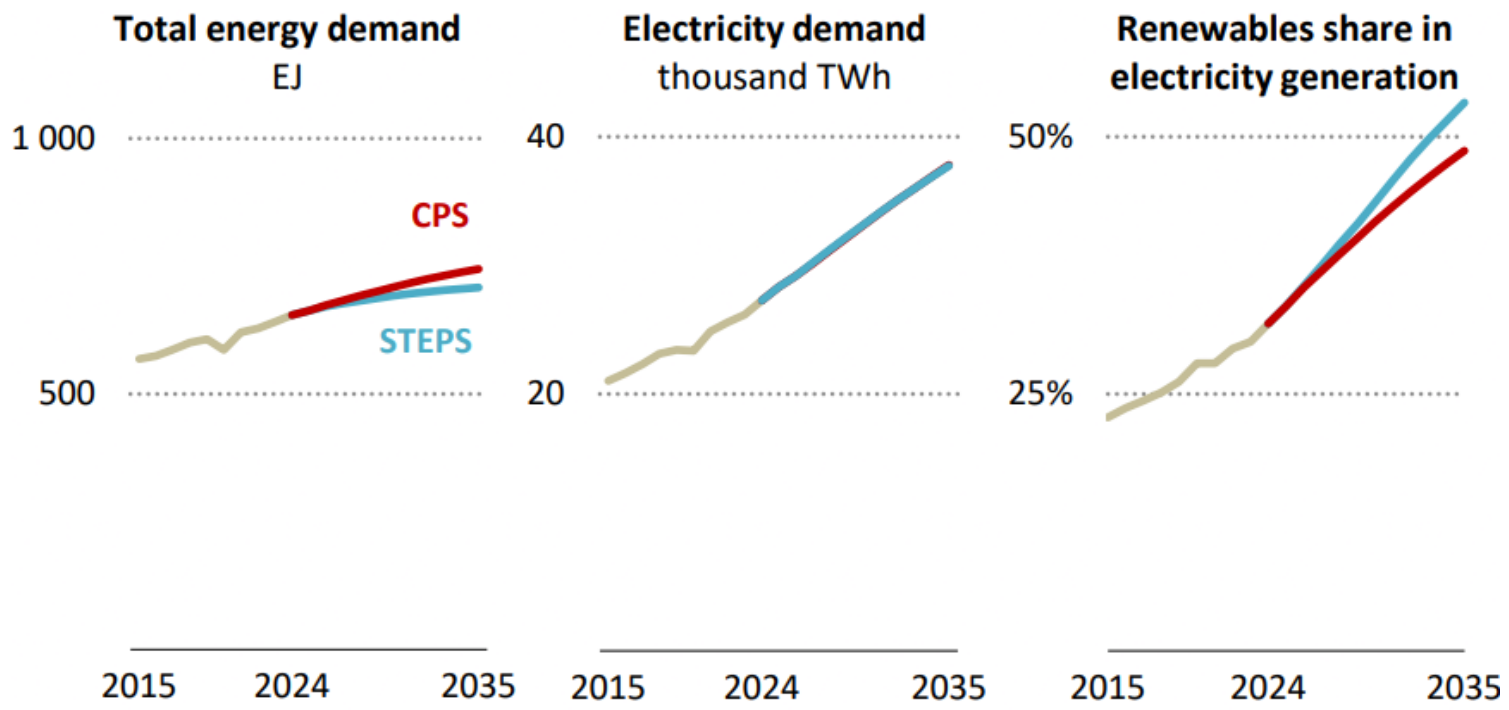
- Over the past five years, the global energy system and international energy markets have been rocked by a series of seismic events causing supply chain disruption, energy supply shortages, record energy prices, and increased volatility across international markets.
- From COVID, conflict in Ukraine, heatwaves, droughts and floods intensified by climate change to renewed tensions in the Middle East, vulnerabilities across every aspect of the energy system have been exposed.
- Where the energy transition initially focused on tackling climate change, these events have highlighted the need for resilient, decentralized, and clean energy systems.
- 2024 may well become seen as a beginning of a paradigm shift where the energy transition becomes increasingly associated with a need to deliver energy security through energy independence to protect countries from the types of shocks and uncertainty that such events bring.
- Investment in both oil, gas and renewables, but also in nuclear, is increasingly being seen as a cornerstone of energy security, enabling countries to disconnect their energy systems from global fuel markets and geopolitical tensions.
- Technologies, such as wind, solar, hydro, and geothermal, but also advanced oil and gas extraction that draw on homegrown resources, reduce the need to import energy from abroad. In addition, once built, they have low and predictable operating costs that shield economies from volatile international fossil fuel prices and bring stability to national budgets and household bills.
- Resilience is also improved through diversifying away from one or a limited number of energy sources or suppliers.

Renewables Account For a Growing Share of Primary Energy up to 2050



Source: BP's Energy Outlook 2025

Total Energy Demand, Electricity Demand and Renewables Share in Electricity Generation by Scenario, 2015-2035



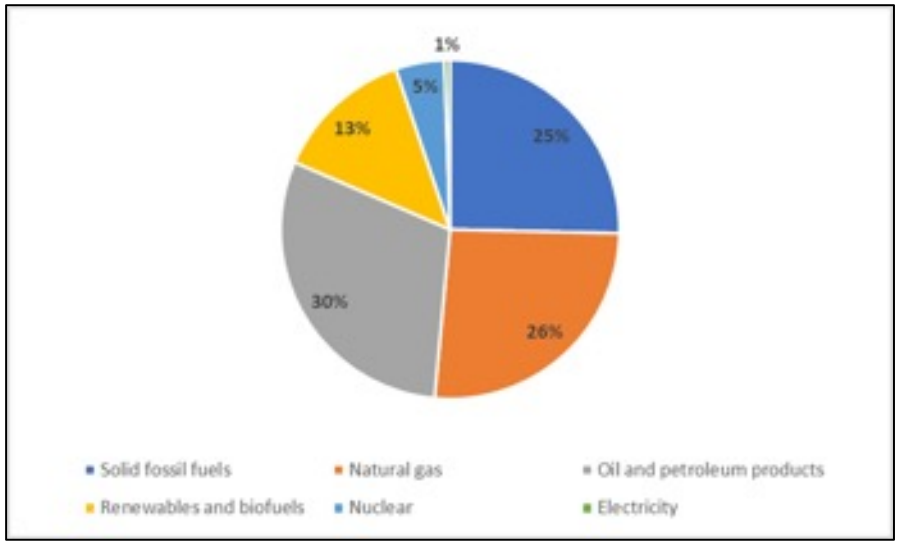
Source: IEA's World Energy Outlook 2025

The SE European Region as Defined by IENE

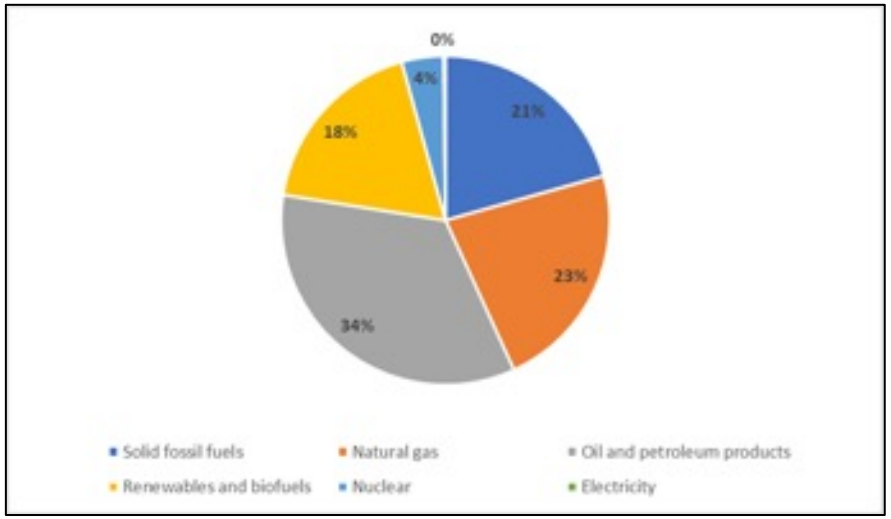
CORE COUNTRIES		PERIPHERAL COUNTRIES	
Albania	Hungary	Azerbaijan	Syria
Bosnia and Herzegovina	Montenegro	Ukraine	Lebanon
Bulgaria	Romania	Austria	Jordan
Croatia	Serbia	Italy	Egypt
Cyprus	Slovenia	Slovakia	
North Macedonia	Türkiye		
Greece	Israel		
Kosovo	Moldova		

Source: IENE

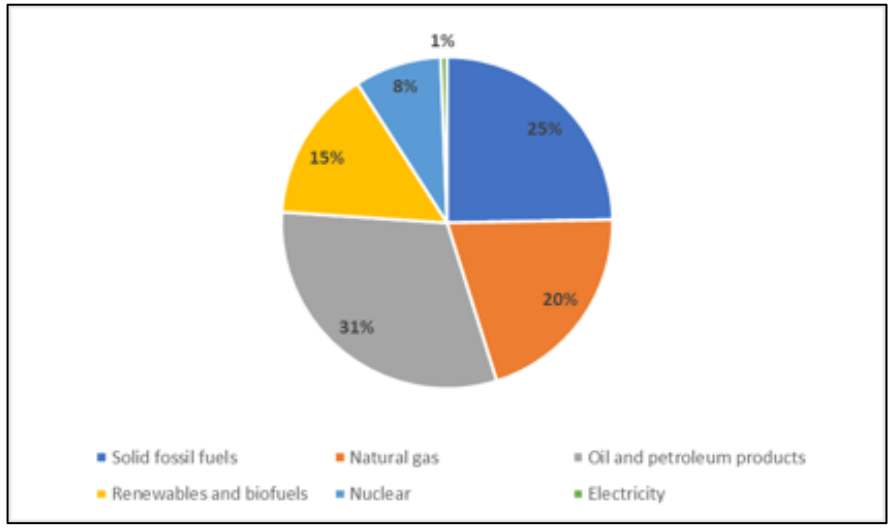
SE Europe’s Energy Mix, Including Türkiye, 2013 and 2023



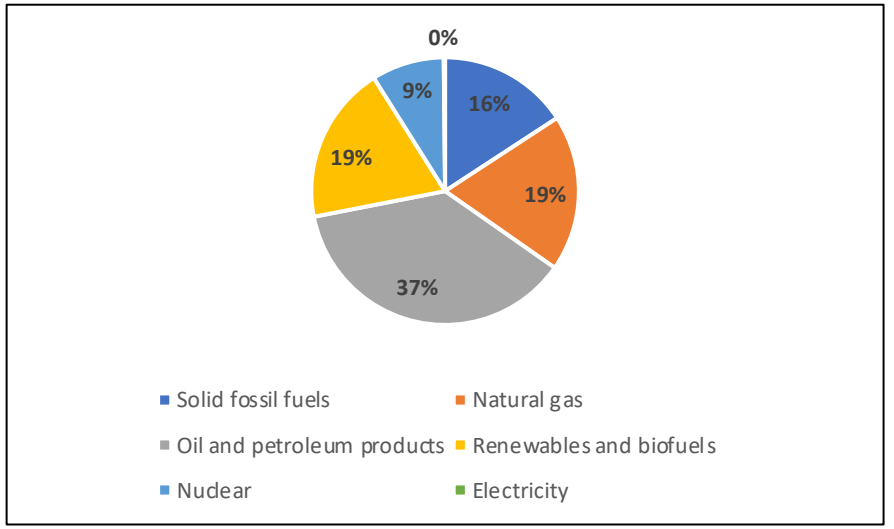
Sources: Eurostat, IENE



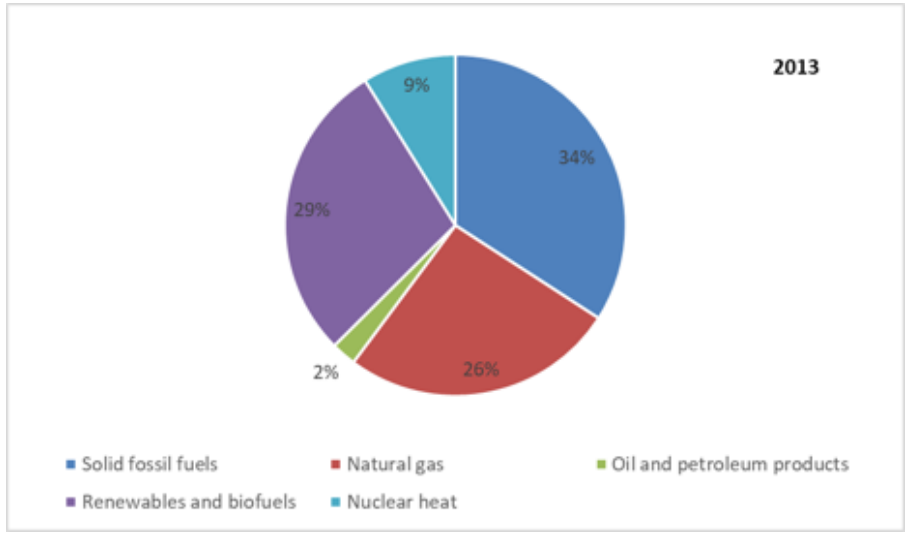
SE Europe’s Energy Mix, Without Türkiye, 2013 and 2023



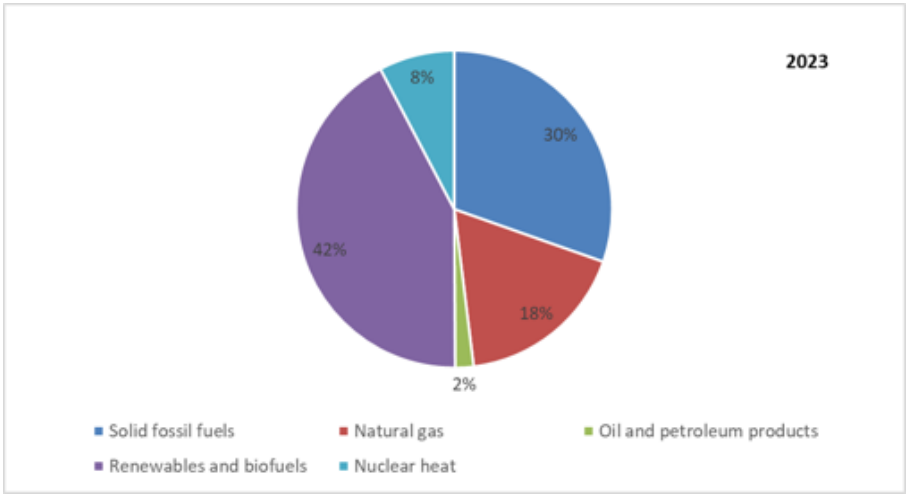
Sources: Eurostat, IENE



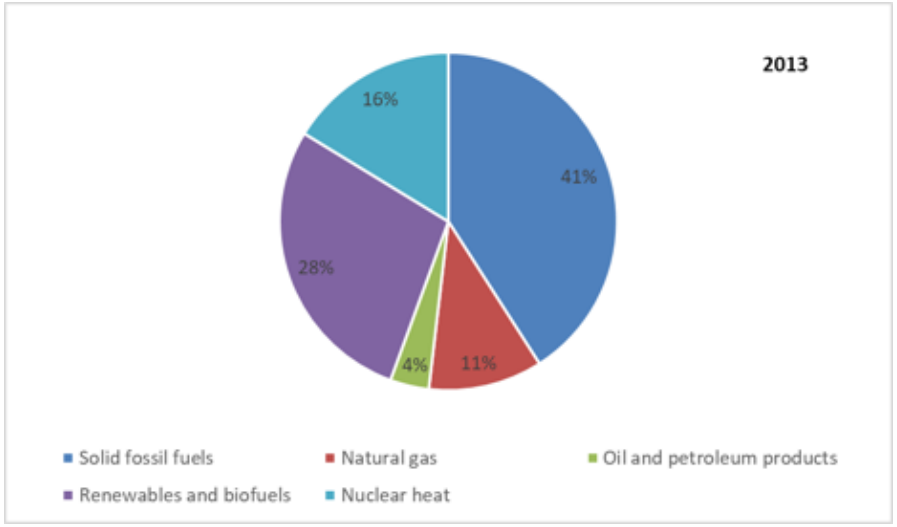
SE Europe’s Power Generation Mix, Including Türkiye, 2013 and 2023



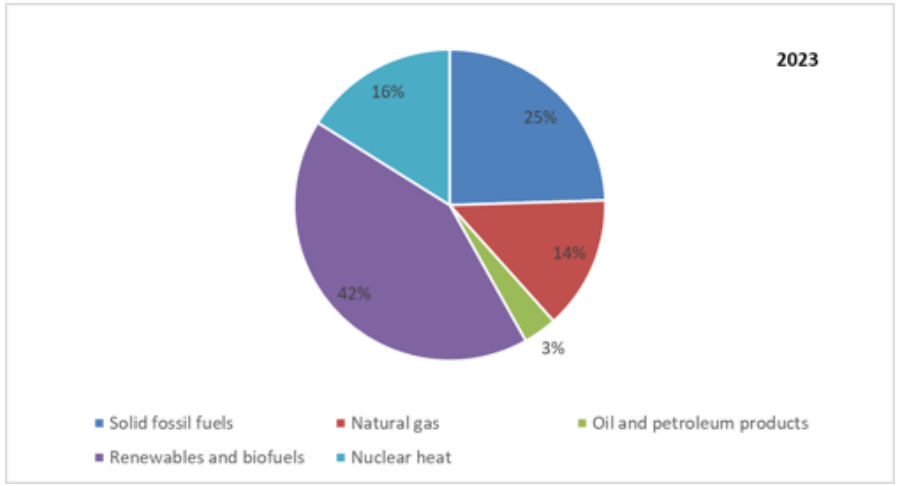
Sources: Eurostat, IENE



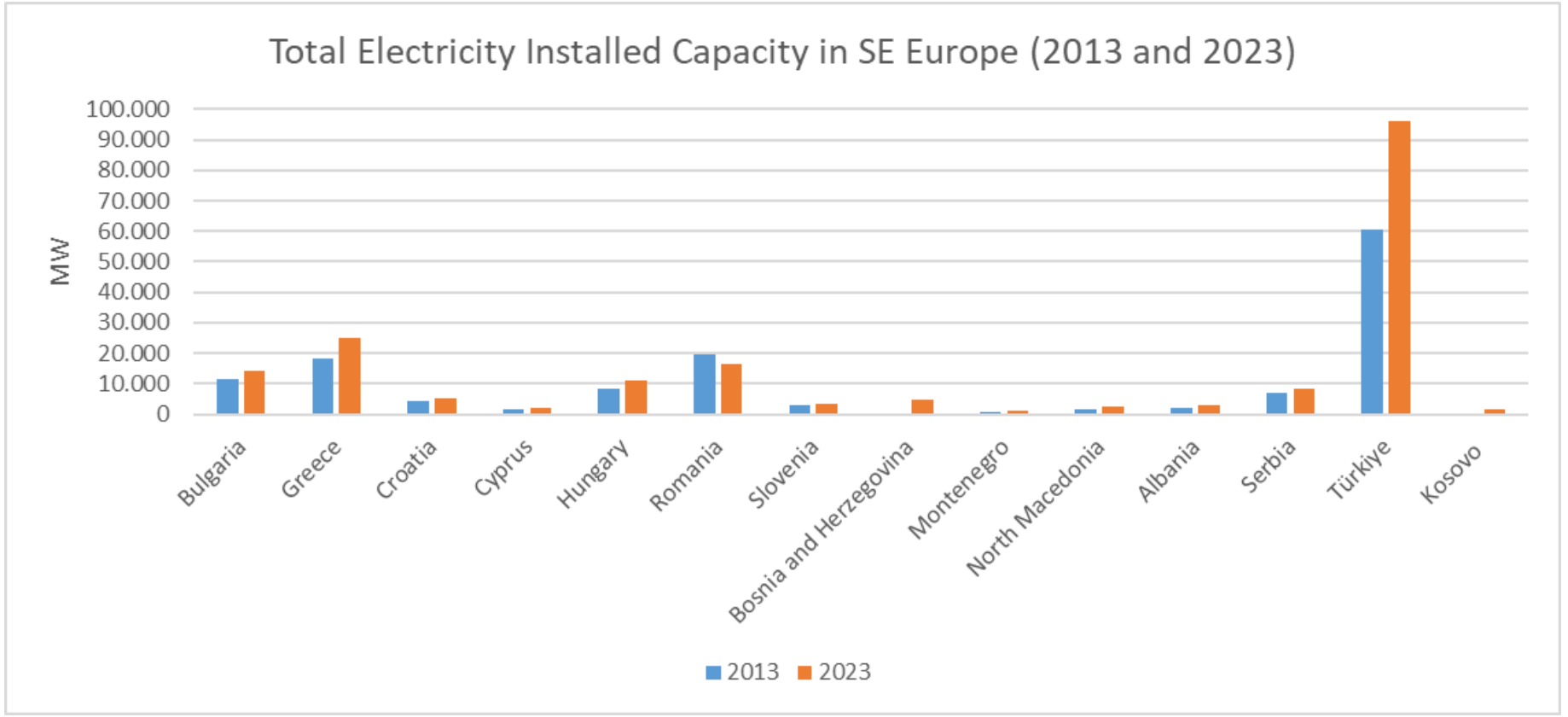
SE Europe’s Power Generation Mix, Without Türkiye, 2013 and 2023



Sources: Eurostat, IENE

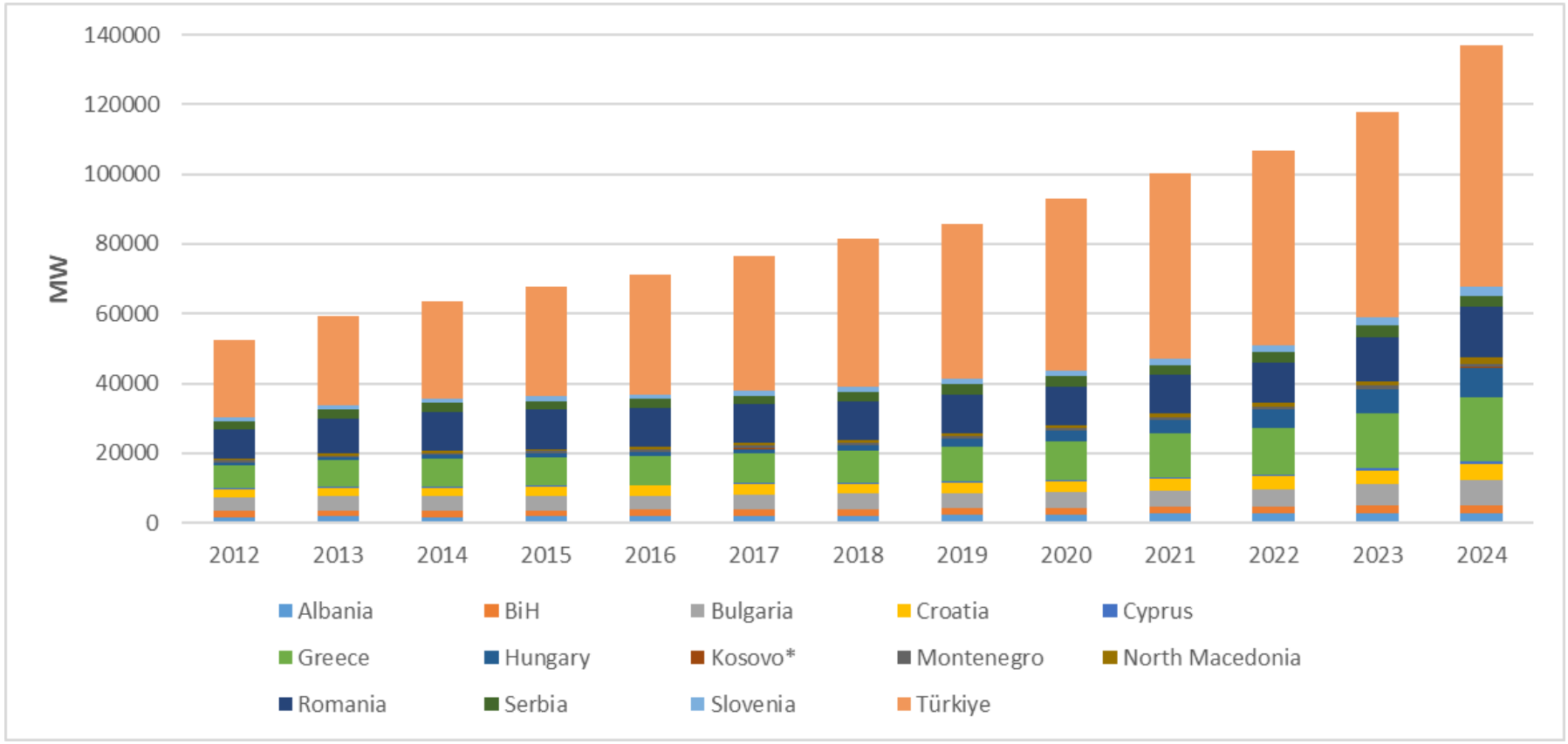


Total Electricity Installed Capacity in SE Europe, 2013 and 2023



Sources: Eurostat, IENE

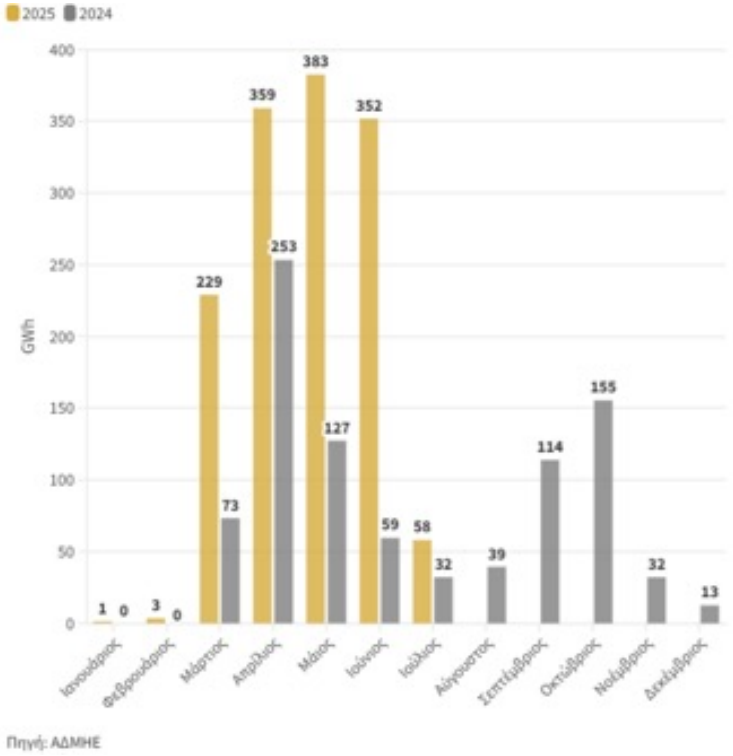
Total Installed RES Capacity (MW) by Country in SE Europe, 2012-2024

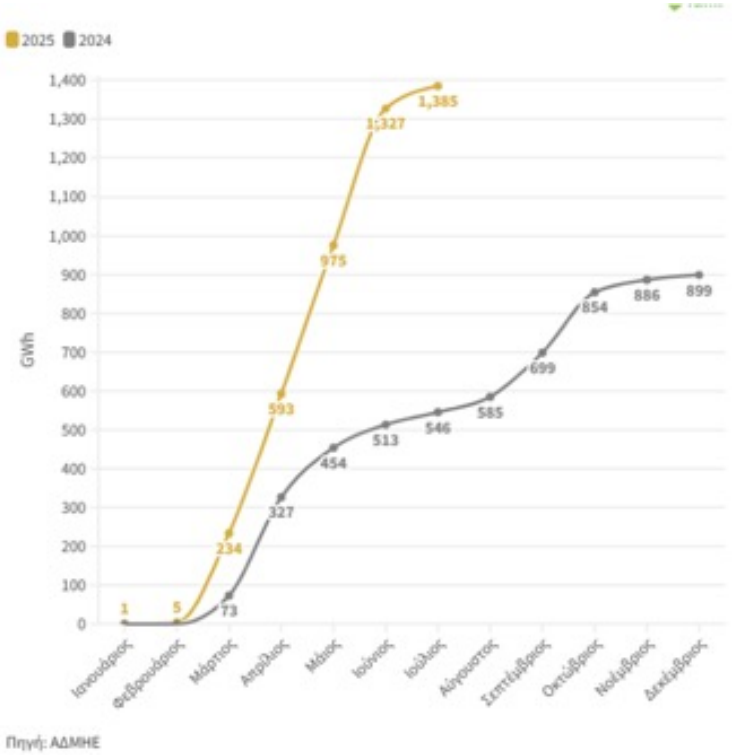


Source: IRENA

RES Curtailments in Greece, January-July 2025

- 1,385 GWh or 8.3% of total RES generation was rejected.
- More than double the RES curtailments of the same period in 2024 (585 GWh).





IENE SE Europe Outlook 2025/2026

Energy Demand in SE Europe: A Scenario Approach

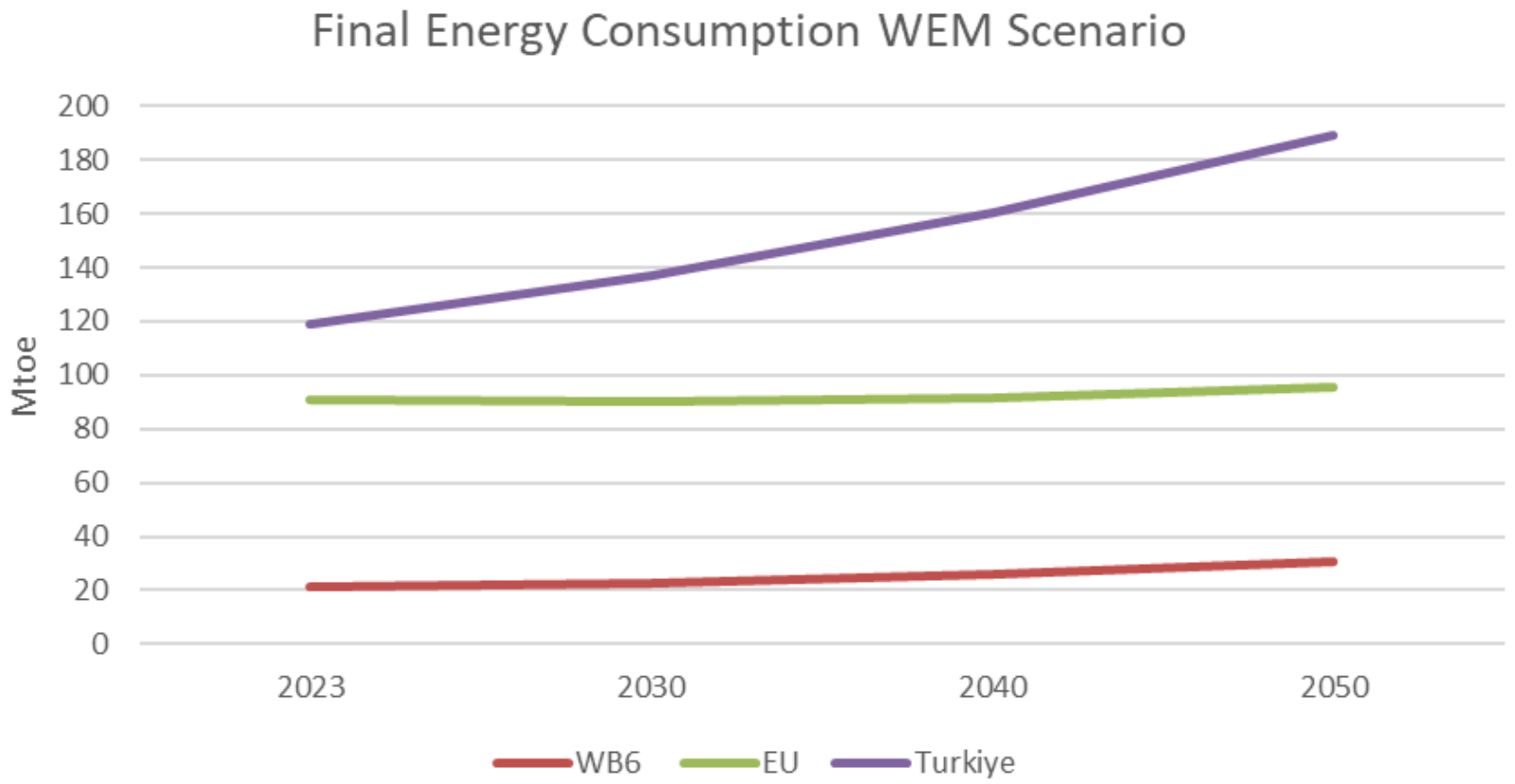
Three scenarios are analysed in the latest “SEE Energy Outlook 2025” study:

- The WEM scenario (With Existing Measures) represents a continuation of current efforts and policies, capturing a CO2 trajectory at the sectoral level derived from the national strategies, National Energy and Climate Plans and UNFCCC submissions of the countries, without additional mitigation ambition.

- The WAM scenario (With Additional Measures) reflects enhanced efforts still within a non-net-zero framework; it applies more ambitious but still realistic sectoral CO2 reductions, based on the same national sources as WEM.

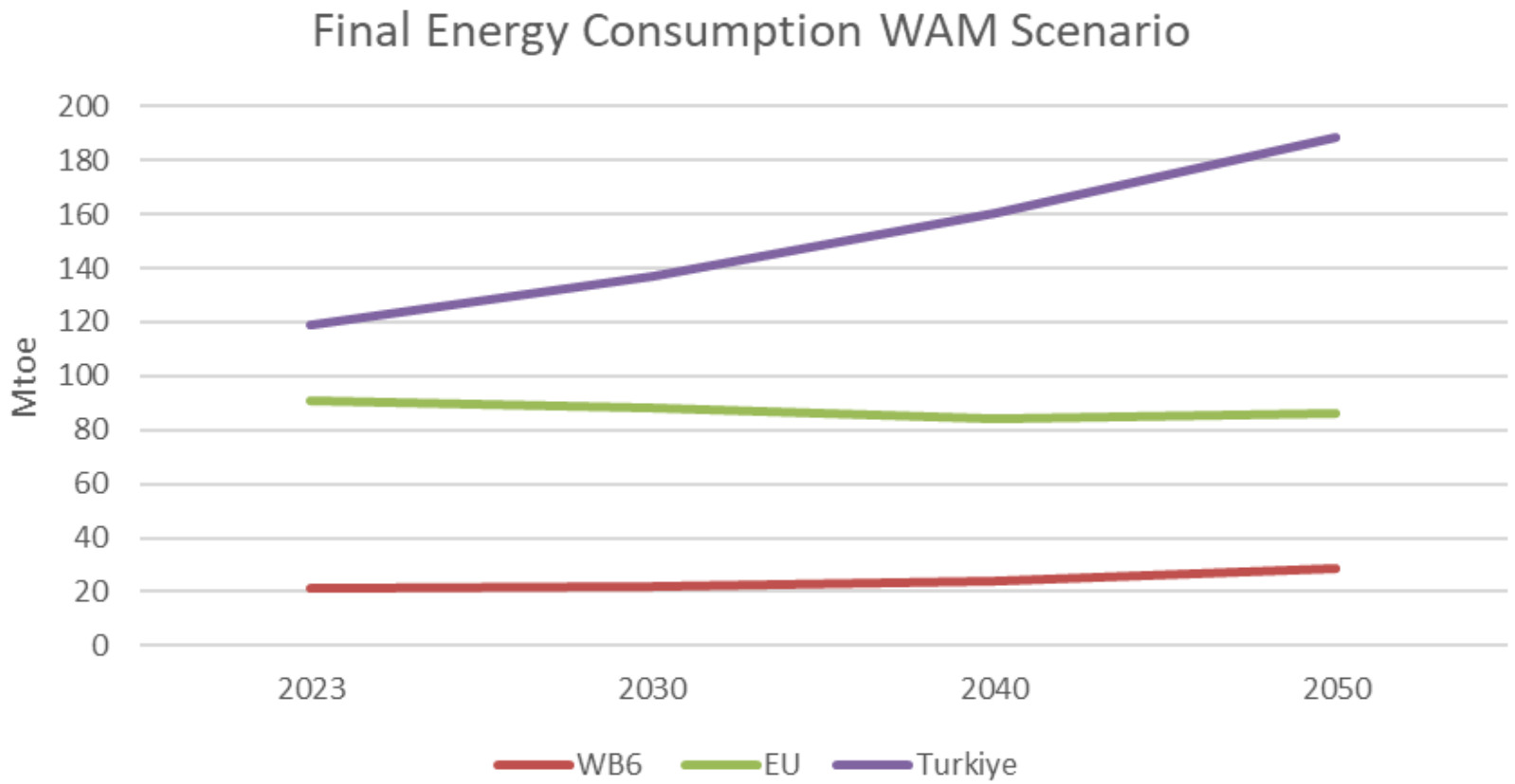
- Finally, the NZ (Net Zero) scenario builds upon the sectoral goals of the WAM scenario and applies an overarching constraint of achieving net zero greenhouse gas emissions at the national level for each of the targeted countries, thereby forcing a system-wide transformation in line with long-term climate neutrality targets.

Final Energy Consumption in SE Europe per Group of Countries, 2023-2050 (WEM Scenario)



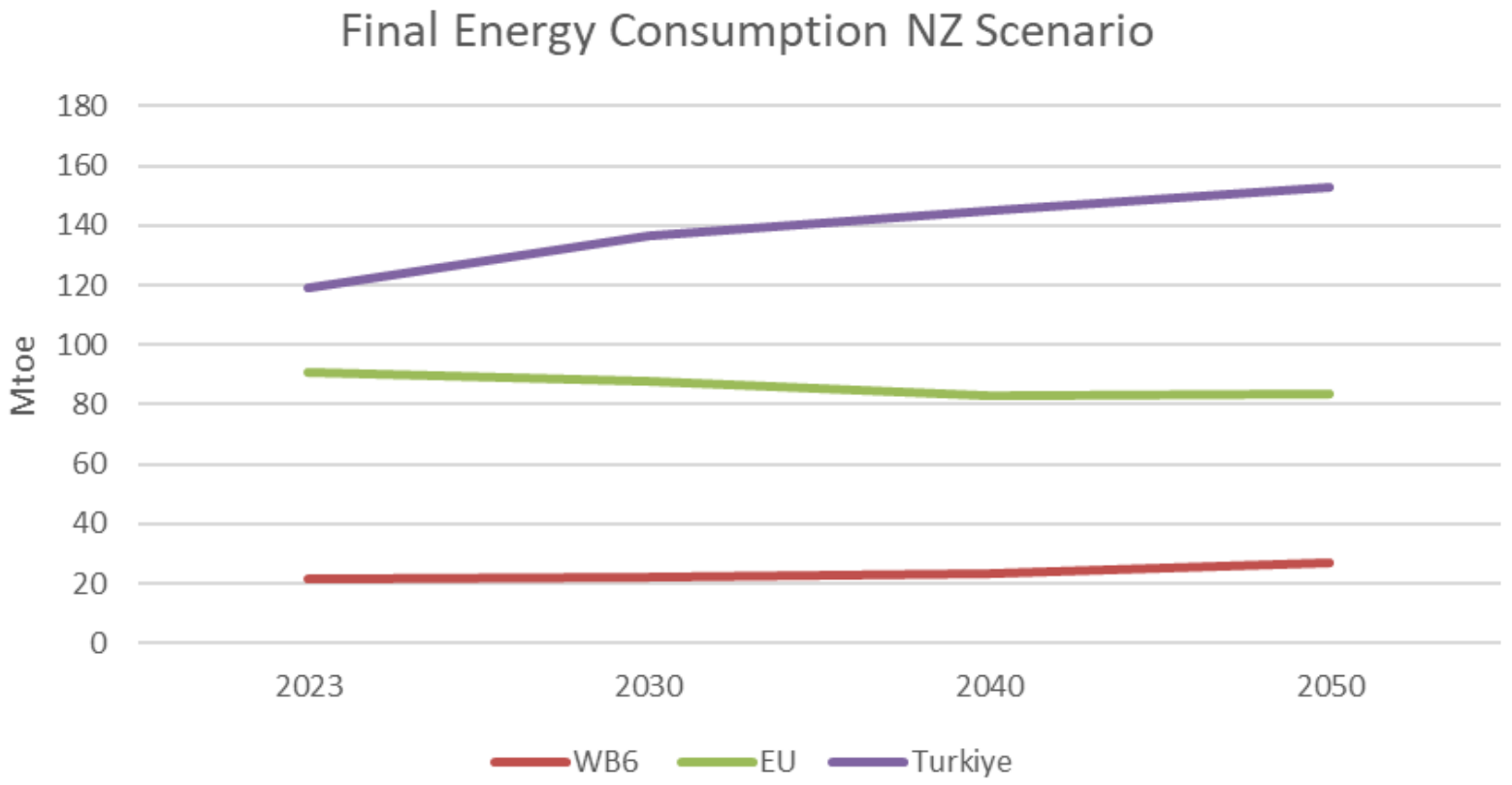
Source: IENE

Final Energy Consumption in SE Europe per Group of Countries, 2023-2050 (WAM Scenario)



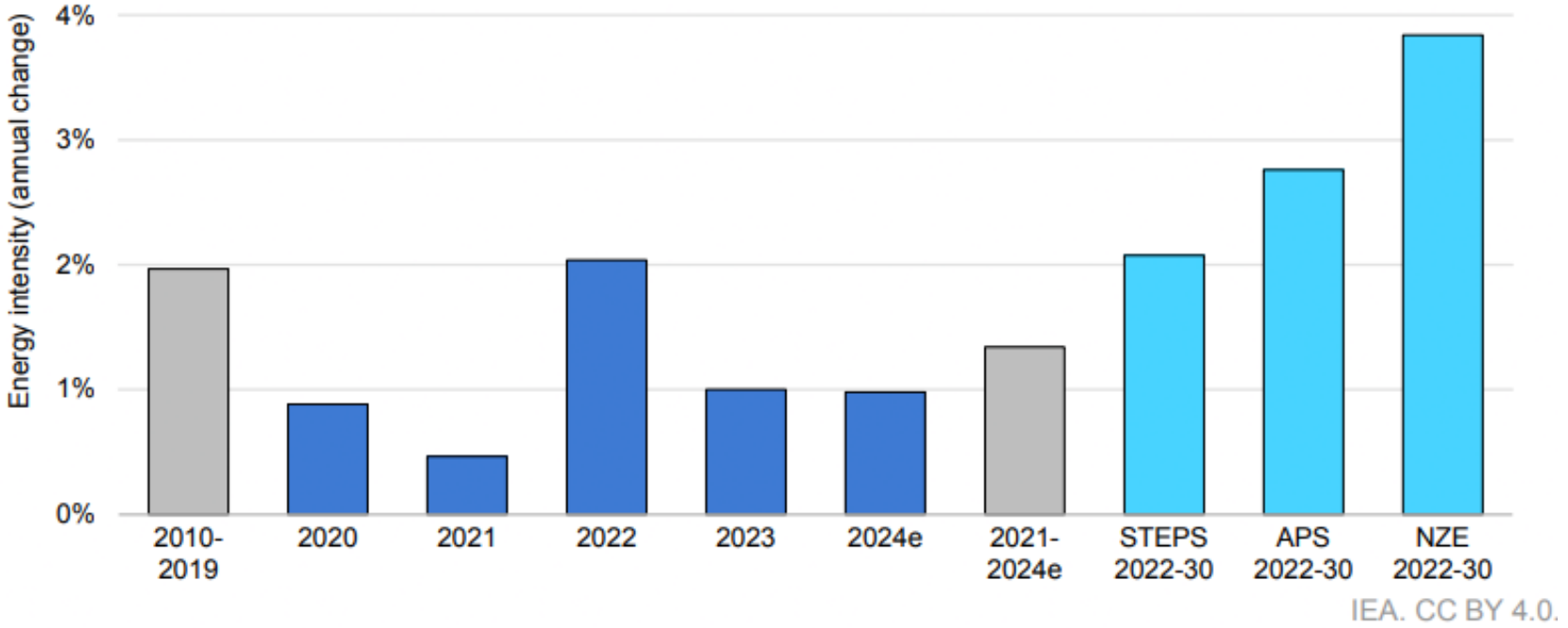
Source: IENE

Final Energy Consumption in SE Europe per Group of Countries, 2023-2050 (NZ Scenario)



Source: IENE

Global Annual Improvement in Primary Energy Intensity, 2010-2024e, and by IEA Scenario, 2022-2030



Notes: STEPS = Stated Policies Scenario, APS = Announced Pledges Scenario, and NZE = Net Zero Emissions by 2050 Scenario. 2024e = estimated values for 2024. Energy intensity of the global economy is an indicator of energy efficiency, composed of total energy supply over gross domestic product. Positive percentages indicate a reduction in energy intensity year-on-year.

Source: IEA's Energy Efficiency 2024

Annual Change in Final Energy Consumption, Total and by Sector, 2000-2024e and by Scenario, 2022-2030

Notes: 2024e = estimated value. STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario.

Source: IEA's Energy Efficiency 2024

Energy Efficiency in SE Europe (I)

- For Europe, and particularly for SE Europe (SEE), energy efficiency improvement is not just a policy aspiration but a necessity. The European Union, as part of its Green Transition strategy, has set specific targets to improve energy efficiency across all member states. The latest benchmark aims for a reduction of 11.7% in final energy consumption by 2030 compared to projected energy consumption based on the 2020 reference scenario. This ambitious goal has been woven into the National Energy and Climate Plans (NECPs) of EU member states, each adjusting the target to reflect their own energy systems and economic structures.
- Over the past fifteen years, the EU has invested heavily in energy efficiency programs, with a particular focus on buildings. The building sector, being one of the largest energy consumers, offers the clearest path toward meaningful reductions. Through regional and cohesion funds, and with the financial backing of European-controlled banks, such as the EIB and the EBRD, substantial resources have been directed toward upgrading heating systems, improving insulation, and promoting more efficient appliances. Countries in SEE, both EU member states and Western Balkan partners, have been direct beneficiaries of this financial support.
- Yet, despite consistent EU funding, the actual results remain murky. There is still no clear and comprehensive picture of how these energy efficiency applications have impacted final energy consumption in SEE. Accountability is patchy, monitoring mechanisms remain underdeveloped, and governments often struggle to ensure that EU and national funds are used effectively. This is a point of growing concern.

Energy Efficiency in SE Europe (II)

- There are already success stories in the SEE region. Greece, for example, since 2013 is pushing large-scale building renovation programs, offering subsidies for households to improve insulation and heating systems. Latest reports indicate that energy consumption in buildings is levelling off. Bulgaria has seen measurable gains in electricity savings through grid modernisation and energy efficiency funds. Serbia, though outside the EU, has benefited from EBRD-backed schemes to improve efficiency in industry and municipal services. Yet these efforts, while notable, remain fragmented and often insufficient in scale.
- Ultimately, energy efficiency is not a silver bullet, but it is one of the few policy tools that delivers across the board: economic, environmental, and social. It lowers costs for households, enhances competitiveness for industries, reduces reliance on external suppliers, and brings countries closer to their climate goals.
- For SEE, with its unique vulnerabilities and opportunities, the case for prioritising energy efficiency could not be clearer. The challenge now is to turn intent into measurable action—and to ensure that energy efficiency becomes more than just a policy slogan, but a lived reality across the region.

Implementing Energy Efficiency Measures in SE Europe

- Industries, in almost all countries in the region, are far more advanced than the enterprises, transport and building sectors in applying energy saving techniques and achieving actual energy savings.
- Hence, greater attention should be paid to enterprises (read services sector) buildings and transport.
- Effective energy savings in transport can be achieved through extensive use of biofuels and electrification of public transport and electric mobility for private vehicles.
- Improving energy efficiency in the built environment presents huge challenges since we are dealing with all different kinds of habitats.
- In the case of buildings, we have a wide range of available tools and techniques ranging from insulation of the building envelope to SWH and PV installations on roofs and terraces, integration of solar passive systems in the building structure, strict application of bioclimatic principles, control of thermal flows, installation of heat pumps, etc.
- Implementing energy efficiency improvements in buildings is easily achievable in most countries in the region with great benefits to the local economies since most of the required tools and systems are manufactured locally. Therefore, the benefit to the national economies is even greater.

Energy Security in SE Europe (I)

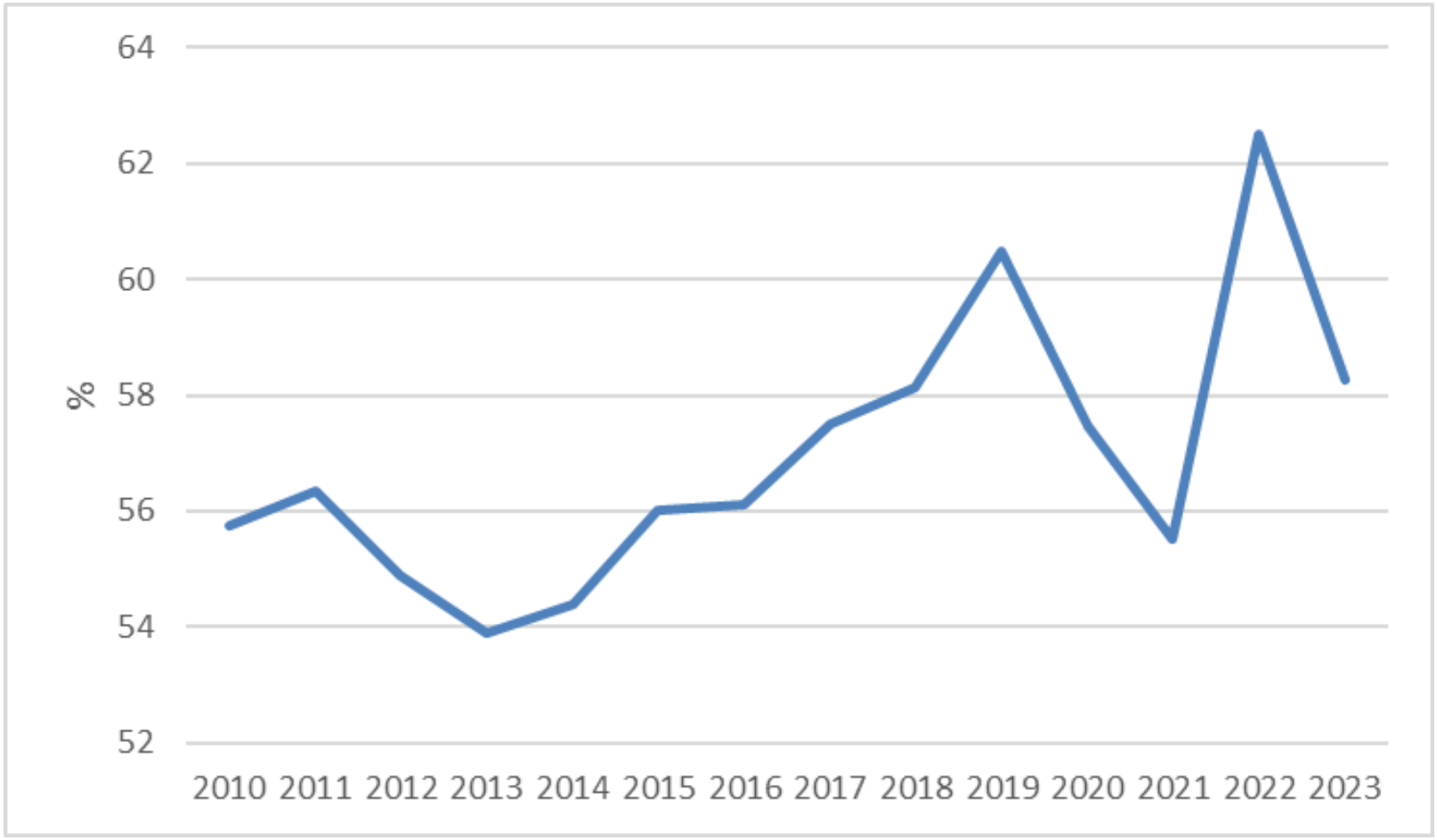
- Energy security is a complex issue and as such cannot be considered in isolation.
- SE Europe, because of its geography, its proximity to high-risk conflict zones (i.e. Syria, Iraq, Ukraine), refugee flow from the Middle East and North Africa and the location of some of its countries (i.e. Turkey, Greece, Romania) at vital energy supply entry points, faces higher energy security threats than the rest of Europe.
- Electricity produced by RES installations, electricity grids and gas supply are closely interlinked as RES cannot operate in vacuum. Hence, decarbonisation policies in the EU and SEE in particular have a clear impact on energy security with most obvious the 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.

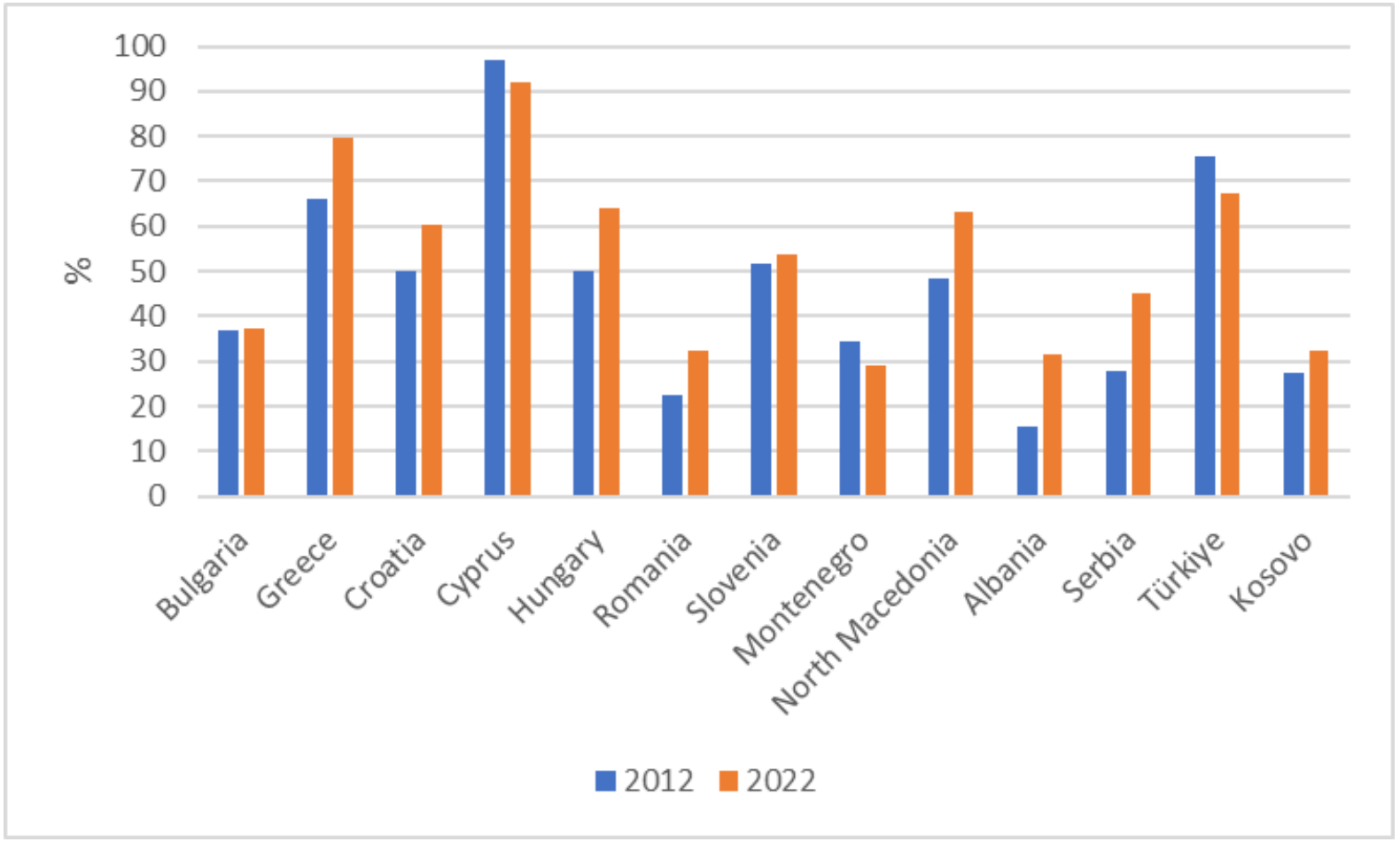
- Security of supply/demand and differentiation of supply sources
- In the case of gas, it is becoming more important and pressing compared to other fuel sources, such as electricity, oil, coal and possibly uranium.
- Gas is a primary area of concern largely because of its rather inflexible transmission method, mainly by means of pipelines.

Energy Dependence (%) in Europe, 2010-2023



Sources: Eurostat, IENE

Energy Dependence (%) in SE Europe, 2012 and 2022

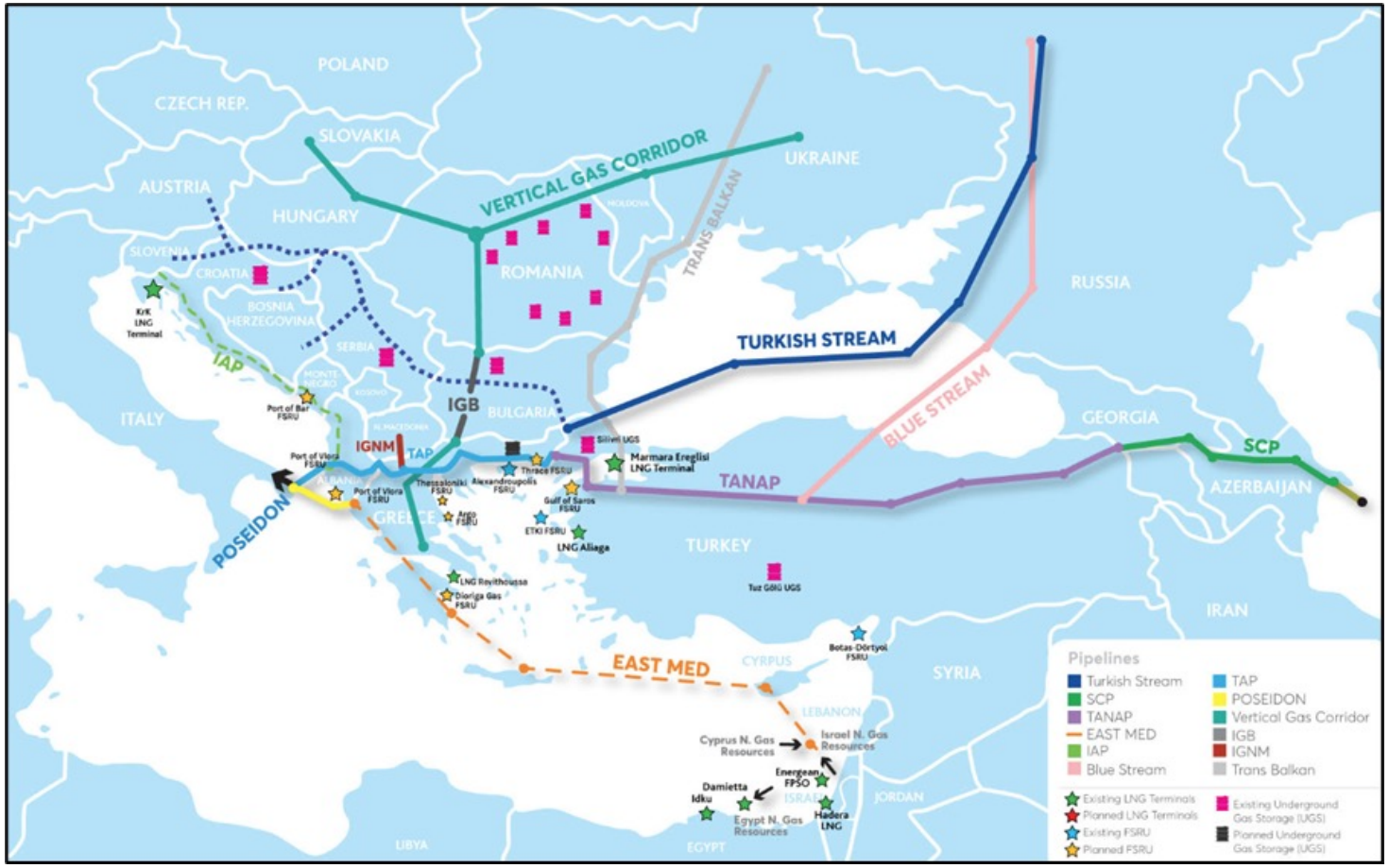


Sources: Eurostat, IENE

Energy Security in SE Europe (II)

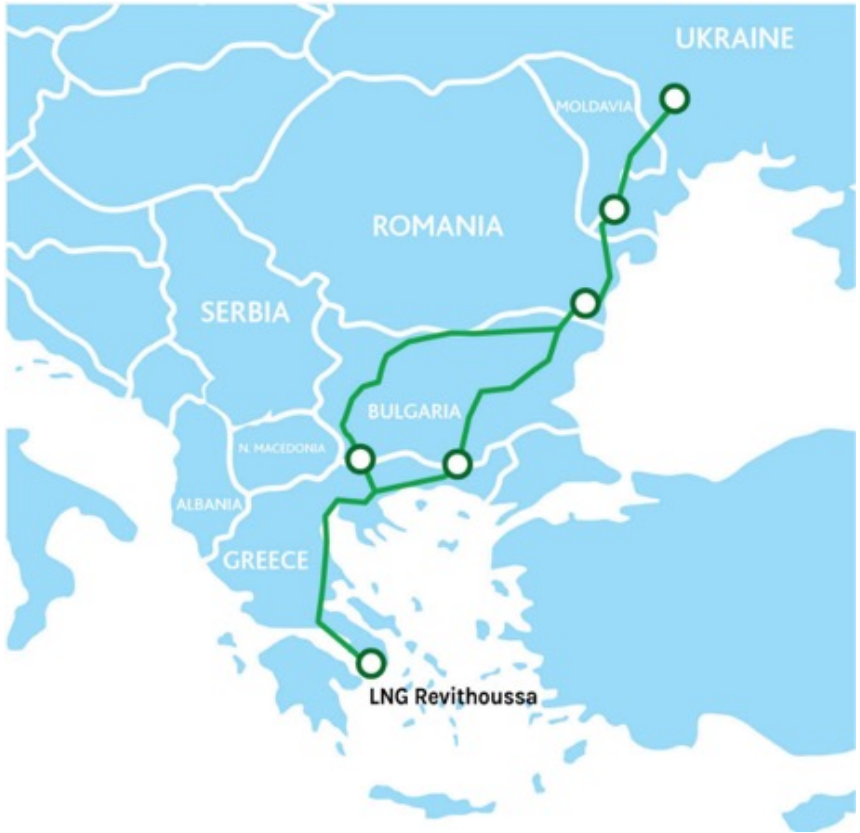
- Securing Energy Transportation
  - Repeated disruptions of Russian gas transit to Europe highlight the vulnerability of key supply corridors.
  - Ensuring reliable shipment of oil and gas remains a top regional priority.
- Electricity Supply & Grid Resilience
  - Need for smoother electricity supply and improved interconnection of island systems with mainland grids.
  - Replacement of diesel generators on islands to reduce environmental impact and prevent supply shortages.
- Protection of Critical Energy Infrastructure
  - Increased risks from terrorism, cyber-attacks and natural hazards require higher safety standards and robust crisis-management plans.
  - Several energy sites across SE Europe constitute potential security hot spots.
- Gas Supply Diversification & Infrastructure Development
  - The South Corridor strengthens European energy security by enabling gas flows from Azerbaijan to SEE and onward to Europe.
  - Additional cross-border gas links and LNG terminals are being developed as gas becomes a key strategic fuel.
- East Mediterranean Gas Potential
  - Major discoveries (Leviathan, Tamar, Zohr, Aphrodite, Zeus, Cronos) and multiple export options under consideration (LNG/FSRU solutions tied into the TANAP–TAP, EastMed Pipeline).

An Expanded South Gas Corridor



Source: IENE

The Vertical Corridor



Source: DESFA

A Holistic Approach to Energy Security

- For Renewables to be able to provide an alternative solution in enhancing energy security, we need reliable base load electricity. This can be provided only through natural gas operated CCP and nuclear plants. To that we should add pumped hydro schemes and electric batteries.
- Demand side management of the energy system through nation wide programmes to improve energy efficiency (primarily in buildings) must also accompany our efforts to enhance energy security. By using smart electricity and gas meters we can predict more accurately the demand curve and hence plan accordingly the operation of the electricity plants on an hourly basis.
- 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.
- Also, CCUS is becoming relevant 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.
- In this context, an understanding of the energy demand in the region is necessary. We would like to know how demand is going to shape over the next 25 years or so and how is this going to affect the needs for new energy infrastructure.

Concluding Remarks (I)

- Energy demand and energy efficiency are closely interlinked with higher efficiency systems leading to lower demand.
- Controlling demand enables one-at regional, national and local level- to optimise the use of available resources whether these are conventional or renewable energy sources
- Availability and operability of energy resources at national and regional level influences energy security.
- In today's uncertain and geopolitically unstable world attaining a high degree of energy security is paramount for the smooth operation of society and economic growth
- Achieving a satisfactory level of energy security requires diversification of energy inputs and a high degree of indigenous energy production, whether fossil fuel, nuclear or RES

Concluding Remarks (II)

- As energy transition is not really happening, at least at the pace where we can expect to achieve transformation of the energy mix within a reasonable time horizon, we shall continue to rely on fossil fuels for some time to come.

- This is necessary in order to be able to move, inevitably, towards energy transition and at the same time maintain economically competitive conditions (i.e. reasonable electricity prices)

- Consequently, lowering of GHGE's is becoming less of a priority, with energy security and price affordability taking priority in the foreseeable future.

- Consequently, improvement of energy efficiency at all levels is becoming a determining factor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