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Greek Energy Market Report 2026

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| Greek Energy Market Report |

2026

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HAEE 2026

Hellenic Association for Energy Economics

Hellenic Association for Energy Economics (HAEE) brings together all those who study, debate and promote the knowledge of energy, environment and economy in our country. HAEE is the Greek affiliate of the International Association for Energy Economics (IAEE), which is a non-profit research and professional organization acting as an interdisciplinary forum for the exchange of ideas and experiences among energy experts.

HAEE was founded in 2015 in Greece and has a global orientation welcoming the participation of researchers and practitioners from around the world interested in energy, environmental and economic related subjects. It acts as an independent consulting body for national and international organizations to whom it provides a broad contribution on issues related to energy, economics, policymaking and theory.

Through meetings and joint initiatives HAEE also provides a means of professional communication and exchange within its members and the authorities defining the Greek energy policy. HAEE organizes meetings amongst experts and specialists interested in networking - organizes conferences and seminars on both national and international levels - promotes training initiatives in the energy and economic sector - provides researches, studies and other services for its members.

HAEE promotes the understanding of energy, environment and economy related topics within universities and encourages the participation in the Association's activities of young students who are invited to seminars and conferences and can make use of the IAEE library for their academic works. HAEE is financially supported by member dues, contributions for research activities carried out for companies and bodies involved in the energy field, and by the sale of conference proceedings as well as conference fees and other initiatives.

National Bank of Greece

National Bank of Greece stands out for its unique history and its dynamic future.

In its 185 years of operation, NBG has expanded, providing a wide range of financial services including mainly retail, corporate and investment banking, specialized asset solutions, transactional banking, leasing, factoring, brokerage, asset management, real estate management and insurance intermediation services.

Additionally, the Bank consistently invests in enhancing the service experience for its 3.3 million digitally active customers, by continuously enriching its range of products and services through digital channels, thus playing an extinctive role in Digital Banking within the Greek banking market.

NBG plays a pivotal role in Greece's energy transition, as the sector evolves from capacity expansion toward greater system resilience and flexibility.

Our focus extends beyond supporting clean energy growth to strengthening the stability, efficiency and long-term sustainability of the energy system as a whole.

As the "Bank for Energy", NBG remains committed to addressing the sector's evolving needs and contributing to a more sustainable and resilient energy future.

Foreword

Prof. Dr. Spiros Papaefthimiou
Chairman HAEE

The Greek Energy Market Report 2026 arrives at a time when the global energy system is once again being tested by geopolitical uncertainty, structural transformation, and the accelerating pace of the energy transition. As this report clearly demonstrates, Greece's energy sector is no longer shaped solely by domestic policy choices or European frameworks, but increasingly by developments far beyond its borders—most notably in critical regions such as the Middle East.

The recent tensions surrounding the Strait of Hormuz have underscored a fundamental reality: energy security remains deeply intertwined with geopolitics. A significant share of global oil and LNG flows transit through this narrow maritime chokepoint, making it one of the most strategically sensitive arteries of the global energy system. As highlighted throughout this report, even the perception of disruption can trigger immediate volatility in international energy prices, with direct implications for European and Greek markets. This reinforces the importance of resilience—not only in infrastructure, but also in market design, diversification strategies, and policy coordination.

Against this backdrop, Greece continues to navigate a complex but promising energy landscape. The country has made substantial progress in recent years, achieving stronger macroeconomic stability, improved fiscal indicators, and a steady decline in unemployment, all while advancing its energy transition. Renewable energy sources now account for a rapidly growing share of electricity generation, positioning Greece closer to the European average and signaling a structural shift in the energy mix. At the same time, the country remains highly dependent on energy imports, with dependency levels significantly above the EU average, highlighting the persistent challenge of energy security.

This dual reality—progress in decarbonization alongside continued import reliance—places Greece at a critical crossroads. On one hand, the expansion of renewable energy, electrification, and storage technologies offers a pathway toward a more sustainable and self-reliant system. On the other, the country must contend with the volatility of global energy markets, where geopolitical events such as those in the Middle East can rapidly reshape supply conditions and price dynamics.

Importantly, Greece is not merely a passive recipient of these global trends. As this report illustrates, it is increasingly emerging as a regional energy hub, particularly in natural gas and electricity markets. Investments in LNG infrastructure, interconnections, and cross-border trade are strengthening the country's role in Southeast Europe, enhancing both national and regional energy security. The development of corridors that connect global energy flows with European demand centers is transforming Greece into a key node within the broader energy system.

The findings presented in this report highlight the need for a balanced and forward-looking approach. Energy policy must simultaneously address decarbonization, affordability, and security—three objectives that are often in tension but must be pursued in parallel. Strengthening grid infrastructure, accelerating storage deployment, and ensuring flexible market mechanisms will be essential to managing the increasing complexity of the energy system.

Ultimately, the Greek energy transition is unfolding within a global environment defined by uncertainty and opportunity. The events in the Middle East serve as a reminder that resilience is not optional—it is a prerequisite. Greece has made significant strides, but the path ahead will require continued investment, strategic planning, and international cooperation.

Foreword

Prof. Dr. Kostas Andriosopoulos
BoD member, HAEE
Project Coordinator

Energy markets in 2026 are once again being shaped by the interplay between structural transformation and geopolitical disruption. Among the most defining developments of the past year has been the renewed instability in the Strait of Hormuz which has reverberated across global oil and natural gas markets, highlighting both their interconnectedness and their vulnerability.

The Hormuz Strait remains one of the most critical chokepoints in the global energy system, facilitating the transit of a substantial share of internationally traded oil and liquefied natural gas. As this report demonstrates, even short-term disruptions or perceived risks in this region can generate immediate price reactions across global benchmarks. In early 2026, gas prices in Europe experienced a sharp increase, reflecting concerns over LNG supply security, while oil markets reacted with heightened volatility. These developments reaffirm the sensitivity of energy markets to geopolitical risk, particularly in a system that has become increasingly globalized and interdependent.

The oil market, while historically more resilient to shocks, continues to exhibit rapid price responses to supply-side risks. However, it also demonstrates a capacity for stabilization, supported by diversified supply sources, strategic reserves, and flexible production mechanisms. In contrast, natural gas markets—especially in Europe—remain more exposed to regional imbalances and infrastructure constraints. The growing reliance on LNG has introduced a new layer of complexity, linking European gas prices more closely to global trade flows and maritime routes such as Hormuz.

Within this context, the transformation of European gas markets over recent years has been profound. The reduction of Russian pipeline gas imports has fundamentally altered the supply structure, with LNG emerging as the dominant source. While this diversification has strengthened energy security in strategic terms, it has also increased exposure to global market dynamics and geopolitical developments beyond Europe's immediate neighborhood. The Hormuz crisis exemplifies this new reality: a regional disruption in the Middle East can now directly influence European gas prices through its impact on LNG flows.

Greece occupies a particularly important position within this evolving landscape. As highlighted in this report, the country has significantly increased its LNG imports, reinforcing its role as a key entry point for gas into Southeast Europe. Infrastructure developments, including LNG terminals and cross-border interconnections, are enabling Greece to function as a regional hub, facilitating the redistribution of gas flows toward neighboring markets. This enhanced role brings both opportunities and responsibilities, as Greece becomes more deeply integrated into global energy networks.

At the same time, the domestic energy system is undergoing rapid change. Renewable energy deployment continues to accelerate, electricity markets are becoming more dynamic, and investments in storage and grid infrastructure are gaining momentum. Yet, oil and natural gas remain central to the energy mix, particularly in sectors where electrification is progressing more slowly. This underscores the continued relevance of hydrocarbon markets, even as the transition toward cleaner energy sources advances.

The key challenge, therefore, lies in managing this transition within an environment of heightened uncertainty. Energy systems must be designed not only for efficiency and sustainability, but also for resilience. The lessons from the Hormuz crisis are clear: supply diversification, infrastructure flexibility, and robust market mechanisms are essential to mitigating the impact of external shocks.

Foreword

Mr. Pavlos Mylonas

CEO, National Bank of Greece

As the Bank of Energy in Greece, National Bank of Greece has been proud to support the Greek Energy Market Report since its inception eight years ago.

Over this period, the energy debate has changed profoundly. A few years ago, the main question was whether Europe could accelerate the green transition.

Today, the question is broader and more demanding: how Europe can advance the transition while also strengthening energy security, preserving affordability and ensuring that the necessary investments remain financially viable.

Recent crises have made clear that energy security and economic resilience are inseparable. Russia's invasion of Ukraine exposed Europe's dependence on imported fossil fuels, while renewed tensions around critical energy routes have reminded us once again of the vulnerability of global supply chains. These developments have generated price volatility, inflationary pressures and uncertainty for households and businesses. But energy shocks can also become catalysts for structural change. The oil crises of the 1970s accelerated efficiency gains, encouraged electrification (c.¼ of global energy consumption today vs 12% in the 1970s) and reduced the oil intensity of advanced economies. Today, the opportunity is different: mature renewable technologies, electrification and storage can reduce exposure to imported fuels and strengthen competitiveness.

Europe has already made important progress. Renewable energy has moved from the periphery to the centre of the power system, and Greece has been among the countries demonstrating strong momentum (wind and PV grew from c.18% of the electricity mix in 2015 to c.45% in 2025). Yet the success of this first phase has also revealed the constraints of the second. Higher RES penetration has increased the importance of grids, interconnections, storage and flexible capacity, while also creating new challenges around price volatility, zero or negative-price hours and curtailments.

This is not a standard commodity-market challenge. Electricity systems must balance supply and demand in real time; reliability has system-wide value; and storage remains limited. As RES penetration rises, value increasingly shifts from simply producing electricity to providing flexibility, availability and resilience. The result is that some of the assets the system needs most may be economically necessary but difficult to finance unless market rules provide credible and predictable revenue visibility.

The next phase therefore requires a more complete investment framework: one that rewards not only energy production, but also system services such as flexibility, availability and balancing. Instruments such as PPAs, CfDs and capacity mechanisms can support this process, provided they are designed to allocate risk transparently and strengthen the visibility of future cash flows. For long-term capital, predictability is as important as price: investors can absorb risk, but they need confidence that the rules governing future revenues will remain credible.

This is where the role of the State and of European institutions becomes essential. The public sector needs to correct market failures, reduce risks that private investors cannot efficiently absorb, and provide the institutional clarity required for capital to be mobilized at scale. In an environment where energy shocks are no longer exceptional, institutional clarity becomes a competitive advantage.

In this environment, the role of financial institutions is evolving and becoming far more challenging. Banks are called upon not only to finance assets, but also to support the overall functioning of the energy system—by enabling infrastructure investment, providing financing flexibility and ensuring projects remain bankable in a market-based environment.

During 2025, National Bank of Greece actively supported large-scale investments in transmission and distribution networks, reinforcing the electricity grid as a cornerstone of a resilient energy system. By the end of 2025, we had established one of the strongest energy financing track records in the country, with outstanding balances approaching €6 billion, of which approximately €2.6 billion relate to renewable energy projects, representing around 7.5 GW of capacity. This reflects a consistent strategic commitment to supporting both clean energy expansion and the infrastructure required for a stable, secure and market-driven system.

The Bank expanded its involvement in battery energy storage systems (BESS), financing seven additional projects awarded 10-year CfD contracts through Ministry of Energy auctions. These include projects developed by CNI Energy and HELLENiQ Renewables across multiple locations and configurations. Together, these investments support the absorption of renewable overproduction, reduce curtailments and contribute to price stability, marking a clear shift toward market-based storage deployment.

In parallel, innovation in risk management continues to play a central role. The Energy Baseload Swap (EBS), already introduced in the Greek market, has become increasingly relevant in an environment of heightened geopolitical uncertainty and energy market volatility. By enabling both consumers and producers to stabilise price exposure over longer horizons, it supports investment decisions and enhances the bankability of projects operating under market-based conditions.

Overall, these initiatives reflect a consistent strategic direction. National Bank of Greece focuses not only on expanding clean energy capacity, but also on strengthening the resilience, flexibility and economic viability of the energy system as a whole. By financing critical infrastructure, enabling flexibility at scale and supporting market-based risk management solutions, the Bank remains committed to advancing Greece’s energy transition in a way that enhances energy security, competitiveness and sustainable growth.

Coordinator

Prof. Dr. Kostas Andriosopoulos is Af. Professor in Finance and Energy Management and the Director of the HELLENiQ ENERGY Center for Sustainability and Energy @Alba Graduate Business School. Kostas is a member in various professional and academic associations, including President of the Energy Committee of the American Hellenic Chamber of Commerce; Founder, former Chairman and active Member of the BoD of the Hellenic Association for Energy Economics; board member of the Global Gas Center - World Energy Council as a Gas and LNG markets expert; member of the board of the International Association for Energy Economics (IAEE); founding board member of the Financial Engineering and Banking Society. As of August 2018, he is the Country Manager of Akuo Energy in Greece.

Lead Researcher

Ilias Tsopelas holds a bachelor (BSc) and a master's (MEng) degree in Mechanical Engineering from the National Technical University of Athens (NTUA). He is currently working as a Research Associate at the Hellenic Association for Energy Economics (HAEE), participating in EC-funded projects. His research profile focuses mainly on energy system modelling and analysis, and energy and climate policy assessment. He also has a computational research background.

Research Team

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Vasiliki Gemeni is a Geologist with an MSc in Applied Environmental Geology from the National and Kapodistrian University of Athens. Her main research fields are Carbon Capture Utilisation and Storage, low carbon technologies, sustainable mining, and renewable energy focusing on geothermal energy. She has participated in many European and national research projects and published her work in many scientific journals and conferences**.**

Research Team

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Eleni Ntemou is a PhD candidate at Aristotle University of Thessaloniki. She is a Research Associate at the Hellenic Association of Energy Economics (HAEE). Eleni obtained her MSc in Computational and Statistical Data Analytics and her bachelors (BSc) in Mathematics and from University of Patras (UoP), Greece.

Athina Stathopoulou is a Mechanical Engineering student at the National Technical University of Athens, specializing in the energy sector and focusing on the challenges of the ongoing energy transition. Alongside her studies, she works as a Communication Associate at the Hellenic Association for Energy Economics (HAEE), supporting communication activities and the dissemination of knowledge on energy and energy economics.

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Executive Summary

The Greek Energy Market Report 2026, is a valuable tool for energy professionals, legislators, researchers, academics, policymakers, students, and others interested in the developments, advances, and challenges regarding the Greek energy market. It is also an asset for market participants and international or domestic companies, willing to invest in the Greek energy sector.

The Report consists of eight distinct chapters that each one includes the most recent developments in the energy sector:

- **Chapter 1** examines the Country Profile of Greece by analyzing and providing its key demographic, macroeconomic, and key energy market statistics, compared with those of the EU, coupled with an analysis of the inflation effects.

- **Chapter 2** discusses the evolution of the energy market up to 2023, along with anticipations for the near and far future relating to the Energy Transition. Further boosts are expected with the expansion of offshore wind technologies in the upcoming years.

- **Chapter 3** analyzes the Electricity sector both in the EU and Greece, outlining various issues concerning prices, generation, demand, capacities, imports, exports, and RES share. The remarkable variations in the wholesale electricity market prices are highlighted as well as the biggest electricity producers in Greece. Also, the electricity generation of the Non-Interconnected Islands is included.

- **Chapter 4** focuses on the considerable contribution of RES to the Greek energy system, by providing the most up-to-date information on license procedure, market analysis, electricity special purchase prices, "green" PPA insights and updates regarding the RES penetration compared to EU.

- **Chapter 5** explores the Natural Gas market for both EU and Greece, regarding the continuing efforts to reduce their dependence on Russian gas and diversify the gas supply. LNG's key position in the supply side continues to stay strong both for EU and Greece.

- **Chapter 6** focuses on the Oil and Refining market, with an analysis on the European oil trade, especially the Russian exports. Also, the outlook of oil demand is showcased.

- **Chapter 7** addresses current energy investment trends in Greece and internationally. This chapter covers overall energy investments, and specifically clean energy technologies. There is also a comprehensive overview of the various EU support mechanisms and funds.

- **Chapter 8 e**xamines how global geopolitical tensions, particularly in key chokepoints like the Strait of Hormuz, shape energy flows, prices, and market stability, indicating the interconnected fragility of our world.

The Greek Energy Market Report 2026 provides a comprehensive overview of the structural developments shaping Greece's energy system within an increasingly complex global environment. The report highlights a dual dynamic: on one hand, the steady progress of the energy transition toward a more sustainable and diversified system; on the other, the growing exposure of energy markets to geopolitical uncertainty, particularly in key regions such as the Middle East.

Executive Summary

Greece's macroeconomic environment has continued to improve, supporting energy demand and investment activity. Economic growth has stabilized at moderate levels following the post-pandemic rebound, while inflation has eased and unemployment has declined. Public finances have strengthened, with government debt on a downward trajectory and borrowing costs stabilizing. These conditions create a more favorable framework for energy investments and infrastructure development, reinforcing Greece's position as an emerging energy hub in Southeast Europe.

The energy transition remains a central pillar of the country's energy strategy. Renewable energy sources, particularly solar and wind, continue to expand rapidly, accounting for an increasing share of electricity generation and bringing Greece closer to European benchmarks. However, the system is approaching a critical inflection point. High renewable penetration is already creating operational challenges, including curtailments and periods of zero or negative electricity prices. These developments underline the urgent need for energy storage deployment, grid expansion, and enhanced system flexibility to support further renewable integration.

Electricity markets in Greece are becoming more dynamic and interconnected. The country has maintained its position as a net electricity exporter, supported by strong renewable generation and expanding interconnections with neighboring markets. At the same time, price volatility has increased significantly, reflecting both domestic structural changes and broader European market conditions. The emergence of negative prices during peak solar generation periods illustrates the evolving nature of electricity market dynamics in a high-renewables system.

Natural gas continues to play a critical role as a transition fuel, providing flexibility and balancing services to the power system. The European gas market has undergone a profound transformation, with LNG emerging as the dominant source of supply following the reduction of Russian pipeline imports. Greece has strengthened its position within this new landscape, significantly increasing LNG imports and enhancing its role as a regional gas hub through infrastructure development and cross-border connectivity. However, the growing reliance on global LNG markets has also increased exposure to international price volatility and geopolitical risks.

The report places particular emphasis on the implications of geopolitical developments for energy markets. The recent tensions in the Strait of Hormuz have demonstrated the vulnerability of global energy supply chains, especially for oil and LNG flows. Price movements in early 2026 reflect the sensitivity of both oil and gas markets to disruptions in key maritime chokepoints, reinforcing the importance of supply diversification and system resilience.

Investment trends further illustrate the scale of the transformation underway. Significant capital is being directed toward renewable energy, grid infrastructure, and storage technologies, supported by European funding mechanisms and national policy frameworks. At the same time, emerging demand drivers—such as electrification, digitalization, and the expansion of data centers—are expected to reshape energy consumption patterns in the coming years.

Overall, Greece's energy system is transitioning toward a more sustainable, interconnected, and resilient model. However, the path forward will require careful balancing of decarbonization objectives with energy security and affordability concerns. In an increasingly uncertain global environment, strengthening infrastructure, accelerating technological deployment, and enhancing regional cooperation will be critical to ensuring a stable and competitive energy future.

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"Everything that an investor needs to know about the Greek Energy Market in 2026"

1. Country Profile

Highlights

In 2025, Greece’s GDP growth increased moderately, reflecting a return to sustainable and steady expansion

Unemployment rate fell to 7.5% in 2025, continuing its improving trend, yet Greece remains above the European average

Inflation rate eased to 2.9% in 2025, slightly above the EU-27 average, driven mainly by non-energy components despite volatile energy prices

Greece’s final energy consumption continued its long-term decline, showing one of the largest reductions in the EU-27 since 2005

Greece’s per capita GHG emissions have declined significantly, though further reductions are needed to meet 2030 targets

Greece’s climate-related economic losses remain low, highlighting opportunities to strengthen adaptation and resilience measures

Overview

Greece's macroeconomic environment has improved significantly in recent years, supported by a strong post-pandemic recovery, declining unemployment, easing inflationary pressures, and strengthening fiscal conditions. The economy has demonstrated resilience, with GDP growth stabilizing at moderate levels, supporting increased economic activity and energy demand, and reflecting a gradual return to a sustainable and balanced trajectory. Although unemployment has followed a downward trend, it remains relatively elevated compared to several European economies, reflecting persistent structural challenges in the labor market. Inflation has moderated following the surge observed during the energy crisis, with overall price growth gradually converging towards the EU average as energy price pressures have eased.

Public finances have also improved markedly. After peaking in the aftermath of the pandemic, Greece's general government debt has entered a gradual downward trajectory, supported by improved fiscal balances and economic stabilization. At the same time, the country's sovereign credit ratings have steadily recovered, allowing Greece to regain investment-grade status and maintain relatively stable government bond yields, reflecting stronger investor confidence.

From an energy perspective, Greece has experienced a long-term decline in total energy consumption since the mid-2000s, driven by structural economic changes and improvements in energy efficiency. Despite this trend, the country remains highly dependent on imported energy, with import dependency significantly exceeding the EU average. Oil continues to dominate the energy mix, although natural gas and renewable energy sources—particularly wind and solar—have expanded rapidly in recent years, reflecting the ongoing transformation of the energy system.

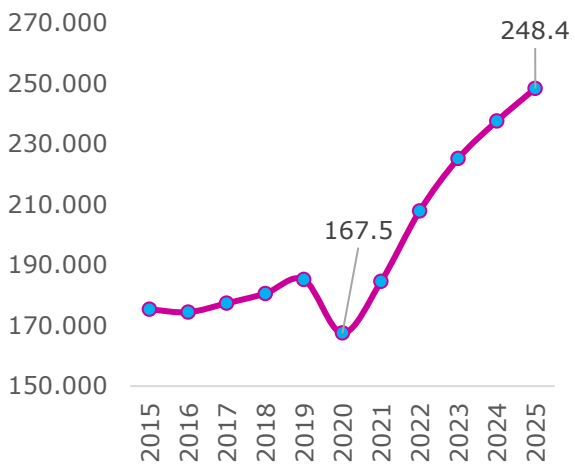
Greenhouse gas emissions have declined substantially over the past two decades, yet further reductions will be required to meet the country's 2030 climate targets. Transport remains the largest emitting sector, highlighting the importance of continued decarbonization efforts across the energy, transport and industrial systems. Overall, Greece is progressing toward a more diversified and lower-carbon energy system, although challenges related to energy security, import dependency and climate mitigation remain central to the country's energy transition.

Greece's GDP continues to grow steadily, reflecting a gradual return to stable and sustainable economic development

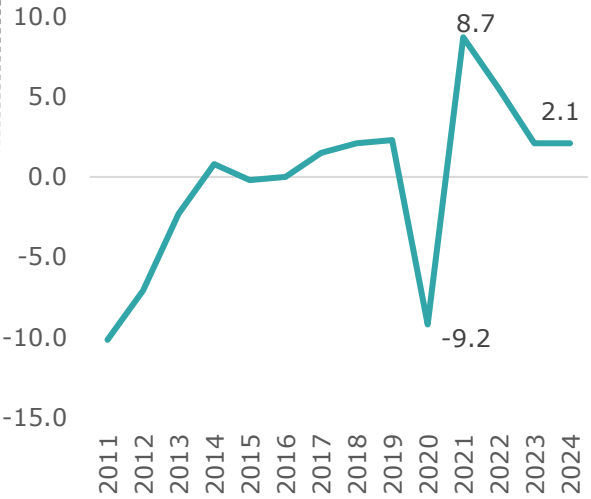
- GDP growth in Greece has shown strong volatility over the past decade, falling to -9.2% in 2020 and rebounding to 8.7% in 2021 and stabilizing at 2.1% in 2024.

- Following the post-pandemic recovery, economic growth has gradually moderated since 2022, indicating a transition toward more stable and sustainable growth.

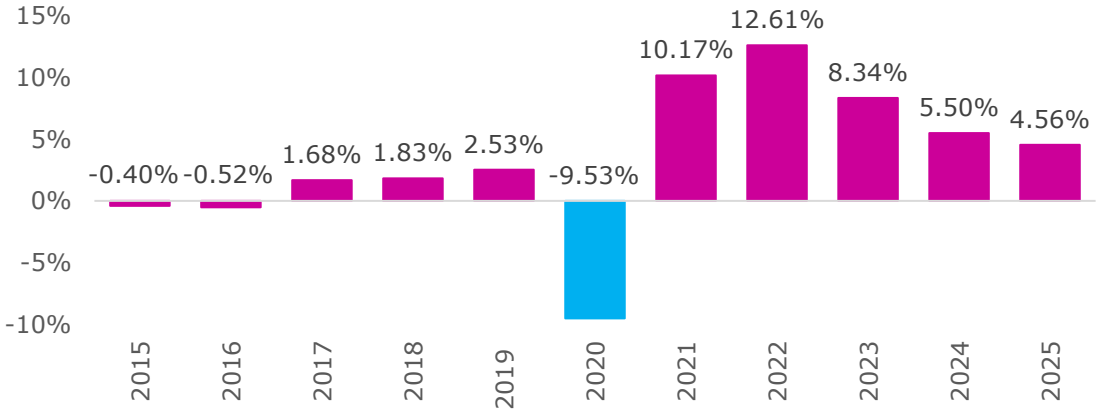
GDP in Current Prices in Greece (billion €), [2015-2025]



GDP at Market Prices, Annual Volume Changes (%), [2011-2024]



Year on Year Change in GDP in Greece (%), [2015-2025]



- The strong rebound in 2021–2022 not only restored pre-pandemic output levels but also reinforced energy demand and industrial activity.

- Since 2023, growth rates have moderated while GDP continues to rise, reflecting a gradual return to sustainable expansion and improved macroeconomic stability.

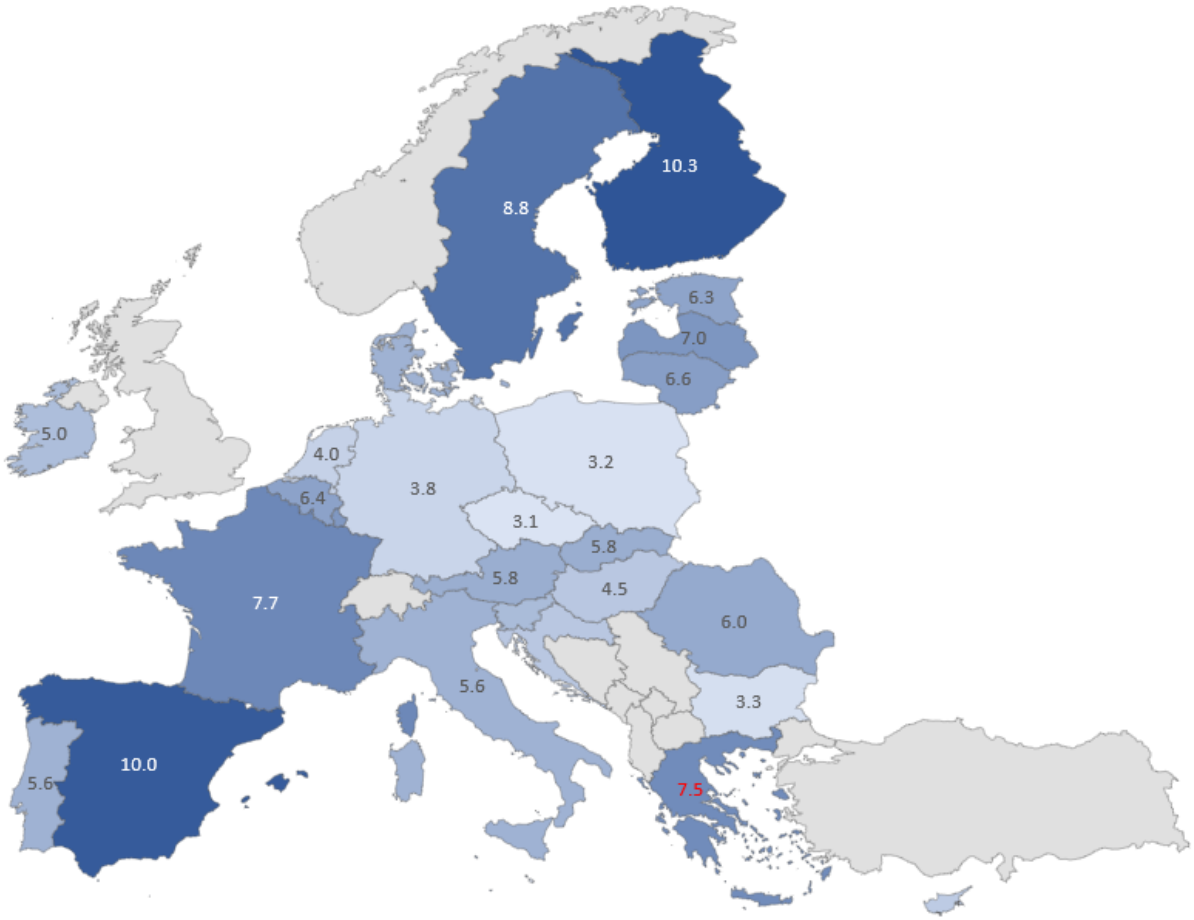
Source: ELSTAT, HAEE analysis

Despite a declining trend, unemployment in Greece remains relatively high compared to several EU countries, reflecting ongoing disparities in the market.

- Unemployment in Greece declined in 2025, maintaining the improving trend observed in recent years and indicating a gradual strengthening of the labor market.

- Finland records the highest unemployment rate among the EU (10.3%), followed by Spain (10.0%) and Sweden (8.8%), indicating relatively weaker labor markets.

Unemployment Rate in EU-27 (%), [2025]



- Greece's unemployment rate stands at 7.5%, remaining comparatively high relative to several Central and Eastern European countries.

- Overall, lower unemployment levels are observed across much of Central Europe, while relatively higher rates appear in parts of Northern and Southern Europe.

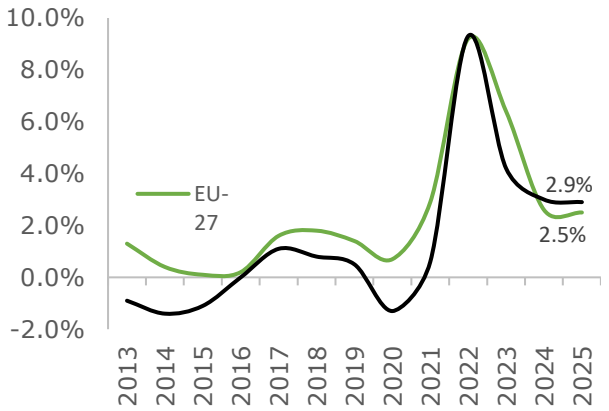
Source: Eurostat, HAEE analysis

Inflation in Greece during 2025 was largely driven by volatile energy prices, while food inflation remained relatively stable.

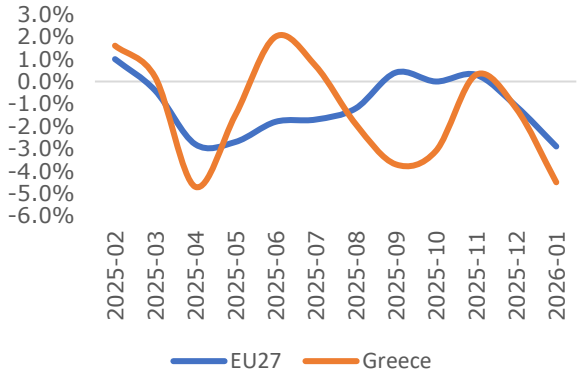
- Inflation in Greece has eased significantly in recent years reaching 2.9% in 2025, remaining slightly above the EU-27 average of 2.5%.

- The recent trend suggests a gradual normalization of price dynamics, although inflationary pressures in Greece remain stronger compared to the EU average.

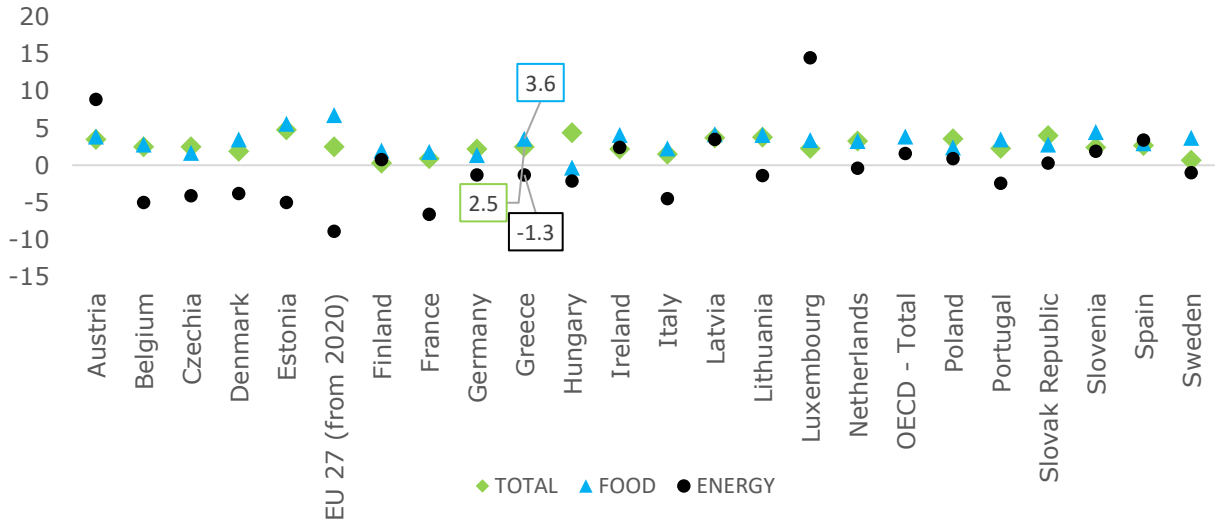
HICP Inflation Rate (%) in EU27 and Greece (Annual Average Rate of Change), [2013-2025]



HICP – Energy (Annual %), [Feb 2025-Jan 2026]



Inflation (CPI) Total / Food / Energy, Annual Growth Rate (%), [Dec 2025]



- Energy inflation in Greece displays greater volatility than in the EU-27, with sharper monthly fluctuations throughout the observed period.

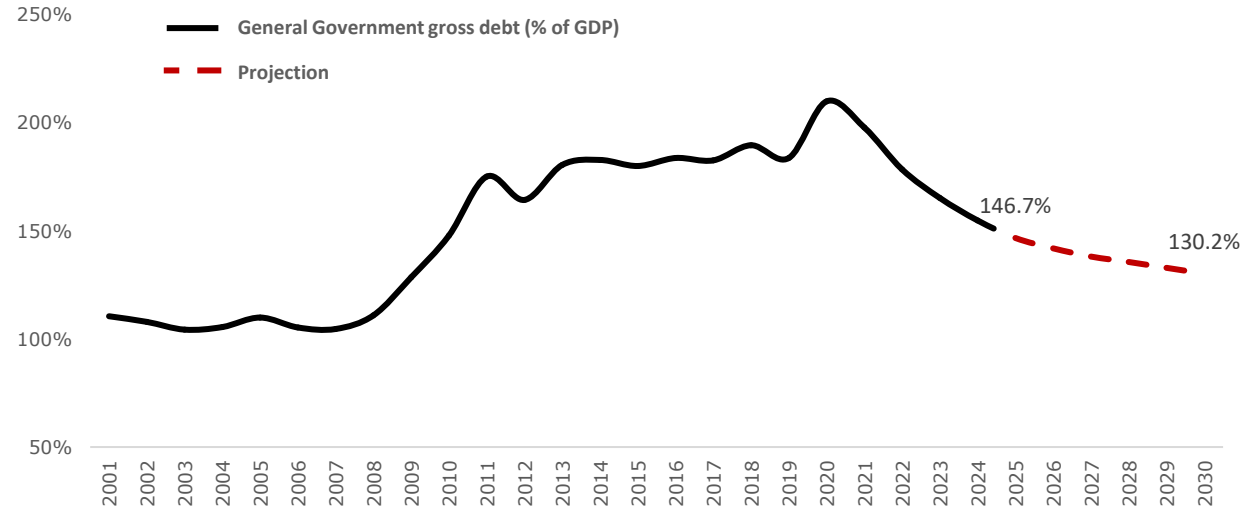
- Energy prices, by contrast, decline (-1.3%), suggesting that recent inflationary pressures are mainly driven by non-energy components.

Source: Eurostat, OECD, HAEE analysis

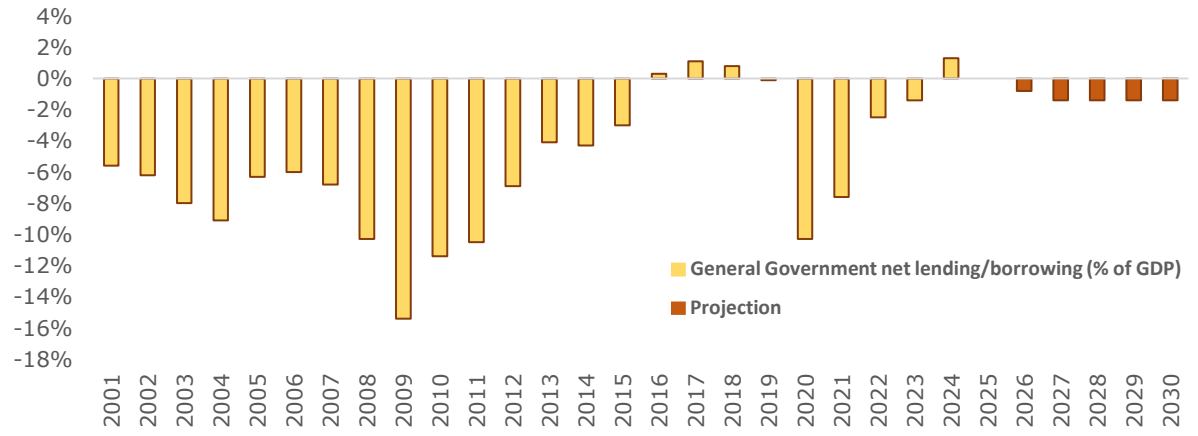
Following its post-pandemic peak, Greece's general government debt is projected to gradually decline amid improving fiscal balances

- Greece's general government gross debt shows a clear declining trend in recent years, reaching 146.7% of GDP in 2025.
- Debt is projected to gradually decrease to around 130.2% of GDP by 2030, indicating continued fiscal improvement while remaining at relatively high levels.

Greek General Government Gross Debt (% of GDP), [2001-2030]



Greek General Government Net Lending/Borrowing (% of GDP), [2001-2030]



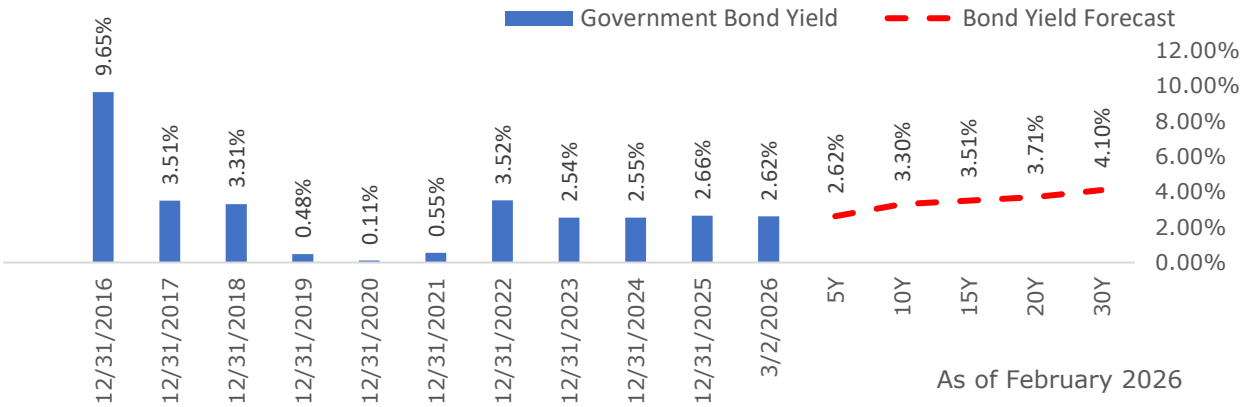
- Greece's general government balance stands close to fiscal balance, marking a significant improvement compared to the large deficits recorded in earlier years.
- Fiscal projections for 2026–2030 indicate a return to moderate deficits, suggesting a stabilization of public finances following the recent fiscal consolidation.

Source: IMF, HAEE analysis

Greece's improved credit ratings have supported stable government bond yields and strengthened market confidence

- By early 2026, Greece's 5-year government bond yield is 2.62%, showing stailized borrowing costs after the increases observed since 2022.
- The projected yield curve suggests a gradual rise in long-term interest rates, indicating expectations of moderately higher borrowing costs in the long run.

Greece Government 5 Year Note Bond Yield and Projection (%), [2016-2026]



Greece Credit Ratings, [2009-2025]

	2009	...	2020	2021	2022	2023	2024	2025
Moody's	A2		Ba3	Ba3	Ba3	Ba1	Baa2	Baa1
Standard & Poor's	A-/BBB+		BB-	BB	BB+	BBB-	BBB-	BBB-
Fitch Ratings	BBB+		BB	BB	BB	BBB-	BB+	BBB-

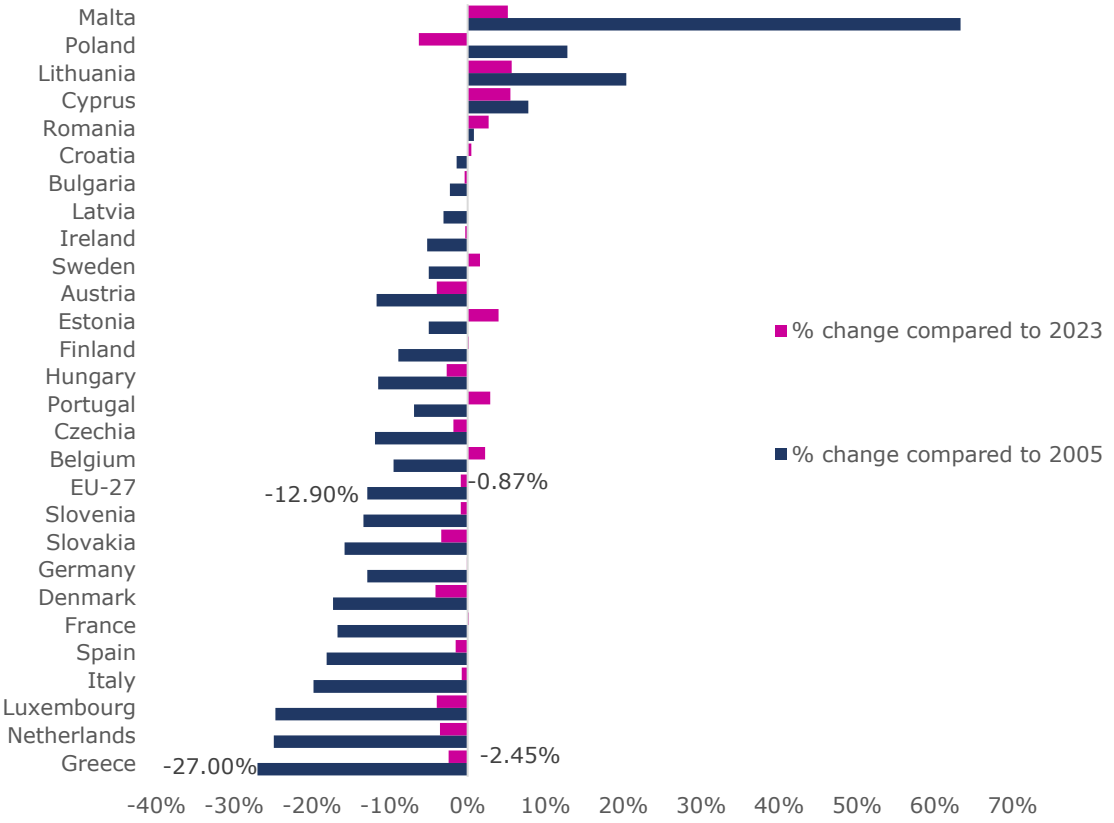
- From 2021 onwards, the country's ratings showed a steady recovery, reflecting improved fiscal performance, economic stabilization and investor confidence.
- By 2025, Greece has largely regained investment-grade status across major rating agencies, signalling a significant improvement in the country's financial credibility.

Source: World Government Bonds, NBG, HAEE analysis

Final energy consumption has declined across the EU since 2005, with Greece outperforming the EU average in reducing energy use

- In 2024, Greece records a 2.45% decline in final energy consumption compared to 2023, indicating a continued reduction in energy demand.
- Compared to 2005, Greece shows a substantial decrease of around 27%, placing it among the countries with the largest long-term reductions.

Final Energy Consumption in EU-27 Member States (% Change compared to 2005 and 2023]



- At the EU level, final energy consumption declined by 0.87% compared to 2023, while remaining about 12.9% lower than 2005 levels.
- Malta, Lithuania, and Poland, record significant increases in energy consumption compared to 2005, highlighting diverging long-term energy demand patterns.

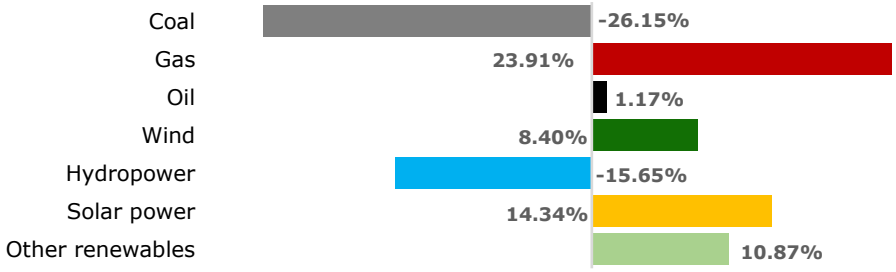
Source: EEA, HAEE analysis

Greece's energy mix remains fossil-fuel intensive, despite the growing contribution of natural gas and renewable energy sources

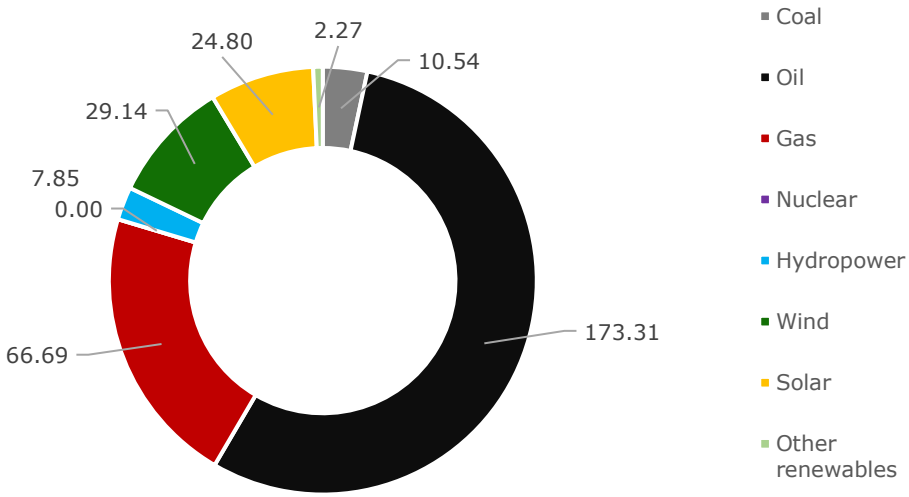
- In 2024, natural gas consumption increased significantly (+23.9%), while coal use declined sharply (-26.2%), reflecting the ongoing shift in Greece's energy mix.

- Renewable sources continued to expand, with solar (+14.3%) and wind (+8.4%) recording notable growth, although hydropower declined considerably (-15.7%).

Annual Change in Primary Consumption in Greece (%), [2024]



Primary Energy Consumption by Source in Greece (TWh), [2024]



- Oil remains the dominant energy source in Greece, accounting for 173.3 TWh of primary energy consumption in 2024, significantly exceeding other energy sources.

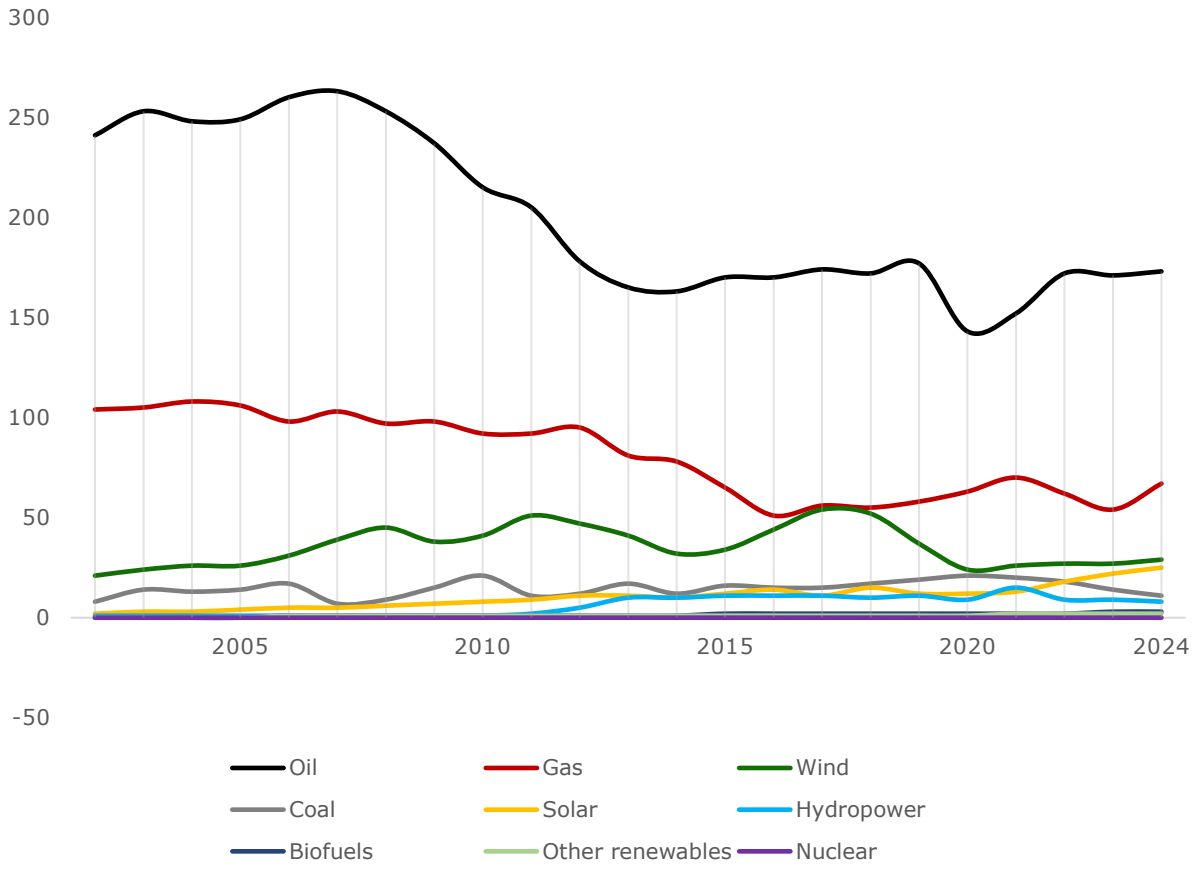
- RES such as wind (29.1 TWh) and solar (24.8 TWh) are major components of the energy mix, indicating the increasing role of RES energy.

Source: Our World In Data, HAEE analysis

Greece's energy mix remains dominated by fossil fuels, although the rapid expansion of RES is reshaping the country's energy system

- In 2024, oil remains the dominant primary energy source in Greece, reaching roughly 173 TWh, significantly higher than all other energy sources.
- Natural gas consumption recovered in 2024, increasing compared to the previous year after the notable decline observed in the mid-2010s.

Evolution of Primary Energy Consumption by Source in Greece, (TWh) [2002-2024]



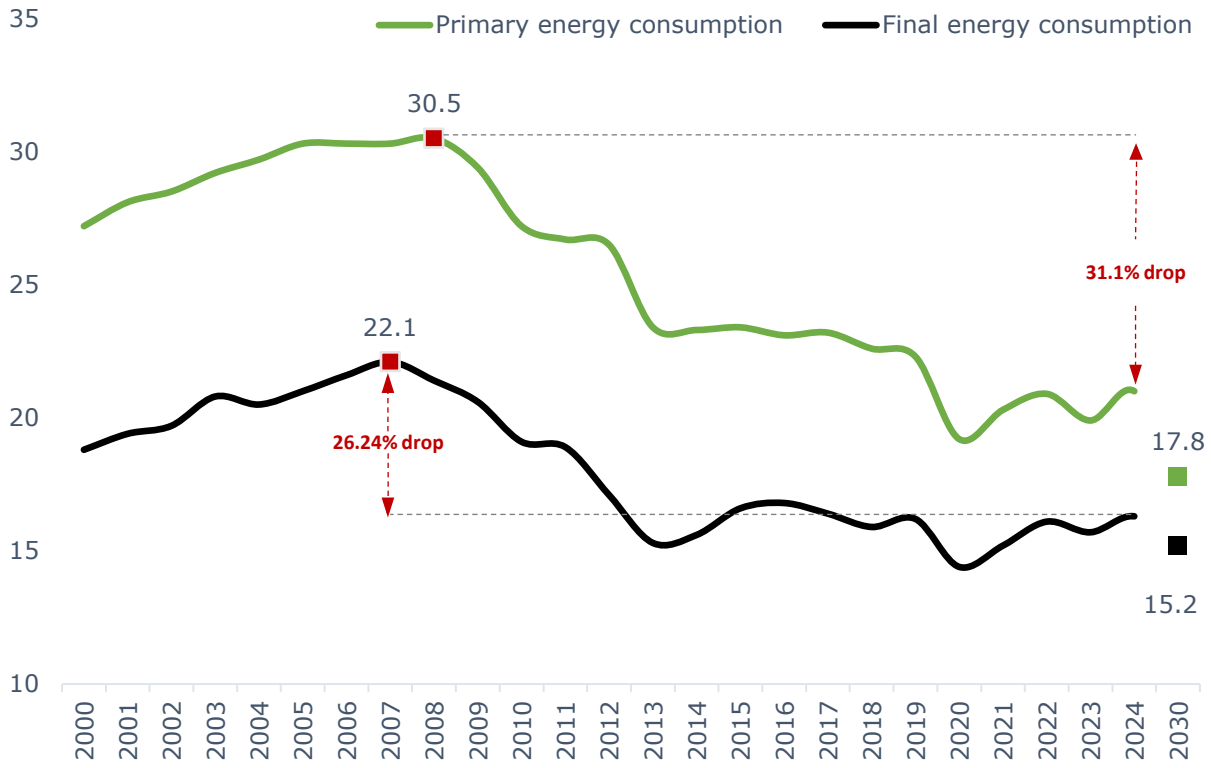
- Renewable energy sources, particularly wind and solar, have expanded considerably over the past decade, reflecting the gradual transformation of Greece's energy mix.
- Overall, a long-term shift toward a more diversified energy mix is oserved, with renewables steadily gaining ground alongside traditional energy sources.

Source: Our World In Data, HAEE analysis

Primary and final energy consumption recorded a slight uptick in 2024, while remaining well below earlier peak levels

- Primary energy consumption in Greece peaked in 2008 at 30.5 Mtoe and declined by about 31.1% by 2024, reaching approximately 21 Mtoe.
- Final energy consumption also reached its maximum in 2007 (22.1 Mtoe) and decreased by around 26.2%, falling to about 16.3 Mtoe in 2024.

Primary vs Final Consumption in Greece (Mtoe), [2000-2024]



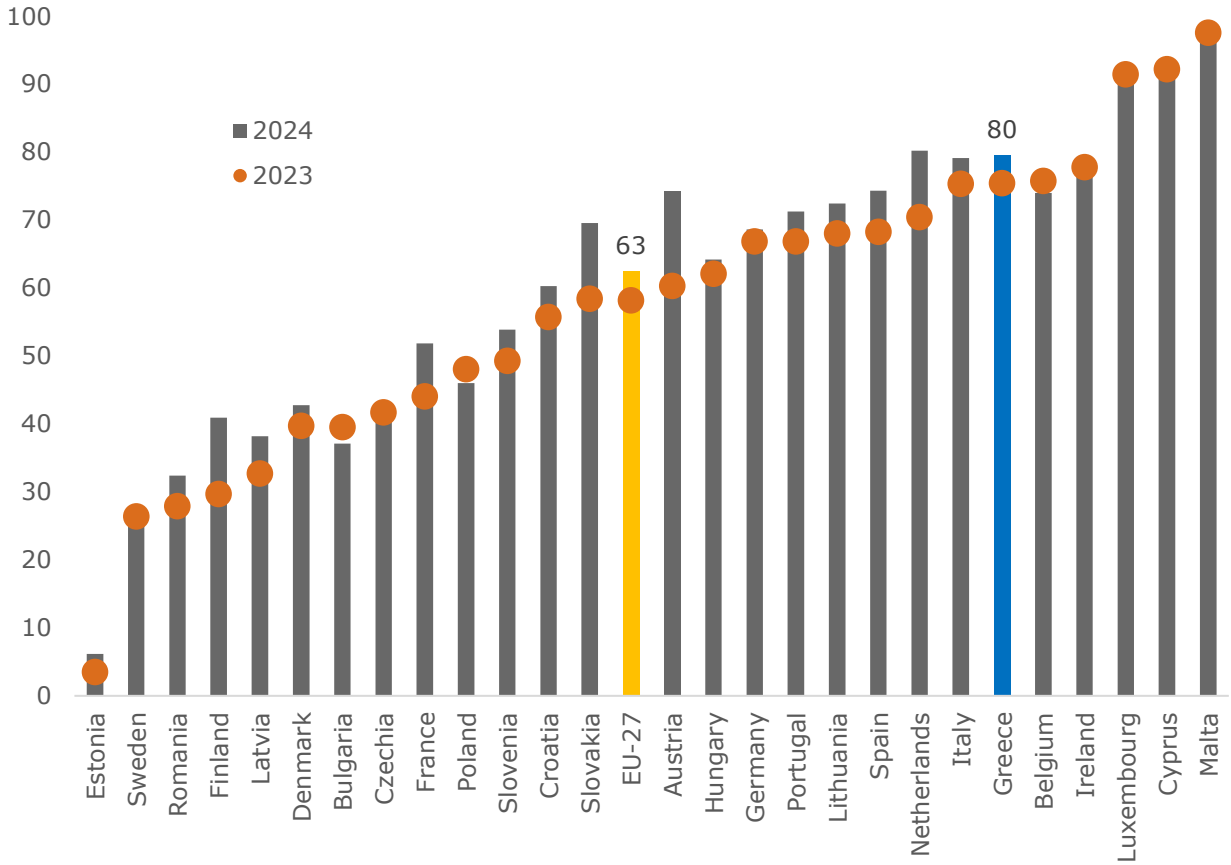
- The larger drop in PEC compared to FEC suggests improvements in energy efficiency and changes in the energy mix, reducing losses in energy transformation processes.
- Looking ahead to 2030, PEC is projected to fall to around 17.8 Mtoe and FEC to about 15.2 Mtoe, aligning with energy efficiency and decarbonization policies.

Source: Eurostat, HAEE analysis

Wide cross-country differences in energy import dependency highlight structural disparities in Europe's energy systems

- Greece shows a very high energy import dependency in 2024 (around 80%), significantly above the EU-27, indicating strong reliance on imported energy.
- Most EU countries increased their dependency slightly from 2023 to 2024, as seen by the higher grey bars compared to the orange markers.

Energy Imports Dependency Rate in Europe (%), [2024]



- Malta, Cyprus and Luxembourg record the highest dependency rates in Europe (above 90%), reflecting their limited domestic energy resources.
- There are large disparities across EU in energy security and self-sufficiency, with several countries—in South Europe—remaining highly dependent on energy imports.

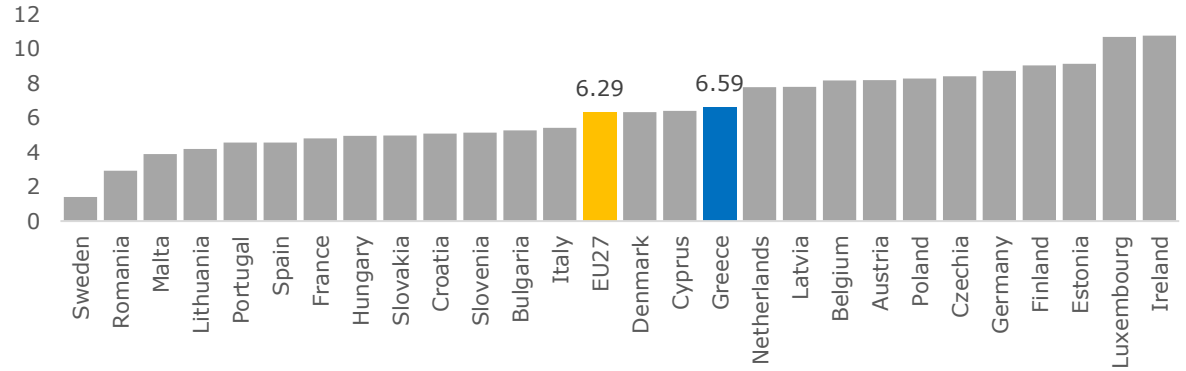
Source: Eurostat, HAEE analysis

While GHG emissions in Greece have declined over time, recent increases highlight decarbonization challenges.

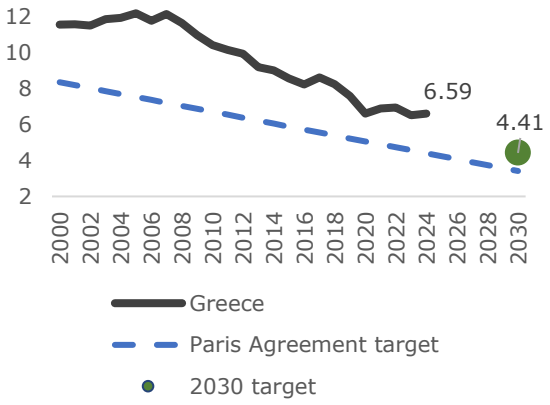
- Greece records GHG emissions of about 6.59 tCO_2 per capita in 2024, which is slightly above the EU-27 average of around 6.29 tCO_2 per capita.

- GHG emissions per capita in Greece have declined significantly since the mid-2000s, falling from around 12 tCO_2 per capita to 6.59 tCO_2 in 2024.

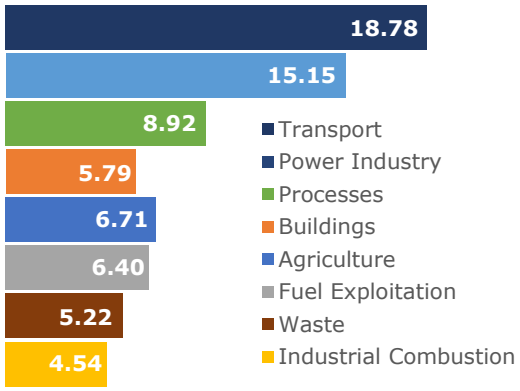
GHG Emissions per Capita by Country (tCO2/cap/yr), [2024]



GHG Emissions per Capita in Greece compared to Paris pledge and 2030 target (tCO2/cap), [2000-2030]



GHG Emissions by sector in Greece (in Mt CO2eq/yr), [2024]



- To meet the 2030 target of approximately 4.41 tCO_2 per capita, Greece will require further decarbonization of energy, transport and industry.

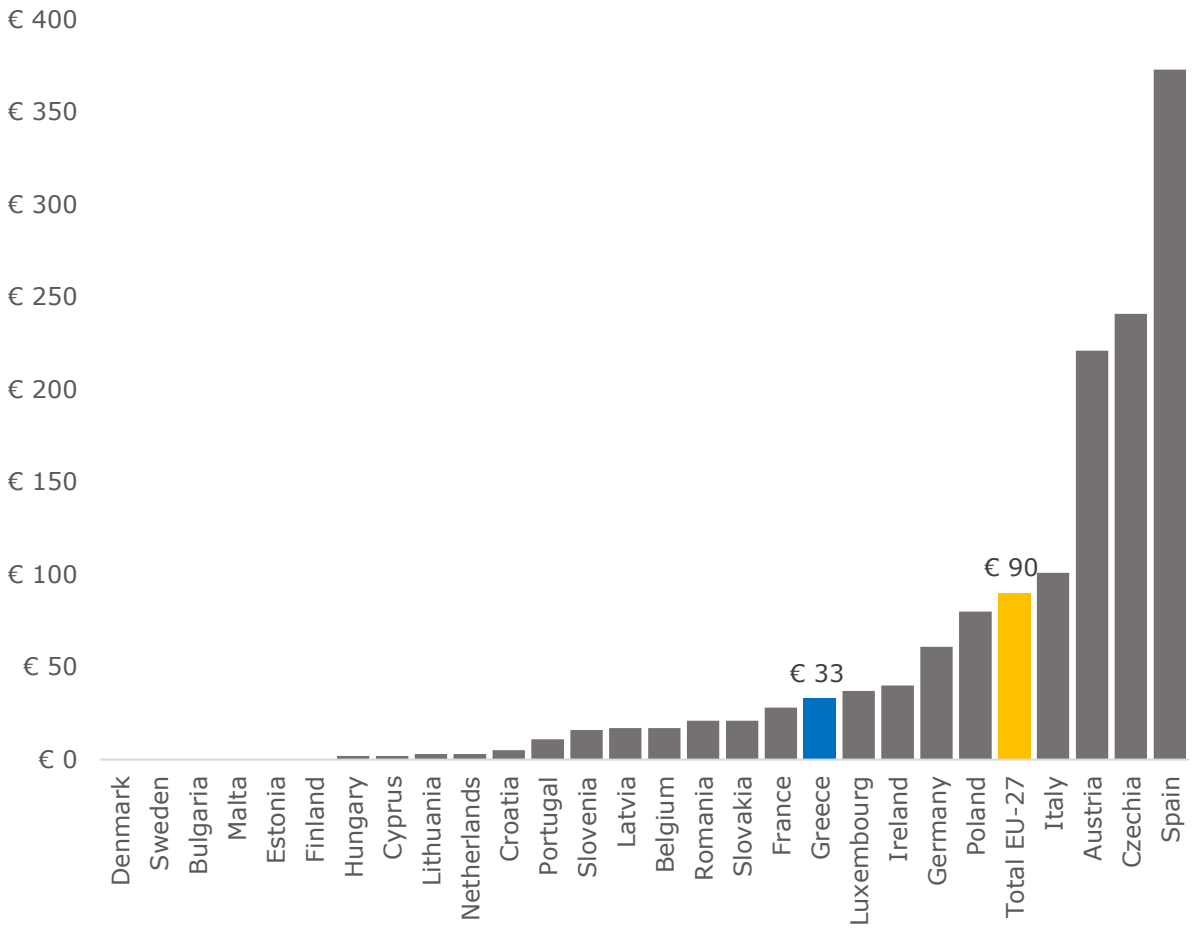
- Transport remains the largest source of GHG emissions in Greece in 2024, producing about 18.78 Mt CO_2eq.

Source: CCPI, EDGAR, HAEE analysis

The economic consequences of climate-related events differ significantly across European countries, reflecting varying levels of exposure

- Climate-related economic losses vary significantly across European countries, indicating substantial disparities in exposure and vulnerability to climate impacts.
- Greece records climate-related economic losses of approximately €33 per capita, remaining well below the European average.

Climate Related Economic Losses, € per capita [2024]



- As illustrated in the chart, a number of countries, ranging from Denmark to Finland, report no recorded climate-related economic losses per capita.
- The uneven distribution of climate-related economic losses highlights the importance of strengthening climate adaptation and resilience strategies across Europe.

Source: Eurostat, HAEE analysis

2. Energy Transition

Highlights

EU clean electricity surpasses 70%, while Greece approaches 50% generation share.

Solar and wind projected to dominate renewable growth toward 2050.

Public EV chargers in Europe exceed 1 million by 2025.

Global grid capacity expected to triple by 2060.

Carbon pricing in Greece rises to about €76 per ton CO_2.

Critical minerals demand surges sharply under global net-zero scenarios.

Overview

The global energy system is undergoing a structural transformation driven by decarbonisation policies, technological innovation and shifting market dynamics. While fossil fuels still represent a significant share of global energy supply, projections indicate a gradual transition toward low-carbon energy sources. Renewable technologies, particularly solar and wind, are expected to drive most of the growth in electricity generation through 2050, supported by declining technology costs and expanding policy support. At the same time, coal's role continues to decline across many economies, while natural gas remains an important transition fuel, providing system flexibility and supporting the integration of variable renewable generation.

In Europe, this transition is already reshaping the electricity sector. The share of clean electricity — including renewables, hydro, nuclear and bioenergy — has increased steadily over the past decade, surpassing 70% of total generation in the European Union by the mid-2020s. Several European countries already produce more than 80–90% of their electricity from clean sources, highlighting the rapid pace of transformation in parts of the continent. Greece has also made significant progress, with clean energy now accounting for roughly half of electricity generation. However, the country's carbon intensity remains somewhat higher than the EU average, reflecting the continued role of natural gas in the power generation mix.

Electrification of transport is emerging as a key component of the broader energy transition. Electric vehicle adoption has accelerated across Europe in recent years, supported by expanding charging infrastructure and policy incentives. In Greece, EV registrations have increased steadily since 2021, signaling the early stages of a broader shift in the passenger vehicle fleet. Across Europe, the number of public charging points has expanded rapidly, exceeding one million units by 2025 and forming a critical foundation for the continued growth of electric mobility.

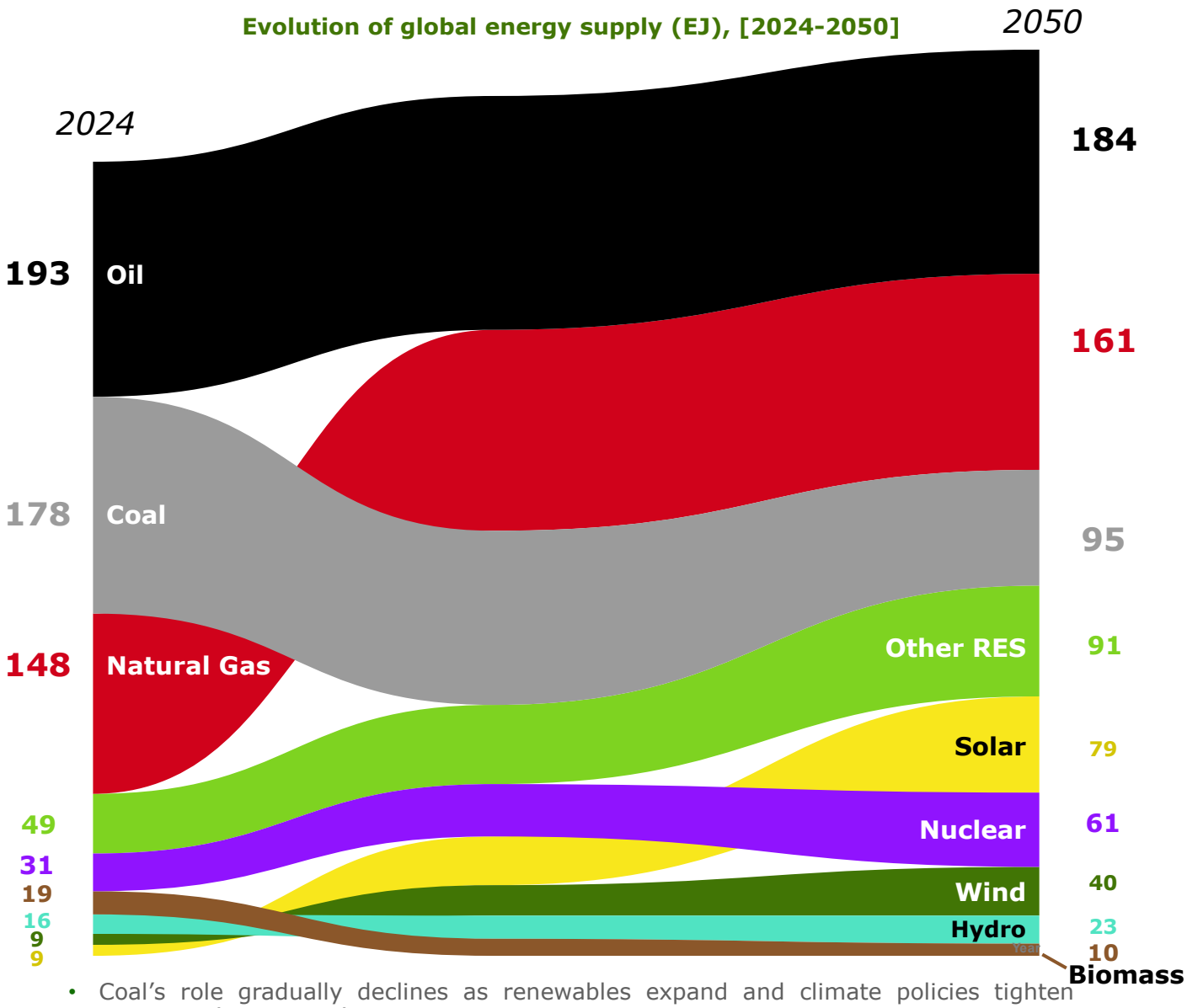
The transition toward a more electrified and renewable-based energy system also requires substantial investments in infrastructure. Electricity grids must expand significantly to integrate large volumes of renewable generation and accommodate rising electricity demand. Global power line capacity is projected to more than triple by 2060, highlighting the scale of network expansion required to support the energy transition.

At the same time, the economics of energy technologies are shifting. Renewable energy technologies are expected to remain among the most cost-competitive sources of electricity, while fossil fuel generation faces increasing cost pressures from carbon pricing and environmental regulation. Meanwhile, the deployment of clean energy technologies is driving a sharp increase in demand for critical minerals such as copper, lithium and nickel. Securing reliable supply chains for these materials is becoming an increasingly important element of global energy and industrial policy.

Global energy supply is projected to shift gradually toward renewables, though fossil fuels remain significant in the global energy mix.

- Solar and wind show the strongest growth through 2050, reflecting accelerating deployment of renewable electricity technologies.
- Natural gas remains a key transition fuel, maintaining a stable share while supporting power system flexibility.

Evolution of global energy supply (EJ), [2024-2050]



- Coal's role gradually declines as renewables expand and climate policies tighten across major economies.
- Oil demand remains substantial in global energy supply, reflecting continued reliance in transport and industry sectors.

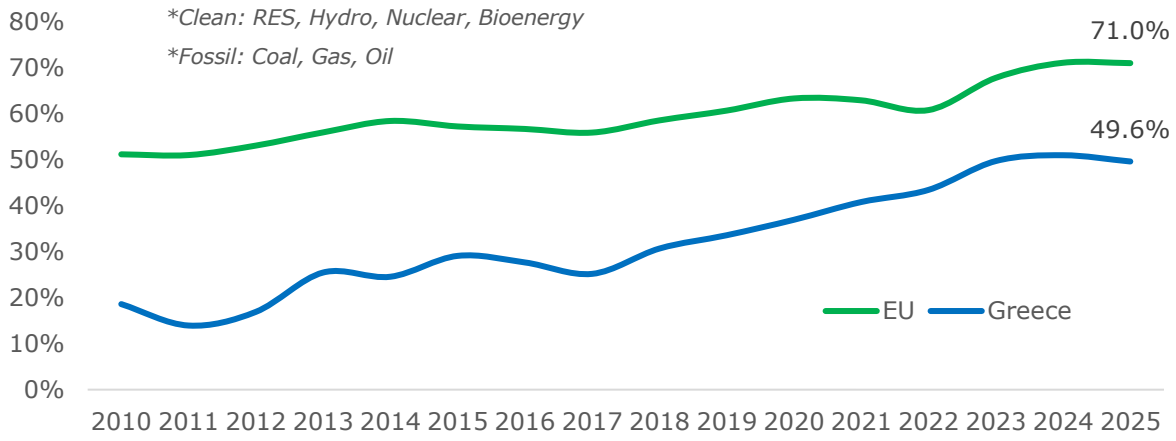
Source: Visual Capitalist, HAEE analysis

Clean energy is steadily expanding in Europe and Greece, reshaping electricity generation and reducing the role of fossil fuels.

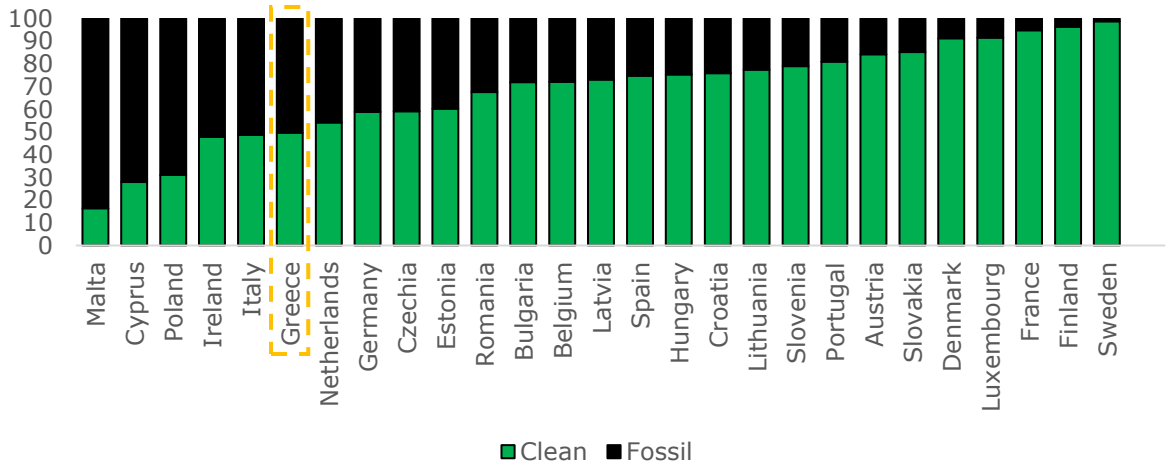
- The EU clean electricity share increased steadily, surpassing 70% by 2024–2025, driven by renewables expansion and stable nuclear generation.

- Greece shows strong progress, with clean energy rising to around 50% of electricity generation, reflecting rapid growth of solar and wind capacity.

Clean Energy* Share of Total Electricity Generation (%) in EU and Greece, [2010-2025]



Clean Energy* vs Fossil Fuel Share of Total Electricity Generation (%) in EU countries, [2025]**



- In 2025, several EU countries generate over 80–90% of electricity from clean sources, highlighting major structural differences across national energy systems.

- Greece remains below the EU clean energy leaders, but the gap is narrowing as renewable deployment accelerates in recent years.

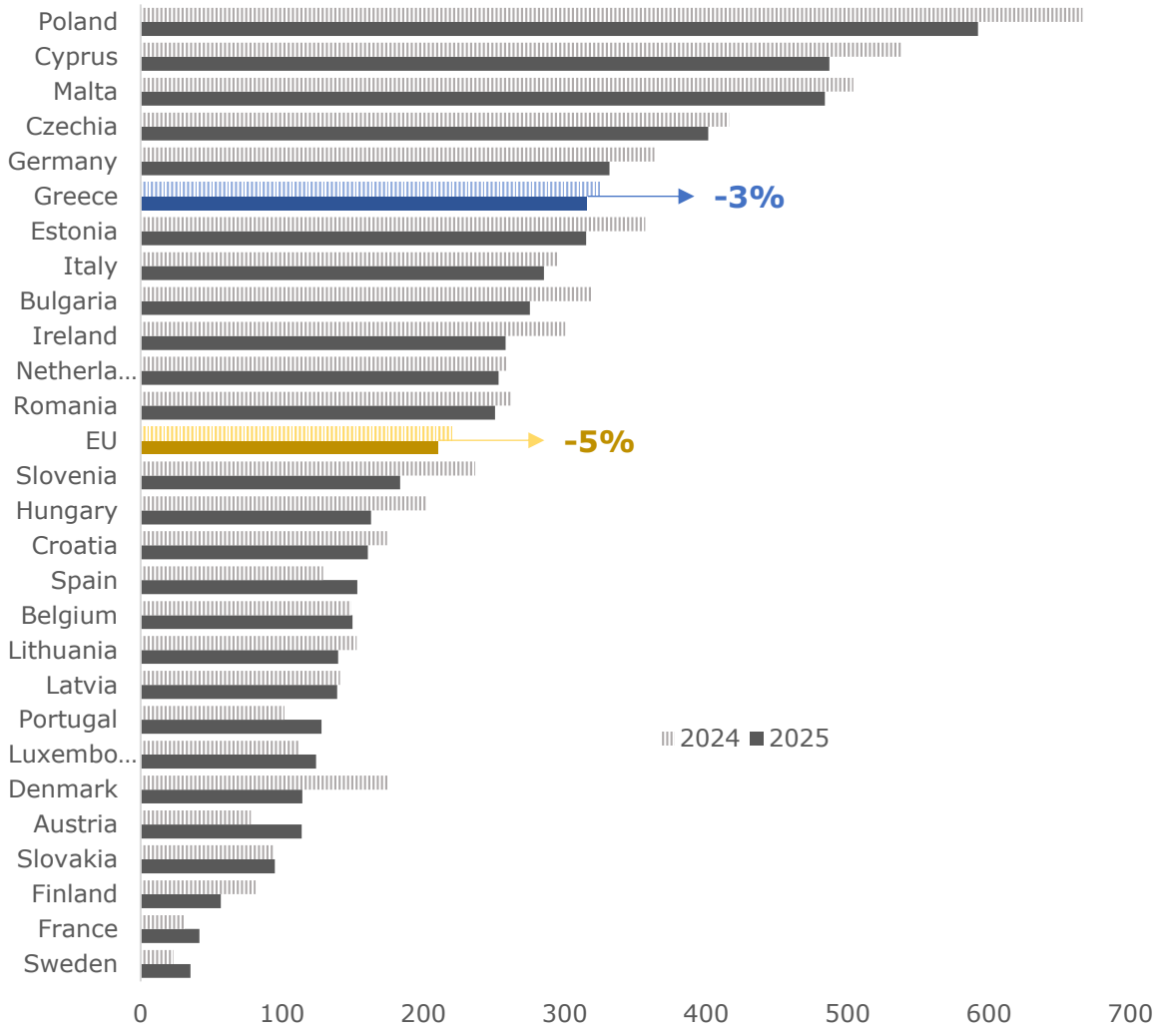
Source: EMBER, HAEE analysis

Carbon intensity across Europe continues to decline, reflecting the growing penetration of renewables and structural changes in generation.

- Countries with high coal dependence, such as Poland and Cyprus, record the highest carbon intensity levels in European electricity generation.

- Greece's carbon intensity remains above the EU average, reflecting the continued role of natural gas in the power generation mix.

Carbon intensity (gCO2/kWh) in Europe, [2024-2025]



- Countries with strong renewables and nuclear portfolios, such as Sweden and France, achieve the lowest carbon intensity levels in Europe.

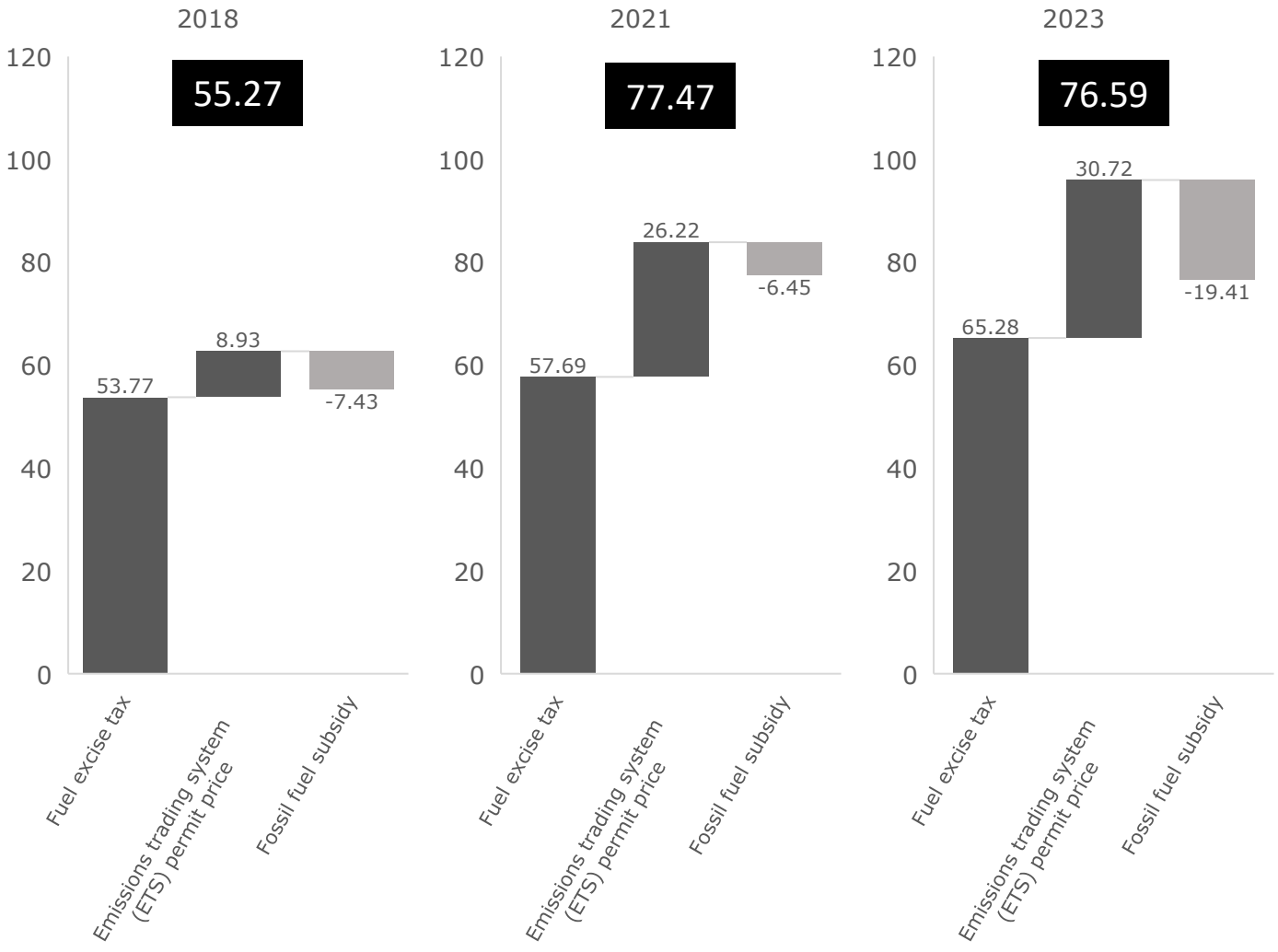
- The overall EU average continues to decline as renewable capacity expands and coal generation gradually exits the system.

Source: EMBER, HAEE analysis

Carbon pricing in Greece has increased in recent years, reflecting higher EU ETS prices and evolving climate policy frameworks.

- Net effective carbon rates increased from €55/tCO₂ in 2018 to about €76/tCO₂ in 2023, reflecting stronger carbon pricing signals.
- The EU ETS permit price became the dominant component, rising significantly and increasing the cost of carbon-intensive energy use.

Breakdown of net effective carbon rates (€/tCO_2) in Greece, [2018-2023]



- Fuel excise taxes remain a stable baseline component of carbon pricing, contributing consistently to Greece's effective carbon rates.
- Fossil fuel subsidies partially offset carbon pricing signals, highlighting ongoing policy challenges in aligning fiscal measures with climate objectives.

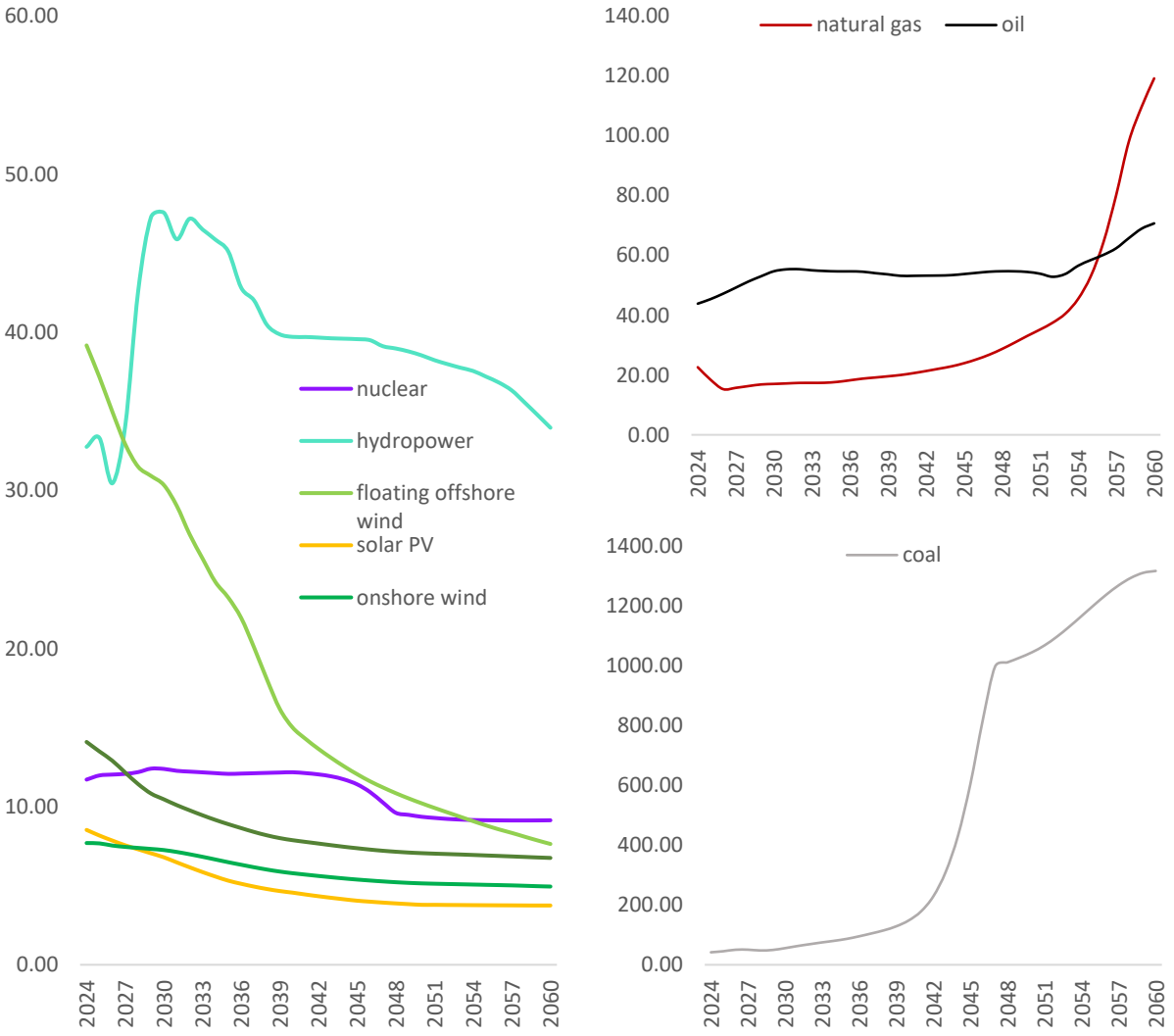
Source: OECD, HAEE analysis

RES technologies are projected to become the most cost-competitive source, while fossil fuel generation faces rising long-term costs.

- Solar PV and onshore wind show the lowest projected LCOE, declining steadily through 2060 as technology improves and deployment scales.

- Offshore wind costs are also expected to fall significantly, reflecting technological advancements and larger project developments.

LCOE (¢/kWh) forecast of sources of energy in Europe, [2024-2060]



- Natural gas and oil generation costs remain volatile, with gas prices projected to increase significantly in long-term scenarios.

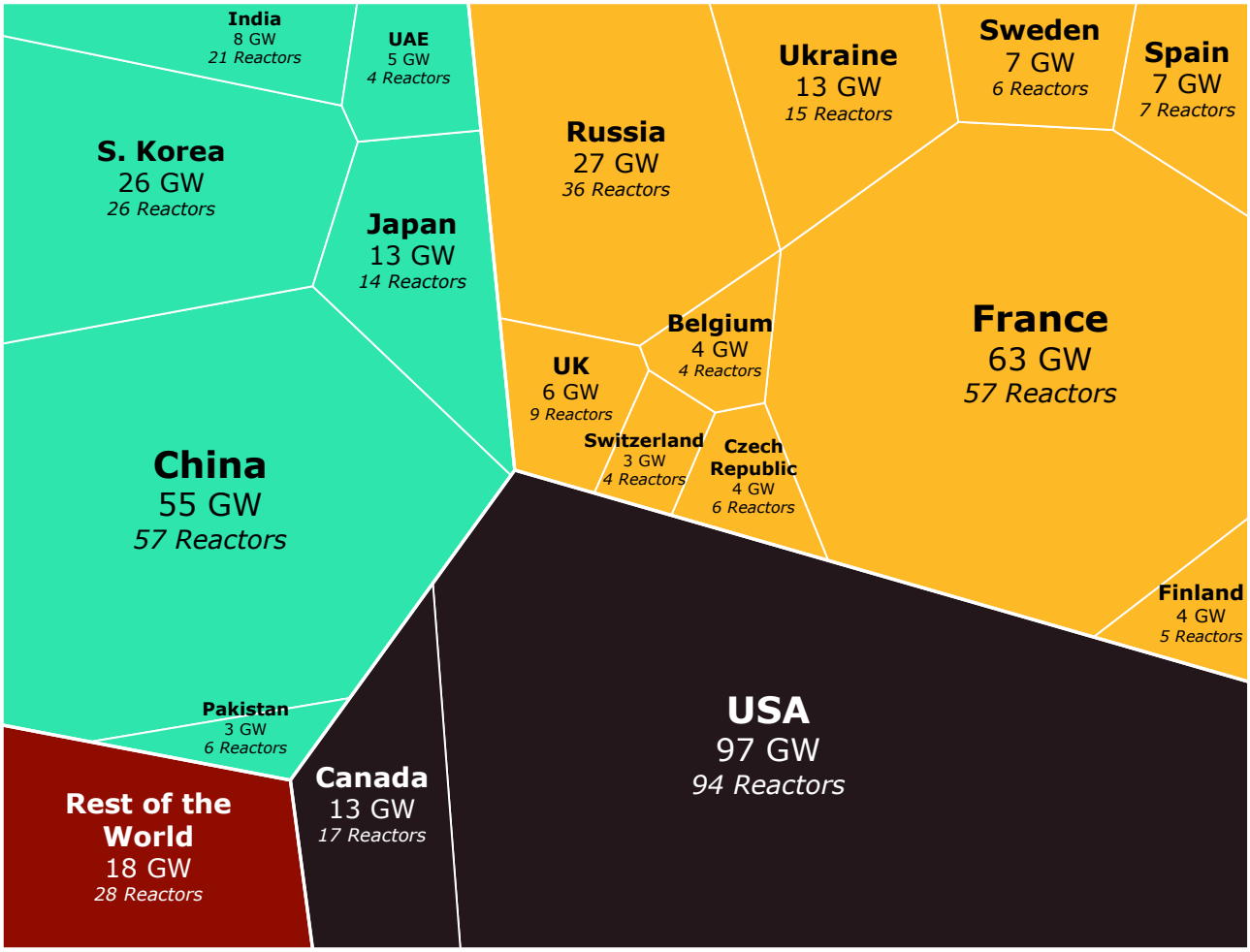
- Coal generation becomes increasingly expensive, reflecting carbon pricing, environmental regulation and declining competitiveness in future power systems.

Source: DNV, HAEE analysis

Nuclear power remains a major low-carbon electricity source globally, with capacity concentrated in a limited number of countries.

- The United States leads global nuclear capacity, operating 97 GW across 94 reactors, maintaining the world's largest nuclear fleet.
- France remains Europe's nuclear leader, with 63 GW and 57 reactors, underpinning its low-carbon electricity system.

Nuclear Power Capacity (GW) and number of reactors by Country, [2025]



- Nuclear power remains a key firm low-carbon generation source, complementing renewables and supporting electricity system stability.
- SMRs will be explored within the Greek system due to lower capital costs, operational flexibility, as an alternative to tradition nuclear power plants.

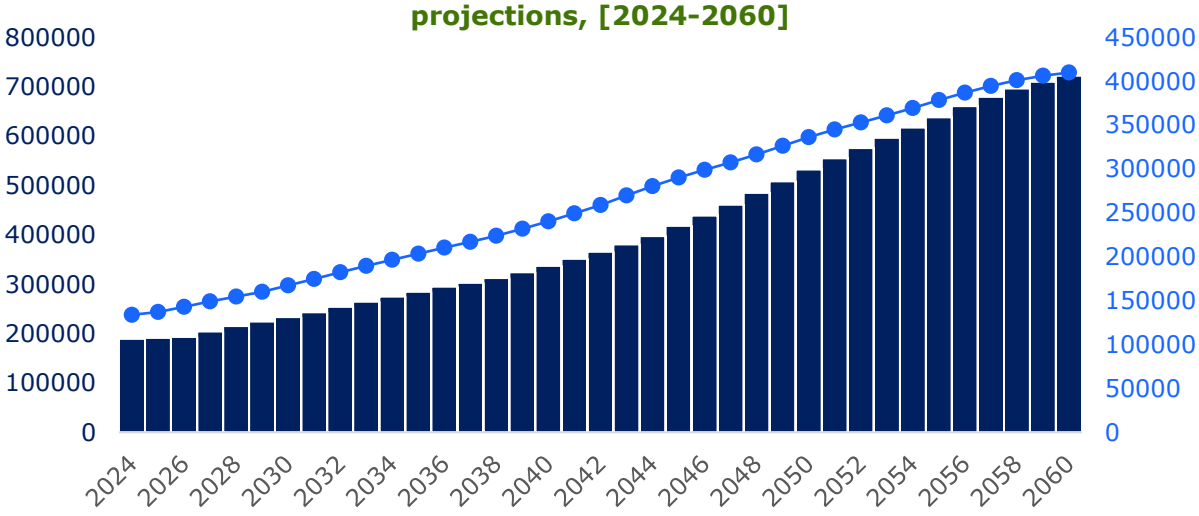
Source: Visual Capitalist, HAEE analysis

Global electricity grids must expand significantly to support electrification and renewable integration across the energy transition.

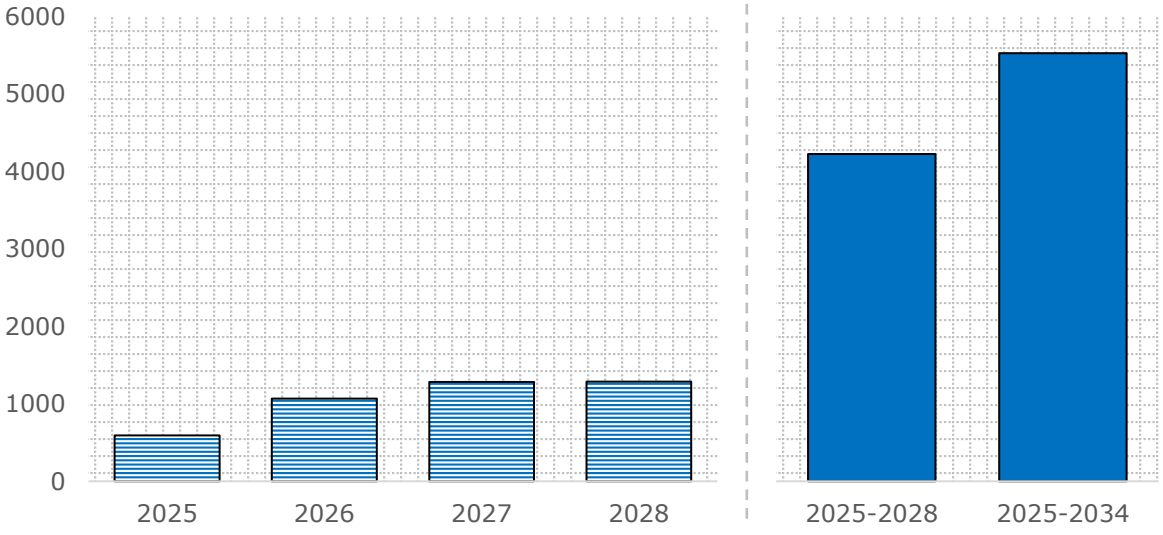
- Global power line capacity is projected to more than triple by 2060, reflecting rising electricity demand and expanding renewable deployment.

- Transmission expansion will be essential to connect new renewable generation with demand centers, particularly for large-scale solar and wind projects.

Global power line capacity (GW*km) and total grid cost (mil. $/yr) projections, [2024-2060]



IPTO Projects' Cost Estimate (mil. €), [2025 -2034]



- Annual grid investment costs are projected to increase steadily through 2060, reflecting the scale of infrastructure required for energy transition.

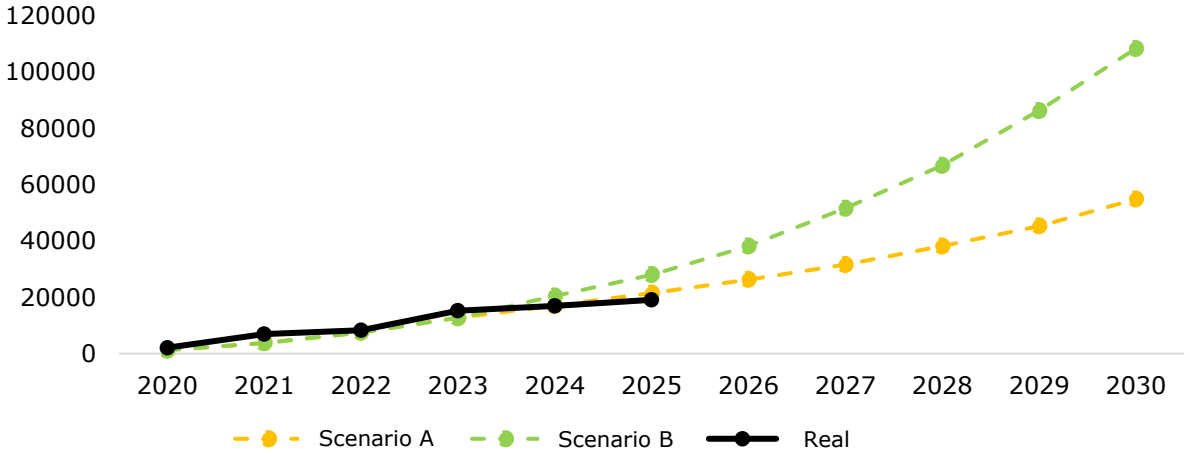
- Strengthening electricity networks will be critical to ensure system reliability, flexibility and cross-border electricity trade in decarbonized power systems.

Source: DNV, HAEE analysis

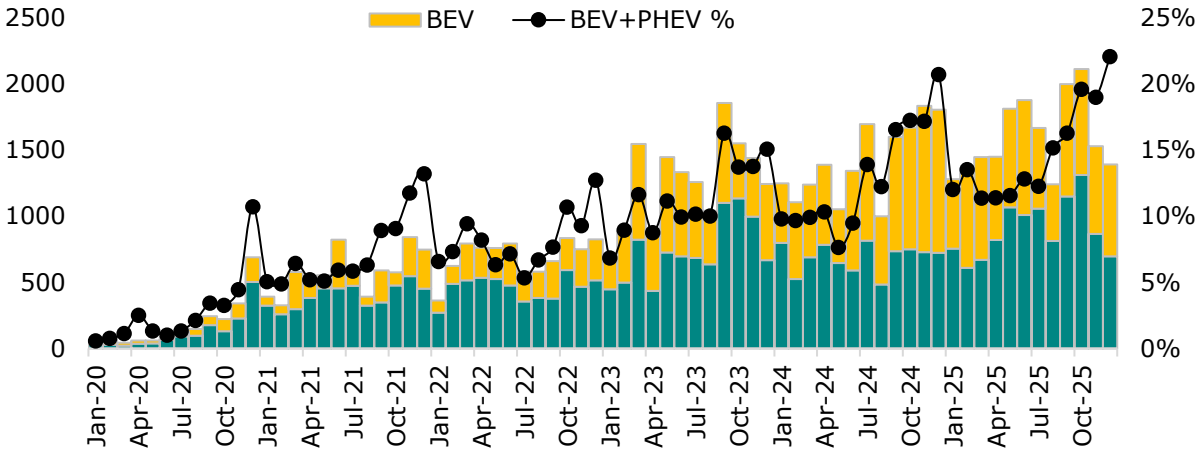
Electric vehicle adoption in Greece is accelerating, but sustained growth will be necessary to meet long-term targets.

- New EV registrations in Greece continue to grow, though current trends remain below the trajectory required to meet NECP targets by 2030.
- Policy scenarios indicate that EV registrations must increase significantly during the second half of the decade to align with national targets.

New EV registrations and NECP targets, [2020-2030]



New BEV & PHEV registrations in Greece and share of total registrations, [2020-2025]



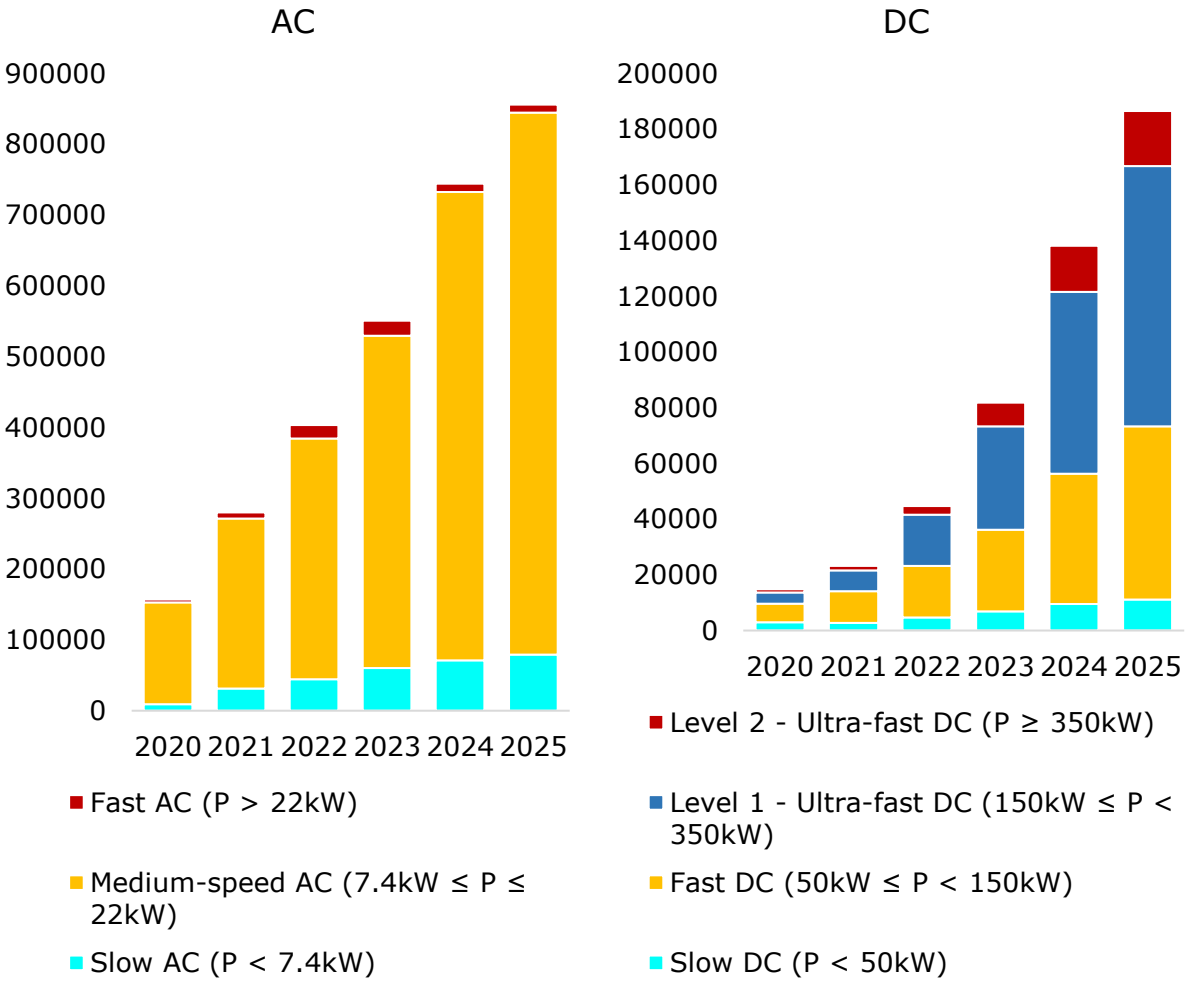
- Monthly registrations of BEVs and PHEVs have increased steadily since 2021, reflecting expanding model availability and policy incentives.
- The share of EVs in total vehicle registrations is rising, signaling gradual electrification of Greece's passenger vehicle fleet.

Source: evstats.gr, NECP, HAEE analysis

Electric vehicle charging infrastructure in Europe is expanding rapidly, supporting the accelerating electrification of the transport sector.

- The number of AC charging points increased strongly since 2020, exceeding 850,000 units by 2025, forming the backbone of public charging networks.
- Medium-speed AC chargers (7.4–22 kW) dominate the infrastructure mix, reflecting their suitability for urban and residential charging.

Evolution of AC & DC chargers in Europe, [2020-2025]



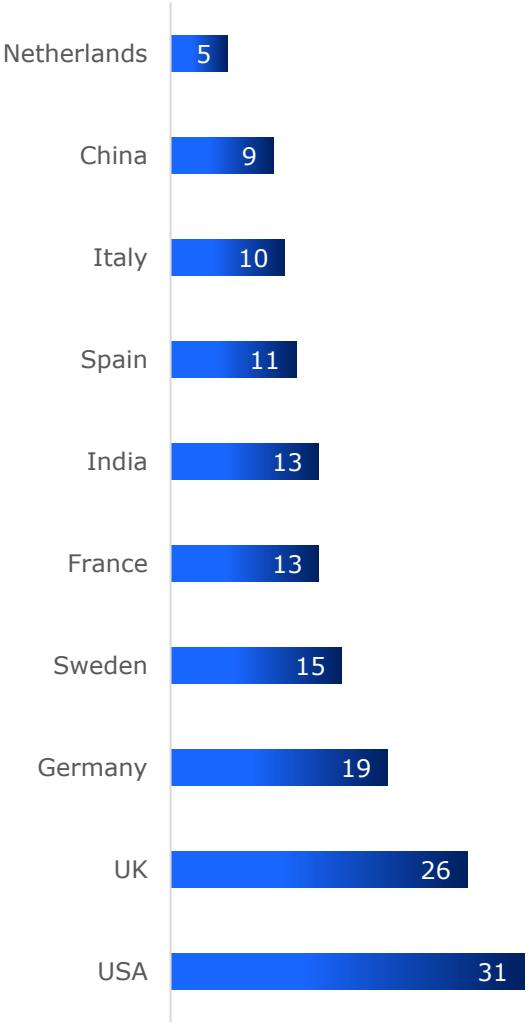
- DC fast chargers expanded rapidly, reaching nearly 190,000 units in 2025, supporting long-distance travel and highway charging networks.
- Growth in ultra-fast charging capacity (>150 kW) highlights the increasing focus on reducing charging times and improving EV usability.

Source: EAFO, HAEE analysis

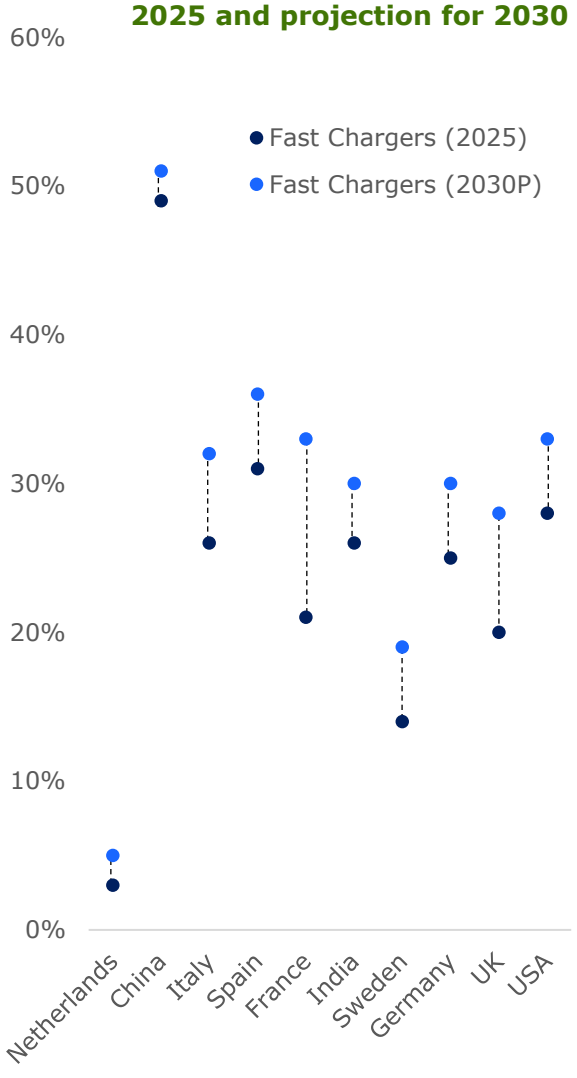
EV adoption is accelerating globally, while charger expansion remains critical to support large-scale electrification of road transport.

- The EV-to-charger ratio varies significantly across countries, reflecting different stages of EV adoption and charging infrastructure deployment.
- Countries such as the USA and UK show high EVs per charger, indicating strong EV uptake but growing pressure on charging networks.

Top 10 Countries by number of EVs per charger, [2025]



Share of chargers in various countries in 2025 and projection for 2030



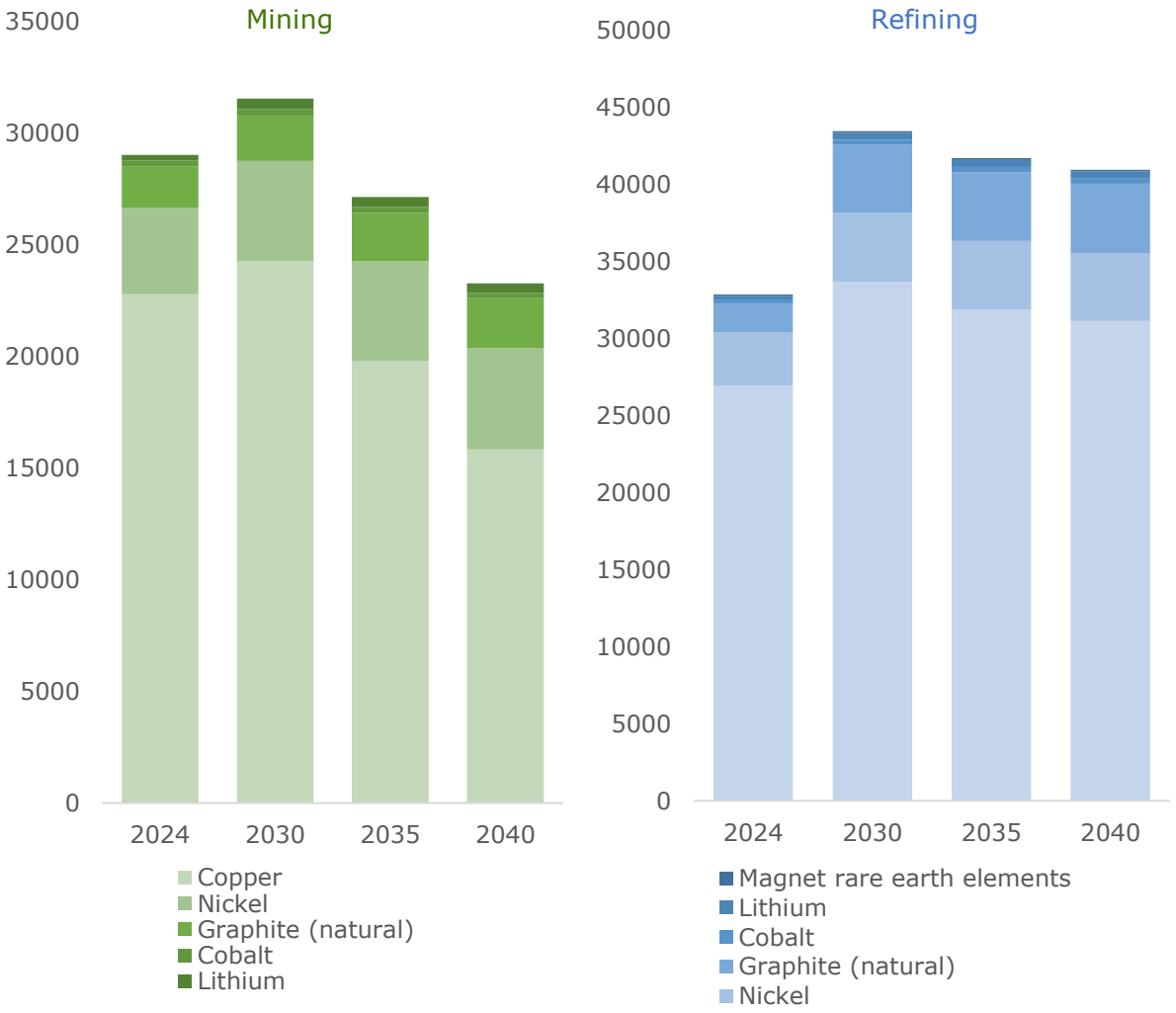
- The share of fast chargers is expected to increase by 2030, improving charging speed and supporting long-distance electric mobility.
- Expanding fast-charging infrastructure will be essential to reduce range anxiety and enable wider EV adoption across European transport systems.

Source: Visual Capitalist, HAEE analysis

Expanding supply of critical minerals will be essential to support the rapid deployment of clean energy technologies worldwide.

- Global mining output for key minerals such as copper, nickel and lithium is projected to increase significantly by 2030.
- Copper remains the dominant mineral by volume, reflecting its central role in electricity networks, renewable generation and electrification.

Global supply for critical minerals (kt) by type of mineral, [2024-2040]



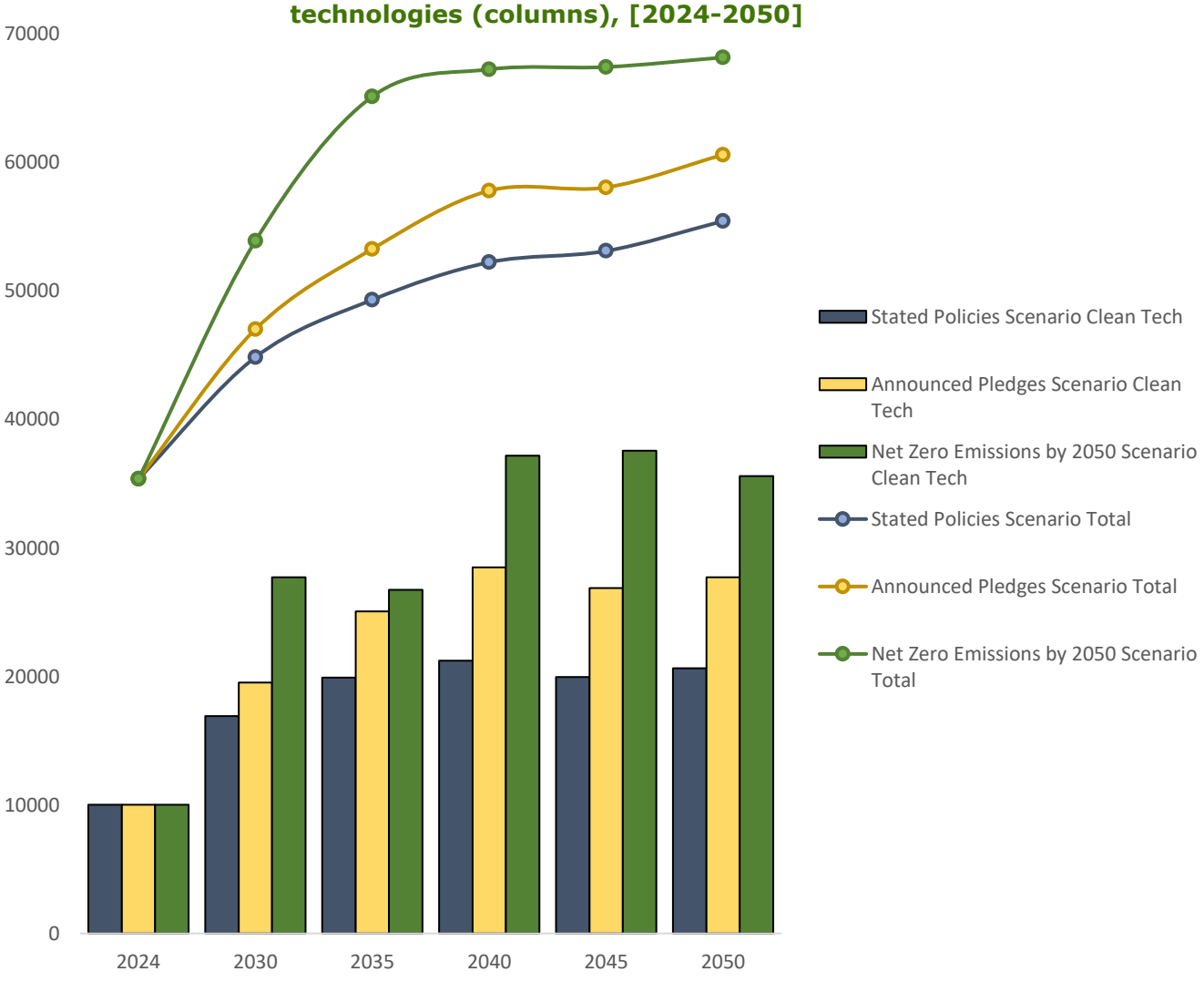
- Refining capacity for lithium, cobalt and rare earth elements is expected to expand, supporting battery manufacturing and clean technology supply chains.
- Strengthening mining and refining capacity will be crucial to avoid supply bottlenecks in the energy transition.

Source: IEA, HAEE analysis

Demand for critical minerals is expected to grow rapidly as clean energy technologies expand across global decarbonisation pathways.

- Global demand for critical minerals increases significantly across all scenarios, driven by expanding deployment of renewable energy and clean technologies.
- In the Net Zero scenario, demand rises the most, reflecting accelerated electrification and large-scale clean energy deployment.

Global demand for critical minerals (kt) - total (lines) and for clean technologies (columns), [2024-2050]



- Minerals demand for clean technologies grows faster than total demand, highlighting their central role in the energy transition.
- Securing supply chains for critical minerals will become a strategic priority for energy security and industrial policy.

Source: IEA, HAEE analysis

3. Power Generation & Consumption Dynamics

Highlights

Over **300GW** of installed capacities in the **EU 27** comes from **wind and solar PV** installations

Greece remained an **electricity exporter** in **2025**, with **2.6TWh** in **export balance**

Electricity demand in EU27 reached **2,769TWh** in **2025**, **increased by 14TWh** compared to **2024**

Bellow zero DAM prices in Greece are burdening the system, reaching **3.8%** of the total MTUs in 2025

Average annual DAM price in Greece approximately **increased** by **3€/MWh in 2025**

Installations and **electricity demand** in **Datacenters** has been **growing exponentially**

Overview

Electricity generation and consumption patterns in Europe and Greece continue to evolve as the energy transition accelerates, with renewable energy sources gaining a larger share of the power mix while electricity demand remains structurally moderated compared to previous decades.

The system is undergoing structural changes, where RES, electrification trends, and market dynamics increasingly shape power generation and consumption patterns.

At **EU27** level, **RES** energy has reached **historically high penetration**. In **2025**, **wind and solar** collectively accounted for approximately **30%** of total electricity generation, surpassing **fossil fuel** generation, which declined to below **29%**. Nevertheless, the transition remains uneven across the member states. Despite electrification trends linked to decarbonization and digitalization, total EU27 energy demand remains lower than a decade ago, pointing at energy efficiency improvements.

Greece exhibits distinct characteristics in both generation and consumption dynamics. The country has rapidly increased RES penetration, making it a dominant component of the national energy mix. Despite the growing contribution of renewables, **natural gas** continues to play a crucial role as the **system's base load and balancing fuel**, providing flexibility and reliability as renewable generation fluctuates.

Electricity demand in Greece demonstrates strong seasonality, with peak consumption occurring during the summer months, with renewable production patterns complement seasonal demand dynamics.

A significant development in the Greek electricity system is the country's growing role in regional electricity trade. In **2025**, **Greece** remained a **net electricity exporter**, exporting more than **2.5 TWh** of electricity **beyond its imports**. Interconnecting countries that play a central role in this dynamic, were Bulgaria serving as the most significant cross-border electricity trading partner, while Italy increasingly relies on electricity imports from Greece during several months of the year.

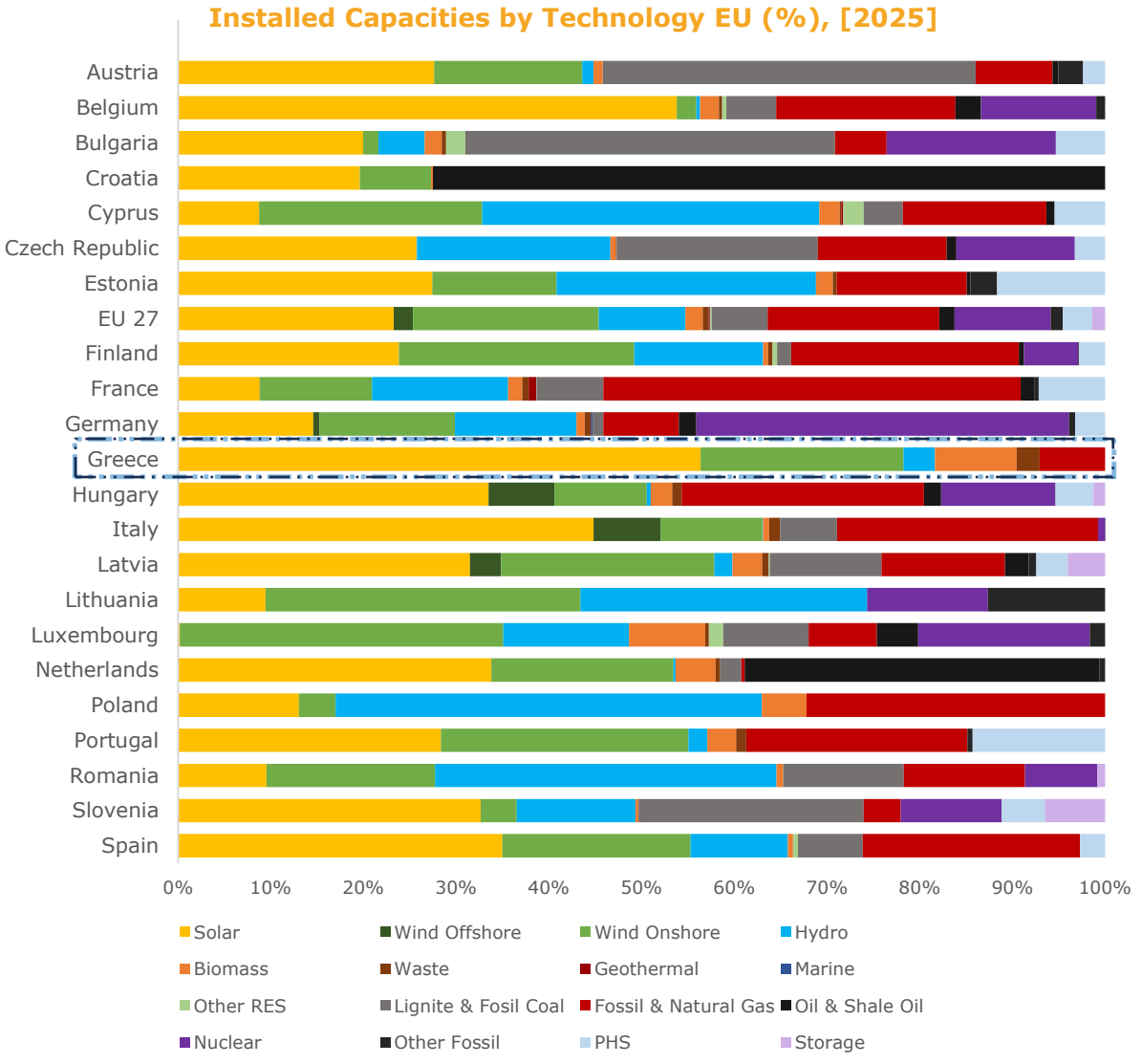
Electricity markets in Greece also experienced notable volatility in 2025. **Average DAM** price reached approximately **€106/MWh**, with significant seasonal and hourly fluctuations. High solar penetration has led to periods of very low or even negative prices during peak photovoltaic production hours, reflecting system oversupply. Conversely, periods of tight supply—particularly during evening hours—can result in sharp price spikes, with prices reaching up to €**561/MWh** in **October** 2025.

Overall, the evolving generation and consumption landscape in Greece and Europe illustrates the complex transition toward a low-carbon electricity system. RES expansion, demand efficiency, cross-border trade, and price volatility are increasingly shaping the dynamics of power markets, while flexible generation and grid interconnections remain critical to maintaining system stability during the transition.

In 2025, wind and solar reached a record 30% of total energy generation, compared to fossil fuels falling bellow 29%.

- When including hydropower and bioenergy, total renewables provided nearly half of all EU power for 2025.

- Solar power accounted for the majority of the generation in most EU27 countries, with Greece relying by 35% on solar for the total energy generation.



- Sweden and Latvia stand out for their hydro power and onshore wind generation, creating an energy profile of high renewable penetration.

- Despite the green transition, Poland, the Czech Republic, Bulgaria, Italy, and the Netherlands still show significant reliance on fossil fuels for power generation.

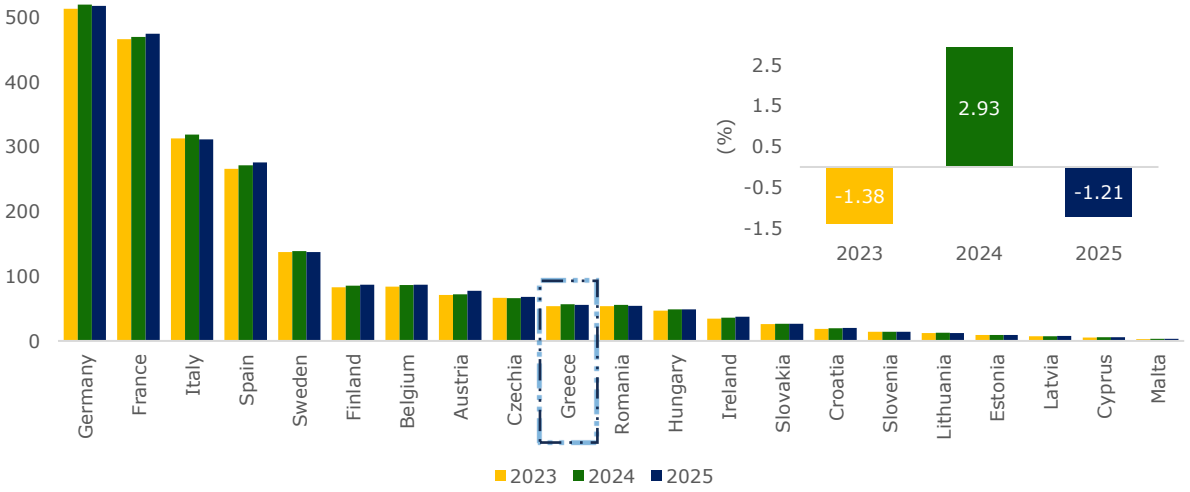
Source: ENTSOE, HAEE analysis

Despite a slight fluctuation in electricity demand in most EU27 countries, it remains lower than a decade ago, suggesting strong energy efficiency

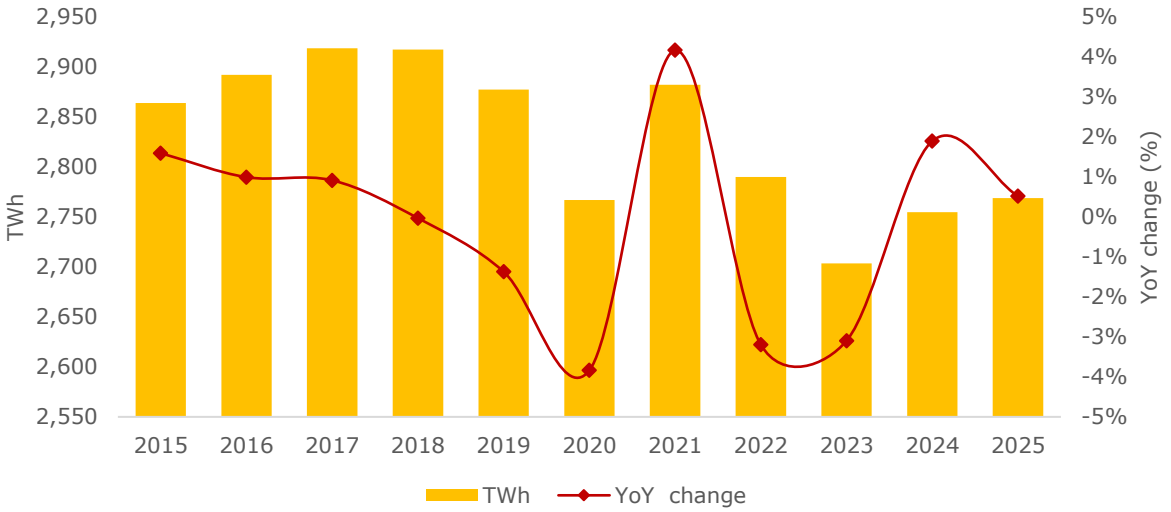
- Compared to most EU27 countries, Greece experienced a decrease in electricity demand in 2025 compared to the previous year.

- Electricity consumption is highly concentrated in Germany, France, Italy, and Spain, collectively dwarfing the rest of the EU in total TWh

Electricity Demand in the EU (TWh) and YoY Demand Change for Greece (%), [2023-2025]



Electricity Demand in the EU (TWh) and YoY change (%), [2015-2025]



- The 2022–2023 period shows a second decline in electricity demand, reflecting the energy crisis and high prices following the geopolitical tensions in Eastern Europe.

- Despite the electrification trend in recent years, the total electricity demand in the EU27 is lower than a decade ago.

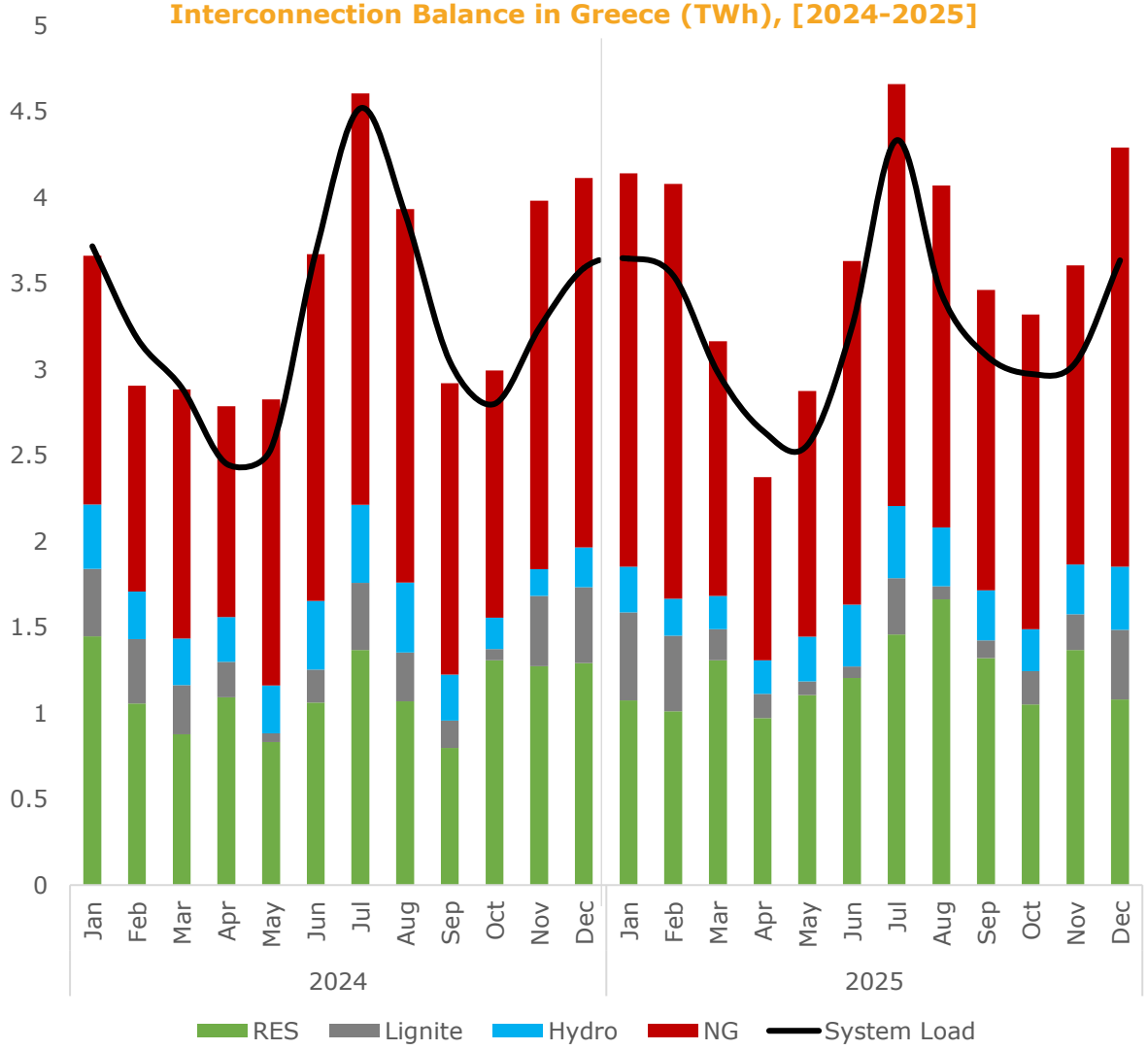
Source: EMBER, HAEE analysis

The peaking in electricity demand in Greece is prominent during the summer months, indicating the high seasonality and area needs

- Natural Gas remains the foundational fuel of the Greek electricity mix throughout the year, acting as the base load and complementary fuel for the energy transition.

- Wind power is robust during the winter months, providing a balanced output of renewable energy during the whole year.

Electricity Mix by Month & Electricity Demand in the Interconnected System & Interconnection Balance in Greece (TWh), [2024-2025]



- The peaking in electricity demand in Greece is prominent during the summer months, indicating the high seasonality and area needs.

- Greece is positioning itself as a renewable energy exporter for a second consecutive year in 2025, with over 3TWh more exported than imported electricity.

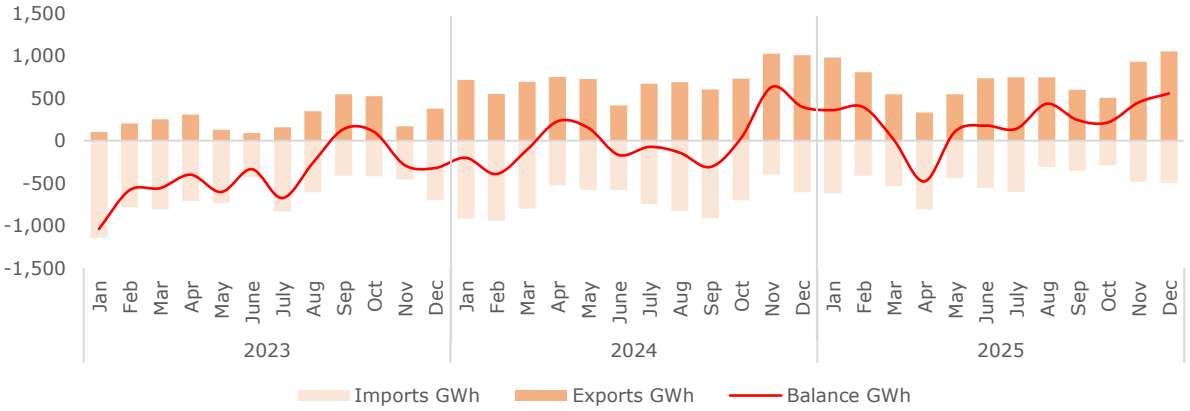
Source: IPTO, HAEE analysis

Greece in 2025 remains an electricity exporter for a second consecutive year due to high renewable penetration in the electricity mix

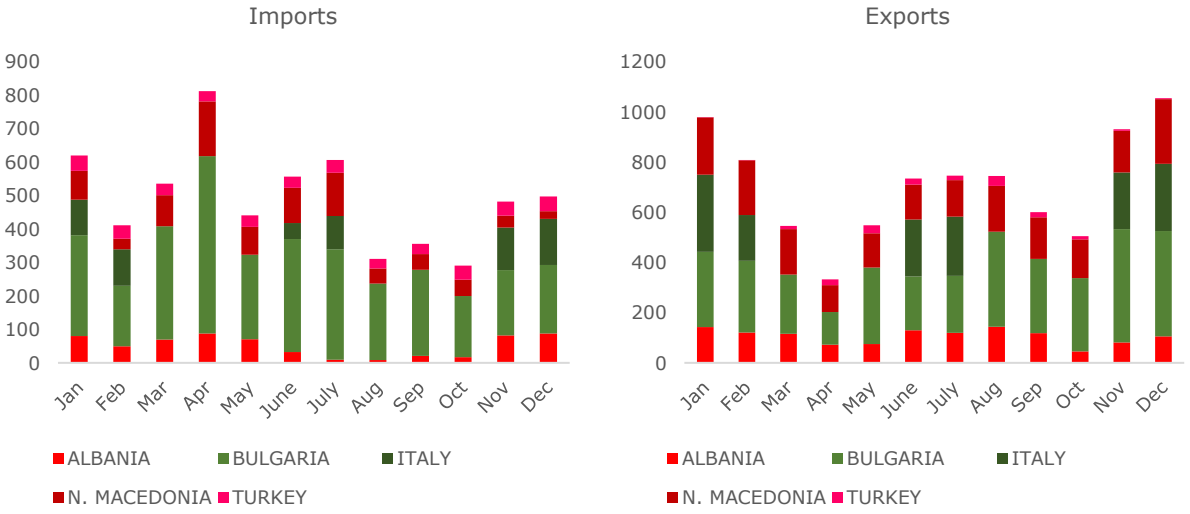
- Electricity exports peak not only during the winter months, but also in the heart of the summer due to high stochastic renewables penetration in the mix.

- The highest import needs are during the summer months for Greece, due to high reliance on electricity for cooling.

Electricity Imports & Exports in Greece (GWh), [2023-2025]



Electricity Imports & Exports per Boarder in Greece (GWh), [2025]



- Bulgaria is the most significant interconnection for the country, both for import and export of electricity quantities.

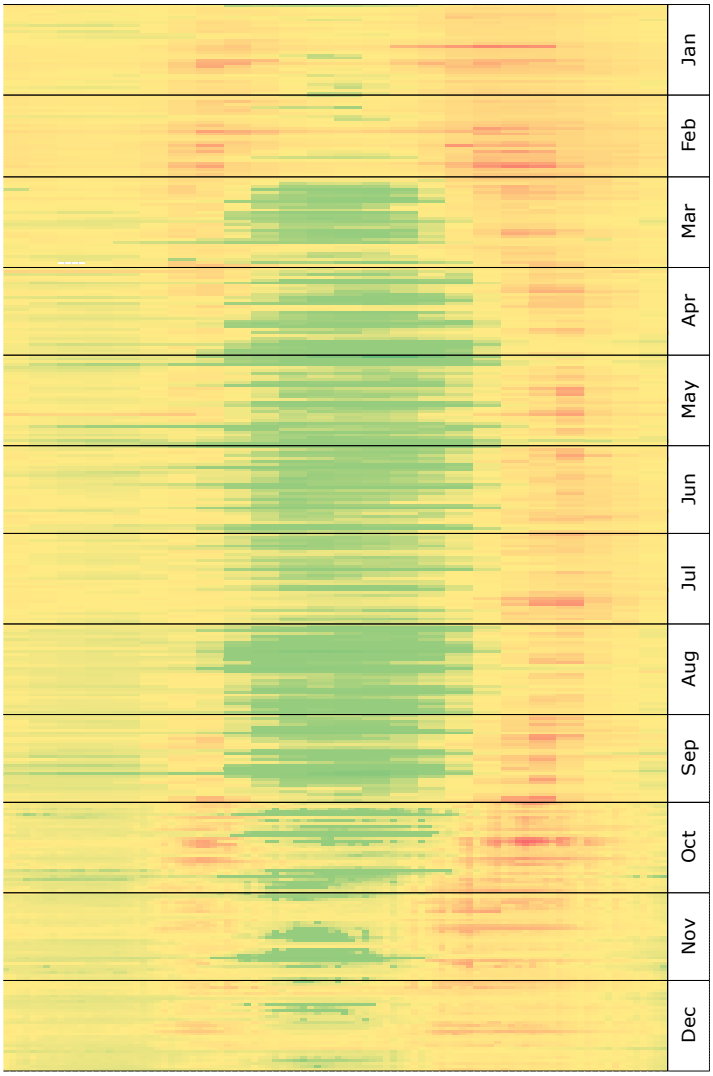
- Italy, though being a country with a similar electricity profile to Greece, heavily relies on imports from Greece during most of the months of the year.

Source: IPTO, HAEE analysis

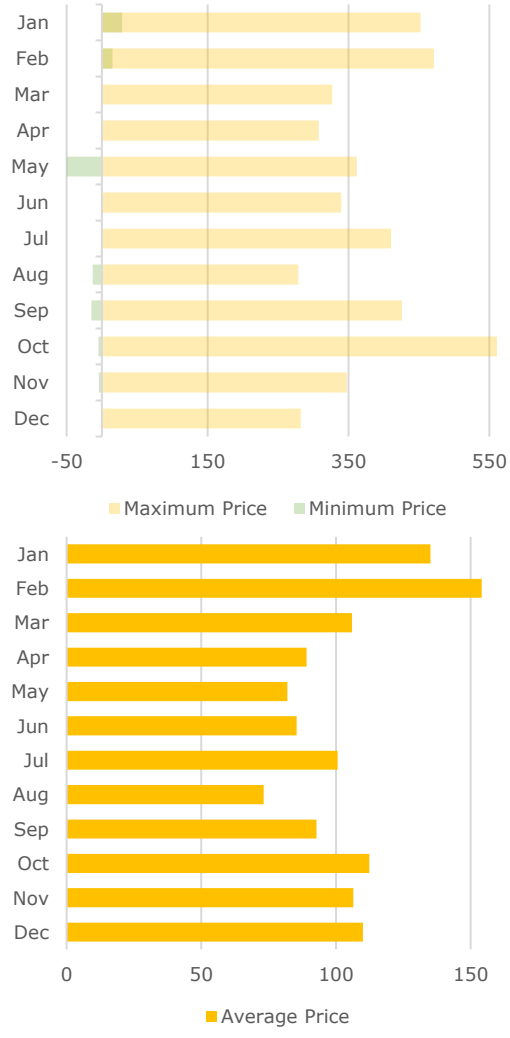
The Weighted Average Market Price for January 2025 was 161.46 €/MWh, a significant increase compared to the previous year of 108.23 €/MWh

- The lowest price in DAM was observed during May of 2025, reaching a -50 €/MWh, while the pattern of low prices continues during peak PV production hours.
- The highest price in DAM for 2025 were observed in October, specifically during evening hours, reaching up to 561 €/MWh.

Hourly DAM prices heatmap, [2025]



DAM prices distribution (€/MWh), [2025]



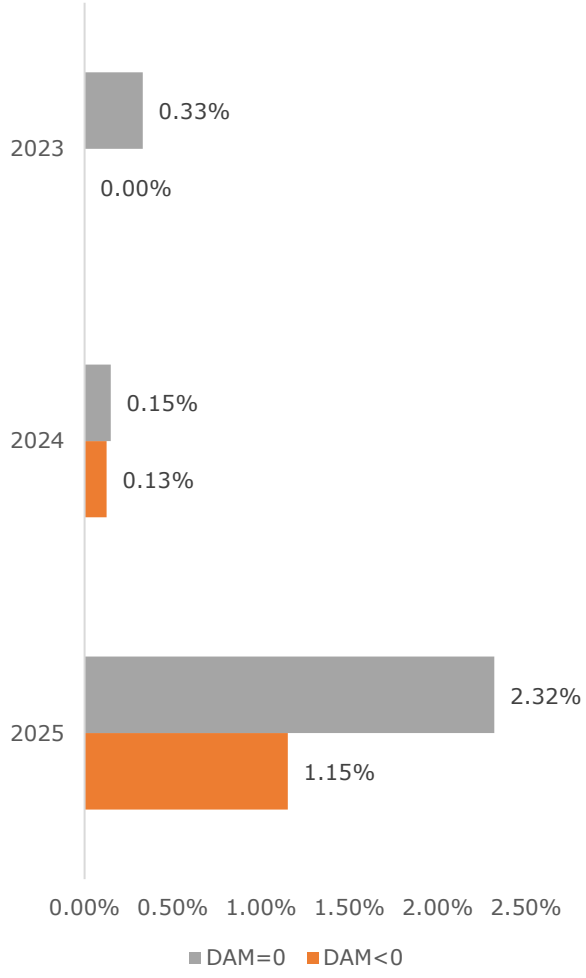
- The Average price of the Day Ahead Market was settled for 106 €/MWh for 2025, with February holding the highest average price of 154 €/MWh.
- The lowest Day Ahead Market prices were observed during peak solar PV months and hours, indicating the oversaturation of photovoltaics in the System.

Source: EnExGroup, HAEE analysis

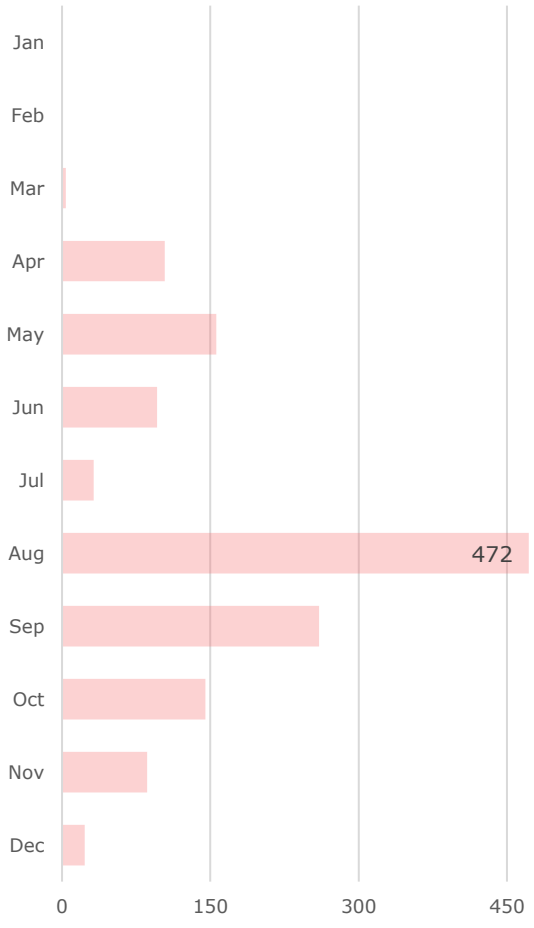
Zero and negative prices in Day Ahead Market are becoming the new reality with each passing year

- Due to PV oversaturation, during their peak production season and hours, Greece follows the pattern of Italy.
- In 2025 1,378 distinct time units had a zero or lower price in Day Ahed Market, 444 of them had a pure negative price.

Negative & Zero DAM prices, [2023-2025]



Monthly Number of Negative & Zero price hours, [2025]



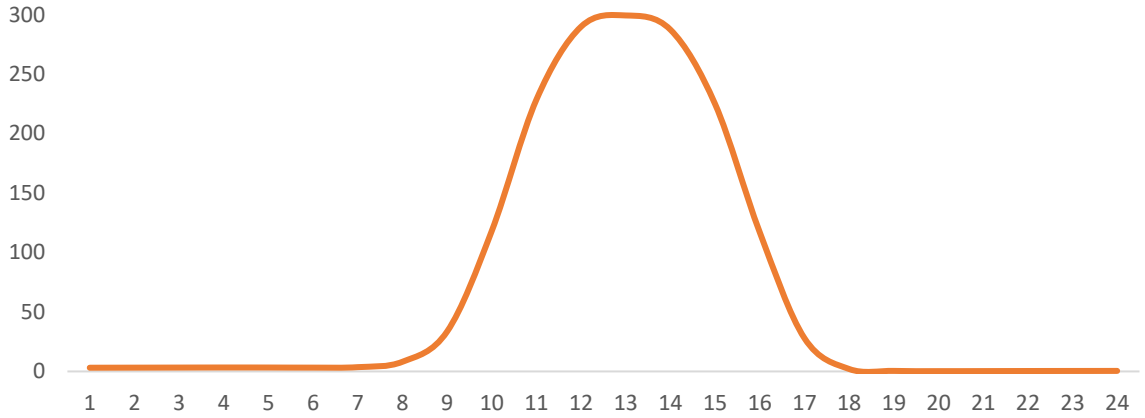
- In 2025 most bellow zero prices were observed during the summer months with 472 distinct time units, indicating the overproduction of PV, and absence of BESS.
- Since 2023, the percentage of time with zero prices has increased by 2%, while negative prices have increased by 1% since 2024.

Source: EnExGroup, HAEE analysis

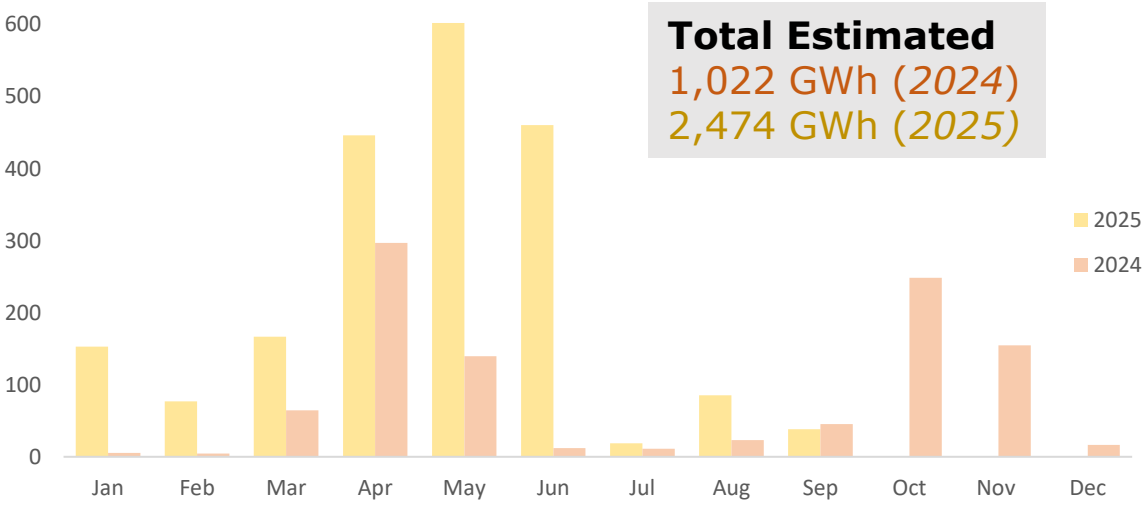
In 2025 every in the first 9 months were observed RES curtailments, a striking difference compared to the previous year

- Most renewable energy curtailments happened during the months of low electricity demand, with a focus on May.
- Even though during the summer months the demand for electricity reaches its peak, in 2025 all of them had RES curtailments.

Average Hourly Curtailments (MW), [2025]



Renewable Energy Curtailments by Month (GWh), [2024-2025]



- Compared to previous year, in 2025 the RES curtailments took place not only during peak PV production hours, but at night hours as well.
- Peak renewable energy curtailments are clearly visible during the lowest demand hours of the day, 11:00 am to 3:00 pm.

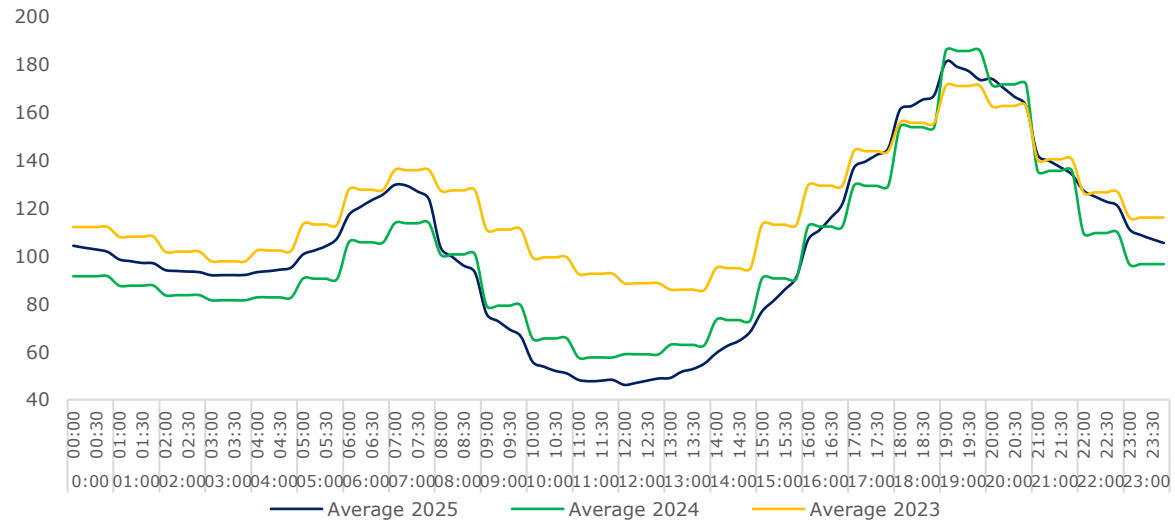
Source: IPTO, HAEE analysis

The price volatility in the Day Ahead Market is increasing drastically with the further introduction of stochastic renewables

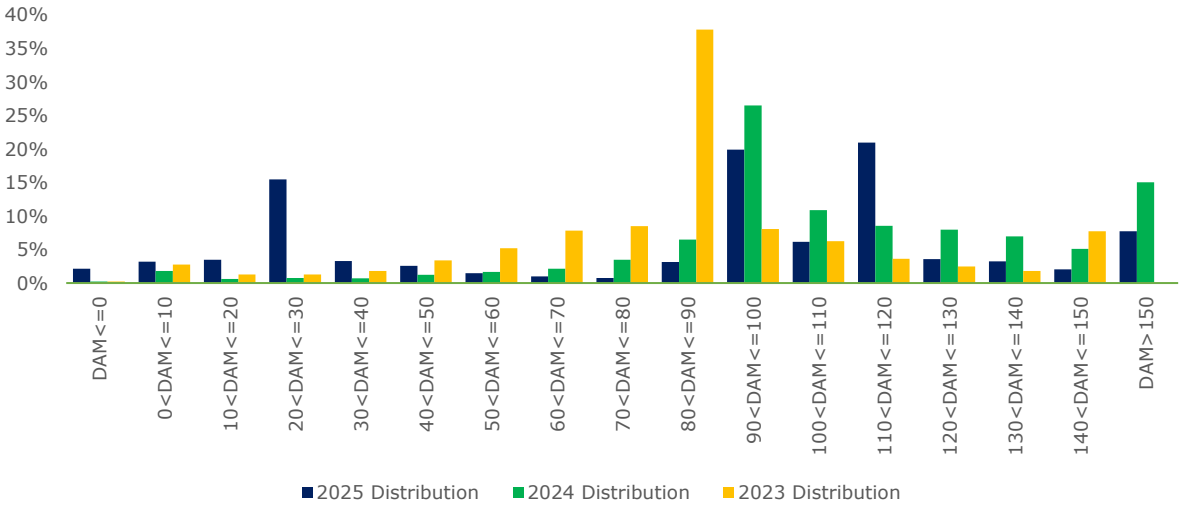
- The volatility in the DAM prices during the hours of the day is becoming more significant, even after the introduction of shorter market time units.

- Lowest hourly average price for the day in 2025 was 46.19€/MWh while in 2024 for the same hour the price was 58.97 €/MWh.

Average Hourly DAM prices (€/MWh), [2023-2025]



DAM prices distribution, [2023-2025]



- The same happens with the highest prices of the day, for 2025 was 181€/MWh, while for 2024 for the same hour was 185 €/MWh.

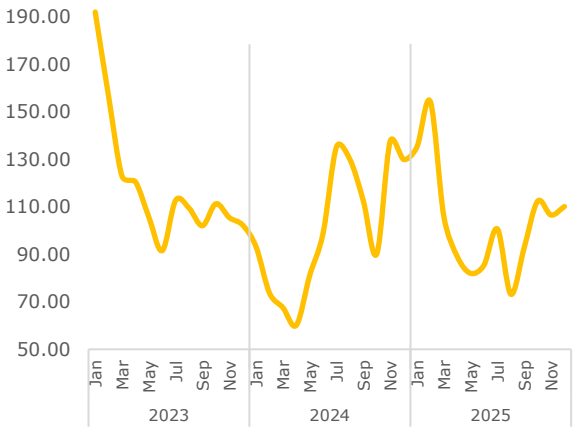
- The main portion of electricity price distribution during 2025 focused in 3 segments, in a 20-30 €/MWh range, 90-100 €/MWh, and 110-120 €/MWh.

Source: EnExGroup, HAEE analysis

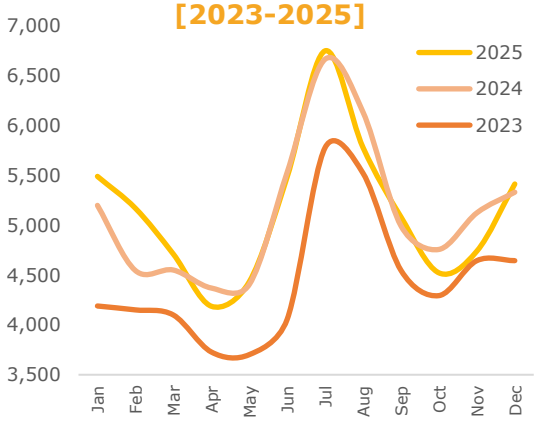
After introduction of quarter-hour time units in DAM, average monthly prices have dropped by 8.5% compared to the first semester of 2025

- The YoY change in average DAM prices was 3% higher compared to 2024, while the opposite happened during 2024 with a 15.5% decrease.
- The traded volumes in DAM during 2025, were lower than the previous two years indicating that the country is inline with EU directives and energy efficient.

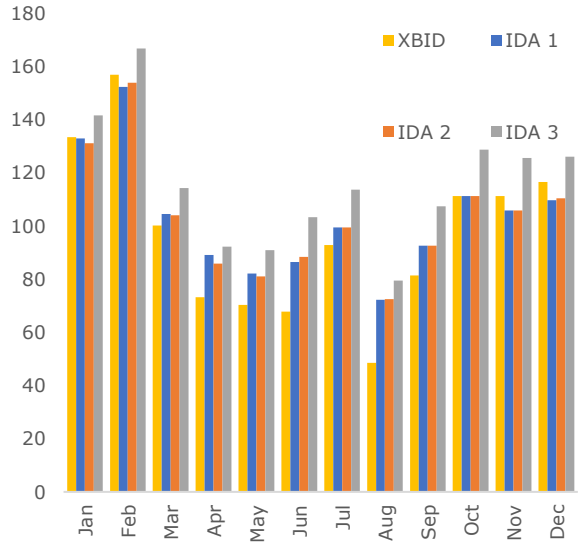
DAM prices €/MWh, [2023-2025]



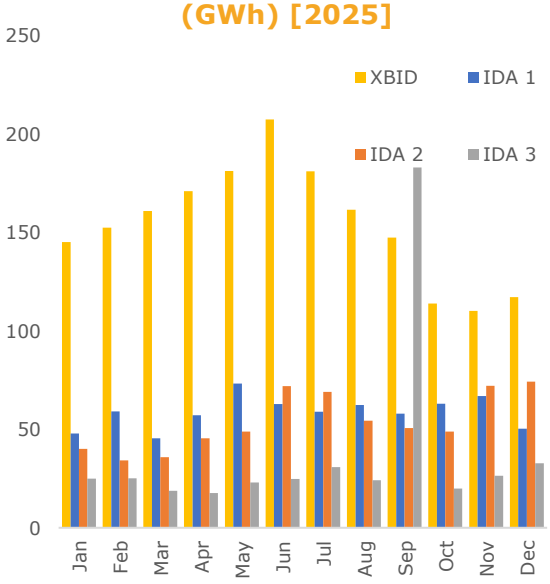
DAM traded volumes (GWh) [2023-2025]



Intraday markets prices €/MWh, [2025]



Intraday markets traded volumes (GWh) [2025]



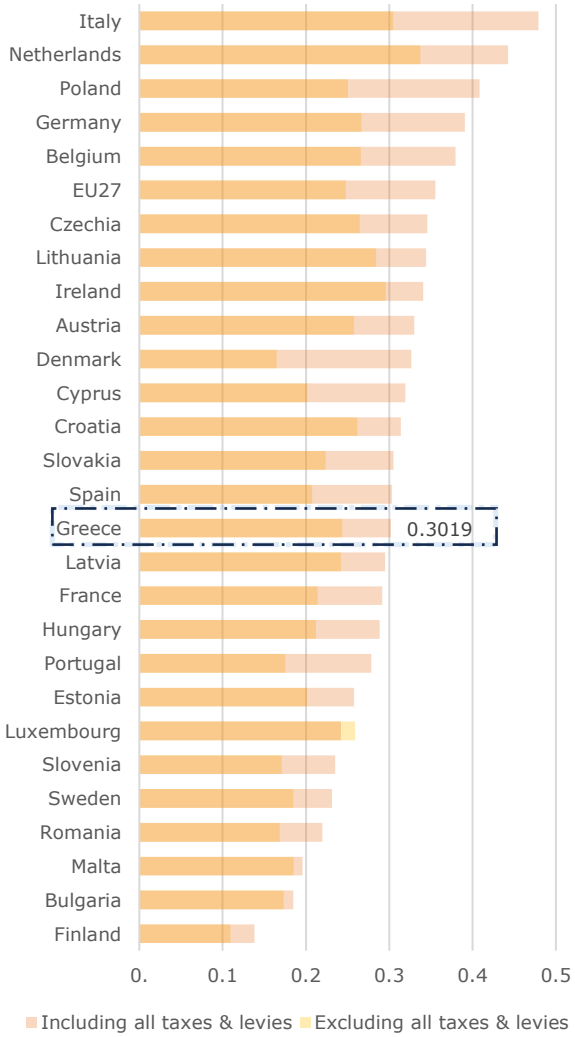
- In 2025 XBID is holding over 50% of the traded volumes in intraday markets due to high flexibility and ability to trade in separate MTUs.
- During 2025, XBID on average had lower clearing prices in 8 out of the 12 months of the year, while the revenue was over 51% of the total revenue of intraday markets.

Source: ENTSOE, HAEE analysis

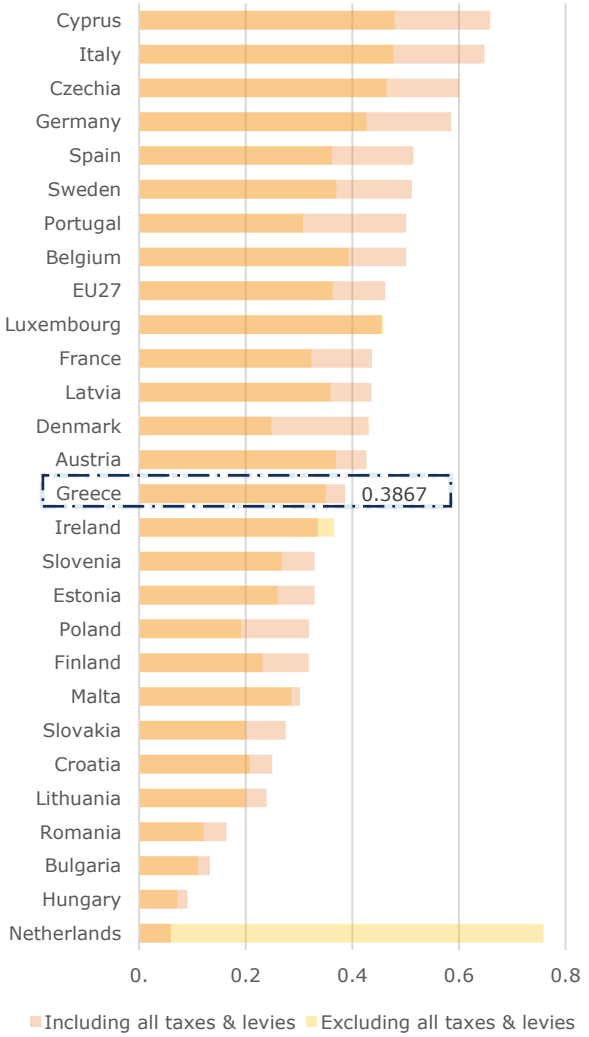
Greece holds 14th and 13th place in cheapest electricity prices for household and non consumers across all EU member states

- Italy had the highest prices in small scale industry reaching 0.3045 €/kWh without taxes and levies, and 0.4793 €/kWh after including them.
- For small scale industry, prices in Greece reached 0.2437 €/kWh and 0.3019 €/kWh without and with taxes and levies respectively.

Non-Household Electricity Prices IA band (€/kWh), [2025-S1]



Household Electricity Prices DA band (€/kWh), [2025-S1]



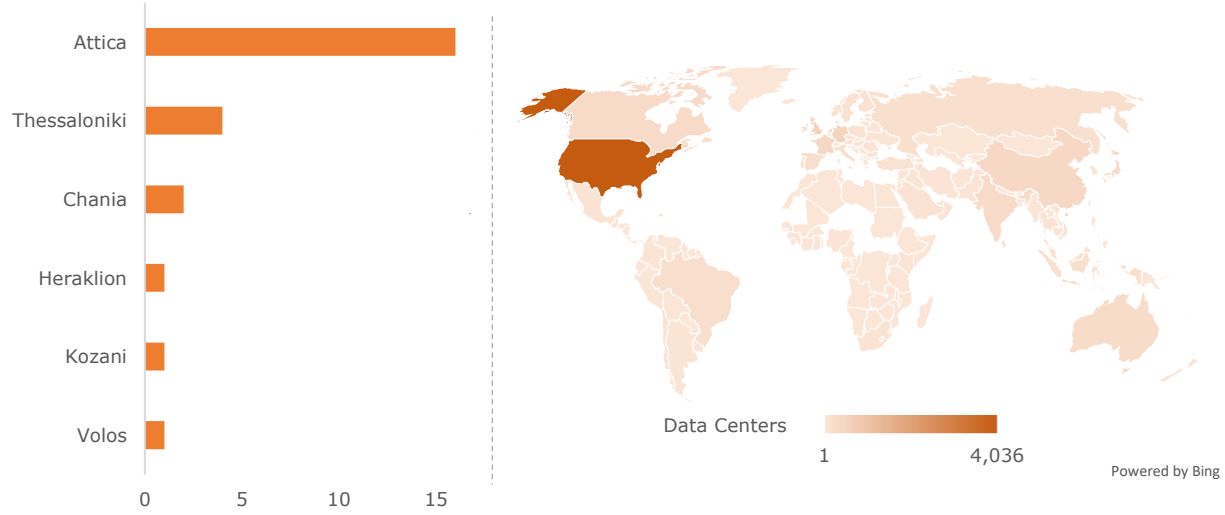
- Households with consumption under 1MW in Netherlands pay approximately 8% or the real cost of electricity due to Temporary Energy Assistance Fund subsidization.
- 17 out the 27 EU member states increased their prices after taxes and levies from 2024 S2 to 2025 S1, but the average difference presented a 2.75% decrease.

Source: Eurostat, HAEE analysis

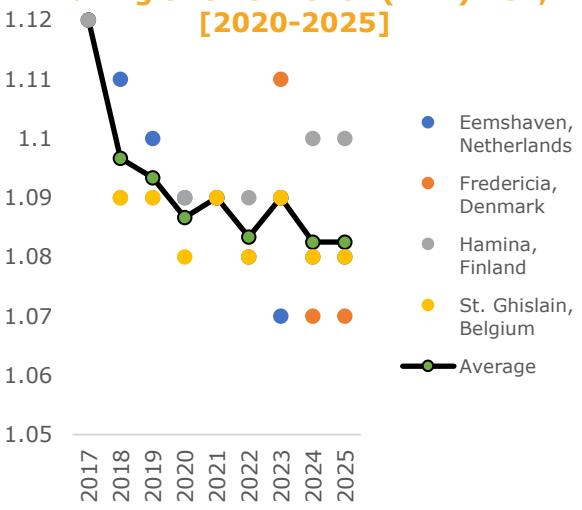
The centralization trend of Datacentres in Greece is high, with 64% and 16% located in the Attica region and Thessaloniki

- In Greece regional digital infrastructure penetration remains at 20% of the national total, highlighting opportunities for decentralization.
- In 2025 11,031 datacenters are installed globally with total capacity of 114.3 GW and electricity consuming of 485.4 TWh, making them a giant consumer.

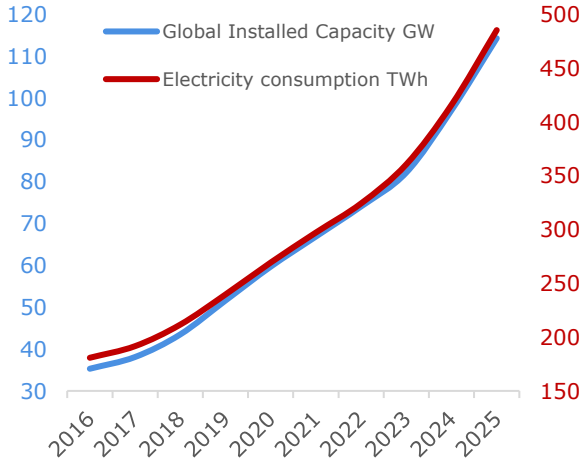
Number of Data Centers in Greece and global, [2025]



Trailing twelve-month (TTM) PUE, [2020-2025]



Number of Datacenters and electricity consumption (TWh), [2016-2025]



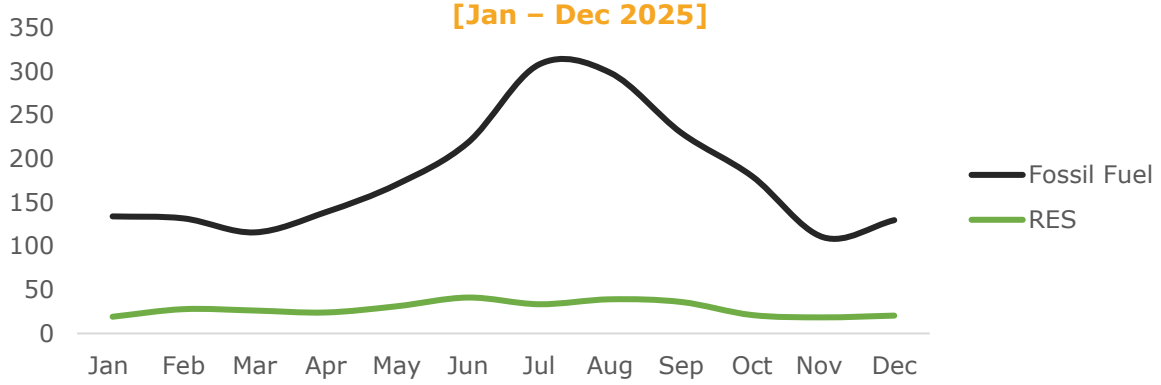
- The average PUE declined from 1.12 in 2017 to 1.08 in 2025, representing an efficiency improvement of 3.3% over eight years.
- Global datacenter electricity consumption increased 168% in the last 10 years, demonstrating that demand growth outpaces PUE gains.

Source: Google, IEA, DataCenterMap, HAEE analysis

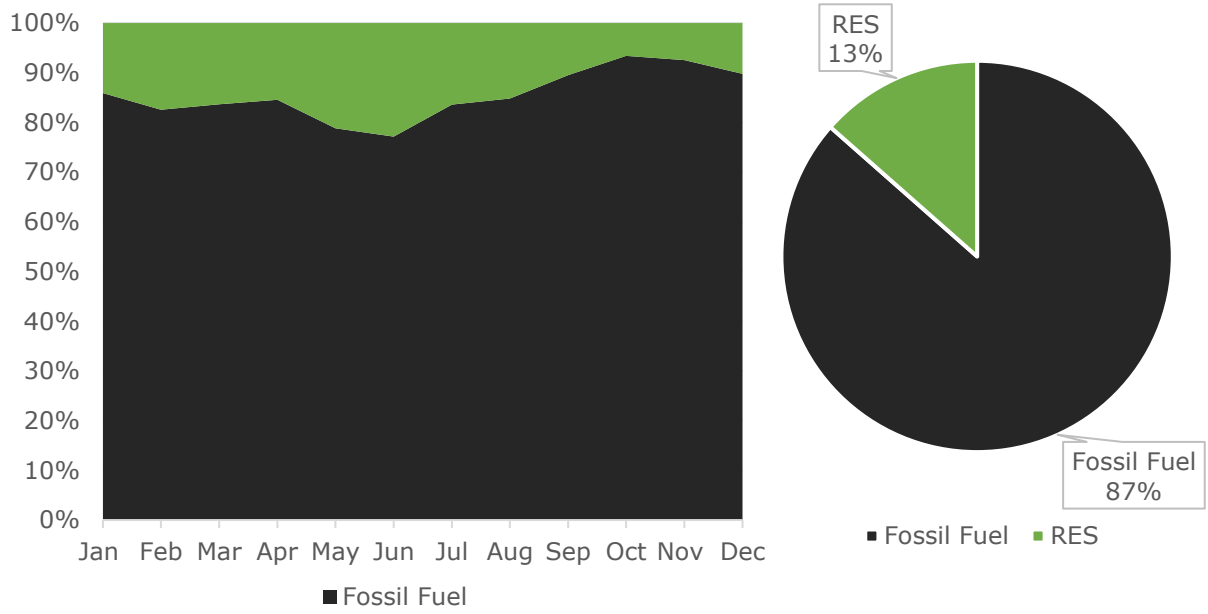
Renewable energy penetration remains low at 13% for 2025 in the Greek NIIs due to χωροταξικών κανονισμών εγκατάστασης

- Most Greek NIIs have reached the full installation capacity of wind turbines, lowering the penetration of RES in the electricity system.
- Most fossil fuel generation in the NIIs is during summer, peak tourist season covering space cooling and EV charging needs on the island.

Electricity Mix in the Greek Non-Interconnected Islands (MWh), [Jan – Dec 2025]



Electricity Mix in the NIIs (%), [Nov 2024- Oct 2025]



- During July and October, fossil fuel generation covers 90% of the electricity demand needs due to increased demand and low-RES generation respectively.
- Maximum RES penetration in the electricity mix was observed during February due to high wind energy generation covering 17% of the total demand.

Source: HEDNO, HAEE analysis

4. RES & Energy Storage

Highlights

RES penetration in the **Greek** energy mix **25.36%**, surpassed the **EU average 25.24%**

Solar PV and wind installation capacities in the country have surpassed **14GW** in total

Almost **€1.8mil** of RES **revenue** in Greece comes from **solar PVs** accounting for **50%** of the **total share**

78.3GW in **BESS** and **PHS licenses** are given by the end of **2025**

Flexible Purchase Agreements under **12GW** of **BESS** are slowly overtaking the market

Greece showed a remarkable **6% decrease** in CO_2 **emissions** in **2024**, with the **EU27** average only **-2%**

Overview

Greece's renewable energy sector has experienced significant growth over the past decade, positioning the country just above the EU average in renewable energy penetration. As of 2024, renewables account for **25.36%** in the **energy mix** of **Greece**, marginally exceeding the **EU-27 average** of **25.24%.** However, the share has remained relatively stable for two consecutive years, indicating that further progress toward decarbonization will increasingly depend on the expansion of energy storage and grid flexibility solutions rather than solely on additional variable renewable generation capacity.

Solar PVs dominate Greece's renewable landscape, accounting for over **63%** of RES capacities, making it the primary driver of the country's renewable electricity generation and revenue. Total installed PV capacity now **exceeds 12 GW**. In terms of economic contribution, solar PV **generates over €1.8 million** in **revenue**, representing around **50% of total RES revenue** in Greece. **Wind** energy remains the second major renewable source, with approximately **5.7 GW** of installed onshore wind capacity by 2025. Growth in wind installations has slowed in recent years due to high capital costs, indicating a temporary plateau in deployment. Most wind capacity is concentrated in Central Greece and Evvoia, while the Ionian and Aegean islands remain relatively underdeveloped in wind potential.

Renewables accounted for 49.6% of electricity generation in the first 10 months of 2025, placing the country 15th among EU-27 member states in renewable electricity penetration. However, **Greece** ranks **4th in solar penetration** among EU-27 member states. Environmental performance is accelerating as well with **CO_2 emissions declined by 6%** in 2024 in Greece.

Despite the growth in RES capacities, the Greek electricity system is facing increasing challenges related to intermittency, grid saturation, and curtailments, particularly from solar generation. This underscores the critical role of energy storage in enabling further renewable expansion. By the end of 2025, **Greece** had **licensed** approximately **73.8 GW** of **energy storage capacity**, including **58.4 GW** in BESS. Notably, these licensed capacities already **exceed** the **17 GW storage** capacity **target** projected in Greece's NECP for 2050, highlighting the rapid acceleration of storage project approvals. However, actual deployment remains limited, with many projects still in the development pipeline.

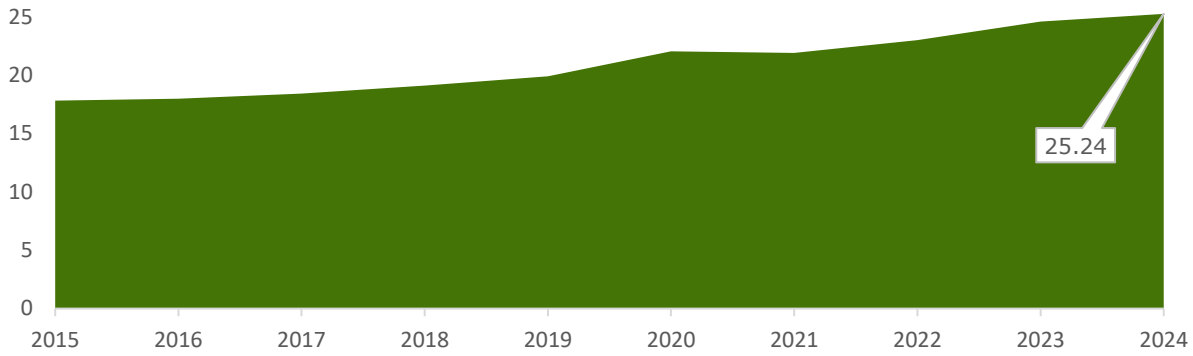
At the **European market** level, storage technologies are also reshaping energy contracting structures. **BESS-related agreements** now represent approximately **47%** of disclosed contracted volumes, approaching the scale of traditional PPAs, with the latter volumes having declined since their peak in 2023 due to price uncertainty.

Greece is transitioning toward a renewable-dominant electricity system, led by solar PV and supported by wind generation. However, the sector is approaching a critical inflection point. Future growth will depend on faster deployment of energy storage, grid modernization, and market mechanisms that improve system flexibility, enabling Greece to move beyond the current renewable plateau and continue its path toward a fully decarbonized energy system.

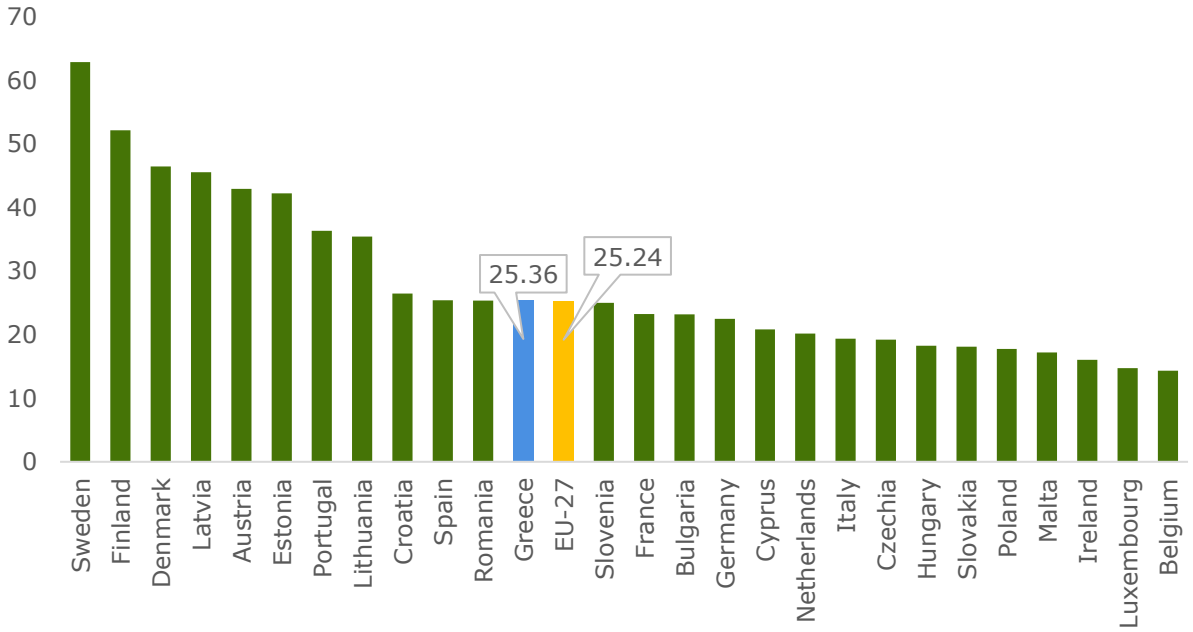
Compare to a decade ago, the share of renewables in the energy mix in EU27 has risen by 42%, standing at 25% in 2024

- After the COVID-19 pandemic plateau, the share of renewables in the energy mix has been steadily growing.
- Nordic countries hold the highest share of renewables in their energy mix, due to high PHS usage for electricity generation.

EU-27 RES Share Evolution in the Energy Mix (%), [2015 -2024]



Share of RES in the Energy Mix in the EU-27 Member States (%), [2024]



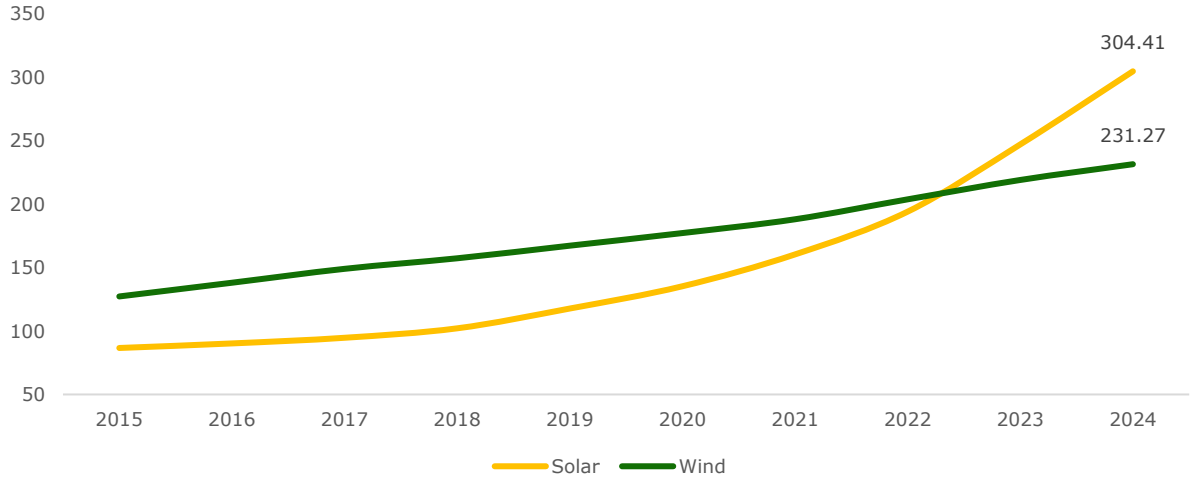
- Greece for a second consecutive year holds the 25% share of renewables in the energy mix, indicating a plateau and a need for storage technologies.
- Belgium, and Luxembourg hold the bottom 2 places in RES penetration, having a share under 15%.

Source: Eurostat, HAEE analysis

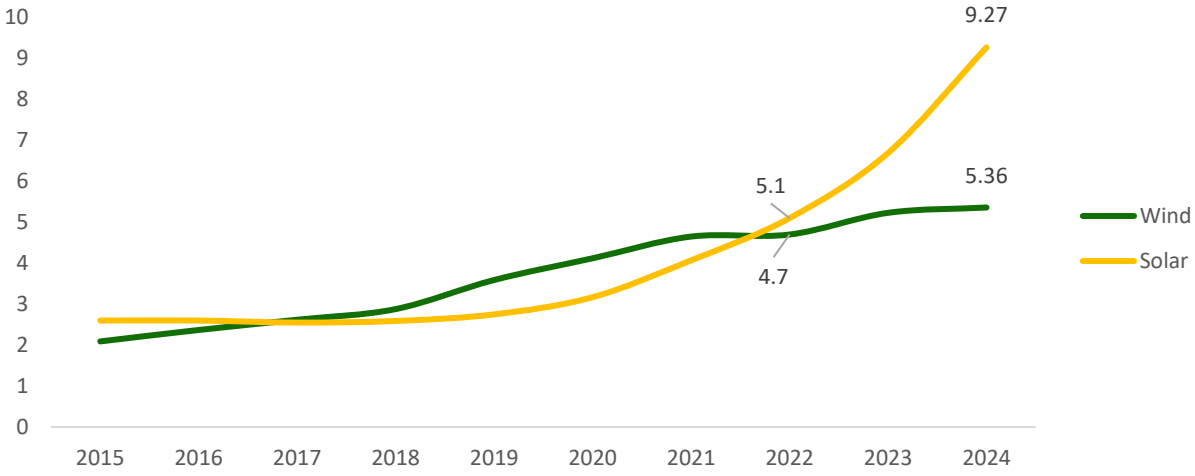
In 2024 in Greece, over 63% of the non dispatchable RES capacities belonged to solar PV installations

- In 2024 in the EU27, installed capacities of non dispatchable RES, solar PV and wind, surpassed 535 GW.
- Both in the EU27 and Greece, the majority of variable RES installations come from solar PV.

Solar & Wind Evolution int EU-27 (GW), [2015 - 2024]



Solar & Wind Evolution int Greece (GW), [2015 - 2024]



- In 2022 solar PV installations surpassed wind installations in Greece with 5.1 GW and 4.7 GW respectfully.
- In 2024 PV and onshore wind installations surpassed 14 GW, while during 2025 their number surpassed the 12 GW mark in total.

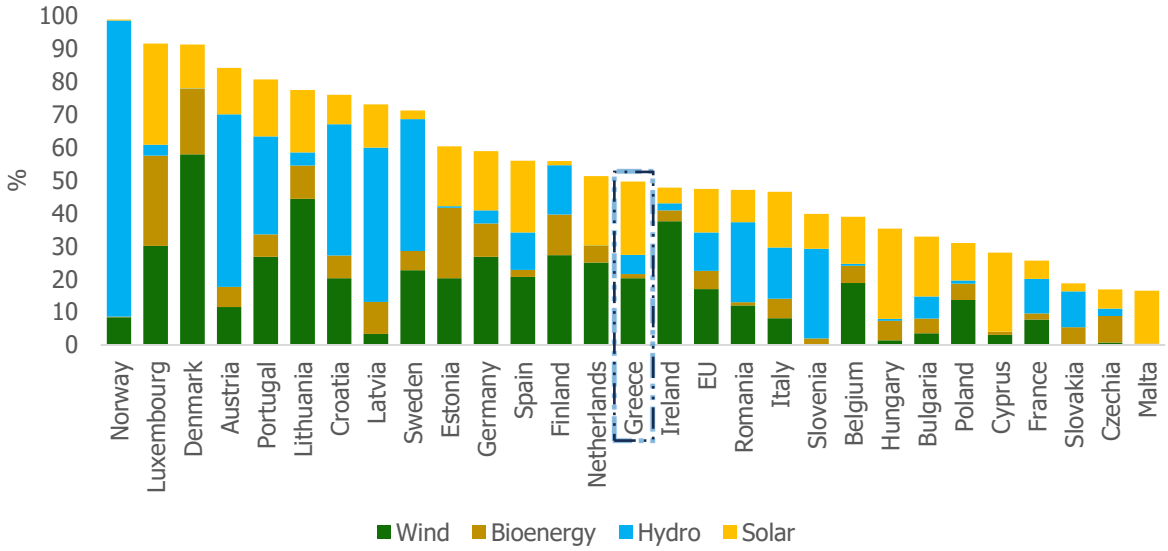
Source: EMBER, HAEE analysis

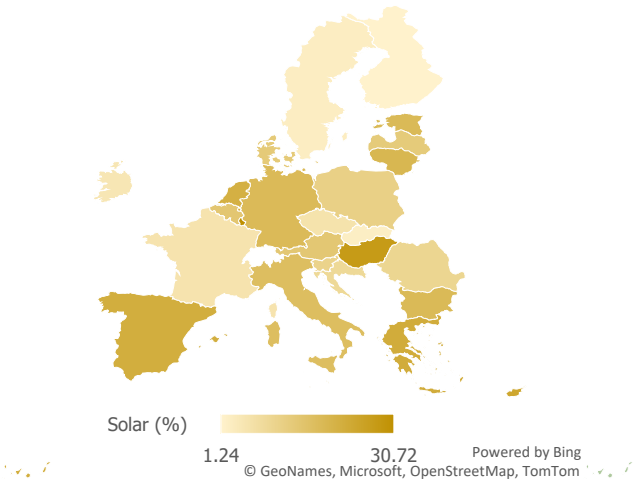
The penetration of RES in the electricity mix of the EU27 member states is no longer measured only from stochastic renewable sources

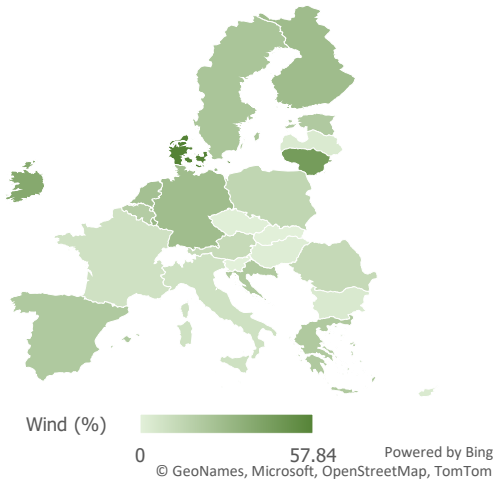
- Norway holds the first place for renewable energy penetration in the electricity mix by 98.74% mainly due to hydro production holding 89.93%.

- Greece holds 15th place for renewable energy penetration with 49.61% among the EU27 member states, but 4th in solar penetration with 22.21%.

EU-27 Member States RES Generation Electricity Mix Penetration (%), [2025]







- Denmark holds first place in wind generated energy penetration in the electricity mix with 57.84%, while overall being on 3rd place with 91.21% renewable penetration.

- With a wide spread of RES penetration in the electricity mix among the EU27 member states, the race to sustainability is uneven.

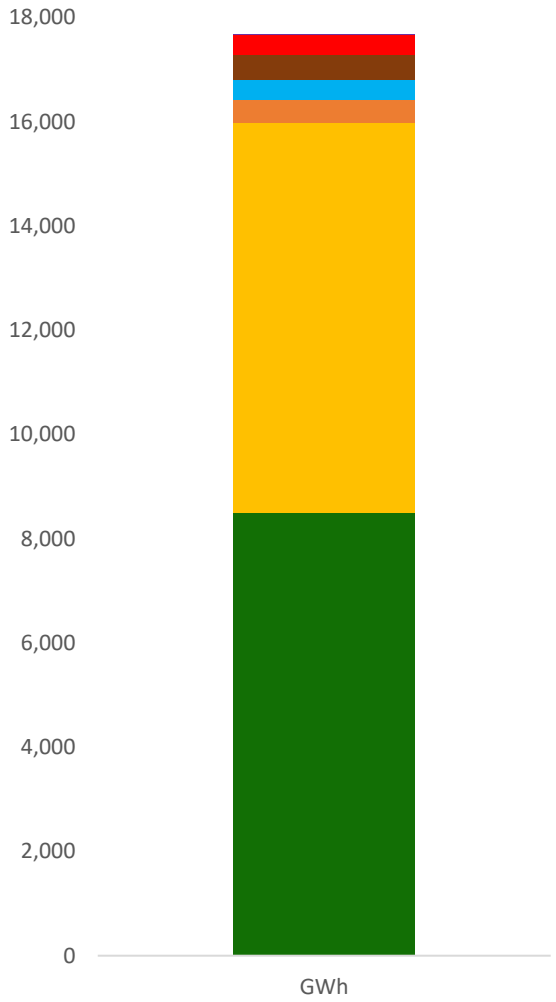
Source: EMBER, HAEE analysis

Solar capacities in the Greek System are overtaking the market making more prominent their oversaturation

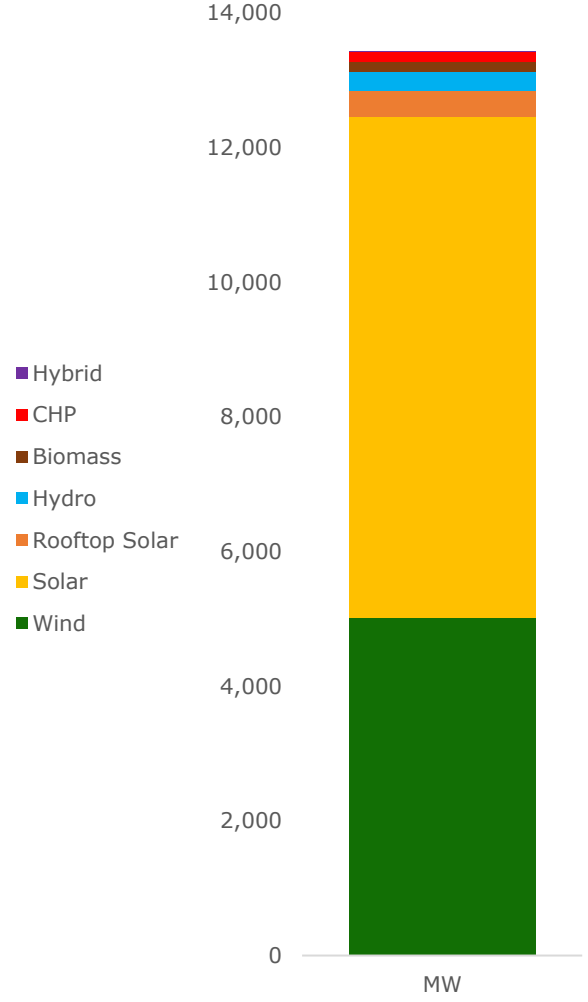
- Main renewable energy generation source for the Greek electricity systems are solar PVs, with over 7GW installed and over 7TWh of production in Jan-Oct 2025.

- Wind capacities are over 5GW in the Greek electricity system, mainly supporting the country during winter months with 8.5TWh of total production in the same period

RES Generation by type in Greece excluding Crete (GWh), [Oct 2025]



Installed Capacity of RES by type in Greece (excluding Crete) (MW), [Oct 2025]



- Hybrid solar PV and BESS installations are taking place in specific non-interconnected islands such as Astypalaia, currently only 3MW installed.

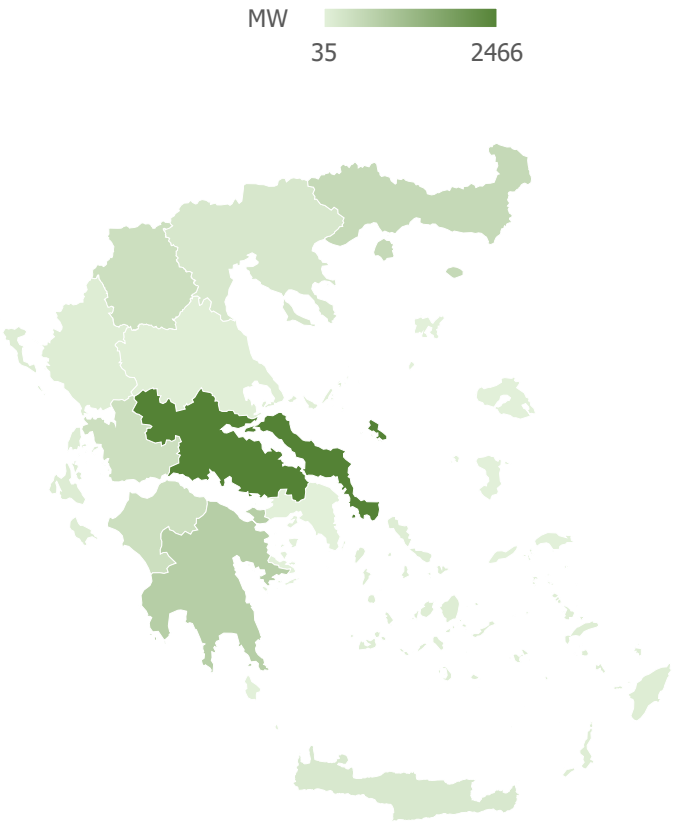
- The interconnected system currently needs to hold back on further PV installation, while the non-interconnected system has yet to reach the max capacities.

Source: DAPEEP, HAEE analysis

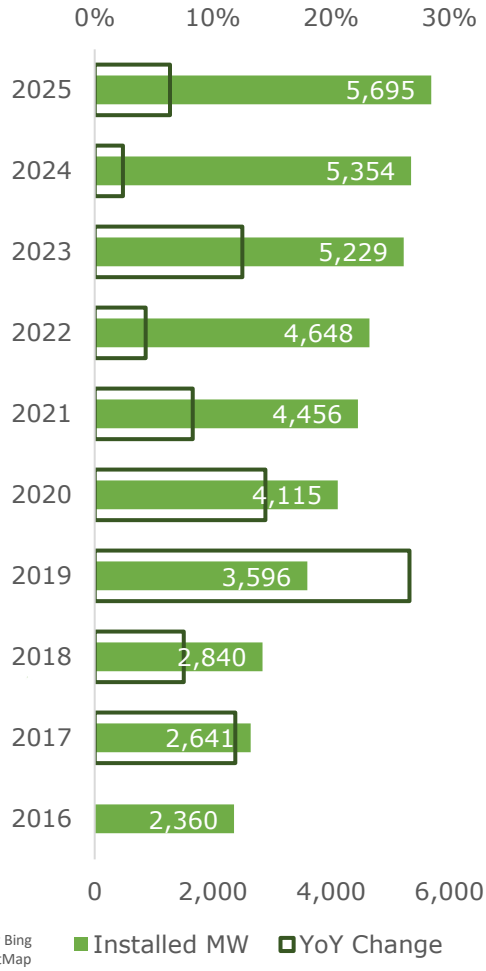
In 2025 Greece has almost reached the 5.7 GW mark in onshore wind installed capacities with a 6% increase compared to 2024

- In 2024 and 2025 Greece seems to have reached a plateau in wind installation with a 2% and 6% YoY change respectively.
- The main mass of installed onshore wind capacity is observed in Central Greece and Evvoia with 2.4GW cumulatively.

Installed Wind Capacity by Region in Greece (MW), [2025]



Installed Wind Capacity (MW) and YoY change (%), [2016-2025]



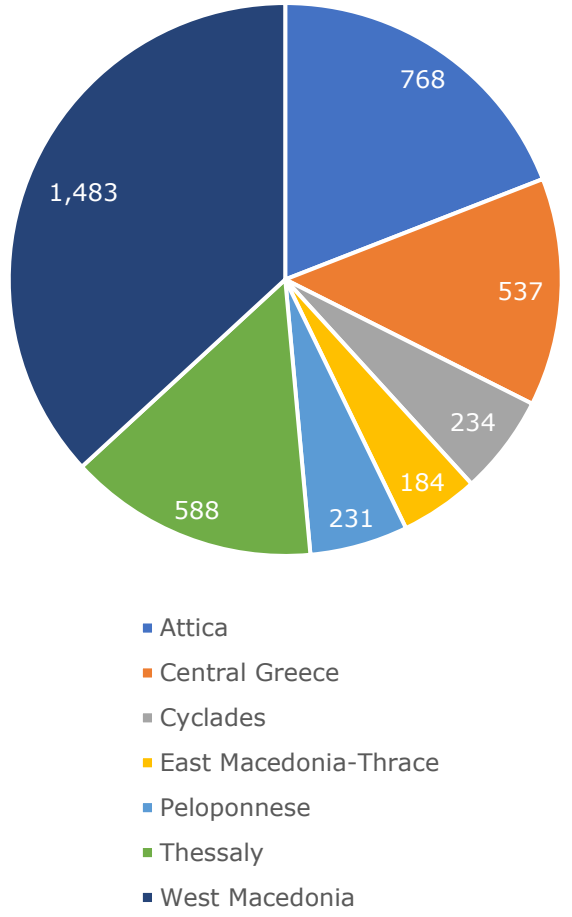
- Ionian and Aegean island only hold 4% of the total installed wind capacity, under-exploiting their potential.
- Most Non-Interconnected Islands to the main grid have reached their Wind installation capacity, the opposite occurs for the main grid.

Source: HWEA, HAEE analysis

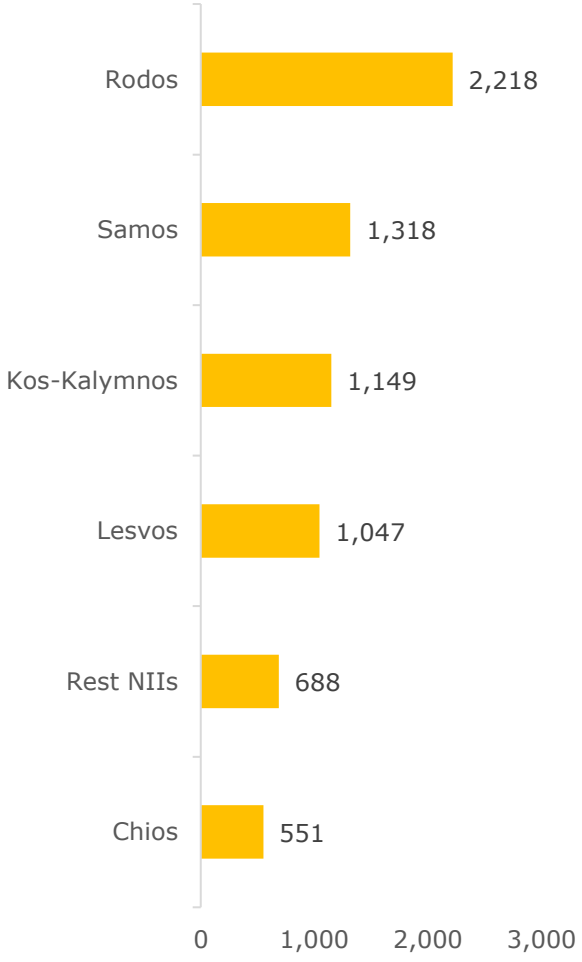
The installed PV capacity in Greece including Crete surpasses 12GW in total, with Rodos holding over 2.2GW

- In 2025 in the interconnected electricity system Attica holds almost 1.5 GW of installed PV capacity.
- West Macedonia holds 37% of the total PV installed capacity in the interconnected electricity system in Greece.

Installed PV Capacity by Region in Interconnected System Greece (MW), [2025]



Installed PV Capacity in NIIs (MW), [2025]



- The total installed PV capacity in the NIIs in October of 2025 reached almost 7GW with Rhodos holding 32% of the total capacity.
- Over 60% of the total PV installations in Greece, excluding Crete, are located in the NIIs, with Rhodos holding over 20%.

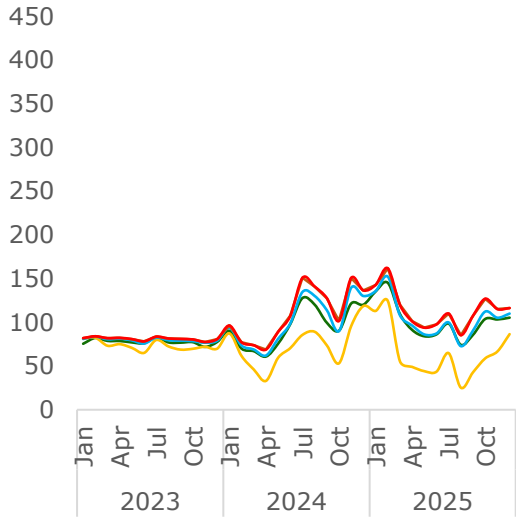
Source: IPTO, HEDNO, HAEE analysis

Solar PV holds the primary revenue among RES technologies, making it the primary driver of the renewables sector in Greece

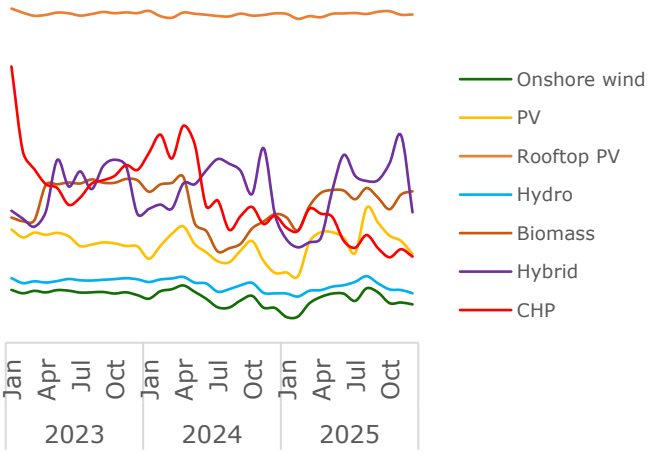
- Wind is still remunerated under cost-based contracts from DAPEEP, while EnEx DAM price undervalues the RES generation, during high generation periods.

- Onshore wind technologies for 2025 were on average remunerated at 48€/MWh, while solar PVs 116€/MWh, highlighting the inequality in the generation profile.

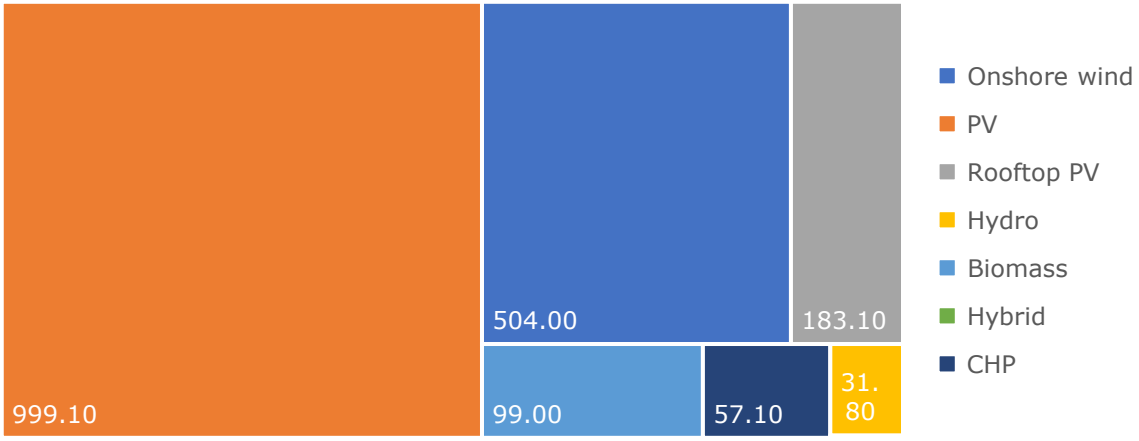
Special Market Price in Greece (€/MWh), [2023 - 2025]



Weighted Average RES Market Price for the Interconnected & Non-Interconnected System in Greece (€/MWh), [2023 - 2025]



Revenue per RES Technology for the Interconnected & Non-Interconnected System in Greece (mil €), [2025]



- Hybrid solar PV and BESS stations showcase great price volatility moving in line with the seasonal demand on the Greek non-interconnected islands.

- Despite high remuneration prices, Biomass and CHP contribute only 5% and 3% respectively to the total revenue, indicating their small scale in the country.

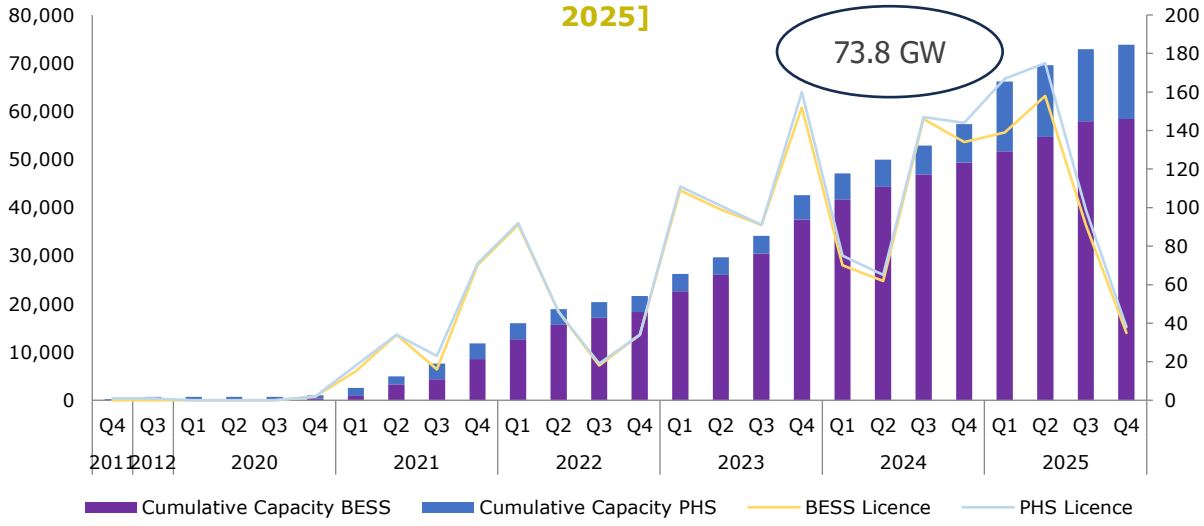
Source: DAPEEP, HAEE analysis

Total awarded BESS and PHS licence capacities in Greece reached 73.8 GW by Q4 2025, though the implementation remains scarce

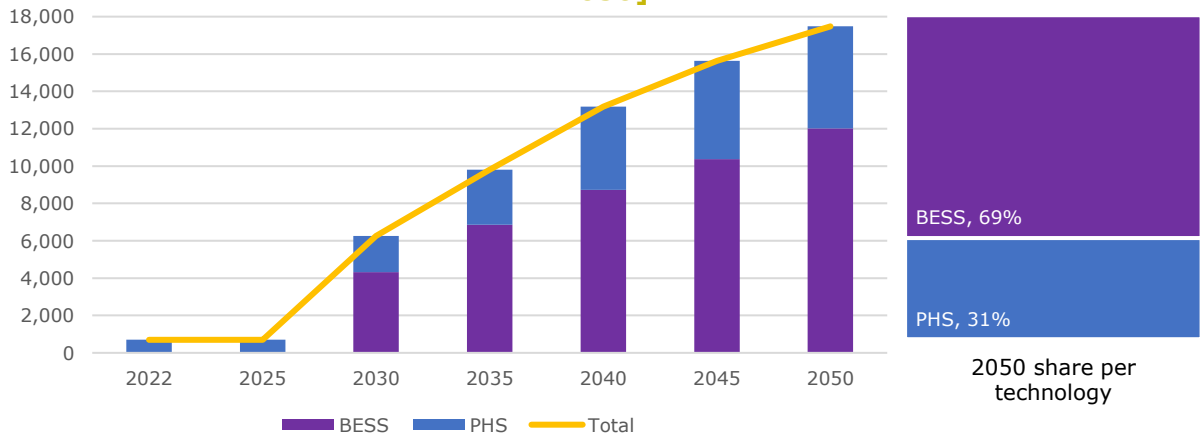
- By Q4 2025, over 58.4 GW in BESS licensing and 15.38 GW of PHS have been granted by the Greek government.

- During 2025, the licensing process of BESS and PHS capacities has declined rapidly, mainly due to saturation in the grid; the technologies have yet to be implemented.

Storage Capacity & Producer Certificates in Greece (MW), [Q1 2021 – Q4 2025]



Electricity Storage Installed Capacities Projections in Greece (MW), [2022 - 2050]



- By 2050, the Greek NECP projects that over 17GW of BESS and PHS will be installed in the Grid; the licenses at the moment have surpassed this point.

- The first BESS from HELLENiQ ENERGY is expected to be operational by April 2026, at 100 MW capacity.

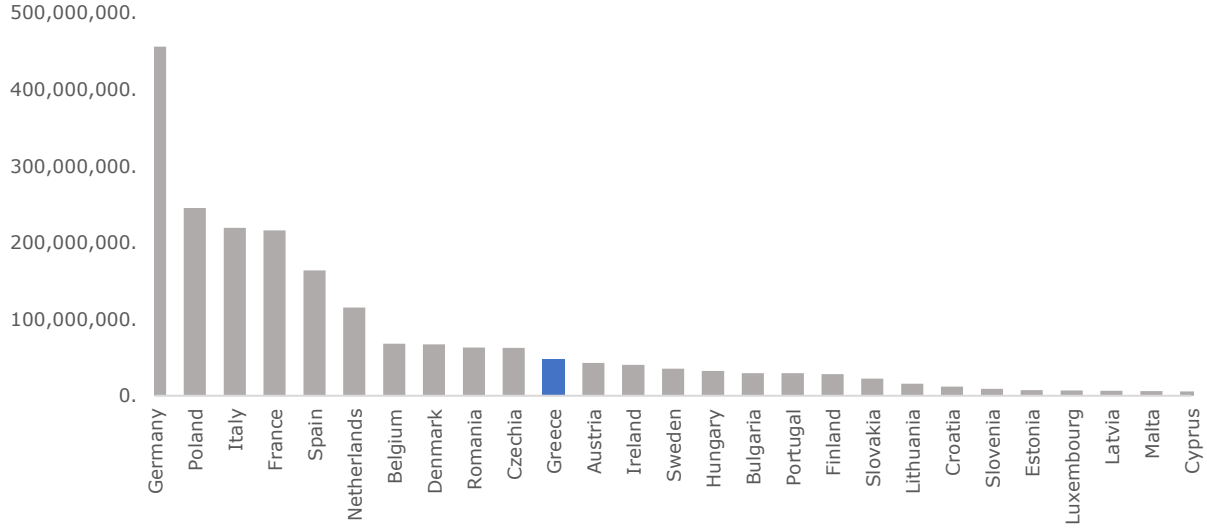
Source: RAEWW, NECP, HAEE analysis

Germany remains by far the largest CO_2 emitter in the EU27 due to its industrial economy, though lowering emissions by 2% in 2024

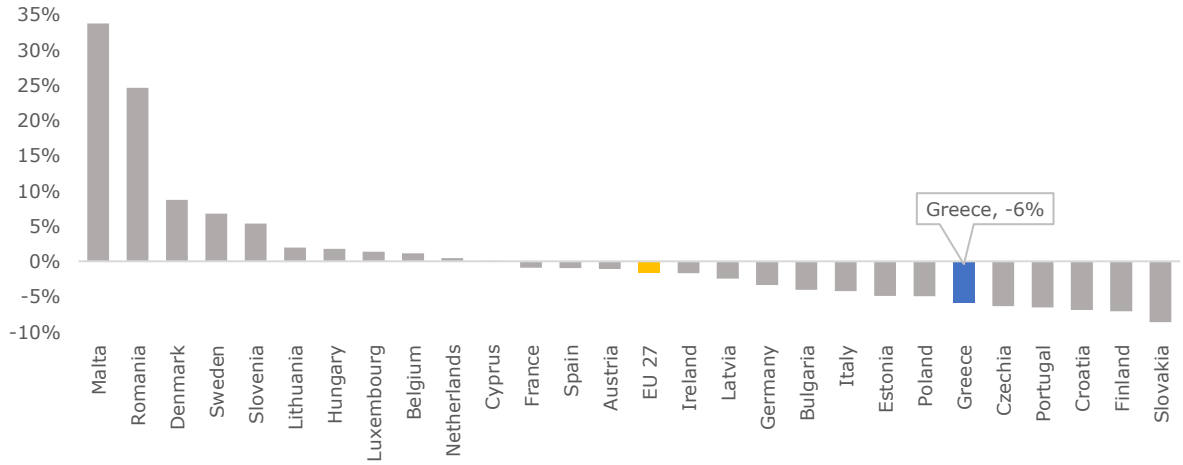
- Poland holds the 2nd largest emitter position, with 244 mil t. of CO_2 emisions due to high reliance on coal for energy generation but still lowered its emissions by 5%.

- Greece stands at 11th position for CO_2 emissions with a total of 47 mil t. for 2024, at the same time, it is a dramatic change from 2023 with 50 mil t.

CO_2 Emissions in EU-27 Member States (t), [2024]



YoY change in CO_2 Emissions in EU-27 Member States (%), [2023-2024]



- The YoY change in CO_2 emissions in the EU27 was 2% lower in 2024, compared to 2023, with a 34 mil t. decrease.

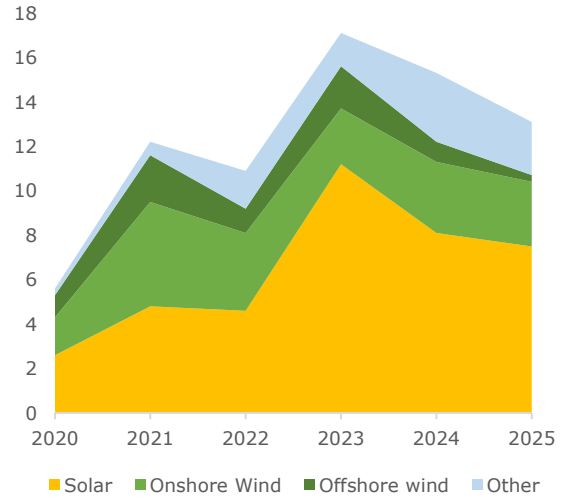
- Greece lowered its CO_2 emissions by 6% in 2024, placing the country on 6th position for lower emissions among the EU27 member states.

Source: Eurostat, HAEE analysis

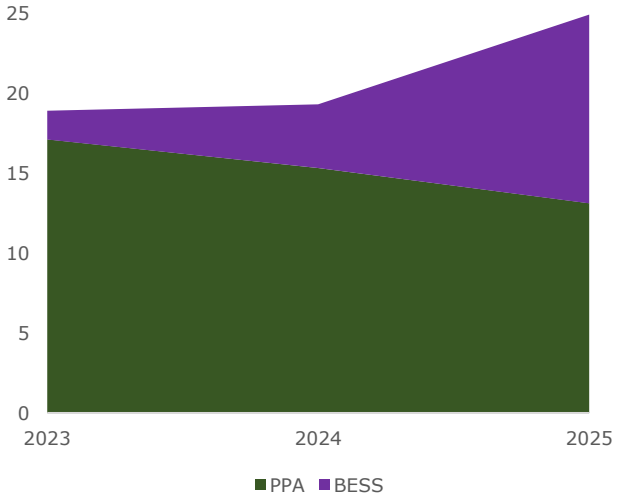
BESS are reshaping the clean energy markets slowly overtaking PPA agreements indicating a shift toward flexibility

- In 2025 disclosed BESS agreements almost reached the PPA agreements in volumes, holding 47% of the total volumes.
- Nearly 12 GW of BESS capacities were contracted under Flexibility Purchase Agreements (FPAs) and optimization agreements.

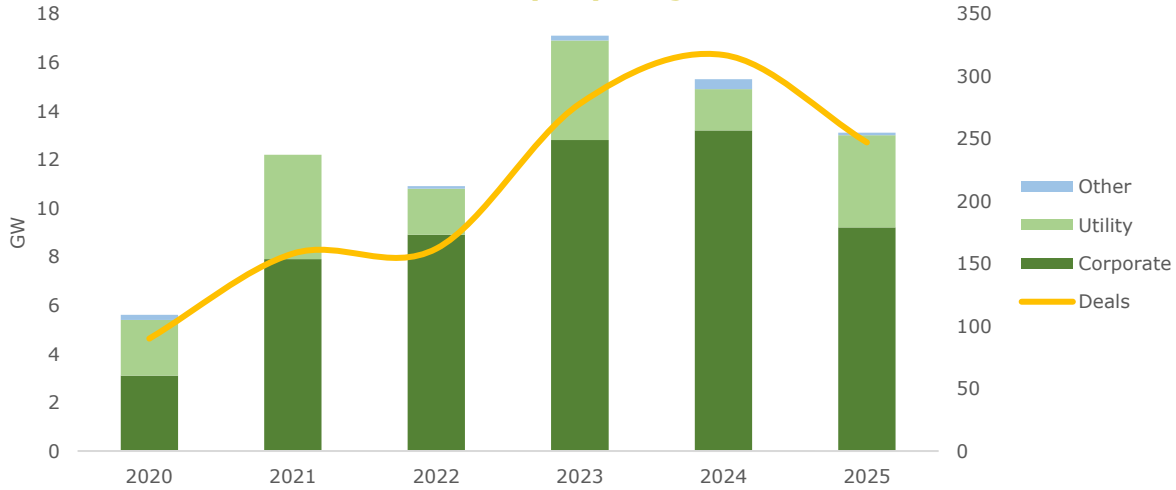
Disclosed Contracted Volumes by Technology in EU (GW), [2020-2025]



Disclosed BESS & PPA Contracted Volumes in EU (GW), [2023-2025]



Disclosed Traded Volumes in PPAs (GW) & Agreements Number, [2020-2025]



- PPA contracts reached their peak during 2023, from then the traded volumes have been declining due to uncertainty in prices.
- Corporate PPA agreements accounted for 70% of the total disclosed volumes in 2025, a significant decrease from 86% of the previous year.

Source: PEXAPARK, HAEE analysis

5. Natural Gas

Highlights

EU gas demand reached 372 bcm in 2025, 13% below pre-crisis levels.

LNG dominates EU supply, exceeding 110 bcm of total imports.

Norway supplies around 92 bcm, remaining Europe's largest pipeline partner.

Russian gas flows to the EU decline 45% between 2024–2025.

Greek LNG imports rise 65%, reaching 30.8 TWh in 2025.

European gas storage exceeds 80% before winter, stabilizing seasonal markets.

Overview

The European natural gas market has undergone a profound transformation in recent years, driven largely by geopolitical developments, structural demand changes and the reconfiguration of supply routes following the 2022 energy crisis. The European Union has significantly reduced its dependence on Russian pipeline gas, replacing much of these volumes with increased liquefied natural gas (LNG) imports and expanded pipeline deliveries from alternative suppliers. LNG has emerged as the largest external supply source to the EU, integrating the European market more closely with global gas trade flows. At the same time, Norway has consolidated its position as Europe's most important pipeline supplier, providing stable and reliable volumes that support the continent's energy security.

This diversification of supply has been supported by the development and utilization of multiple supply corridors. Pipeline imports from North Africa and the Caspian region continue to play an important complementary role, strengthening the EU's southern entry points and contributing to a more resilient supply structure. Overall, the European gas system now relies on a more geographically diversified mix of suppliers and delivery routes, reducing exposure to single-source risks while increasing reliance on global LNG markets.

Demand dynamics have also shifted significantly. Natural gas consumption in the EU remains structurally lower than pre-crisis levels, reflecting a combination of energy efficiency improvements, increased renewable energy deployment and electrification in several sectors. Despite a partial recovery in demand during 2024 and 2025, total consumption remains well below the average levels observed before the crisis. Gas demand continues to display strong seasonal patterns, with winter consumption driven primarily by heating demand and gas-fired power generation, while summer demand is significantly lower.

Within this evolving landscape, natural gas storage has become a key instrument for maintaining market stability and supply security. High storage levels help buffer seasonal demand fluctuations and mitigate potential supply disruptions, allowing the system to balance LNG inflows, pipeline imports and domestic consumption throughout the year. The coordinated management of storage capacity across Europe has played a crucial role in stabilizing markets following the volatility experienced during the energy crisis.

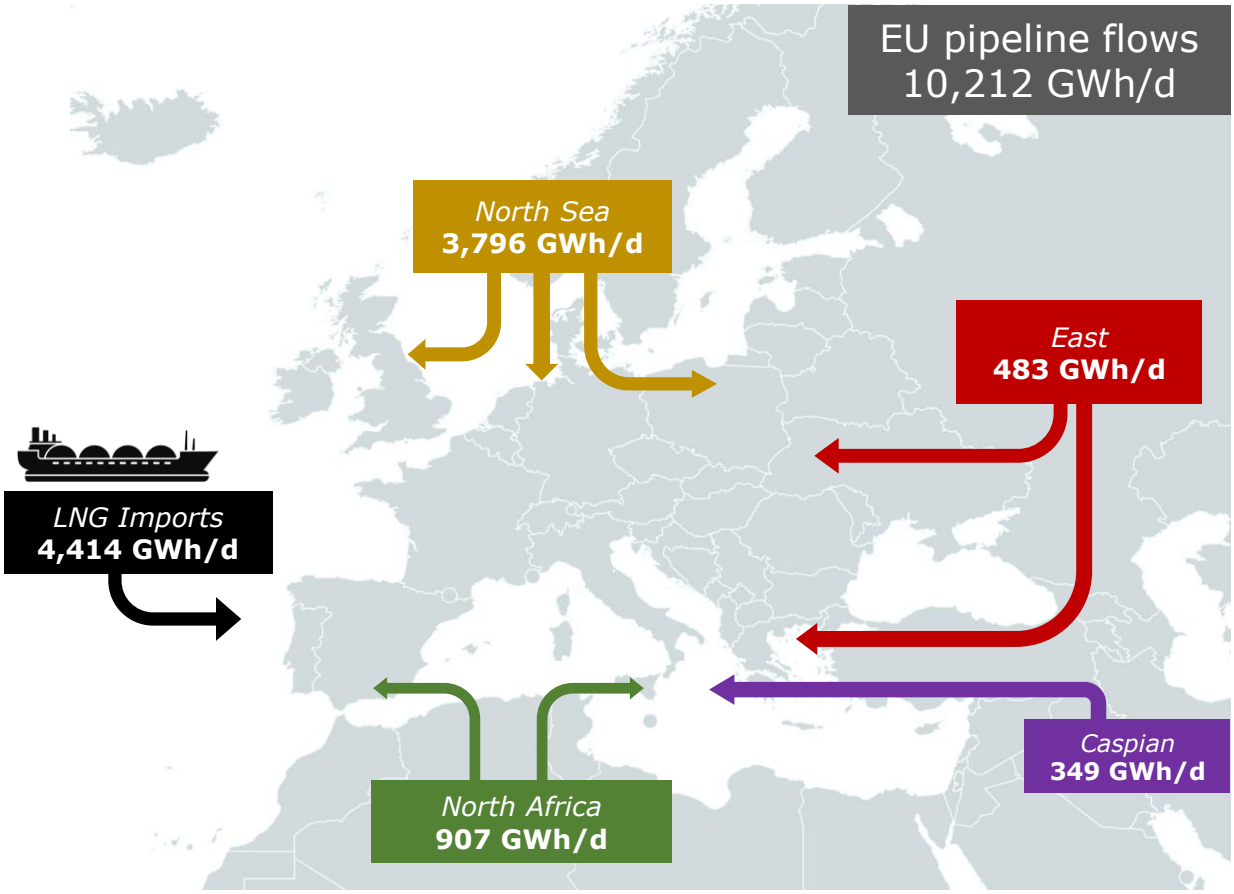
Greece has also experienced important changes in its natural gas market. Domestic demand follows the broader European seasonal pattern, with consumption rising during winter months due to heating needs and increased gas-fired power generation. At the same time, Greece's role in the regional gas system is expanding. LNG imports have increased significantly, strengthening the country's position as a key entry point for gas flows into Southeast Europe.

Infrastructure developments are reinforcing this role. Through projects such as the Vertical Gas Corridor and interconnections with neighboring markets, Greece is increasingly positioned as a regional hub facilitating south–north gas flows across the Balkans and toward Central Europe. By linking LNG terminals with regional transmission networks and storage infrastructure, the country contributes to the broader diversification and resilience of Europe's natural gas supply system.

The EU27 in 2025 relies on diversified supply routes, significantly reducing reliance on Russia while strengthening supply security.

- LNG is the largest external supply source to the EU, averaging 4,414 GWh/d, underscoring the growing role of global gas markets.
- The North Sea corridor (3,796 GWh/d) remains the backbone of European supply, supported primarily by stable Norwegian pipeline exports.

Average Physical Gas Flows to EU-27 (GWh/d), [2025]



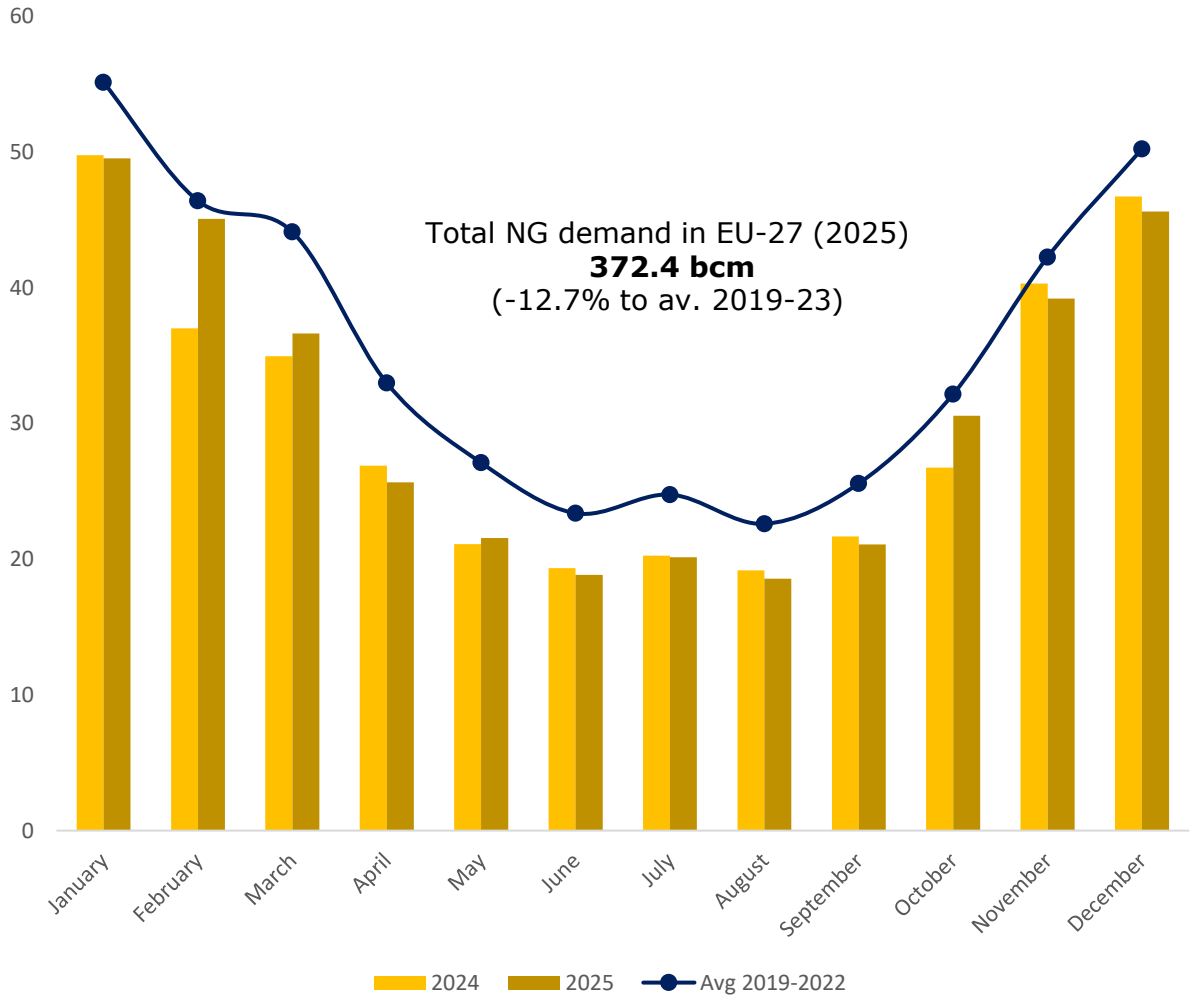
- Southern corridors provide diversification: North Africa (907 GWh/d) and Caspian gas (349 GWh/d) strengthen supply through the EU's southern entry points.
- Eastern pipeline flows (483 GWh/d) remain limited compared to historical levels, reflecting Europe's structural shift away from Russian pipeline gas.

Source: ENTSOG, HAEE analysis

EU natural gas demand remains structurally lower than pre-crisis levels, reflecting efficiency gains and fuel switching.

- EU gas demand continues to show strong seasonality, with winter consumption exceeding 50 bcm/month, driven mainly by heating demand and power generation.
- Despite partial recovery in 2024–2025, demand remains consistently below historical averages, reflecting structural demand reduction after the 2022 energy crisis.

Monthly Natural Gas Demand in EU27 (bcm), [Av. 2019-23 vs 2024, 2025]



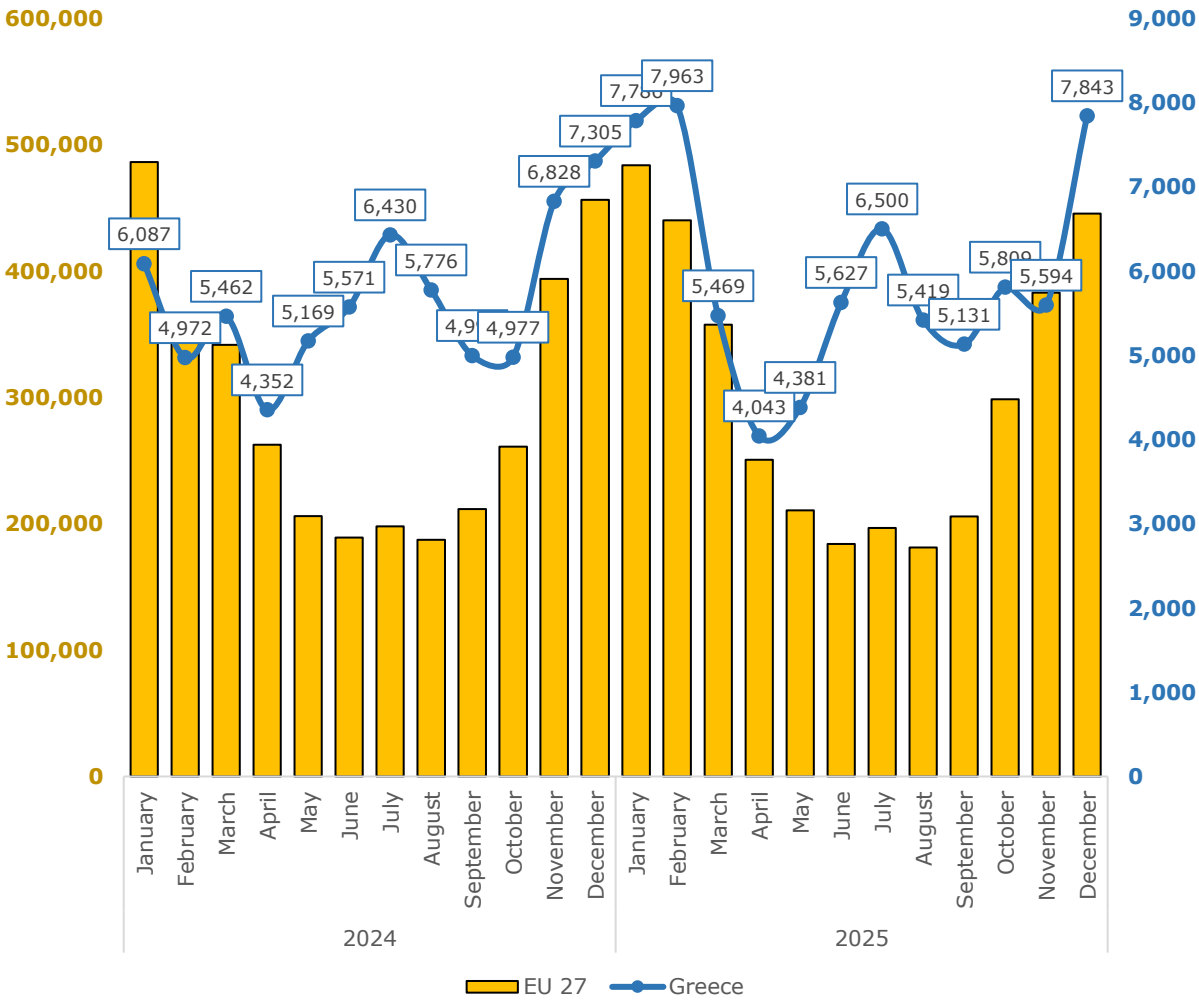
- Summer monthly consumption stabilizes around 18–25 bcm, highlighting the growing role of gas in balancing renewable generation and maintaining stability.
- Structural demand decline reflects energy efficiency improvements, electrification, and renewable deployment, reducing the EU's long-term dependence on natural gas.

Source: Eurostat, HAEE analysis

Natural gas demand in Greece broadly follows EU seasonal patterns, reflecting weather-driven consumption.

- Gas consumption in Greece shows strong seasonality, with winter peaks driven by heating demand and increased gas-fired power generation.
- Monthly demand in Greece fluctuates between ~4,000 and 8,000 GWh, closely aligned with broader European demand patterns.

Natural Gas Demand (GWh) in Greece and EU, [2024-2025]



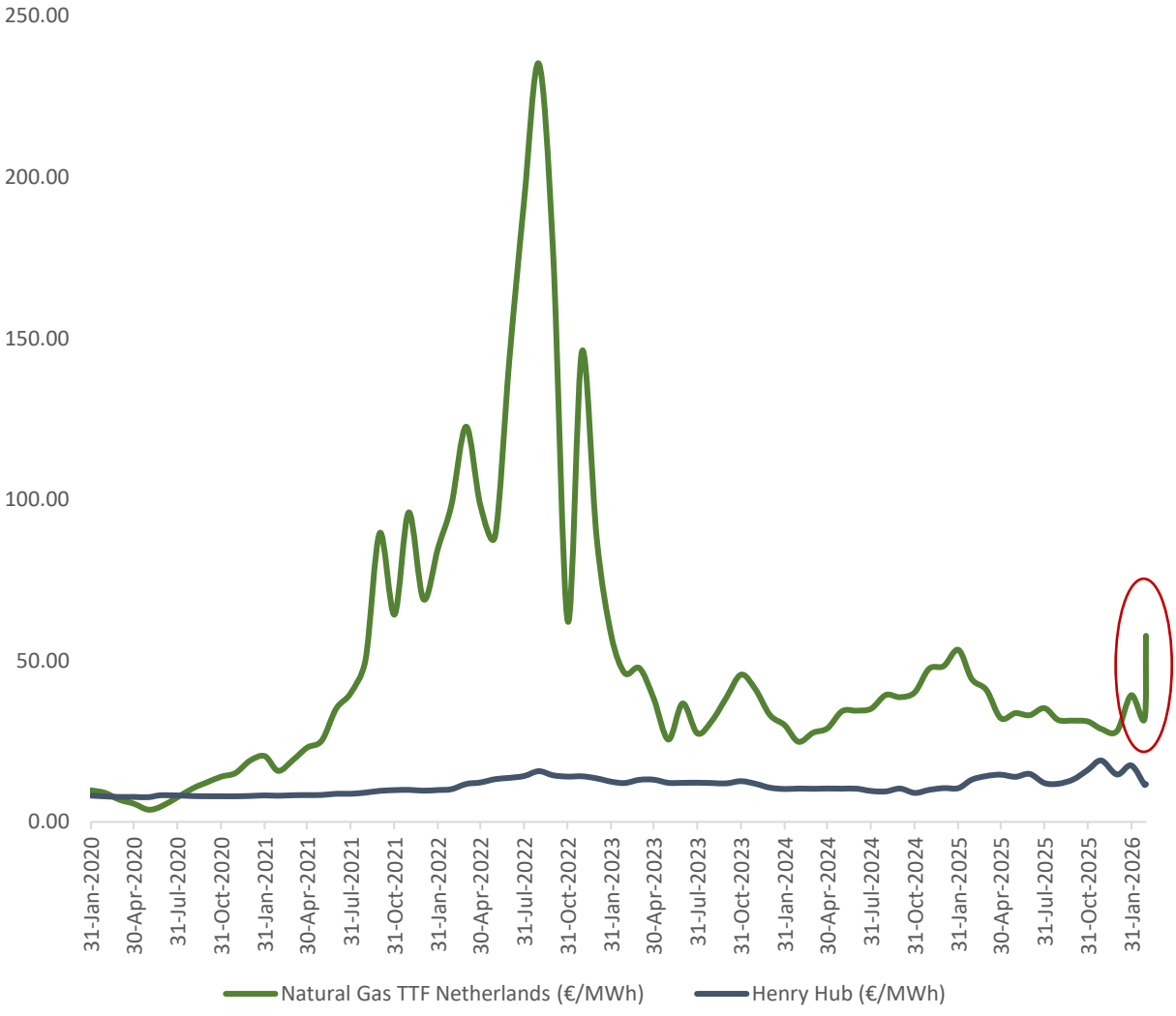
- EU-27 gas demand remains significantly larger, reflecting the scale of industrial consumption and residential heating across major European economies.
- Greece's demand profile highlights the importance of gas in electricity generation, particularly during periods of low renewable output.

Source: Eurostat, HAEE analysis

Natural gas prices spiked in early 2026 following geopolitical tensions in the Strait of Hormuz, highlighting persistent market vulnerability.

- The Hormuz Strait crisis triggered a sharp short-term increase in TTF prices, reflecting concerns over potential LNG supply disruptions.
- European gas markets reacted immediately due to their strong dependence on global LNG trade flows, many of which transit through Hormuz.

Evolution of natural gas prices (€/MWh), [Jan 2020-Mar 2026]



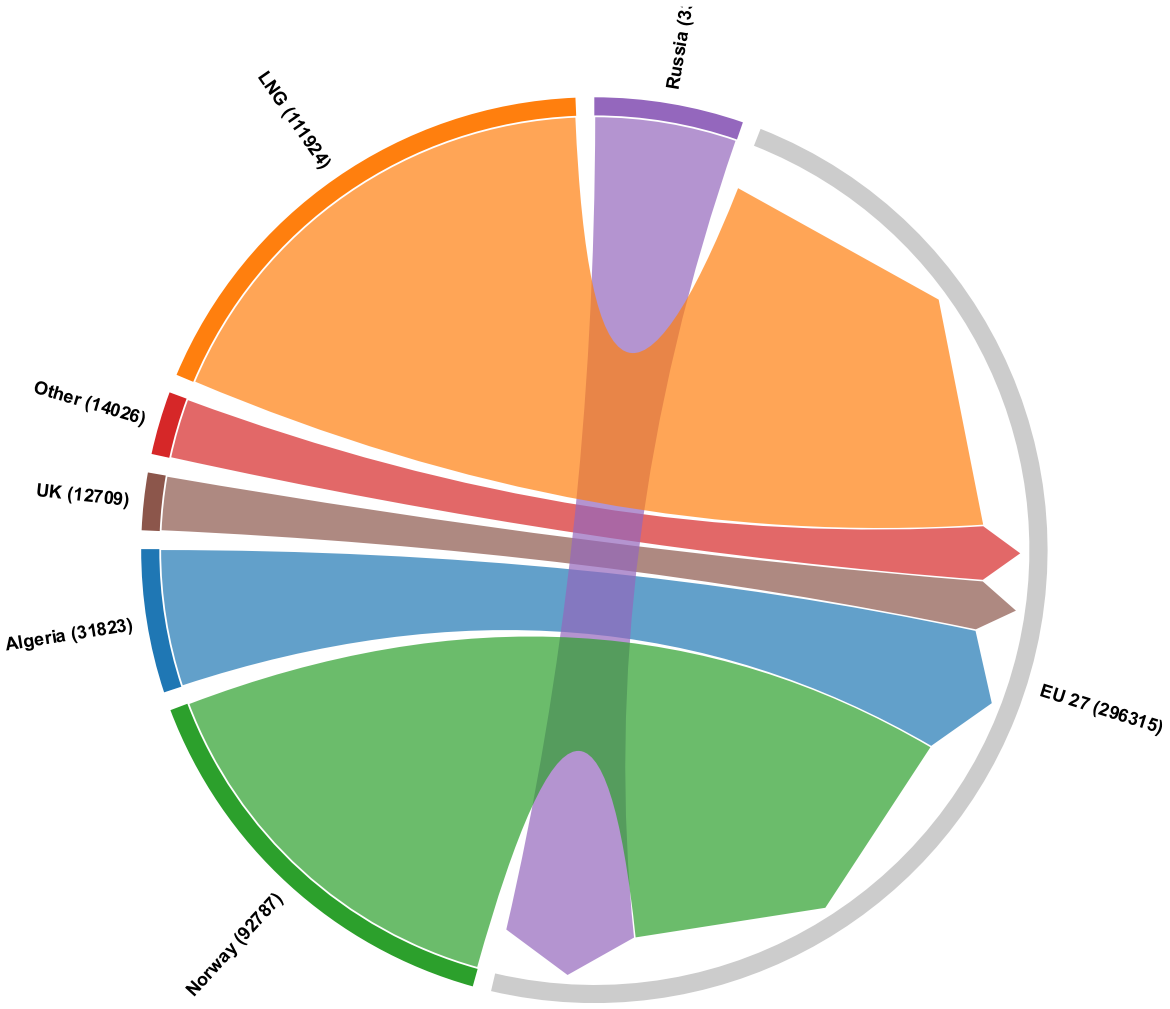
- The episode illustrates how geopolitical risks in key maritime chokepoints can rapidly transmit price shocks to European gas markets.
- Despite the spike, European prices remain far below the extreme levels observed during the 2022 energy crisis.

Source: DESFA, HAEE analysis

Imports reflect a diversified supply structure, combining LNG and pipeline sources to enhance resilience and reduce geopolitical dependency.

- LNG represents the largest share of EU imports, exceeding 110 bcm, highlighting the structural shift toward global gas markets.
- Norway remains the dominant pipeline supplier, delivering around 92 bcm, reinforcing its role as Europe's most reliable gas partner.

EU Natural Gas Imports (mil. m³) by origin, [2025]



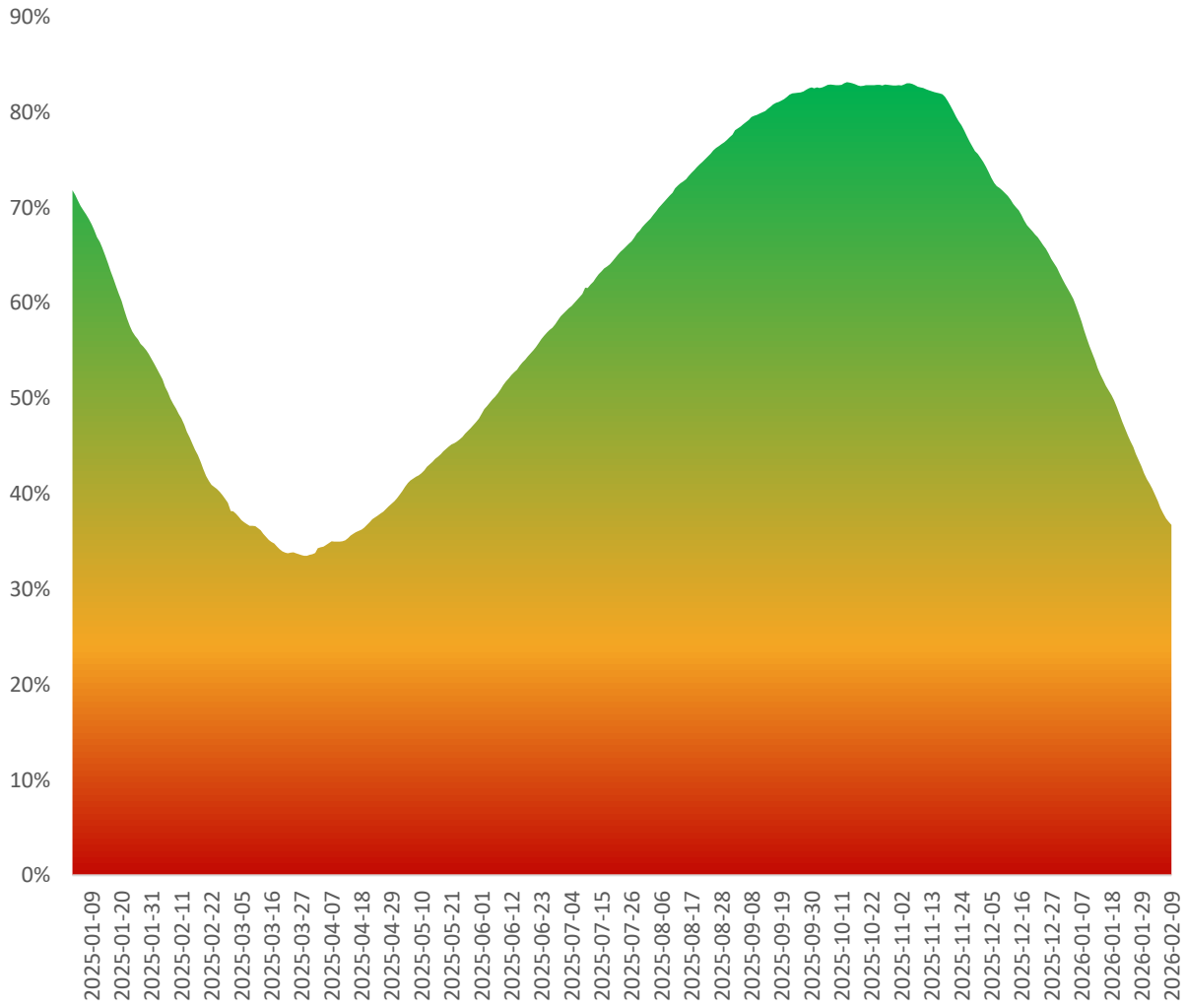
- Algeria contributes about 32 bcm, maintaining its position as the main southern pipeline supplier to European markets.
- Russian imports remain limited, while smaller volumes from the UK and other sources complement the EU's diversified supply portfolio.

Source: bruegel, HAEE analysis

Gas storage remains a critical flexibility mechanism, supporting seasonal balancing and strengthening supply security across the EU.

- Storage levels decline during winter, reaching around 35% by early spring, reflecting withdrawals to meet seasonal heating demand.
- Injection season gradually rebuilds inventories, with storage levels exceeding 80% in autumn, supporting market stability ahead of winter.

Level of natural gas storage (%) in Europe, [2025]



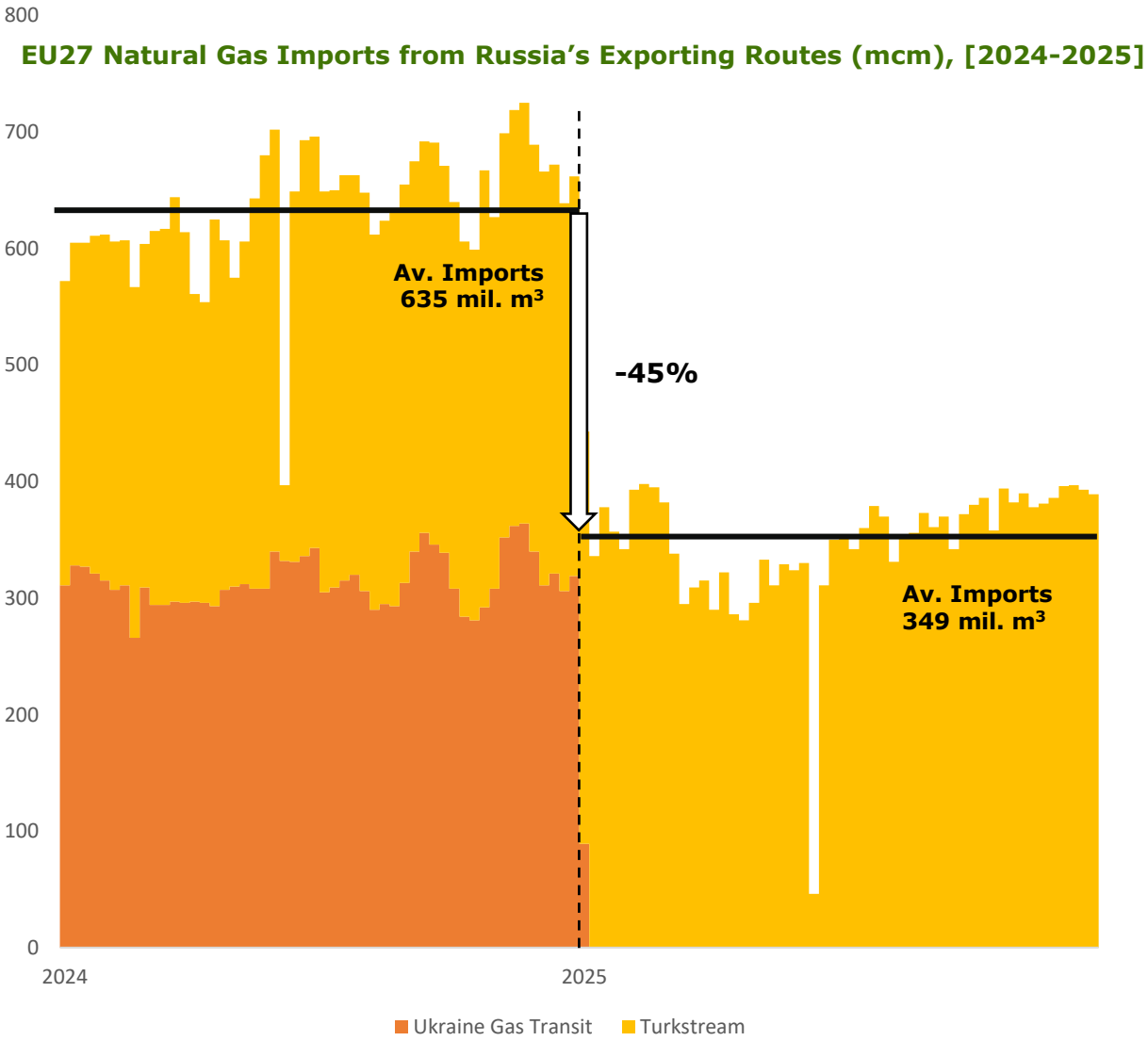
- High storage levels play a key role in mitigating supply disruptions and price volatility in the European gas market.
- Storage infrastructure enhances system flexibility, allowing the EU to balance LNG inflows, pipeline supplies and seasonal demand fluctuations.

Source: ENTSOG, HAEE analysis

Russian gas flows to the EU continue to decline, reflecting the structural reconfiguration of European gas supply routes.

- Average imports via Russian routes declined from 635 mcm to 349 mcm, representing a 45% reduction between 2024 and 2025.
- The termination of Ukrainian transit flows significantly reduced Russian pipeline gas deliveries to European markets.

EU27 Natural Gas Imports from Russia's Exporting Routes (mcm), [2024-2025]



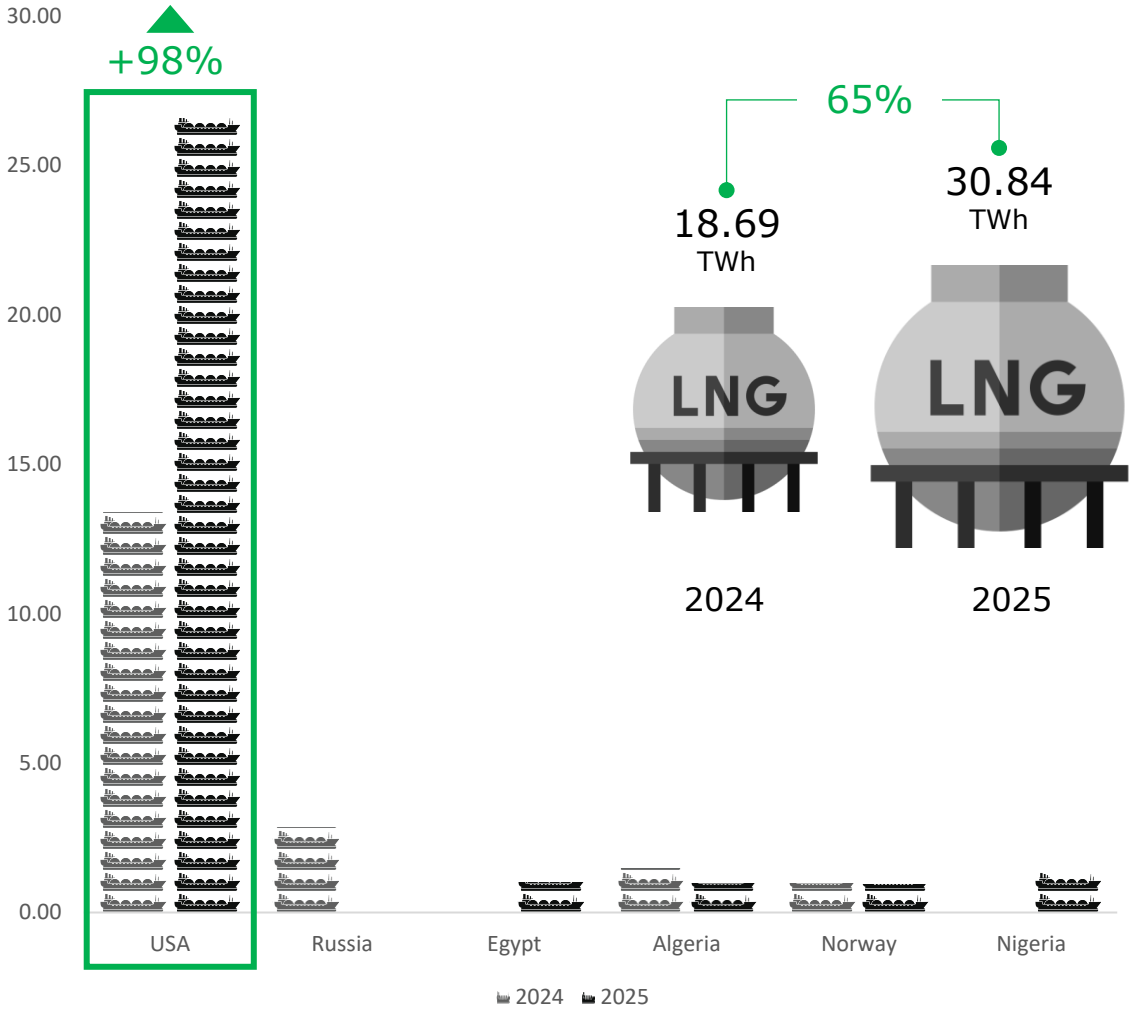
- TurkStream remains the main remaining Russian supply route to the EU, maintaining moderate flows toward Southeast European markets.
- Reduced Russian imports reinforce the EU's shift toward LNG and alternative pipeline suppliers to enhance supply security.

Source: bruegel, HAEE analysis

Greece’s LNG imports increased significantly, reinforcing the country’s role as a key gas entry point for Southeast Europe.

- LNG imports reached 30.84 TWh in 2025, marking a 65% increase compared to 2024 and highlighting stronger gas inflows through Greek terminals.
- US LNG dominates Greek imports, increasing sharply and accounting for the largest share of total LNG supply in 2025.

LNG Imports in Greece (TWh), [2024-2025]



- LNG imports from Russia, Egypt, Algeria and Norway remain relatively limited, contributing smaller volumes to Greece’s diversified supply portfolio.
- Rising LNG inflows strengthen Greece’s position as a regional gas hub, supporting supply diversification and flows toward Southeast European markets.

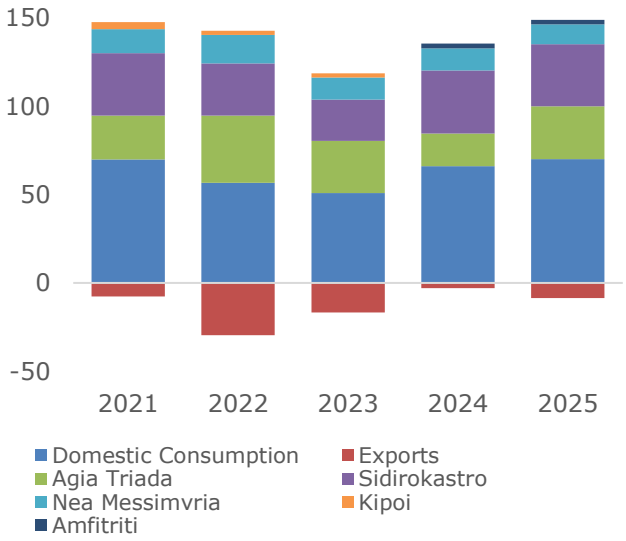
Source: DESFA, HAEE analysis

Greece reflects growing regional integration, with multiple entry points supporting domestic demand and increasing cross-border gas flows.

- Domestic consumption remains the largest component of Greece's gas balance, while exports have increased, reflecting stronger regional market integration.

- Entry points at Sidirokastro, Agia Triada and Nea Messimvria play a key role in diversifying supply and supporting cross-border gas trade.

Natural Gas Imports/Exports in Greece by Entry Points (TWh), [2021-2025]



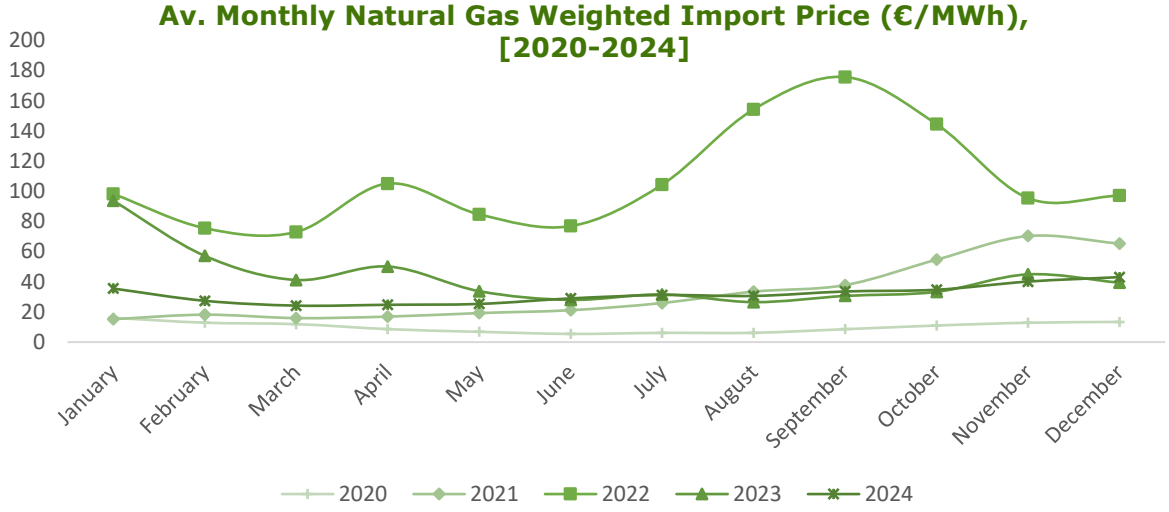
2025 (Change from 2024)

Consumption: 70.16 TWh *(6%)*

Exports: 8.59 TWh *(195%)*

Imports: 78.88 TWh *(14%)*

Av. Monthly Natural Gas Weighted Import Price (€/MWh), [2020-2024]



- Average import prices peaked sharply during 2022, reflecting the European gas crisis and extreme volatility in global gas markets.

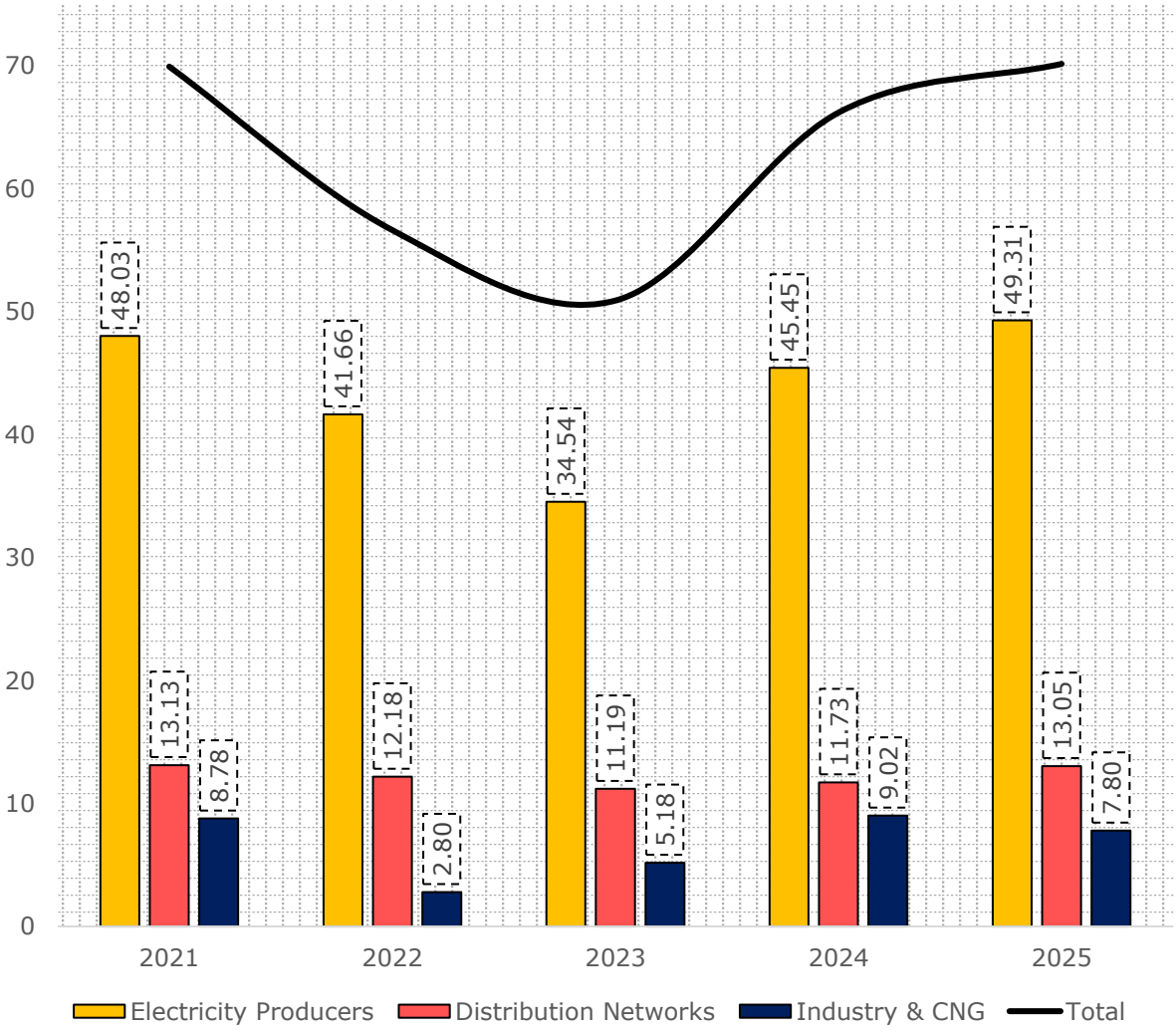
- Prices gradually moderated in 2023–2024, though they remain above pre-crisis levels, reflecting structural changes in European gas supply.

Source: DESFA, HAEE analysis

Gas demand varies by customer category, with power generation dominating, while networks and industry have smaller shares.

- Gas consumption dropped significantly in 2022–2023 amid high prices and supply uncertainty, reflecting demand destruction following the broader energy crisis.
- Electricity generation remains the dominant gas consumer, highlighting gas's critical role in balancing the power system despite renewable expansion.

Natural Gas consumption (TWh) by consumer category, [2021-2025]



- Demand recovery in 2024–2025 indicates normalization of prices and supply conditions, though volatility risks remain due to geopolitical tensions.
- Continued reliance on gas in power generation increases exposure to external shocks, including disruptions linked to the Strait of Hormuz crisis.

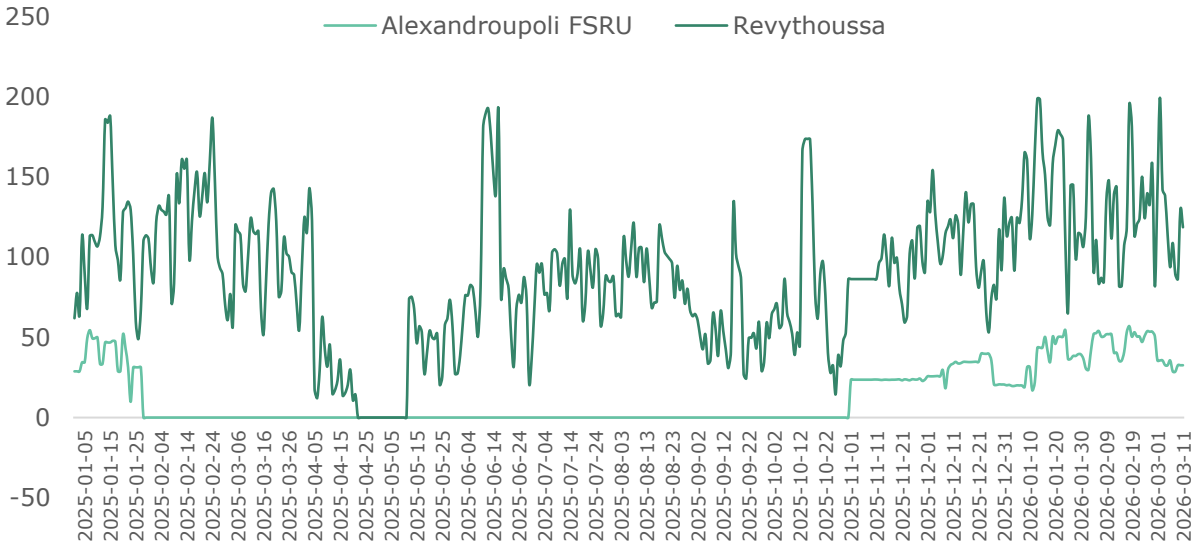
Source: DESFA, HAEE analysis

The commissioning of the Alexandroupoli FSRU marks a major step in Greece's LNG infrastructure expansion.

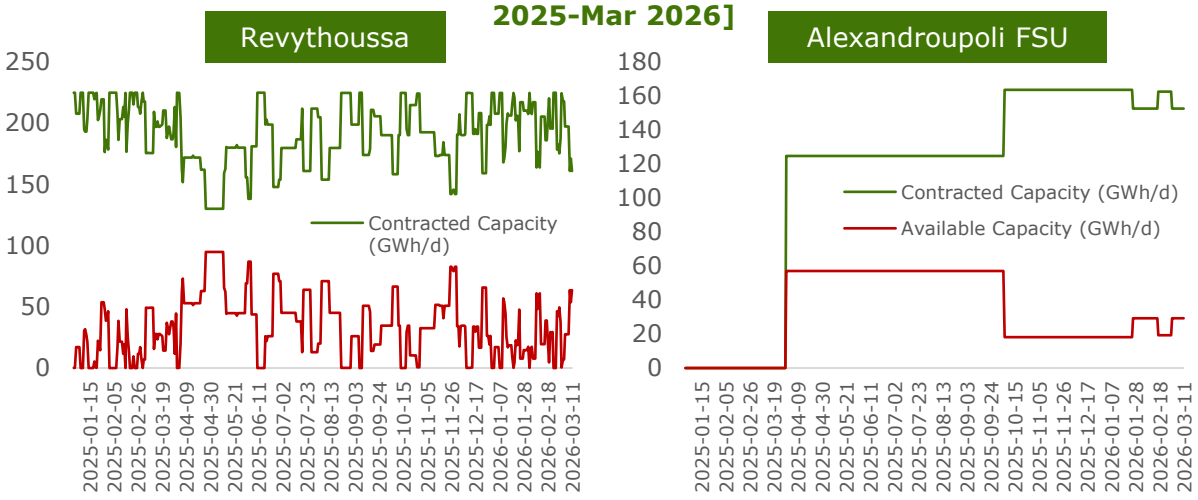
- Revythoussa remains Greece's main LNG entry point, with send-out levels fluctuating significantly according to seasonal demand and regional gas market conditions.

- The gradual ramp-up of Alexandroupoli FSRU send-out capacity from late 2025 adds a new supply source supporting diversification and regional gas flows.

Send-out capacity (GWh/d) for LNG Terminals in Greece, [Jan 2025-Mar 2026]



Contracted and Available capacity (GWh/d) for LNG Terminals in Greece, [Jan 2025-Mar 2026]

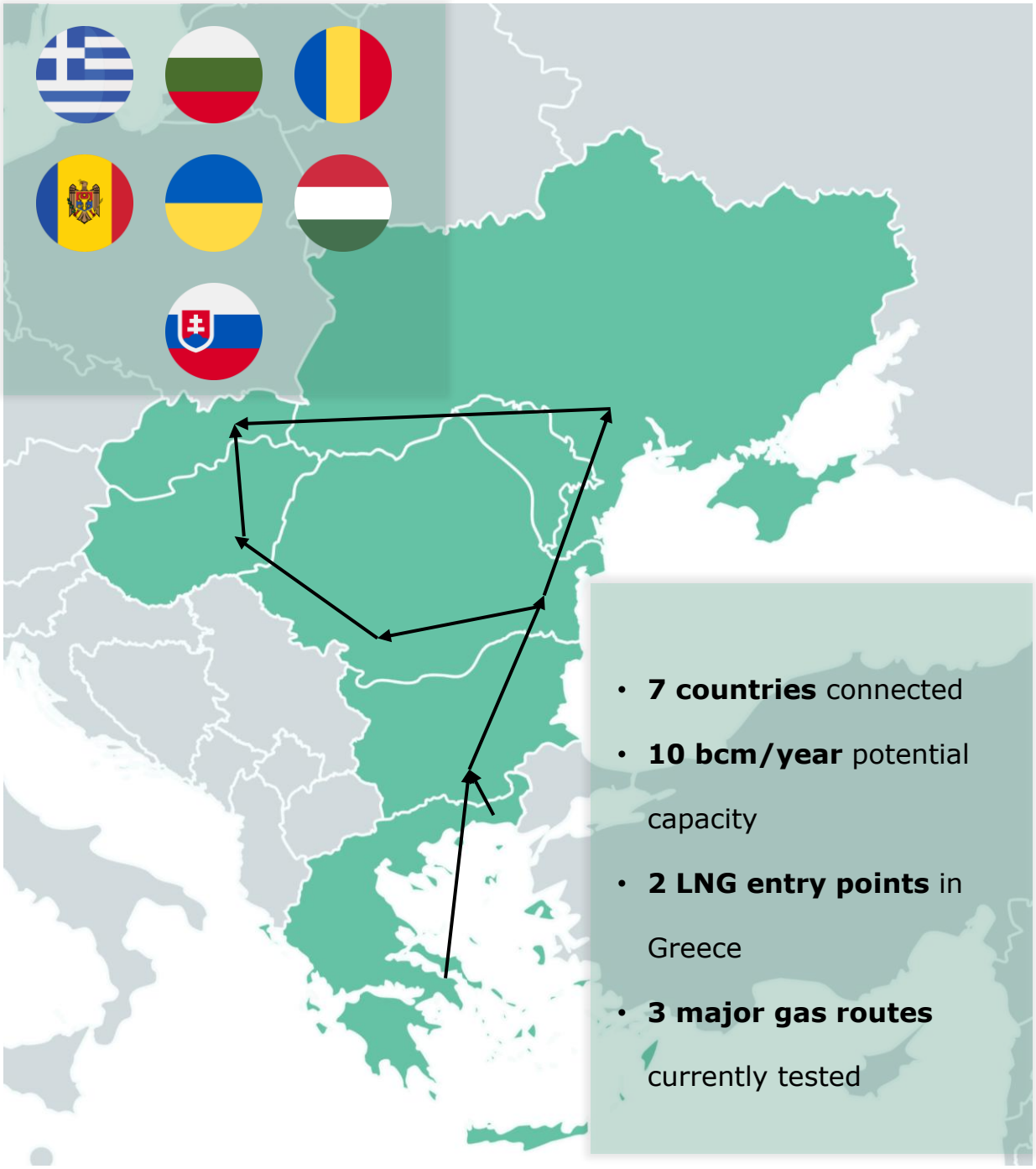


- Revythoussa shows consistently high contracted capacity, reflecting strong market utilization and its continued importance for LNG imports into the Greek system.

- The FSRU contracted capacity increases after commissioning, while available capacity highlights additional flexibility for regional LNG trading and short-term bookings.

Source: ALSI DIE, HAEE analysis

The Energy Gateway to Europe

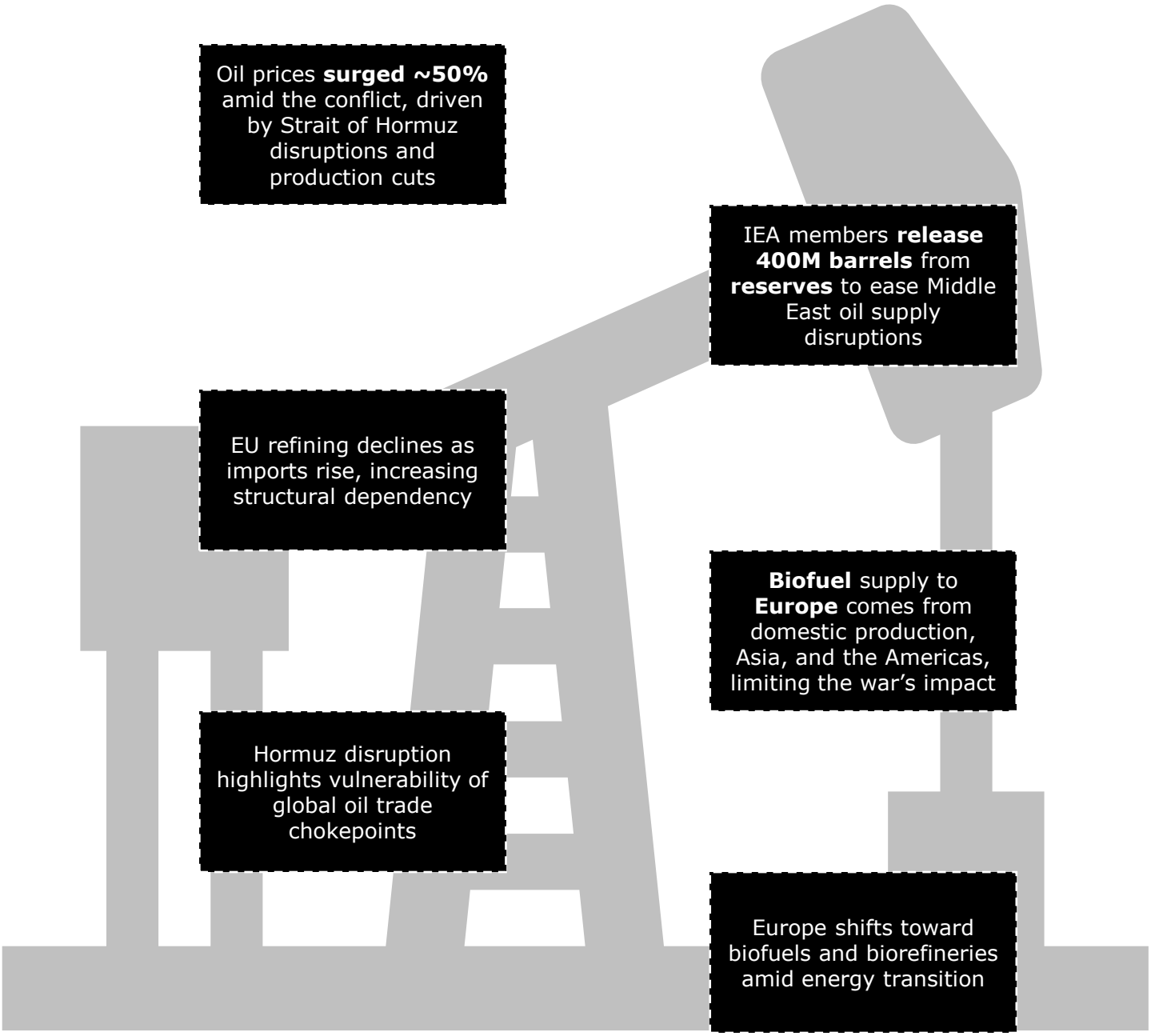


- The Vertical Gas Corridor enables south–north gas flows from Greece through the Balkans, using infrastructure such as the IGB interconnector and the reversed Trans-Balkan pipeline.
- By linking Greek LNG terminals with regional transmission networks and Ukrainian storage, the corridor strengthens supply diversification and energy security in Southeast and Central Europe.

Source: DESFA, HAEE analysis

6. Oil Markets & Refining Evolution

Highlights



Overview

Oil markets over 2025–2026 illustrate the coexistence of structurally loose fundamentals and acute geopolitical vulnerability, with the Strait of Hormuz crisis acting as the key disruptive catalyst. On the supply side, global markets entered 2025 in a state of relative oversupply, driven by OPEC+ easing production cuts and strong output growth from the United States, Brazil, Canada, and emerging producers such as Guyana. This resulted in a cumulative inventory build of approximately 470 million barrels and sustained downward pressure on benchmark prices, which stabilized in the $70–$80/bbl range prior to the escalation.

However, this apparent equilibrium proved fragile. The escalation of tensions in the Middle East and the subsequent disruption of maritime traffic through the Strait of Hormuz rapidly introduced a significant geopolitical risk premium. As one of the most critical global chokepoints—handling a substantial share of seaborne crude and refined product flows—the strait's partial disruption had immediate market repercussions. The collapse in vessel transits from roughly 153 to 13 per day signaled not only physical constraints but also heightened uncertainty regarding future supply availability, insurance costs, and shipping routes.

This shock revealed an important asymmetry in global energy markets: while supply may be diversified geographically, logistics remain highly concentrated. Asian economies, particularly China and India, are directly exposed due to their reliance on Gulf crude flows, while Europe is indirectly affected through price transmission and refined product markets. Europe's dependence on medium and heavy crude from the Middle East—accounting for a significant share of feedstock for diesel and jet fuel—translated into sharp increases in refined product prices, with notable spikes in gasoil, jet fuel, and marine fuels.

At the same time, Europe's improved resilience relative to the 2022 crisis played a stabilizing role. Strategic petroleum reserves, exceeding 108 million tonnes at EU level, alongside diversified import routes and suppliers, helped cushion immediate supply shortages. Greece, in particular, maintained reserves above the mandatory 90-day threshold and leveraged alternative supply channels from Libya, Egypt, and Norway. Nevertheless, the crisis underscored persistent structural vulnerabilities, especially as Europe transitions away from domestic refining capacity toward increased reliance on imports of refined products.

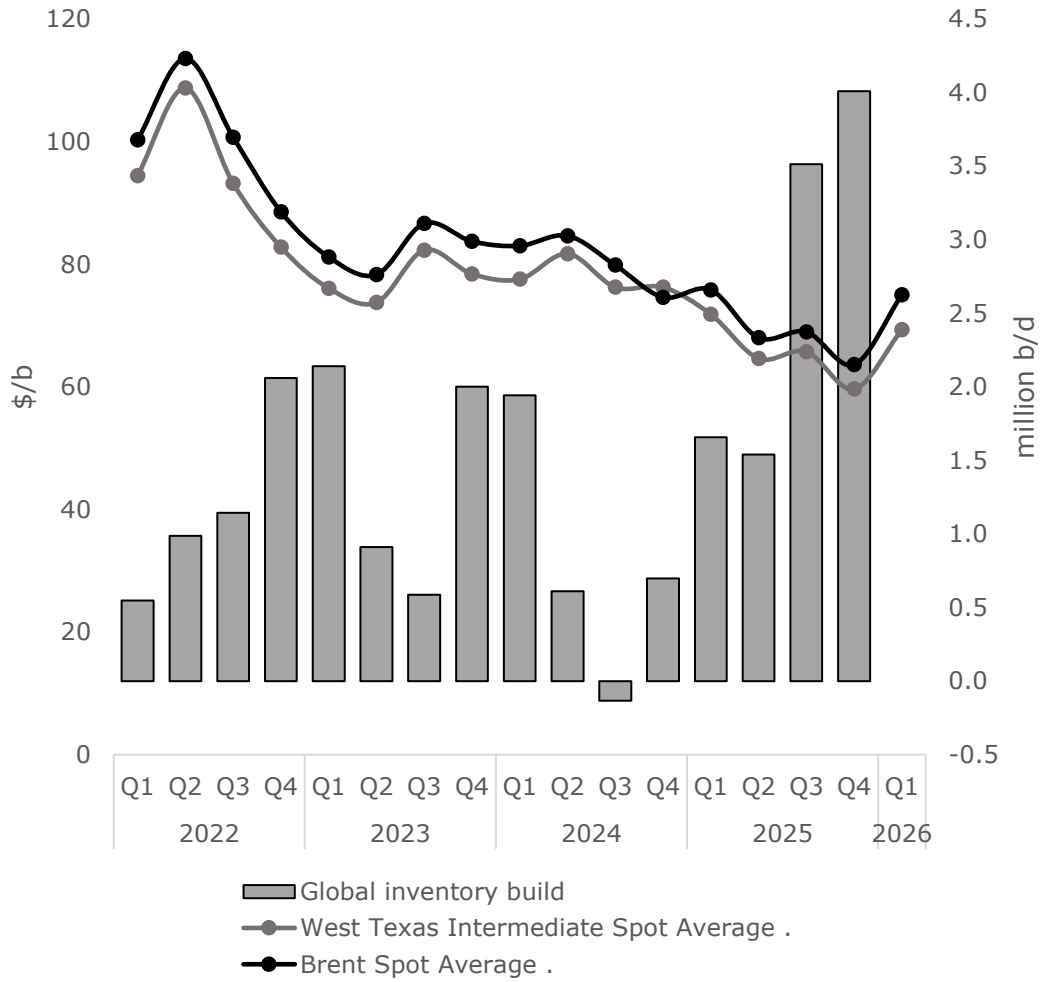
In parallel, the energy transition is reshaping market dynamics. The decline in conventional refining capacity, coupled with the rise of biorefineries and alternative fuels, is altering trade patterns and pricing structures. Biofuels, while less directly exposed to Hormuz disruptions due to diversified supply chains, are increasingly influenced by fossil fuel price movements.

Overall, the Hormuz crisis demonstrates that even in a context of global oversupply, geopolitical disruptions can rapidly tighten markets. For policymakers, this reinforces the need to integrate energy security, infrastructure resilience, and transition strategies into a coherent framework capable of withstanding both structural and shock-driven pressures.

Brent prices declined as global oil stocks rose by 470 mb in 2025, pushing stocks to multi-year highs, indicating structural market oversupply.

- Brent and WTI prices fell from their 2022 peaks, with Brent dropping from over $100/bbl in Q2 2022 to the $70–$80 range by 2024–2025.
- Global inventory builds accelerated in Q3–Q4 2025, reaching ~4 mb/d, their highest level, increasing downward pressure on prices into 2026.

Crude oil prices ($/b) and Global inventory build (million b/d)



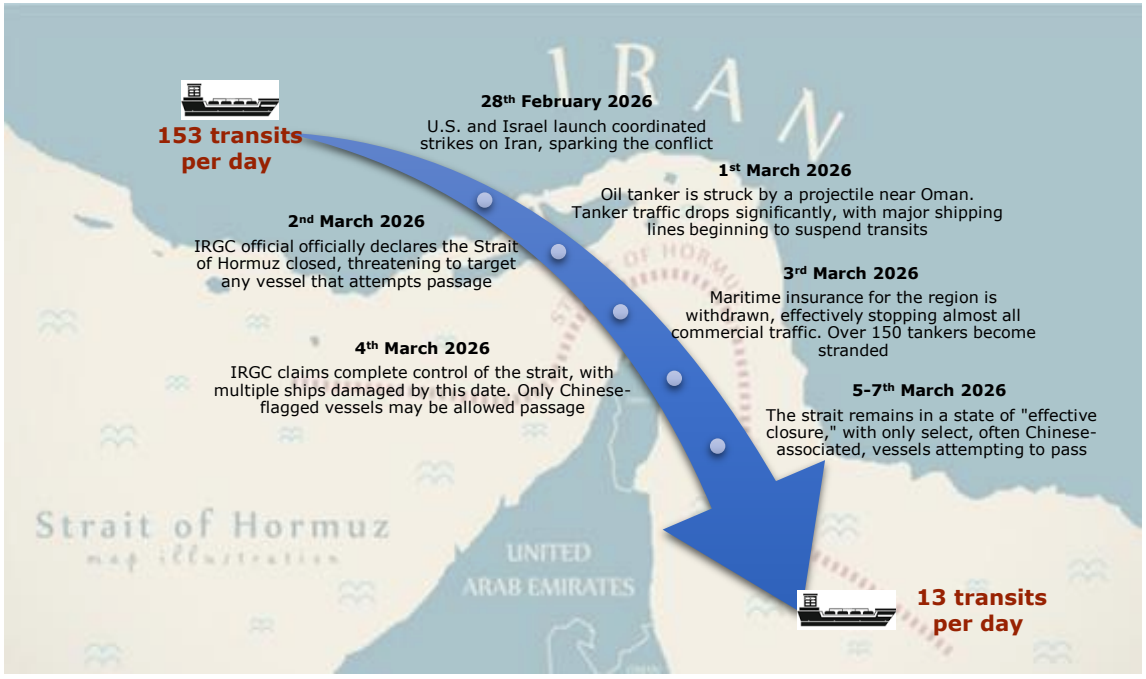
- Q3 2024 saw a brief inventory draw, indicating temporary tightening and a short price recovery before oversupply returned in Q4 2024–2025.
- Global oil supply has been in surplus since early 2025, rising 5.6 mb/d due to OPEC+ easing cuts and strong output from the US, Brazil, Canada, Guyana, and Argentina.

Source: EIA, HAEE analysis

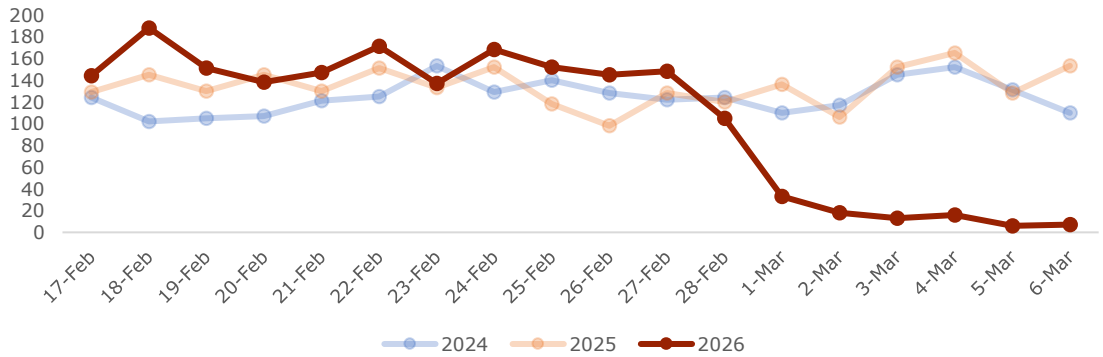
In 2025, oil shipments through the Strait of Hormuz were worth nearly $600bn in energy trade annually.

- Maritime traffic through the Strait of Hormuz collapsed following U.S.–Israel strikes on Iran, with daily vessel transits dropping from ~153 to ~13
- China imports ~40% of its crude oil through the strait, while its vessels have largely stopped transiting and some remain stranded in the Persian Gulf.

Timeline: The 2026 Hormuz maritime stagnation



Total ship traffic through the Strait of Hormuz since the beginning of conflict



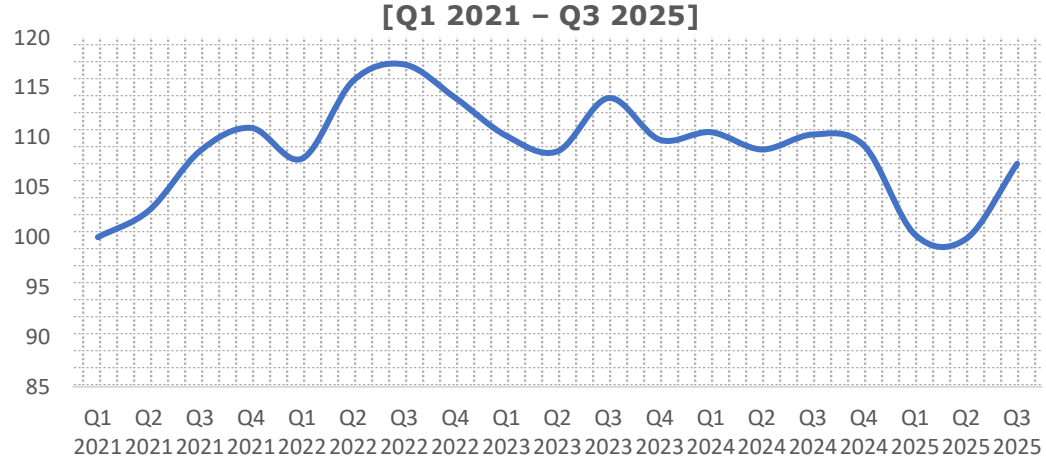
- The week before "closure", crude oil accounted for 38% of global seaborne trade volume passing through the Strait, while refined oil products accounted for 19%
- The shipments through the strait include not only Iranian oil but also exports from Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.

Source: CSIS, HAEE analysis

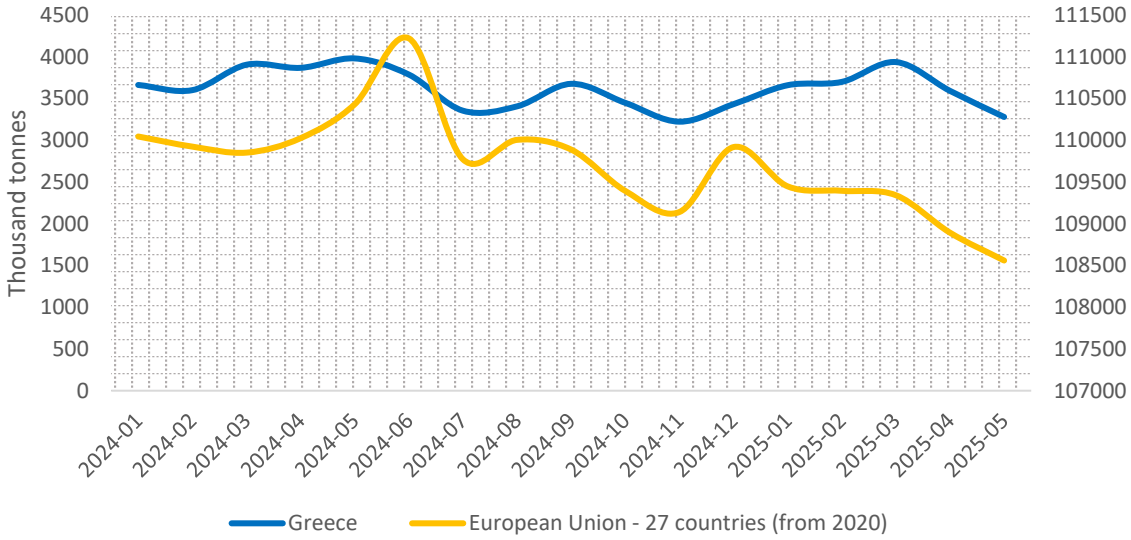
The EU held 108.6 million tonnes of emergency oil stocks in May 2025, up 7.3% from June 2022, but slightly down 1.7% from May 2024.

- The EU energy import index rose sharply in 2021–2022, plateaued above baseline (10%) in 2023–2024, then returned to baseline in 2025
- Crude oil accounts for the largest share (43.5 Mt) of EU emergency oil stocks, followed by gas/diesel oil (39.0 Mt) and gasoline (10.4 Mt)

Index of volume of EU imports of petroleum oils (Q12021 = 100), [Q1 2021 – Q3 2025]



Emergency oil stocks (thousand t) of the EU and Greece, [Jan 2024 - May 2025]



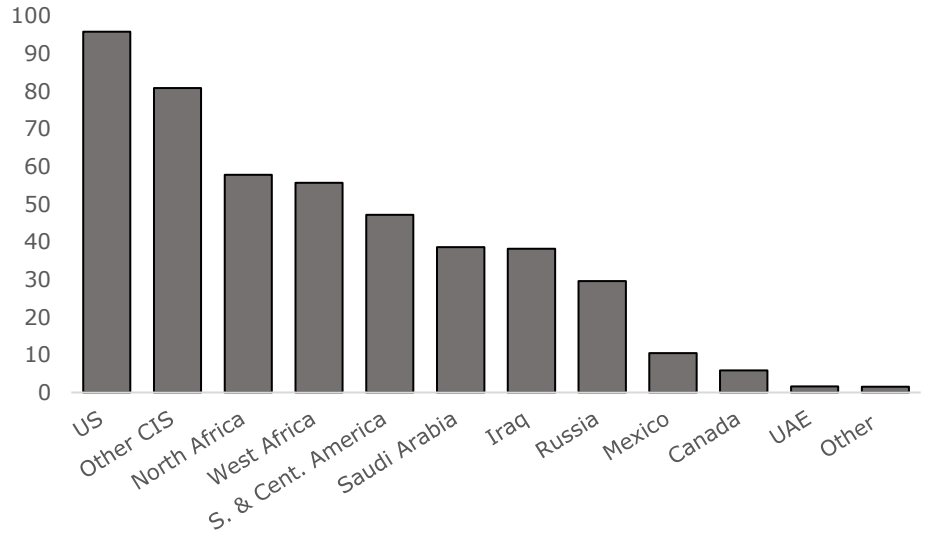
- Greek refineries keep crude reserves above the mandatory 90-day level and have alternative supplies from Libya, Egypt, and Norway despite the Middle East crisis.
- EU countries must keep stocks at minimum levels and coordinate with the Commission on timing, considering domestic and global oil market conditions

Source: Eurostat, HAEE analysis

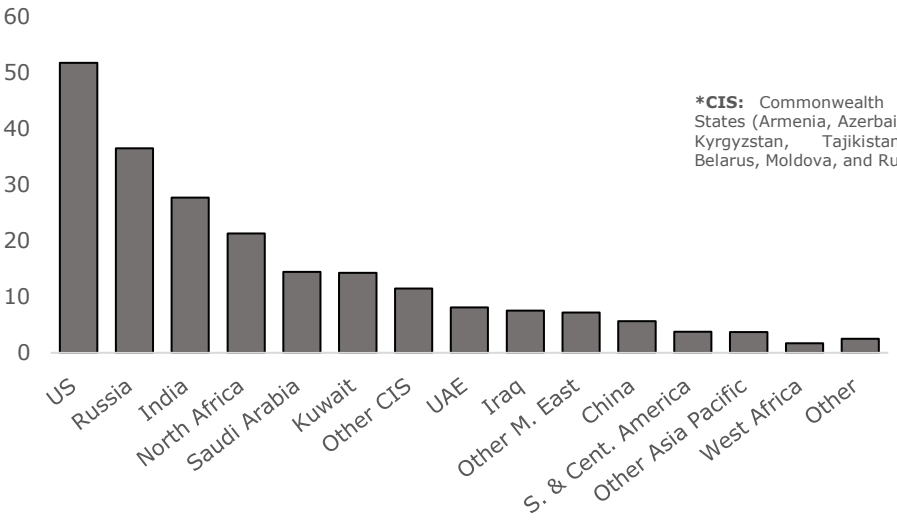
Europe, the world's second-largest crude importer (22%), saw 2024 imports decline amid its energy transition and fossil fuel reduction.

- The US was Europe's top supplier of both crude oil (~96 million tonnes) and refined products (~52 million tonnes) in 2024
- Russia ranks 8th in crude oil exports to Europe (~30 Mt) but remains the second-largest supplier of oil products (~37 Mt), indicating continued indirect dependency

Countries exporting crude oil (mil. tonnes) to Europe [2024]



Countries exporting refined products (mil. tonnes) to Europe [2024]



***CIS:** Commonwealth of Independent States (Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Belarus, Moldova, and Russia)

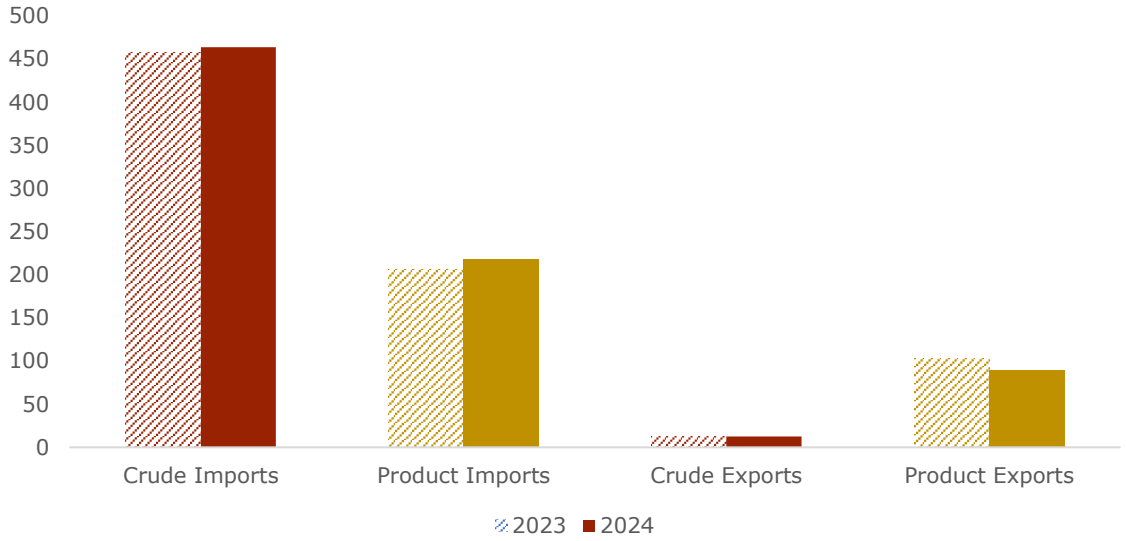
- The Middle East remains a key crude source for Europe: Saudi Arabia (~39 Mt) and Iraq (~38 Mt) together roughly match the "Other CIS" group (~81 Mt)
- Europe's refined product imports rose 13% YoY to 0.22 bn t in 2024, making it the world's second-largest importer amid domestic refinery closures

Source: Energy Institute, HAEE analysis

As the import-export gap widens, Europe is shifting from a refining hub to an import-dependent distributor of refined products.

- In 2024, Europe imported 463.4 million tonnes of crude oil, representing 21.5% of the global market, 1.3% increase compared to 2023.
- Product imports saw a notable 5.7% year-on-year rise, reaching 218 million tonnes in 2024, indicating Europe's increasingly rely on external refiners.

Europe's oil & refined products trade (mil. tonnes), [2023-2024]



Crude Imports	Product Imports	Crude Exports	Product Exports
463.4 Million tonnes (2024)	**218** Million tonnes (2024)	**12.4** Million tonnes (2024)	**89.9** Million tonnes (2024)
↑ 1.3% vs 2023	↑ 5.7% vs 2023	↑ 0.8% vs 2023	↓ 12.5% vs 2023
World share: 21.5%	World share: 17.3%	World share: 0.6%	World share: 7.1%

- Product exports fell 12.5% to 89.9 Mt in 2024, highlighting declining competitiveness and market share of European refineries due to margin pressures and closures
- Europe's crude exports in 2024 were minimal at 12.4 Mt (0.6% of world trade), underscoring its role as a net importer with little influence on global markets

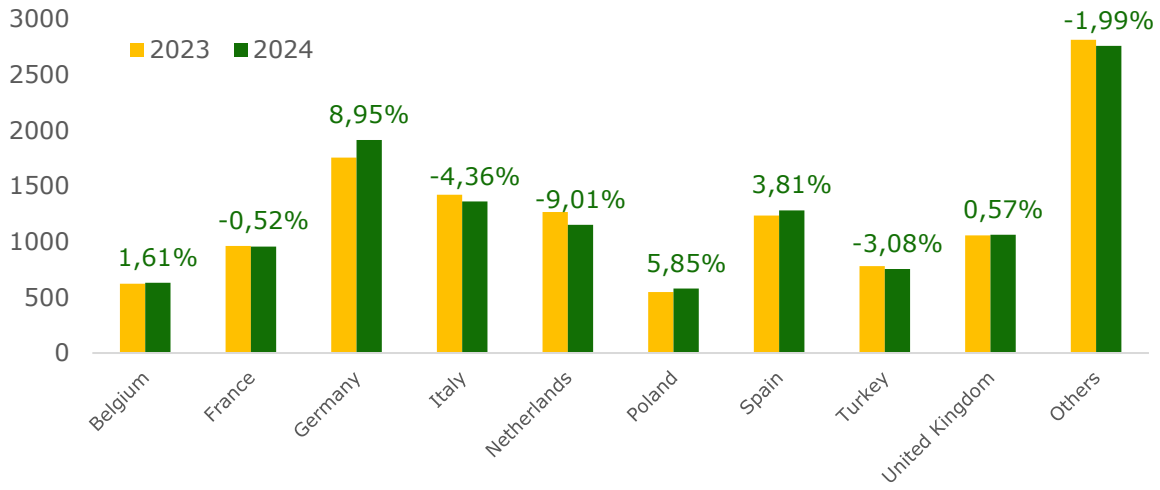
Source: Energy Institute, HAEE analysis

Diesel and gasoline still make up most EU refinery output, though total supply continues to fall for a second consecutive year.

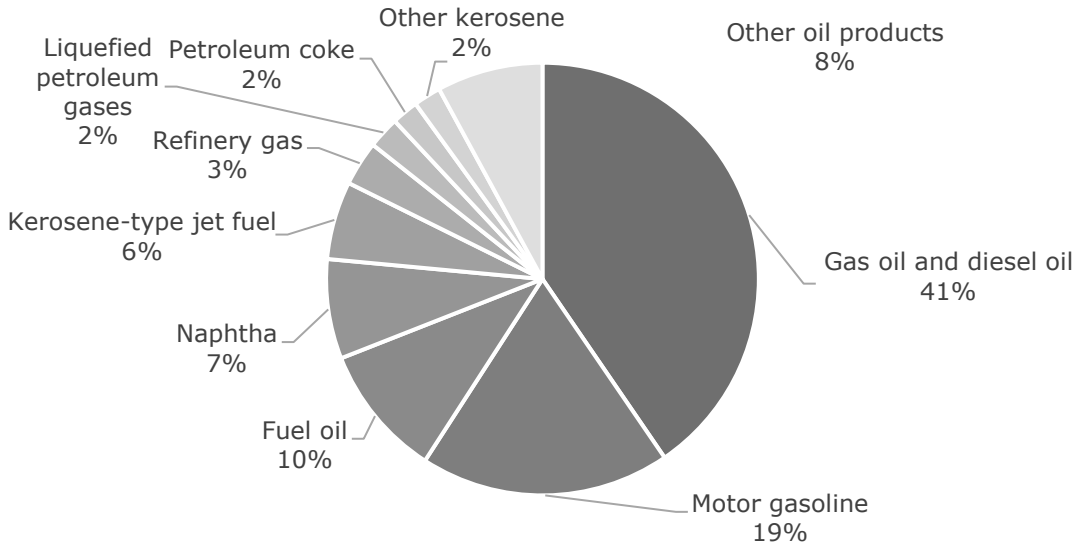
- Total OECD Europe throughput is nearly flat since 2022, as it processed 12,598 kb/d in 2022 and only 12,447 kb/d in 2024, a decline of 151 kb/d (-1.2%).

- Germany alone accounts for 15.4% of OECD Europe throughput, with major declines in the Netherlands and Italy, while Spain and Poland defy the trend

OECD Europe refinery throughput [2023-2024]



Refinery gross output by product in the EU [2024]



- Gas oil and diesel make up 41% of EU refinery output, reflecting Europe's diesel-heavy transport system as EV adoption grows

- Fuel oil still represents 10% of output, reflecting continued demand from shipping (bunker fuel) and some industrial uses

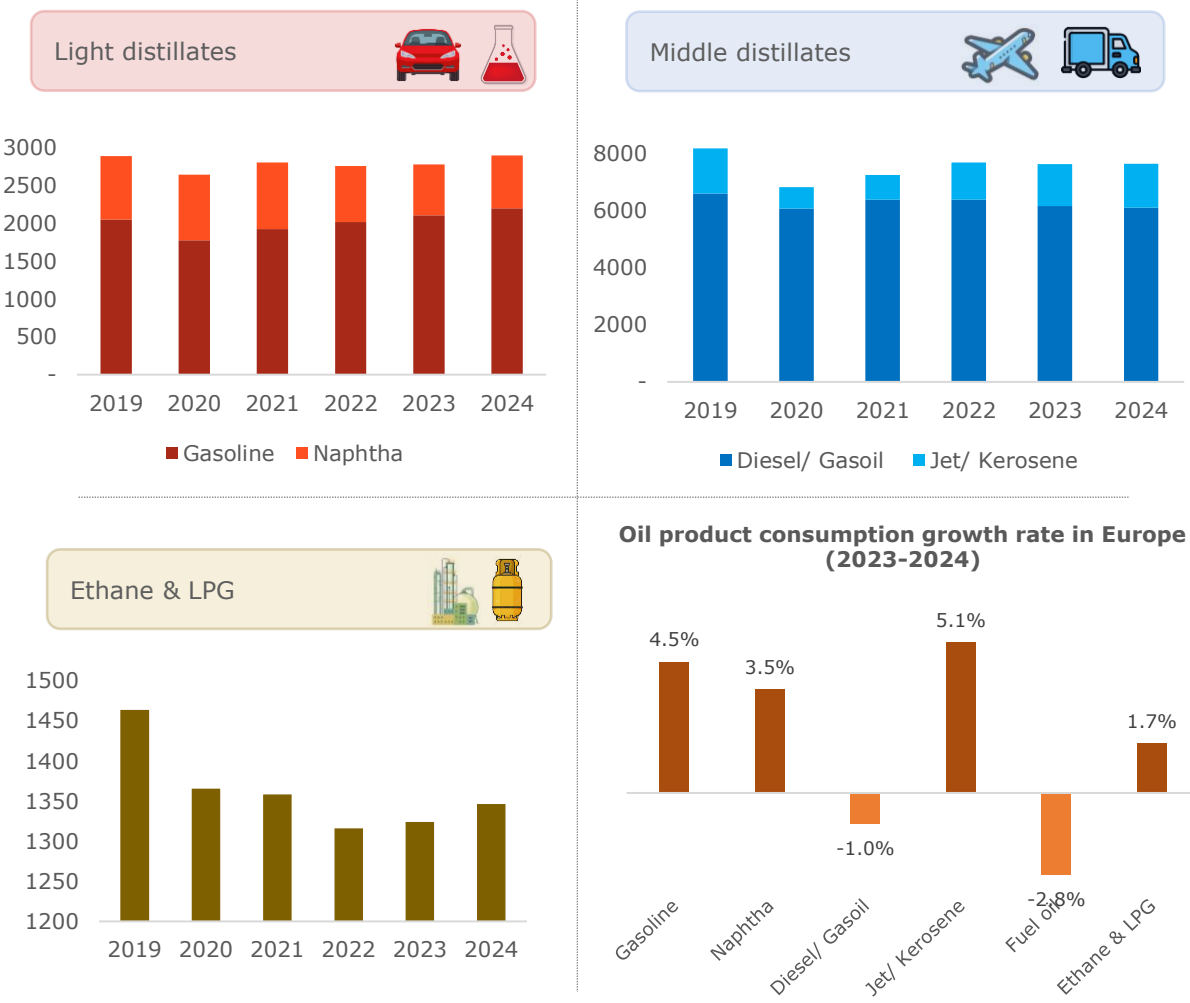
Source: Eurostat, HAEE analysis

Fuel oil is the fastest-declining product (-2.8% in 2023–2024) as gas, renewables, and cleaner fuels replace it in power generation and industry

- Even though middle distillates remain Europe's largest oil product group, consumption fell by 7.6% in 2019-2024. with diesel declining in 2023–2024 by 1.0%

- Jet fuel/ kerosene leads growth, rebounding from 752 kb/d in 2020 to 1,536 kb/d in 2024 (+5.1% in 2023–2024), nearly reaching 2019 levels

Evolution of oil product consumption (thousand b/d) in Europe, [2019-2024]



- Gasoline consumption is rising despite growing EV adoption, from 2,018 kb/d in 2022 to 2,200 kb/d in 2024 (+4.5% growth rate in 2023–2024)

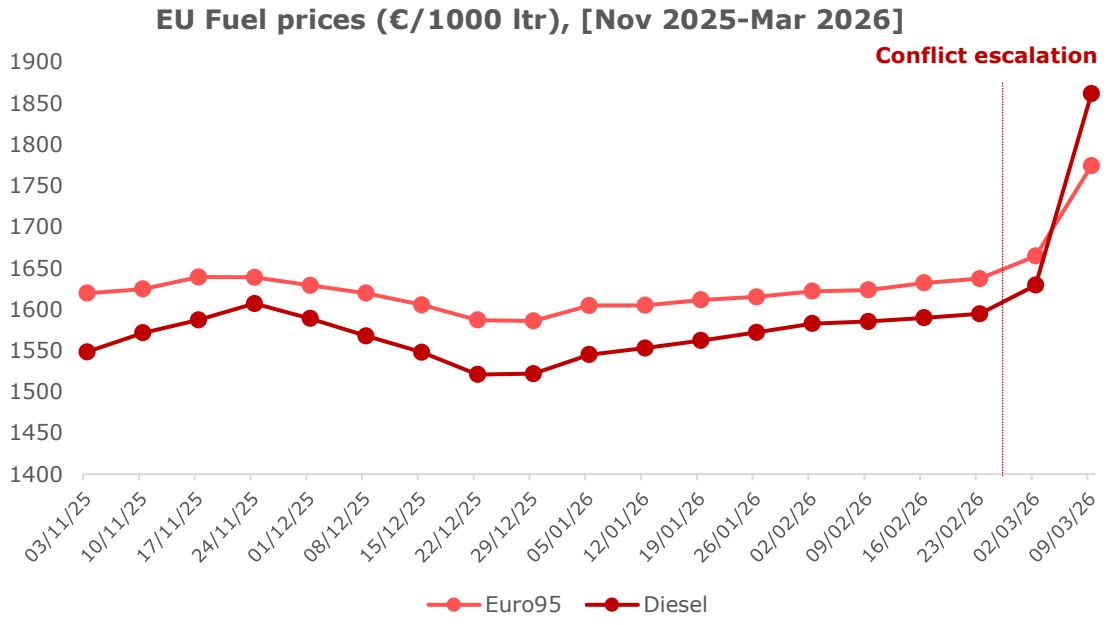
- Naphtha consumption is collapsing, down from 835 kb/d in 2019 to 697 kb/d in 2024 (a decline of nearly 17% over five years), with a 3.5% rebound in 2023–2024

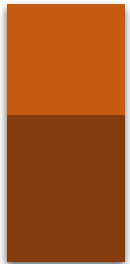
Source: Energy Institute, HAEE analysis

Euro 95 prices rose sharply across EU after the escalation, reversing typically stable weekly trends, approaching 2022-level pressures.

- Diesel prices rose sharply between 23 Feb and 9 Mar, led by Germany (+14%) and Austria (+13%), with Finland also recording a notable increase (€1.71 to €1.93/l).

- Across the EU, Euro-Super 95 prices increased by ~8% (€1.64 to €1.77/l), while more moderate gains were observed in Estonia, Poland and Spain.





Product cost 43%

Taxes (VAT + excise) **57%**

	Euro 95	Diesel
2022 increase after 24 Feb	**+13.62%** (€/l)	**+20.52%** (€/l)
2026 increase after 28 Feb	**+4.69** (€/l)	**+7.97%** (€/l)

- After 28 Feb 2026, prices rose moderately (+4.7% Euro95, +8.0% diesel) vs the 2022 Russia invasion surge, highlighting the stronger market shock at that time.

- Oil prices fell as markets anticipated a potential near-term de-escalation, easing fears of supply disruptions.

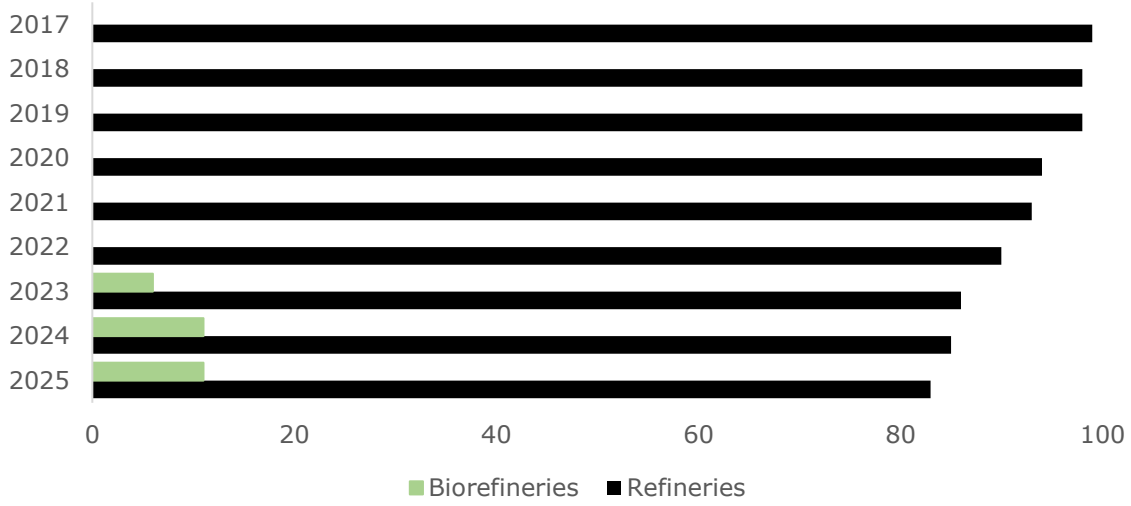
Source: EU, HAEE analysis

Strong margins and tight markets push European refining profits to post-Ukraine highs, with utilization projected at ~95% in 2026

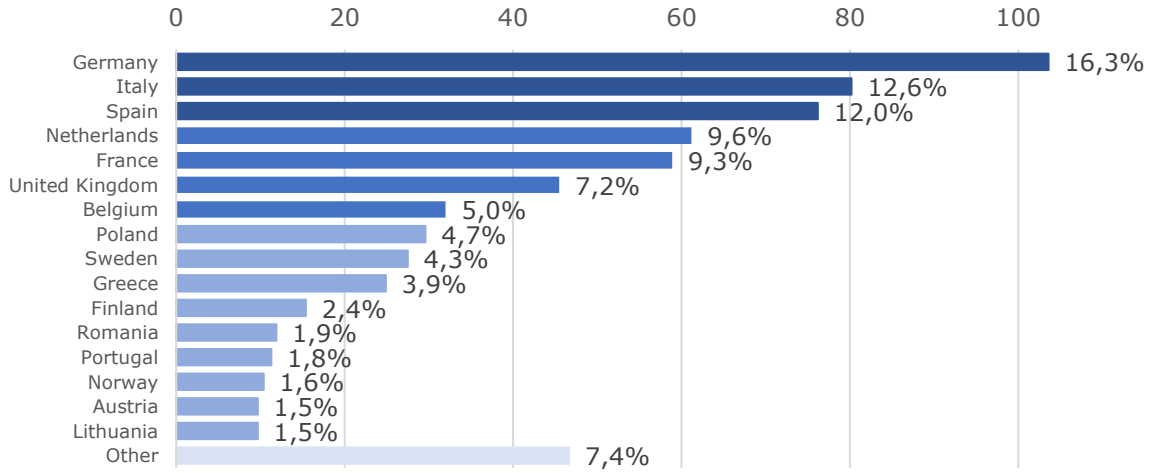
- Europe's conventional refineries fell 17% from 99 in 2017 to 83 in 2025, driven by overcapacity, falling margins, and the energy transition.

- Biorefineries appeared in 2023, reaching 11 by 2024–2025, signaling a shift from fossil fuel processing to renewable fuel production in Europe.

Number of refineries and biorefineries in Europe, [2017-2025]



Primary capacity (Mt/a) of the European refineries by country



- Germany holds 16.3% of EU refining capacity, followed by Italy, Spain, the Netherlands, and France, with the top five holding nearly 60%; Greece has 3.9%.

- European refinery utilization is expected to fall from ~84% in 2024 to 81% by 2027, with nearly 1 million b/d of capacity potentially closing in 2029–2030.

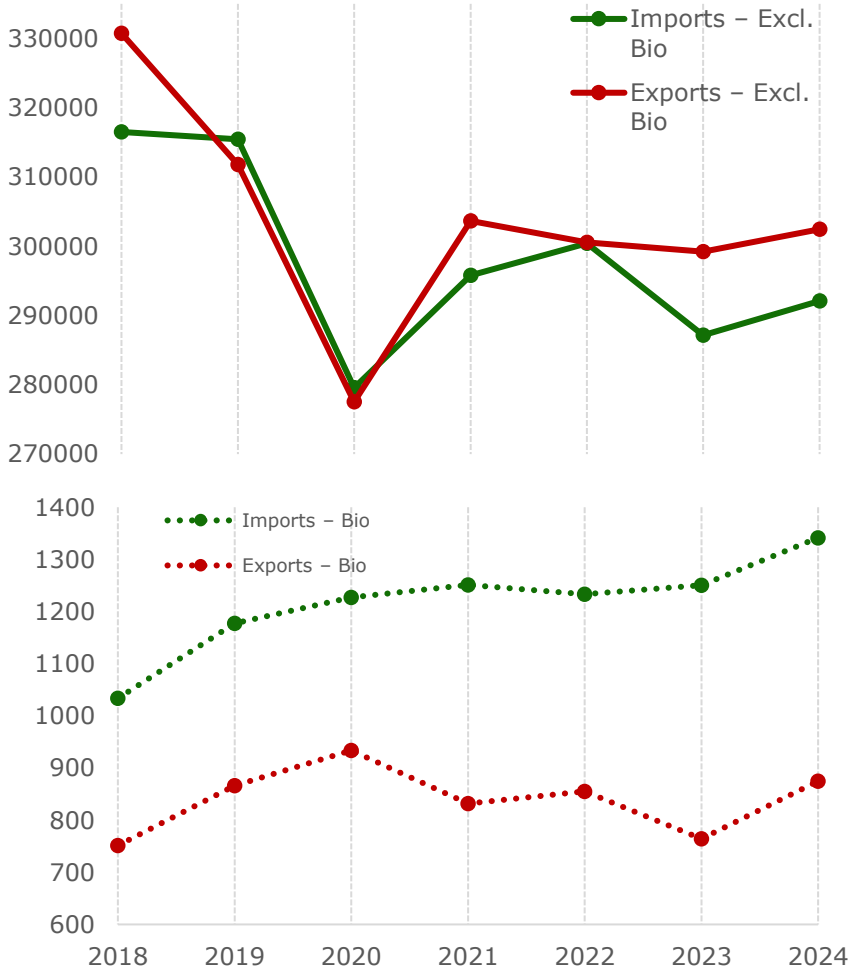
Source: Eurostat, HAEE analysis

The European biofuel market reached USD 43.7 bn in 2025 and is set to grow 9.4% CAGR through 2035, on RED III and SAF mandates.

- Conventional petroleum trade fell in 2020, rebounded in 2021-2022, and stabilised near 290–302 kt by 2023–2024, with imports slightly exceeding exports.

- Since 2022, EU petroleum products exports have consistently exceeded imports in conventional products, making the EU a net exporter.

Oil & petroleum products (excl Bio - above) vs Bio-fuel portion (below) trade in thousand tonnes evolution at EU, [2018-2024]



- Biofuel imports have grown from ~1,033 kt in 2018 to ~1,341 kt in 2024, ~30% increase over the period, while biofuel exports remain much lower (~875 kt in 2024)

- The European biofuels market, valued at USD 26.6 bn in 2024 and estimated at USD 28.1 bn in 2025, is projected to reach USD 43.4 bn by 2033 (5.6% CAGR)

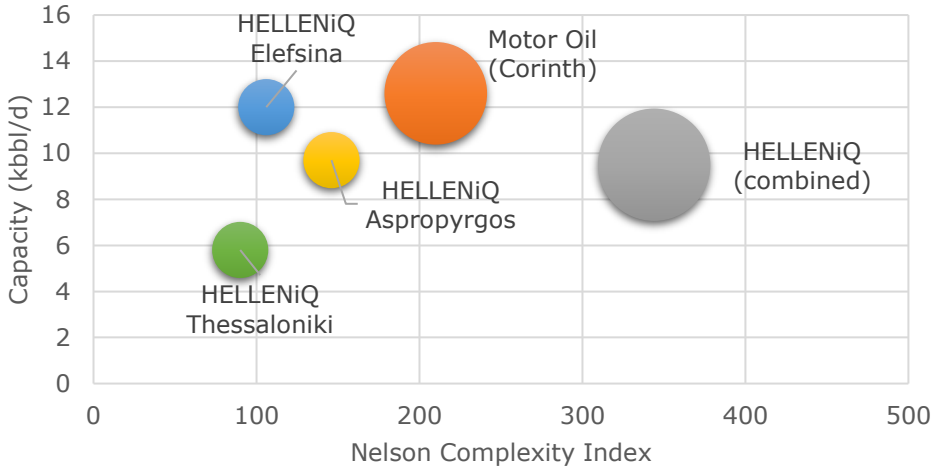
Source: Eurostat, HAEE analysis

Greek refining sector dominated by HELLENiQ's scale and flexibility, while Motor Oil focuses on high-value products and export strategies.

- Motor Oil operates a single high-complexity refinery, while HELLENiQ manages a larger, three-refinery system to balance scale and diversity

- HELLENiQ leverages its larger and diversified refining system to maximize throughput and operational flexibility. Motor Oil focuses on premium, high-margin product

Refining capacity (thousand bbl/d) & complexity of the major Greek refineries



Market presence		
	MOTOR OIL	HELLENiQ ENERGY
Export share (9M 2025)	43% of total revenue (€3.64bn out of €8.48bn)	~54% (by volume) (10.5 Million metric tons)
Retail fuel station	1,500	1,583 +329 fuel stations abroad
Core Exported products	High-value fuels (Gasoline, Diesel), Jet fuel, and Propylene (newly added 160k tpa capacity)	Primarily Transport Fuels (Diesel, Gasoline), Aviation, and Marine Fuels.
Refining margin (1H2025)	Benefited from a "supportive environment" with margins recovering in Q3 2025; stays above benchmarks due to its 12.61 complexity index	Benchmark refining margin fell to $5.3/bbl

- Motor Oil focuses on petrochemicals and recycled lubricants, while HELLENiQ sees aviation fuel demand up 4.8% in 1H25

- Motor Oil exports to 75+ countries (43% of 9M25 revenue), while HELLENiQ ENERGY remains export-focused (~54% by volume) across SE Europe

Source: Energy Institute, HAEE analysis

Biorefinery & Circular Economy Footprint

Renewable Energy

MOTOR OIL

839 MW
Installed capacity (2024)

2.7 GW
Operational by 2030

72 MW
BESS STORAGE
144 MWh installed (2025)

HELLENiQ ENERGY

500 MW
Installed capacity (2024)

5.2 GW
Operational by 2030

1.1 MT
CO_2 Avoided
Renewable deployment

Circular Economy

MOTOR OIL

43,000 t/y
Base oils
Recovered via regeneration

60ktpa
Low-Carbon H_2
By 2029

>300,000 tpa
Waste Processing target (2026)

HELLENiQ ENERGY

>88% Waste
Reused or Recycled

≤ 15%
LANDFILL CAP
Waste to disposal by 2030

Up to **43%**
Reduction in Air Pollutants

Alternative Fuels

MOTOR OIL

25 kt/y
e-methanol
Target 2029

250 kt/year
ADVANCED BIOFUELS
Target 2030

~200 ktpa
biodiesel capacity
from biogenic feedstocks (2030)

HELLENiQ ENERGY

150 ktpa SAF
production unit

45 ktpa UCO
RENEWABLE DIESEL

e-fuels
IN DEVELOPMENT
e-methanol & e-jet fuels from captured CO_2

Source: Motor Oil, HELLENiQ, HAEE analysis

7. Investments

Highlights

$2.309tn global energy transition investment in 2025

€455bn invested by the EU in clean energy and transition technologies

€13.8bn Greek energy sector loans in 2024, nearly 3x higher vs 2017

15% of new corporate lending in Greece directed to the energy sector

€3.5bn+ energy and RES transactions recorded in Greece in 2024

>80% of Greek energy M&A value concentrated in renewables during 2024–2025

Overview

In 2025, global energy investment continued its structural shift toward electrification and low-carbon technologies, with clean energy spending reaching approximately $2.15 trillion and accounting for around 64% of total global energy investment. Global power sector investment reached a record $1.49 trillion, exceeding fossil fuel investment by almost 44%, while renewable energy investment alone rose to $780 billion, more than doubling compared to 2015. Energy efficiency and end-use investments also continued their upward trajectory, reaching $773 billion globally, with the EU maintaining stronger momentum than China in efficiency-related spending.

China remained the dominant global investment market in the energy transition, investing approximately $800 billion in 2025 and accounting for roughly 34% of global transition investment. However, Western economies collectively maintained a comparable investment scale, with the combined investment of the US, EU and UK reaching nearly $920 billion. The EU alone invested around $455 billion, remaining ahead of the US as a bloc, while Saudi Arabia entered the global top-10 energy transition markets for the first time due to rapidly increasing investment in renewables and grid infrastructure diversification.

Energy markets throughout 2025 remained heavily influenced by geopolitical risk. The escalation of tensions in the Middle East, including the US–Iran–Israel conflict and repeated threats regarding the Strait of Hormuz, sustained elevated Brent and WTI oil prices and reinforced structural volatility in LNG and natural gas markets. European gas prices continued to display significantly higher volatility than US Henry Hub benchmarks, underlining Europe's continued exposure to external supply shocks and the strategic importance of energy diversification and infrastructure resilience.

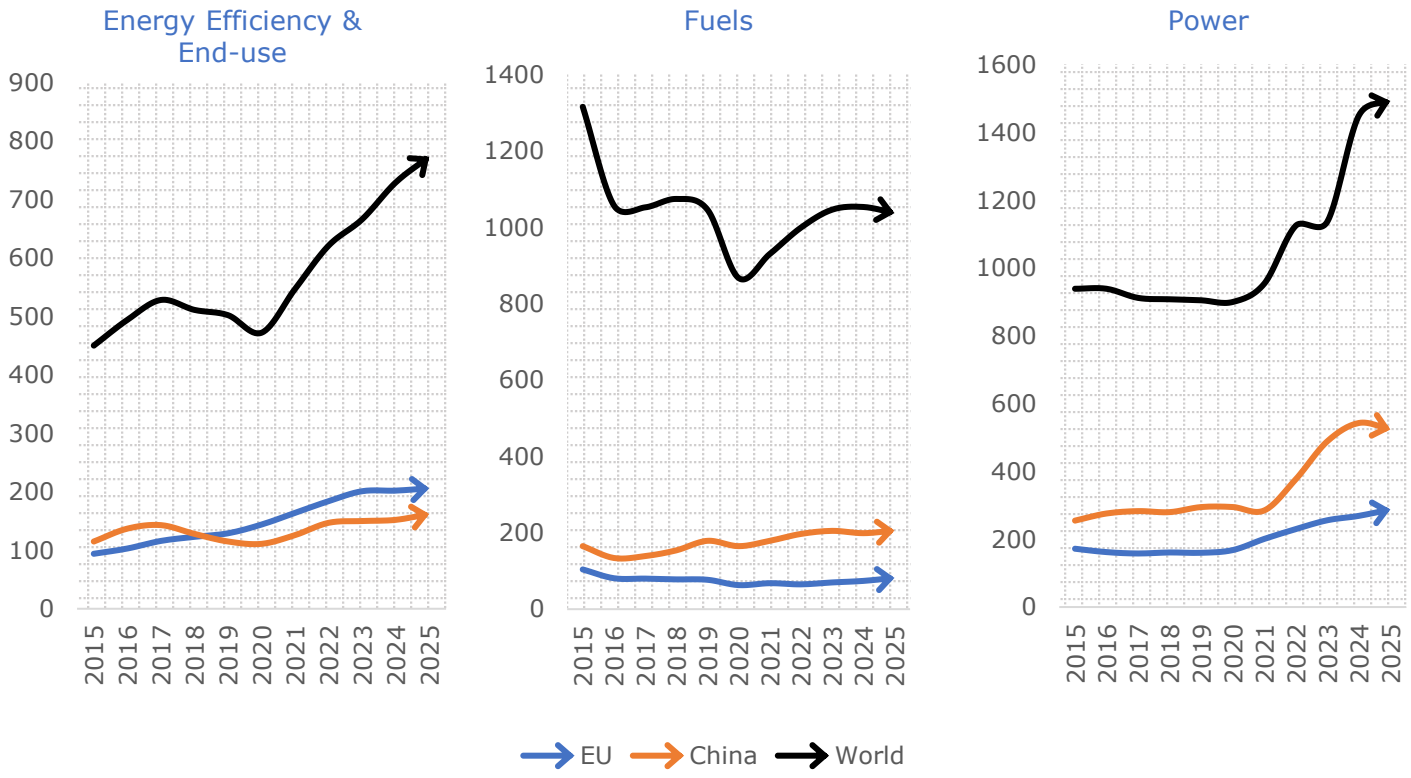
At the same time, EU spending on Russian pipeline gas imports declined from €49.9 billion in 2022 to only €5.9 billion in 2025, an almost 90% decrease, while Norway emerged as the EU's dominant pipeline gas supplier, accounting for approximately 52% of total pipeline gas import spending in 2025.Within Greece, energy transition activity accelerated significantly across investment, banking and M&A markets.

Renewable energy transactions accounted for more than 80% of total energy-related M&A value in both 2024 and 2025, while loans to the Greek energy sector almost tripled between 2017 and 2024, increasing from below €5 billion to nearly €13.8 billion. At the same time, non-performing loan ratios across all major loan categories declined to near single-digit levels by 2026, confirming the normalization of Greek banking conditions and improving financing capacity for infrastructure, energy and industrial investment.

In 2025 there is a sharp global rise in power & efficiency spending, while China focuses on fuels, and the EU on end-use efficiency

- Global power investment reached a record ~$1.5tn in 2025, rising by 3% yoy and by almost 66% compared to 2020, reinforcing the shift towards electrification.
- China remains the growth engine in power investments, with spending increasing from $295bn in 2020 to $524bn in 2025 despite a slight slowdown in 2025.

Global Energy Investment Vs Chinese and European Energy Investment (billion $), [2015-2025]



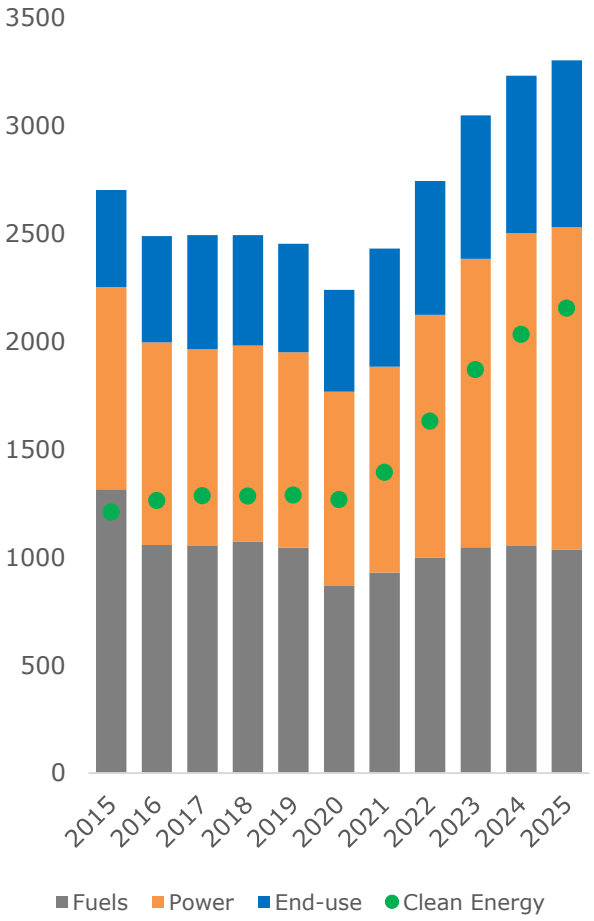
- The EU maintains stronger momentum in efficiency investments than China, reaching $206bn in 2025, while China rebounded to $162bn.
- Global fuel investment remained broadly flat at around $1tn in 2025, while power investment exceeded fuel investment by approximately 44%.

Source: IEA, HAEE analysis

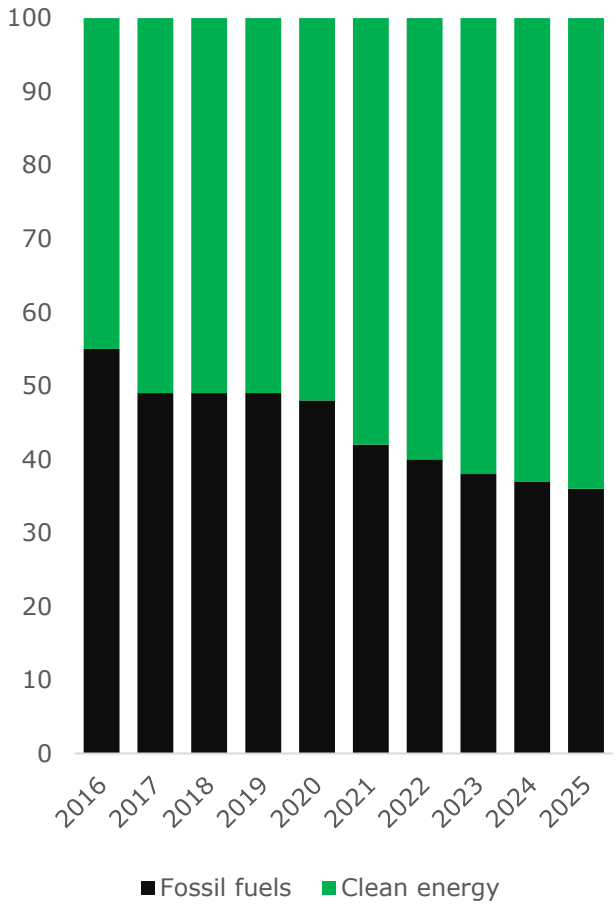
Clean energy continues to outpace fossil fuels in 2025, driven by record growth in power and end-use investments

- Total global energy investment surpassed $3.3tn in 2025, increasing by around 2% year-on-year and reaching a new historical high.
- Clean energy investment exceeded $2.1tn in 2025, almost doubling compared to 2015 and strengthening its dominance in global energy spending.

Global Energy Investments per type (billion $), [2015-2025]



Global Fossil fuel and clean energy shares of total energy sector investment (%), [2016 – 2025]



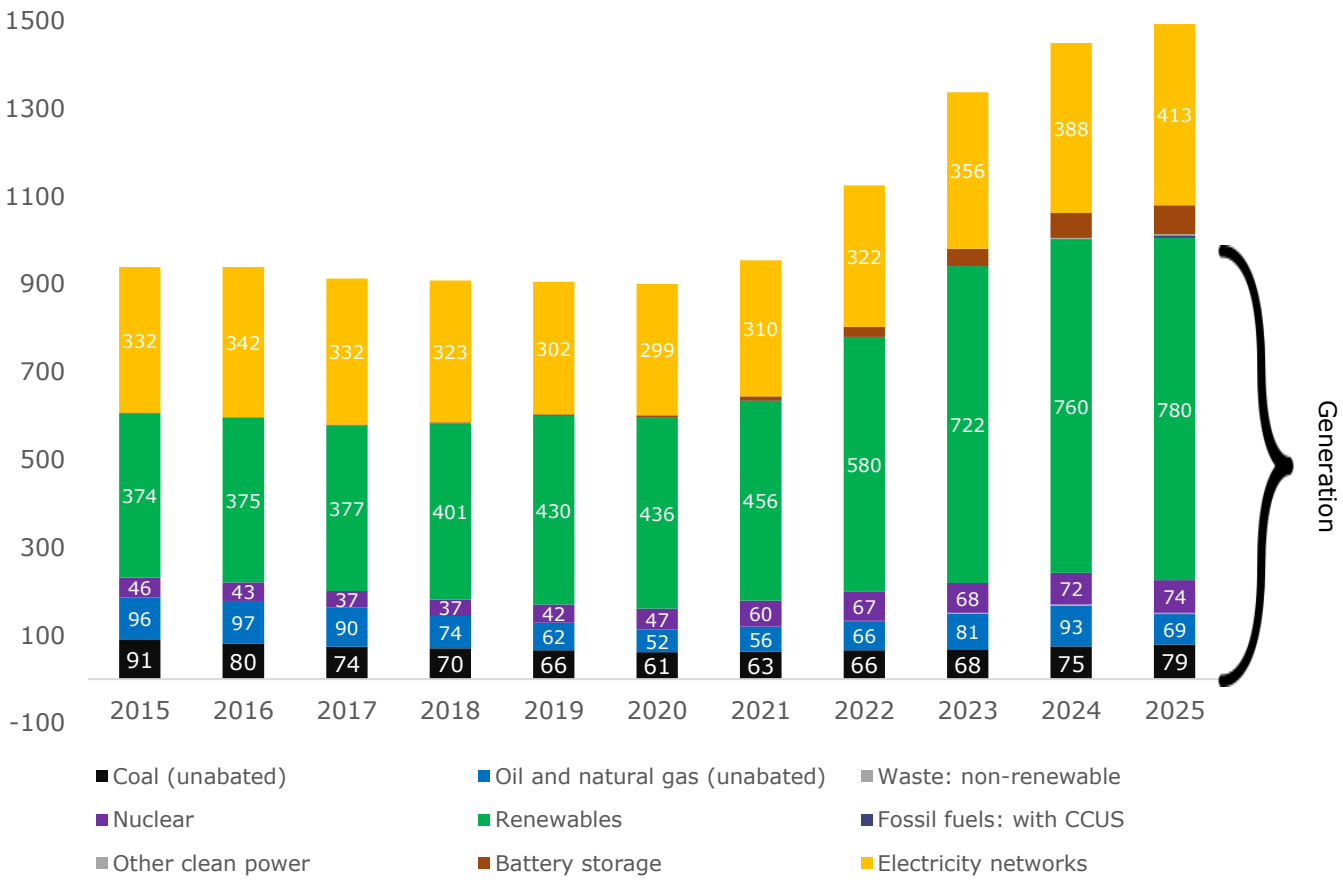
- Clean energy's share of total energy investment increased to approximately 64% in 2025, while fossil fuel investment declined to around 36%.
- Since 2022, cumulative clean investment has significantly exceeded fossil ones, confirming a reallocation of global capital flows toward low-carbon technologies.

Source: IEA, HAEE analysis

Power sector investment is dominated by renewables and grids, with clean technologies driving almost all growth over the last decade

- Renewable investment more than doubled from $374bn in 2015 to $780bn in 2025, representing cumulative growth of 109% and a CAGR of 7.6%.
- Electricity network investment increased from $332bn in 2015 to $413bn in 2025, reflecting slower but steady growth of 24% over the decade.

Global Investments in Power Sector (billion $), [2015-2025]



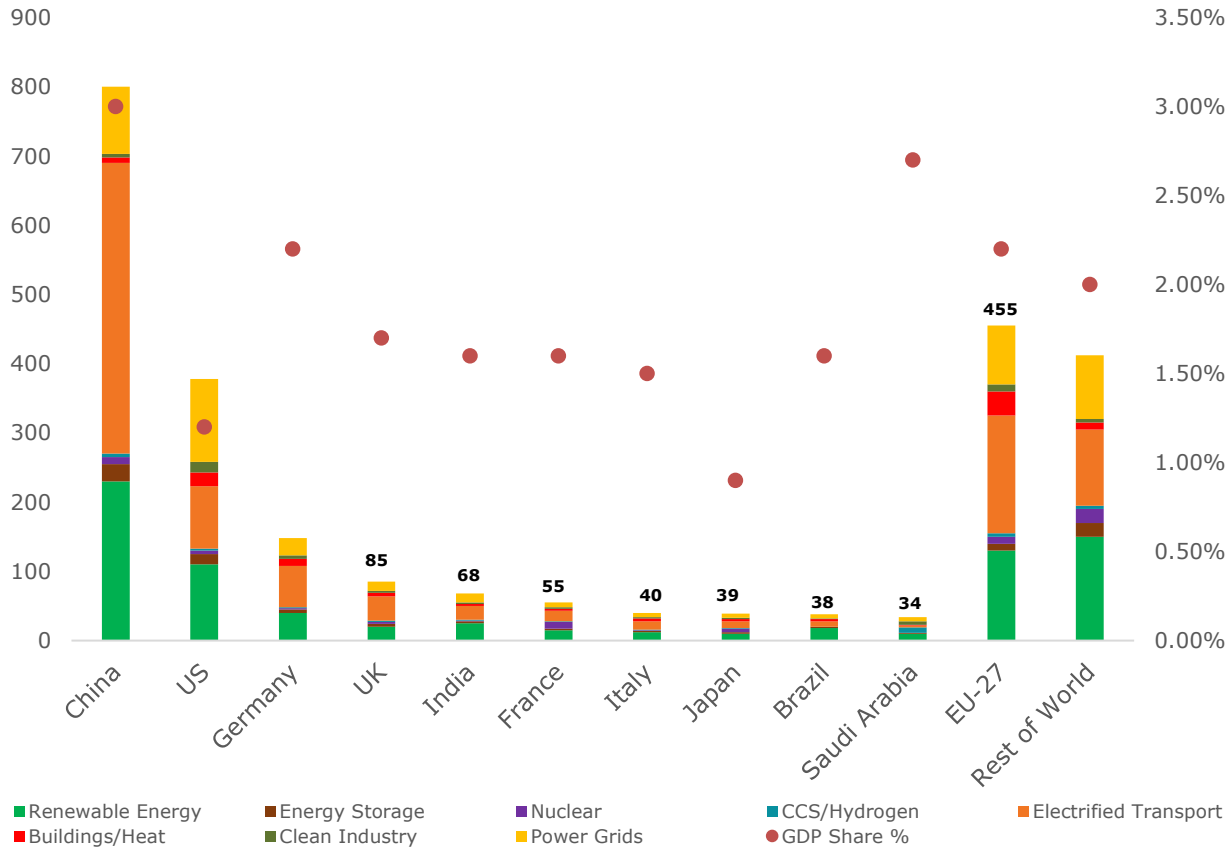
- Battery storage investment accelerated sharply after 2021, rising from $60bn to $74bn between 2021-2025 and highlighting the growing need for system flexibility.
- Coal investment declined from $91bn in 2015 to $79bn in 2025, while oil and gas investment fell by ~28% over the same period.

Source: IEA, HAEE analysis

Western economies collectively maintained a comparable to China investment scale driven by electrification and grid expansion

- China retained its leading position with $800bn in energy transition investment in 2025, accounting for around 34% of global spending and exceeding the combined investment of the next six countries.
- The US remained the second-largest individual market globally with $378bn in energy transition investment in 2025.

Energy transition investment by major economies and share of GDP, (billion $ and GDP share %), [2025]



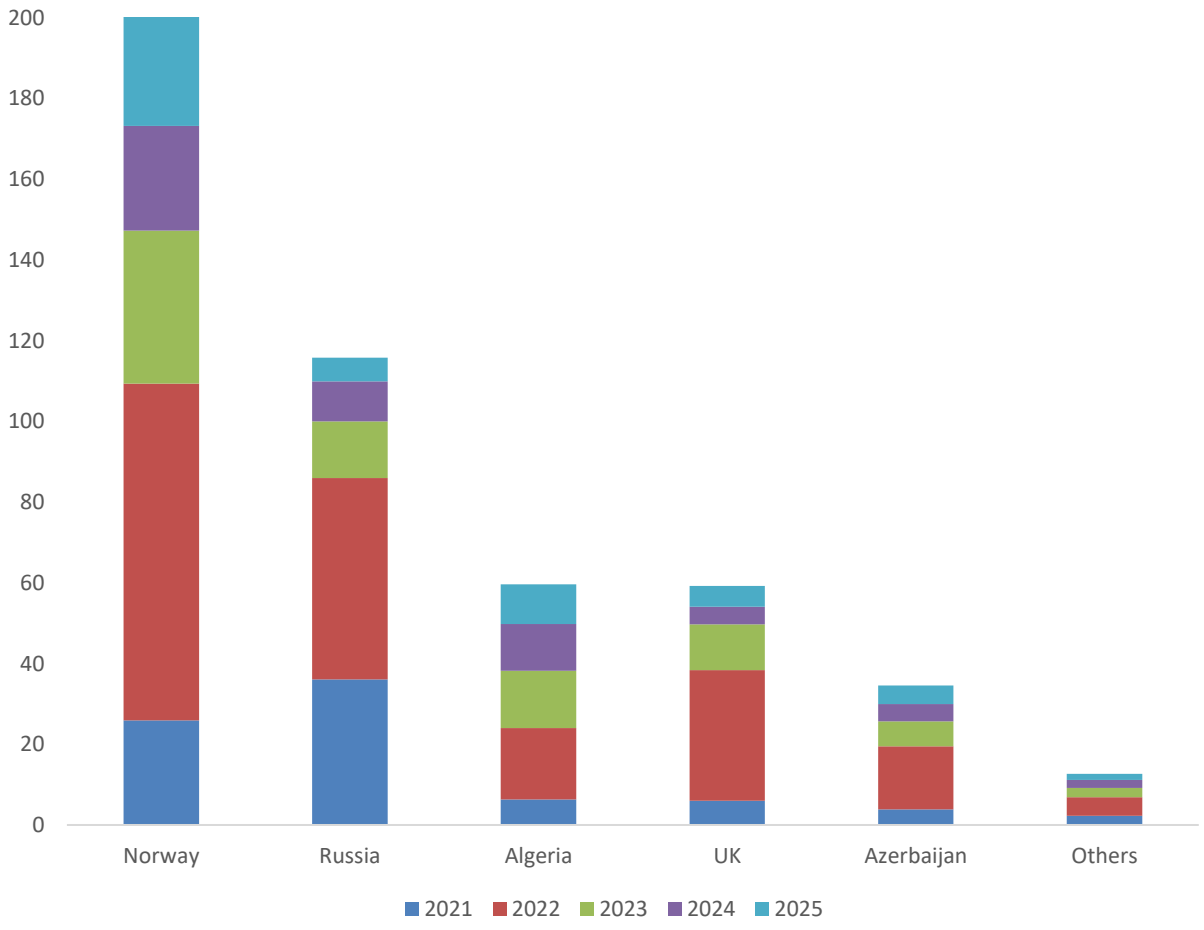
- The EU remained the second-largest market globally as a bloc, investing $455bn in 2025, ahead of the US at $378bn.
- Saudi Arabia entered the global top-10 for the first time in 2025, driven by rapidly increasing investment in renewables and grid infrastructure diversification.

Source: IEA, HAEE analysis

EU pipeline gas spending shifted structurally away from Russia, with Norway emerging as the key supplier amid persistent geopolitical risk

- EU spending on Russian pipeline gas fell from €49.9bn in 2022 to just €5.9bn in 2025, marking an almost 90% decline since the peak of the energy crisis.
- Total EU pipeline gas import spending declined from €203.7bn in 2022 to €56.2bn in 2025, reflecting lower gas prices and reduced Russian dependence.

EU countries' spending on pipeline gas imports by source country (billion €), [2021-2025]



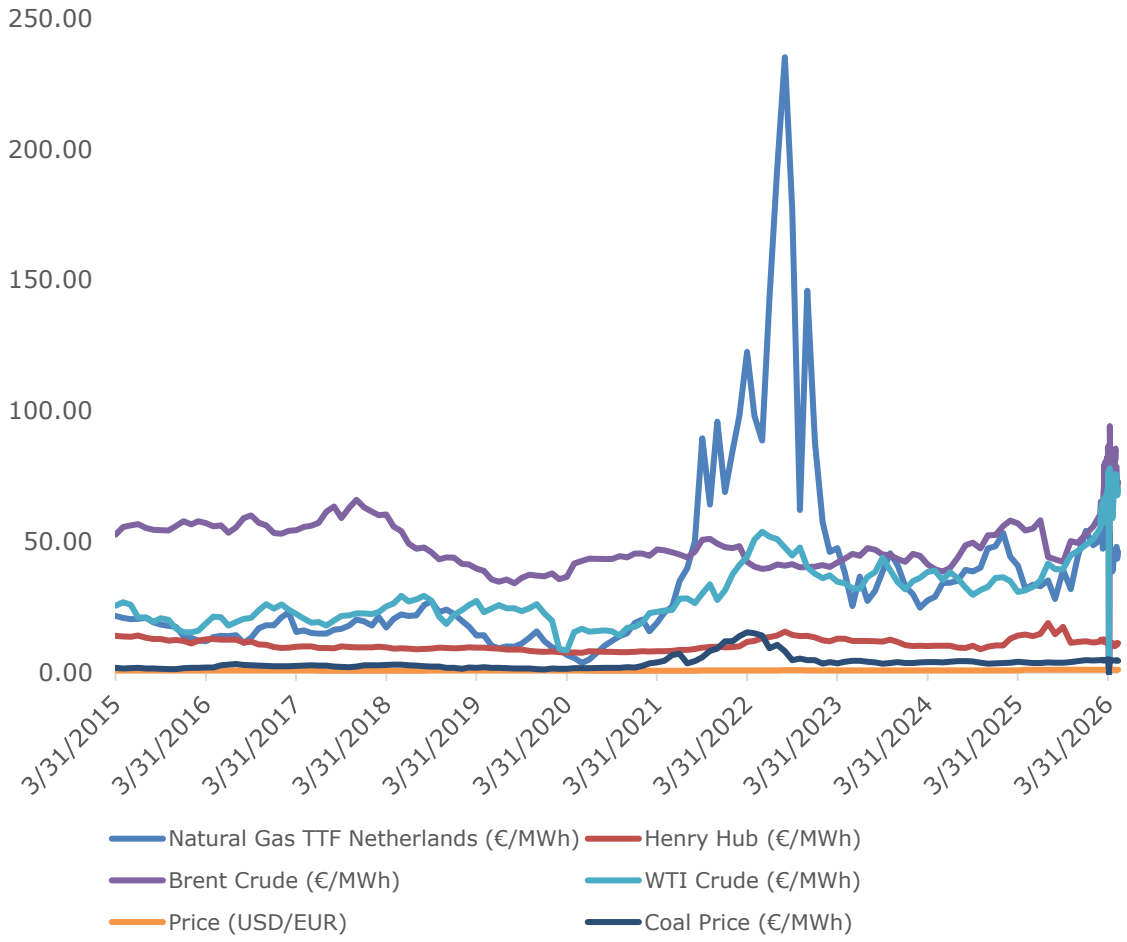
- Algeria became the third-largest supplier in 2025 with €9.8bn, while Azerbaijan maintained a stable role through the Southern Gas Corridor.
- Norway alone accounted for more than €200bn in cumulative EU gas import spending during 2021–2025, highlighting its strategic importance for European energy security.

Source: Institute for Energy Economics and Financial Analysis, HAEE analysis

Energy markets in 2025 remained shaped by geopolitical risk, with Middle East tensions reinforcing structural volatility in prices

- The 2025 escalation in the Middle East renewed fears of a Hormuz supply shock, with analysts warning that a prolonged closure could push oil prices above $120/bbl
- Henry Hub prices remained comparatively stable despite global tensions, highlighting the resilience of U.S. domestic gas production and lower import dependency.

Energy Commodities Historical prices & USD/EUR Exchange Rate [2015–2026]



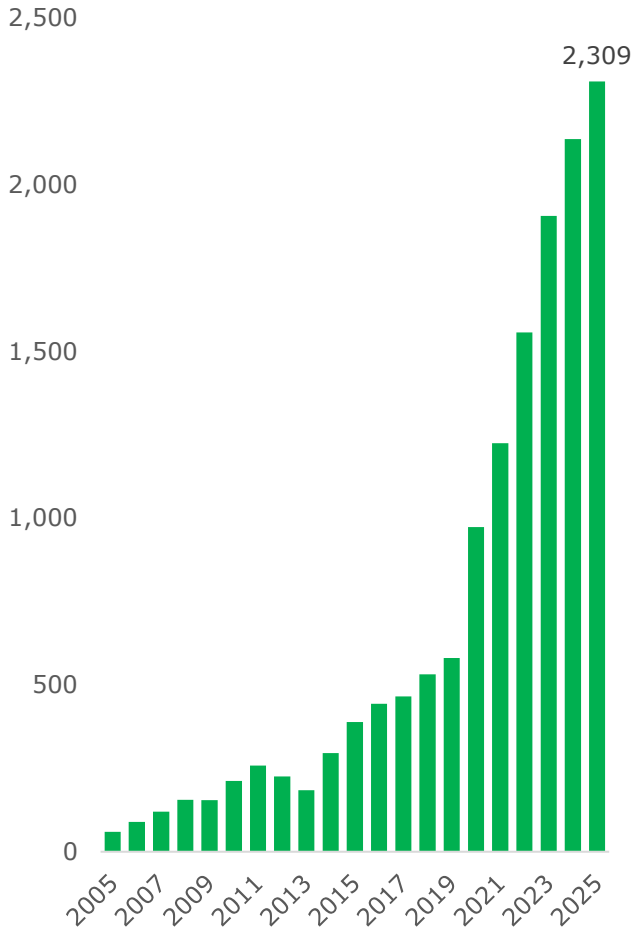
- Oil and gas markets increasingly priced in geopolitical risk premiums during 2025, driven by attacks on energy infrastructure, shipping disruptions
- The divergence between European and U.S. gas prices continued to underline the strategic importance of energy independence and diversified supply chains

Source: IEA, IRENA, BNEF HAEE analysis

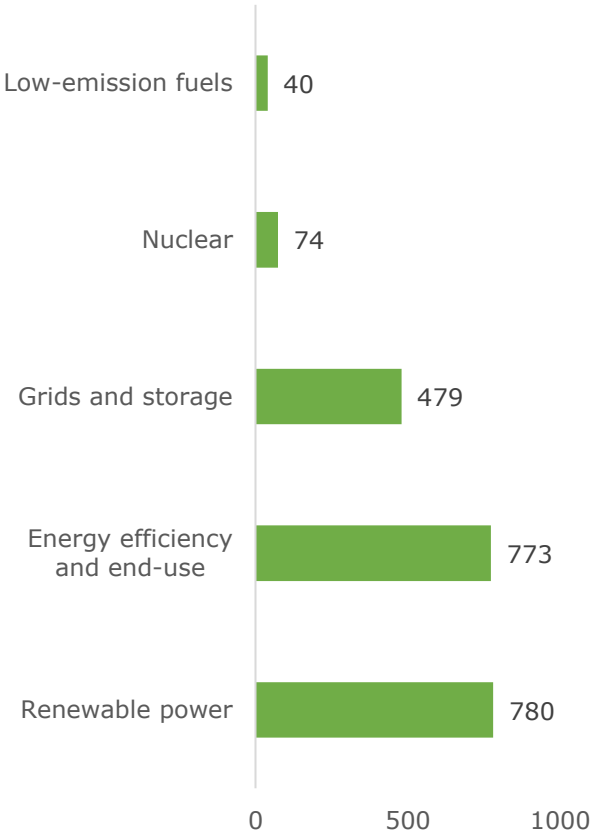
Global transition investment surpassed $2.3tn in 2025, with renewables, efficiency and grids driving capital allocation

- Global energy transition investment increased from just $60bn in 2005 to more than $2.3tn in 2025, representing nearly 40x growth over two decades.
- Investment growth accelerated sharply after 2020, with total spending more than doubling from $973bn in 2020 to $2.3tn in 2025.

Investments in energy transition worldwide (billion $), [2004-2025]



Global clean energy investment, by subsector (billion $), [2025]



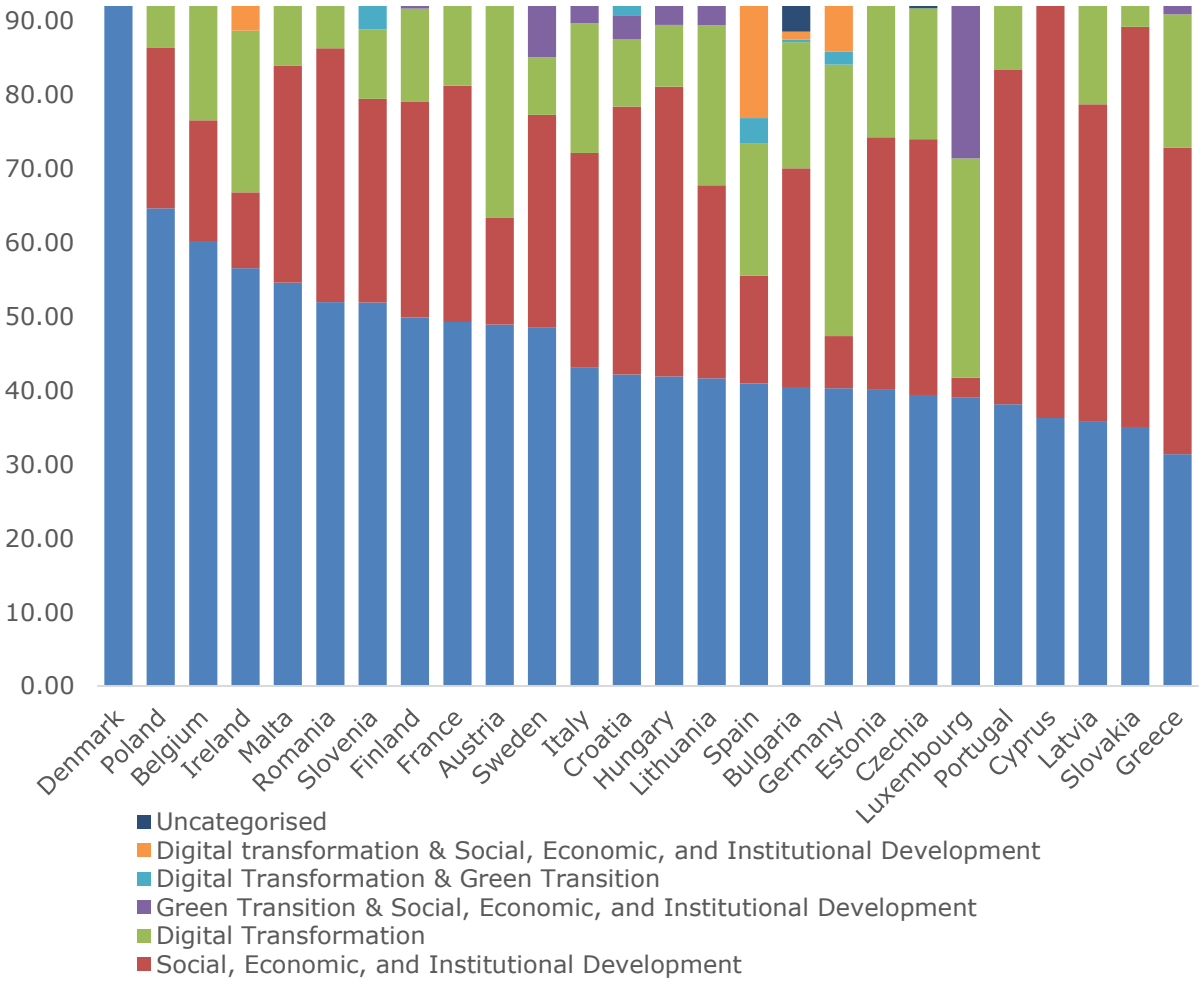
- Renewable power remained the largest investment category in 2025 at $780bn, closely followed by energy efficiency and end-use investments at $773bn.
- Renewables, efficiency, and grids together accounted for more than 88% of total clean energy investment in 2025, reinforcing their central role in the energy transition.

Source: BNEF, Statista, HAEE analysis

EU Recovery and Resilience Facility funding in 2025 remained strongly concentrated on digital and green transition priorities

- Greece allocated one of the highest shares of RRF resources to social, economic and institutional development, while maintaining comparatively lower allocations to green transition measures.
- Denmark, Poland and Belgium allocated more than 60% of total RRF funding to broad or uncategorized investment categories, significantly above the EU average.

NextGenerationEU: share of Recovery & Resilience Facility resources allocated by use, (% share), [2025]



- Luxembourg and Germany dedicated close to 40–45% of RRF resources to green transition priorities, among the highest shares across the EU.
- The gap between the highest and lowest green transition allocation shares across EU countries exceeded 30 percentage points, highlighting major differences in national recovery strategies

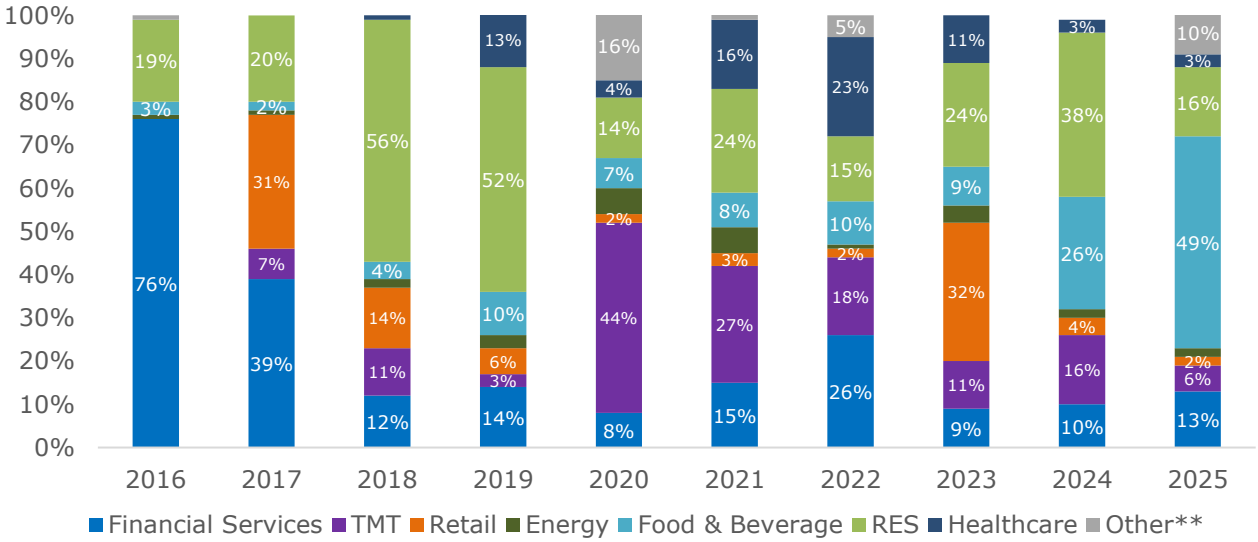
Source: Statista, HAEE analysis

Greek M&A activity shifted decisively toward energy, renewables and infrastructure-related sectors

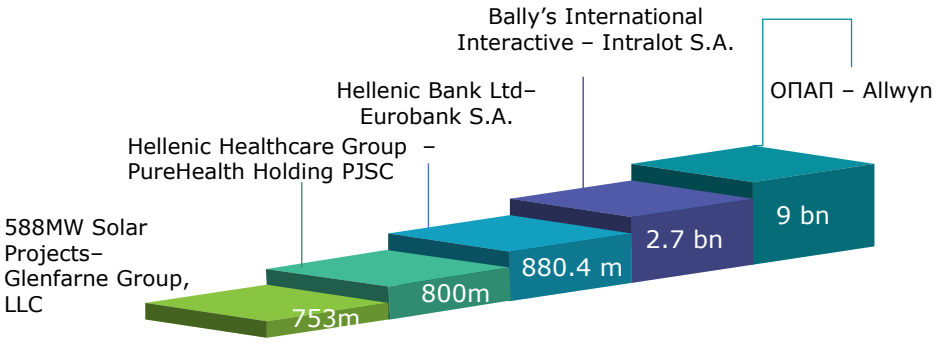
- Renewable energy became the dominant M&A sector in several years after 2018, reaching more than 50% of total deal activity in both 2018 and 2019.

- Financial services led the market in 2016 with a 76% share, but its contribution became more balanced after the banking sector restructuring phase.

Key Sectors of M&A Activity in Greece (%), [2015-2024]



Top 5 Transactions in Greece (€), [2025]



- Energy and RES together accounted for more than 50% of total M&A activity in 2023–2025, reflecting strong investor appetite for energy transition assets.

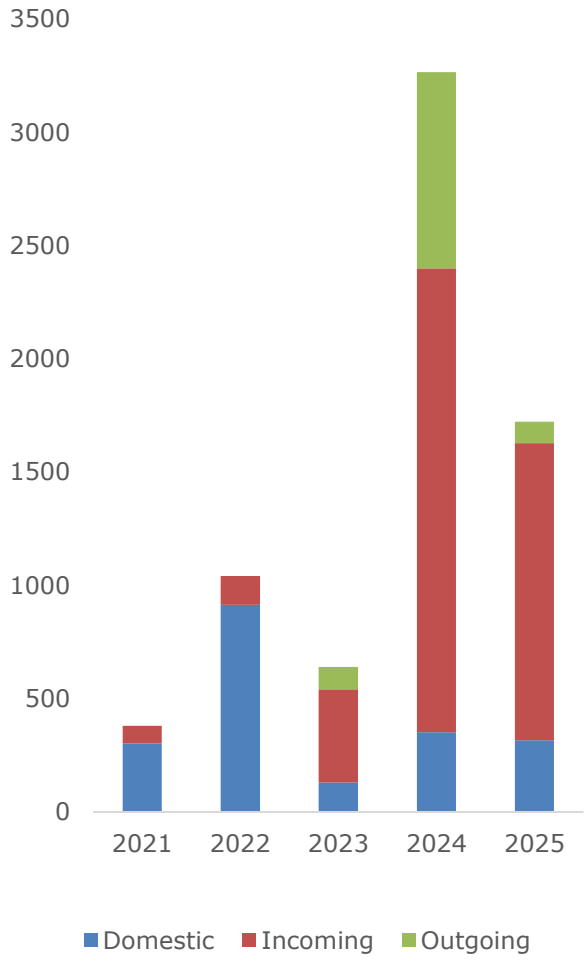
- The top five transactions in 2025 exceeded €14bn cumulatively, highlighting the return of large-scale strategic and cross-border investments in the Greek market.

Source: pwc, HAEE analysis

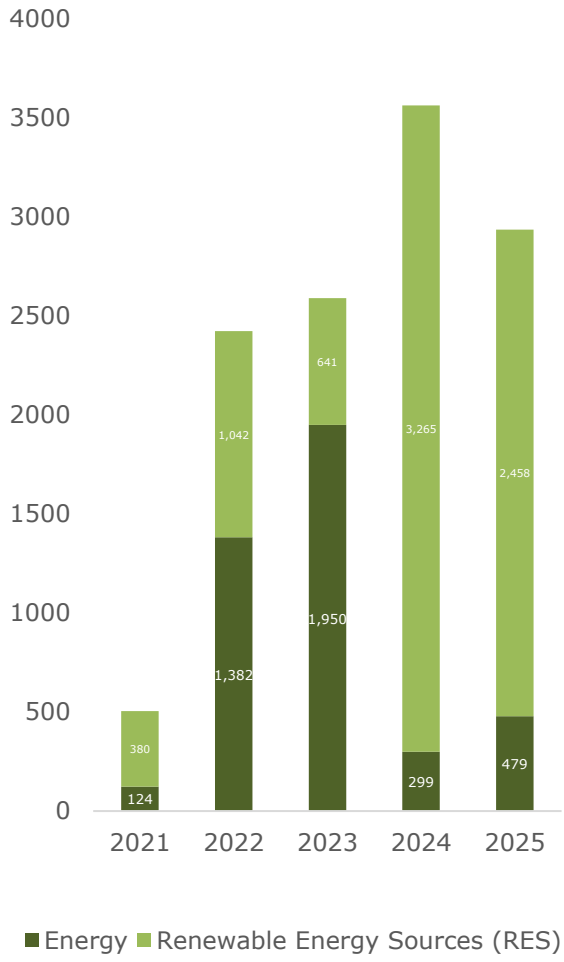
Renewables became the driver of energy-related M&A activity in Greece with inbound investment flows accelerating sharply in 2024–2025

- Total transactions in energy and renewables peaked at more than €3.5bn in 2024, driven almost entirely by RES deals exceeding €3.2bn.
- Inbound RES transactions surged to more than €2.0bn in 2024, highlighting strong foreign investor appetite for Greek renewable assets and infrastructure.

Direction of RES Transactions in Greece (million €) [2021-2025]



Transactions in Energy and Renewables in Greece (million €) [2021-2025]



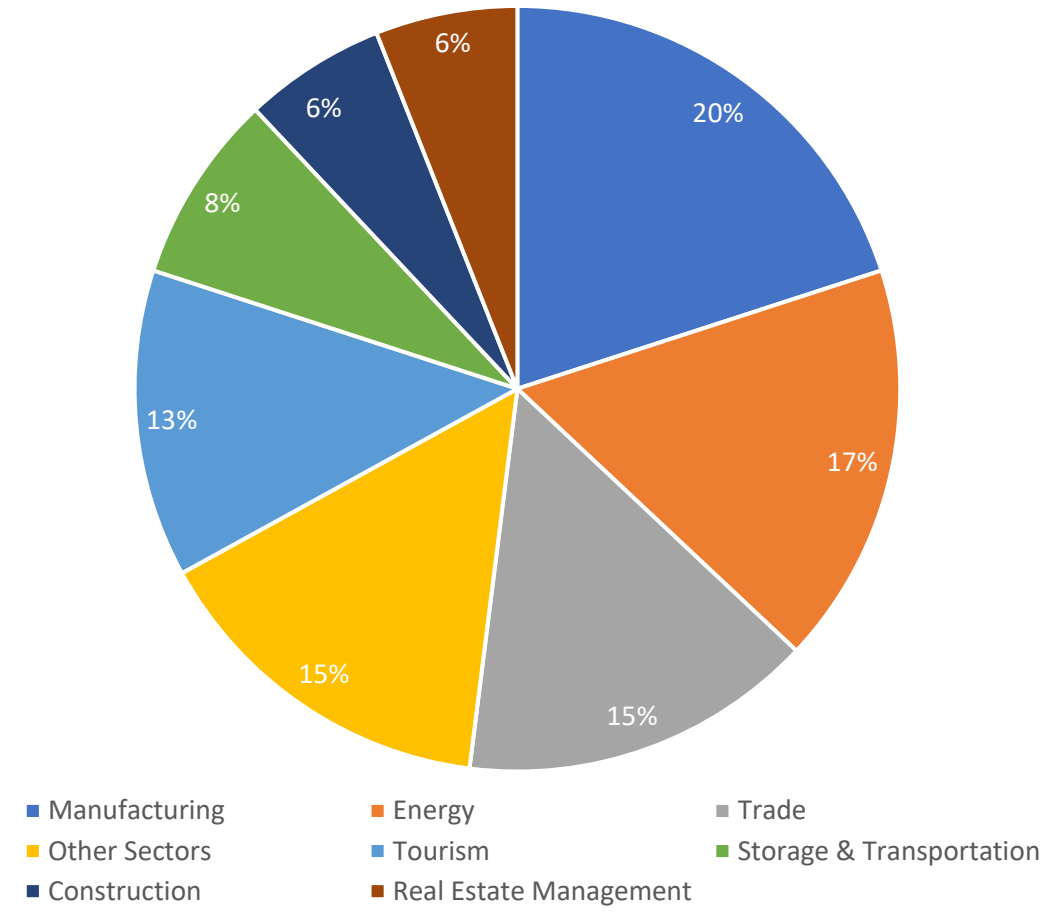
- Outgoing RES transactions also increased significantly, exceeding €850m in 2024, reflecting the growing internationalization of Greek energy groups.
- Domestic transactions remained comparatively stable throughout 2021–2025, generally ranging between €100m and €350m annually.

Source: pwc, HAEE analysis

Bank lending to Greek non-financial corporations in 2025 remained concentrated in productive and energy-intensive sectors

- Energy-related activities represented 17% of total NFC lending, confirming the growing importance of energy infrastructure and transition-related investment.
- Trade and other sectors each accounted for around 15% of total lending, together representing nearly one-third of corporate bank exposure.

Sectoral Distribution of Bank Loans to NFCs (%), [2025]

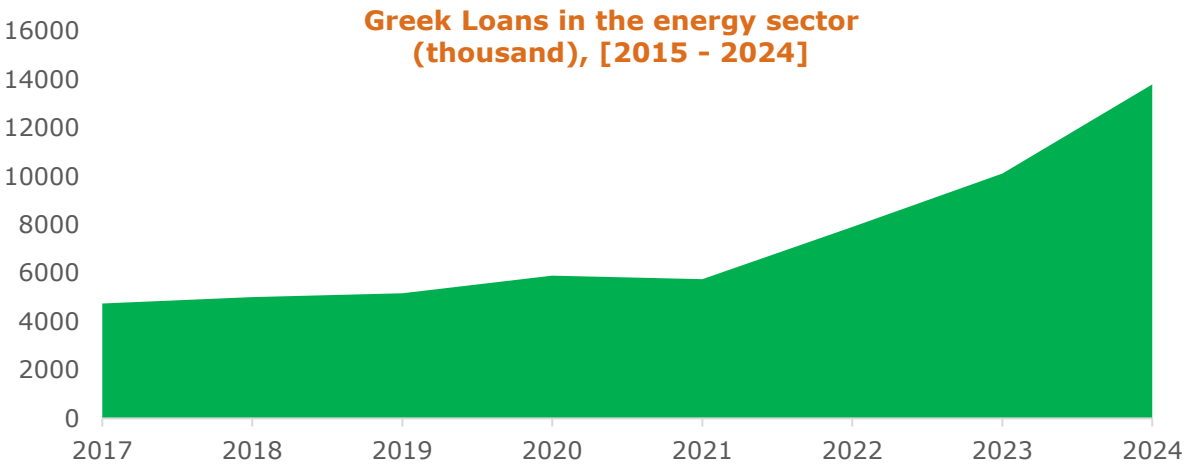


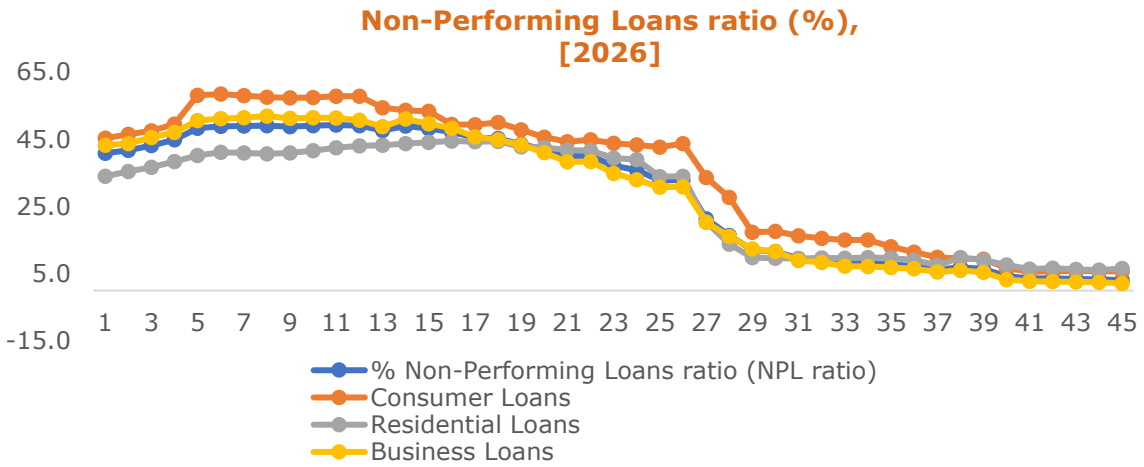
- Manufacturing accounted for the largest share of NFC bank loans in 2025 at 20%, highlighting the sector's central role in productive investment and industrial financing.
- Storage & transportation represented 8% of total lending, reflecting increasing financing needs linked to logistics, supply chains and trade connectivity.

Source: Bank of Greece, HAEE analysis

Greek bank lending to the energy sector accelerated after 2021, while NPL ratios across all loan categories continued to decline

- Loans to the Greek energy sector almost tripled between 2017 and 2024, increasing from below €5bn to nearly €14bn, reflecting strong investment momentum in energy infrastructure and renewables.
- Energy sector lending grew by more than 35% between 2023 and 2024 alone, marking the strongest annual increase of the period.





- Consumer loans remained the riskiest portfolio throughout the period, peaking above 55% NPLs before falling to around 5–6% by 2026.
- Residential loan NPLs declined more gradually than other categories, but still fell from around 40% to below 10%, reflecting improving household credit conditions.

Source: Bank of Greece, HAEE analysis

RRF-Funded Energy Reforms Focus on Security, Storage and System Modernization

Full Reform & Investment Tracker (RRF / MFF)

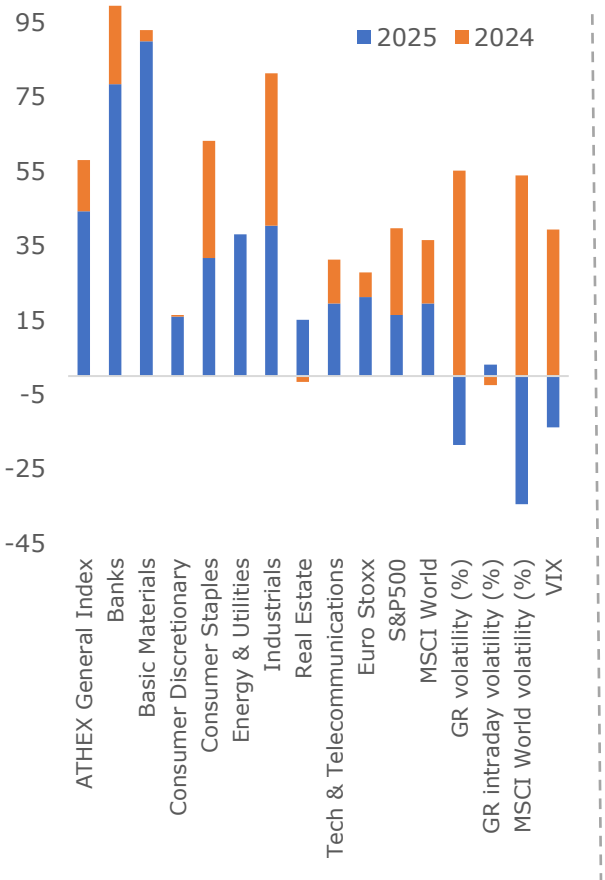
Type	Measure	Funding	Common Priority	Status	Key Elements / Progress
Reform	Regulatory framework towards a smart grid	RRF 16991	Energy Security	On track	Smart meter incentives; dynamic pricing framework; DSO control centres and SCADA-DMS systems under implementation
Reform	Roadmap for innovative energy efficiency interventions and new financial instruments	RRF 16993	Energy Security	On track	On-bill financing; subsidised loans; innovative non-grant energy efficiency instruments
Reform	Grid and storage capacity – fostering storage investments	RRF 16990	Energy Security	Completed	Framework for standalone and RES-coupled storage; competitive tenders launched
Reform	Restructuring and enhancement of RES-CHP Account revenues	RRF 16865	Energy Security	Completed	Financial sustainability of RES account; Guarantees of Origin system; installed RES capacity reached 9.6 GW
Investment	Installation of energy storage for additional RES penetration	-	Energy Security	On track	Integrated into storage investment 16926
Investment	Energy efficiency and promotion of RES for self-consumption	RRF 16994	Energy Security	On track	18,527 approved PV systems; support for households, farmers and municipalities
Investment	Promotion of CCS technologies to foster industry decarbonization	-	Energy Security	Delayed	Removed from RRF; redesign and alternative funding under consideration
Investment	Electricity interconnection of islands and electricity network upgrades	RRF 16870 / MFF	Energy Security	On track	Cyclades interconnection; Lavrio–Serifos–Melos–Thera projects; substations under construction
Investment	Support of storage systems to enhance RES penetration	RRF 16926 / MFF	Energy Security	On track	1,380 MW target; Amfilochia Pumped Hydro Storage and BESS deployment

Source: Ministry of Economy & Finance, HAEE analysis

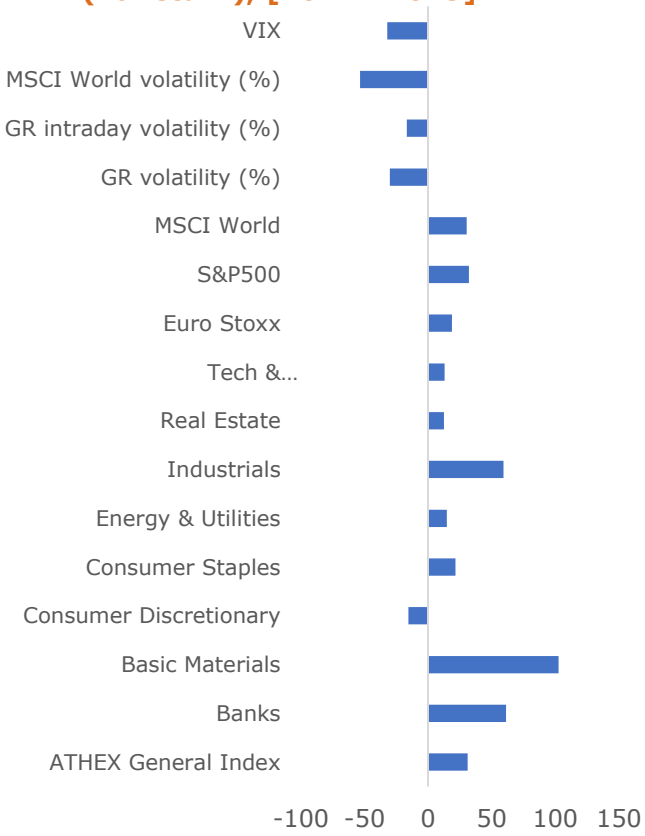
Greek equity markets maintained strong momentum in 2025, with banks, basic materials and the ATHEX General Index outperforming

- The ATHEX General Index delivered returns of around 45% in 2024 and remained strongly positive in 2025, outperforming several major European indices.
- Greek banks recorded the strongest sectoral performance, generating returns above 100% over the last 12 months and remaining the top-performing segment of the market.

Stock Greek Market Indices Performance Comparison (% return), [2024 - 2025]



Stock Greek Market Indices Performance 12 months maturity (% return), [2024 - 2025]



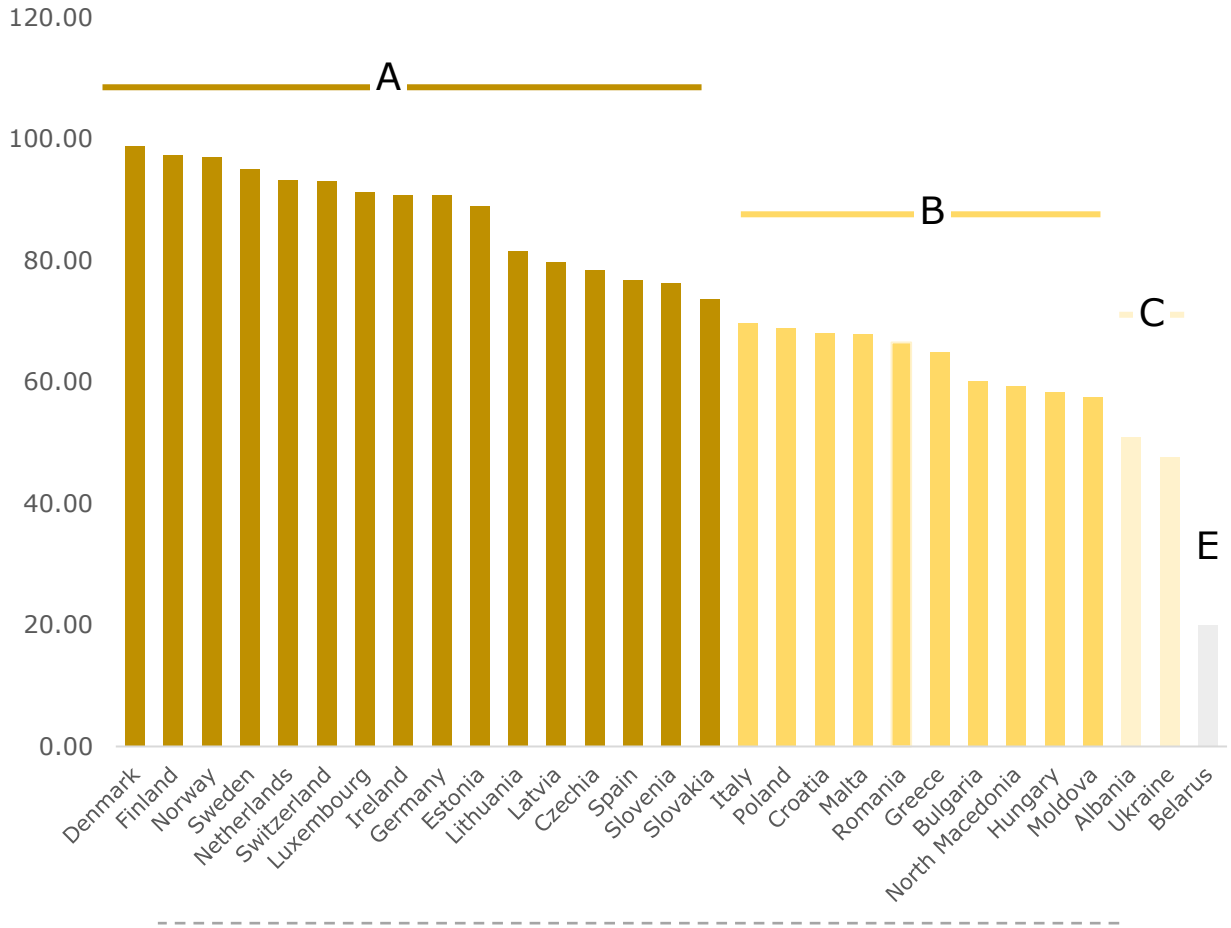
- Energy & utilities continued to post positive returns, benefiting from resilient earnings and sustained investment in renewables and grid infrastructure.
- Greek market volatility remained significantly lower than the peaks observed during previous crises, despite ongoing geopolitical uncertainty and tighter global financial conditions.

Source: European Commission, BRUEGEL, HAEE analysis

In 2024, Nordic countries dominated as Eastern and Southeastern Europe trailed behind in ESG performance

- Denmark (98.8), Finland (98.7), and Norway (97.3) lead EU ESG performance in 2024, with all top 10 countries scoring above 90, forming the 'A-tier' of ESG leaders.
- Countries like Ireland, Estonia, and Lithuania fall into the 80–90 range (B-tier), showing strong but slightly more varied ESG integration and implementation.

Countries by overall ESG ranking in Europe [2024]



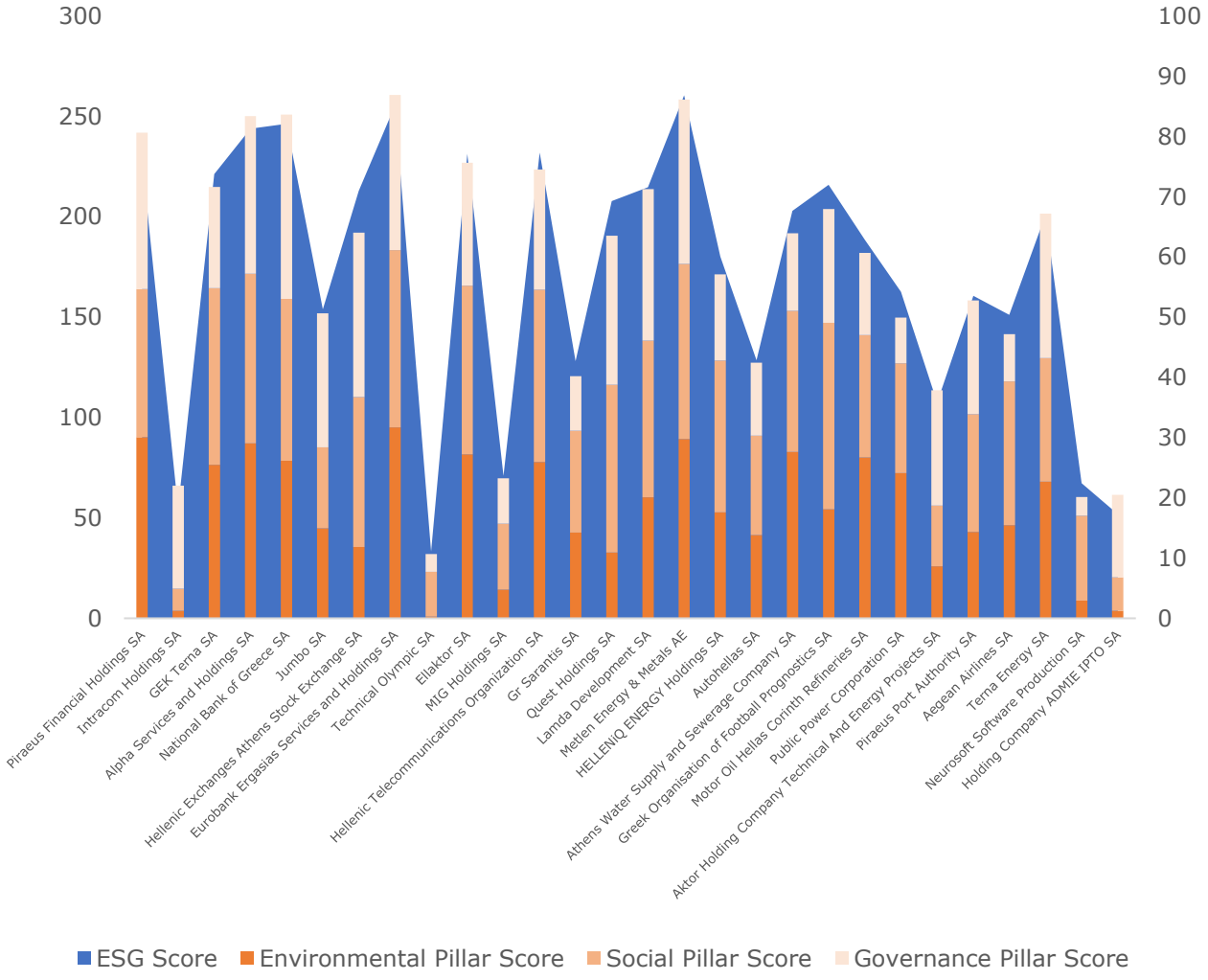
- Greece, Romania and Bulgaria occupy the lower mid-tier (C and D), reflecting weaker regulatory enforcement, ESG reporting maturity, and institutional capacity.
- The gap between top- and bottom-performing countries exceeds 50 points, underscoring a deep East–West divide in ESG performance.

Source: Refinitiv, HAEE analysis

The Greek listed market shows a gradual strengthening of ESG integration in 2025, although performance gaps remain significant

- Energy, utilities and financial institutions consistently ranked among the highest-performing sectors, with several companies exceeding ESG scores of 70%.
- Smaller-cap and industrial companies displayed the widest dispersion in ESG performance, with score gaps exceeding 40 percentage points between market leaders and laggards.

Greek-listed Companies based on ESG Scores (%), [2025]



- Environmental performance remains the main differentiating factor across companies, while governance-related indicators appear comparatively more mature and standardized.
- Motor Oil, Terna Energy and Hellenic Petroleum recorded some of the highest ESG scores in the market, exceeding 75–80%.

Source: Refinitiv, HAEE analysis

8. Energy Geopolitics

Highlights

Global energy trade remains structurally imbalanced between supply and demand regions.

EU import dependency remains high, with Greece among most exposed.

The Strait of Hormuz remains the world's most critical energy chokepoint.

The Hormuz crisis triggered sharp spikes in global oil and gas prices.

Europe's LNG shift increases exposure to global maritime supply disruptions.

The energy transition introduces new dependencies in critical clean technology supply chains.

Overview

Global energy geopolitics continues to be shaped by deep structural imbalances between supply-rich and demand-intensive regions, with trade flows increasingly concentrated along a limited number of critical maritime corridors. Asia has firmly established itself as the dominant center of global energy demand, while the Middle East, alongside North America and parts of the CIS, remains the backbone of global supply. This asymmetry reinforces the strategic importance of energy trade routes and amplifies the geopolitical relevance of chokepoints, none more critical than the Strait of Hormuz.

The Strait of Hormuz stands as the single most important artery in the global energy system, facilitating the transit of roughly one-fifth of global oil supply and a substantial share of LNG trade. Its centrality links major Gulf exporters—including Saudi Arabia, Iraq, the United Arab Emirates and Qatar—with key demand centers in Asia, particularly China and India. This concentration of flows creates a structural vulnerability: any disruption, even temporary, has immediate and far-reaching consequences across global energy markets.

This vulnerability was clearly demonstrated during the Strait of Hormuz crisis in early 2026, when geopolitical tensions triggered sharp price reactions across both oil and gas markets. European gas prices (TTF) surged significantly, reflecting heightened concerns over LNG supply security, while global oil benchmarks such as Brent and WTI rose as markets priced in potential supply constraints. Even in the absence of prolonged physical disruptions, the episode underscored how risk perceptions alone can drive volatility, particularly in increasingly interconnected and financially driven energy markets.

At the same time, Europe's evolving energy landscape has reshaped its geopolitical exposure. The rapid shift away from Russian pipeline gas has increased reliance on LNG imports, embedding Europe more deeply into global maritime trade networks and intensifying competition with Asian buyers. While diversification efforts have improved resilience, they have also heightened sensitivity to global price signals and chokepoint risks. This is particularly relevant for countries such as Greece, where high import dependency continues to define energy security considerations.

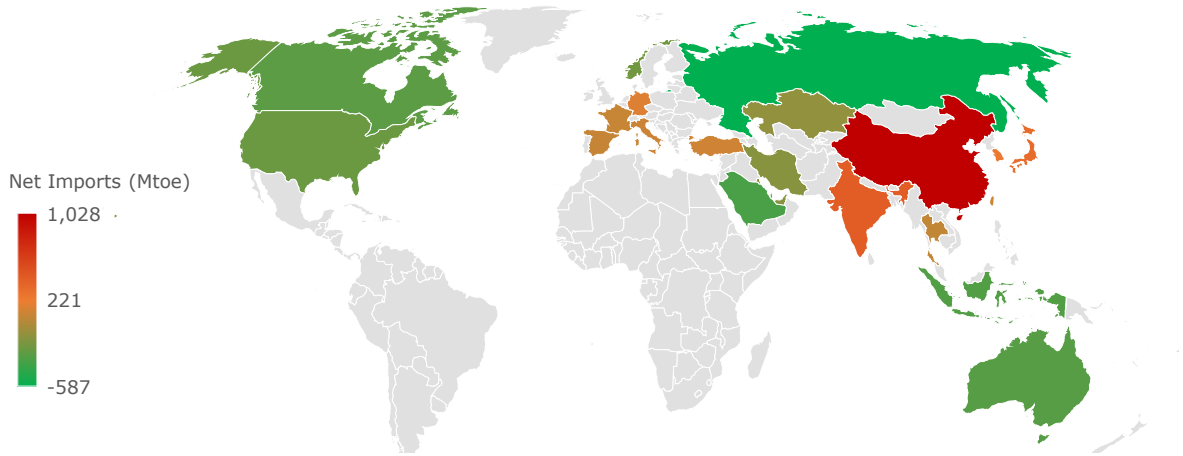
Beyond hydrocarbons, the energy transition introduces new geopolitical dynamics. Clean energy supply chains—especially for solar technologies—are highly concentrated, with China dominating global production and exports. This creates a parallel form of dependency, shifting geopolitical risk from fuel flows to industrial supply chains.

Overall, the global energy system is entering a phase where traditional and emerging dependencies coexist. The Strait of Hormuz crisis serves as a stark reminder that, despite progress in diversification and decarbonisation, the security of physical energy flows remains a cornerstone of global stability.

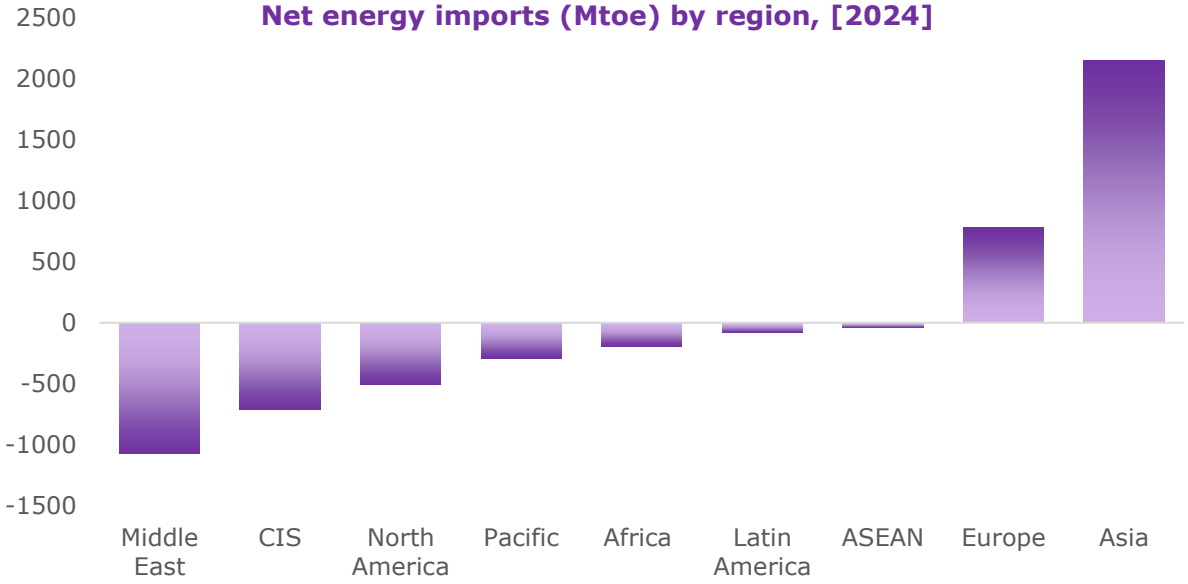
Global energy trade is asymmetric, with major import-dependent regions shaping geopolitical dynamics and supply security concerns.

- Asia emerges as the largest net energy importing region, reflecting strong demand growth and increasing dependence on external energy supplies.
- Europe remains a structurally import-dependent region, despite diversification efforts following the 2022 energy crisis.

Net energy imports (Mtoe) by country, [2024]



Net energy imports (Mtoe) by region, [2024]



- The Middle East and CIS countries are key net exporters, playing a central role in global energy supply and geopolitical influence.
- Global energy flows highlight persistent imbalances between supply-rich and demand-heavy regions, shaping trade routes and strategic alliances.

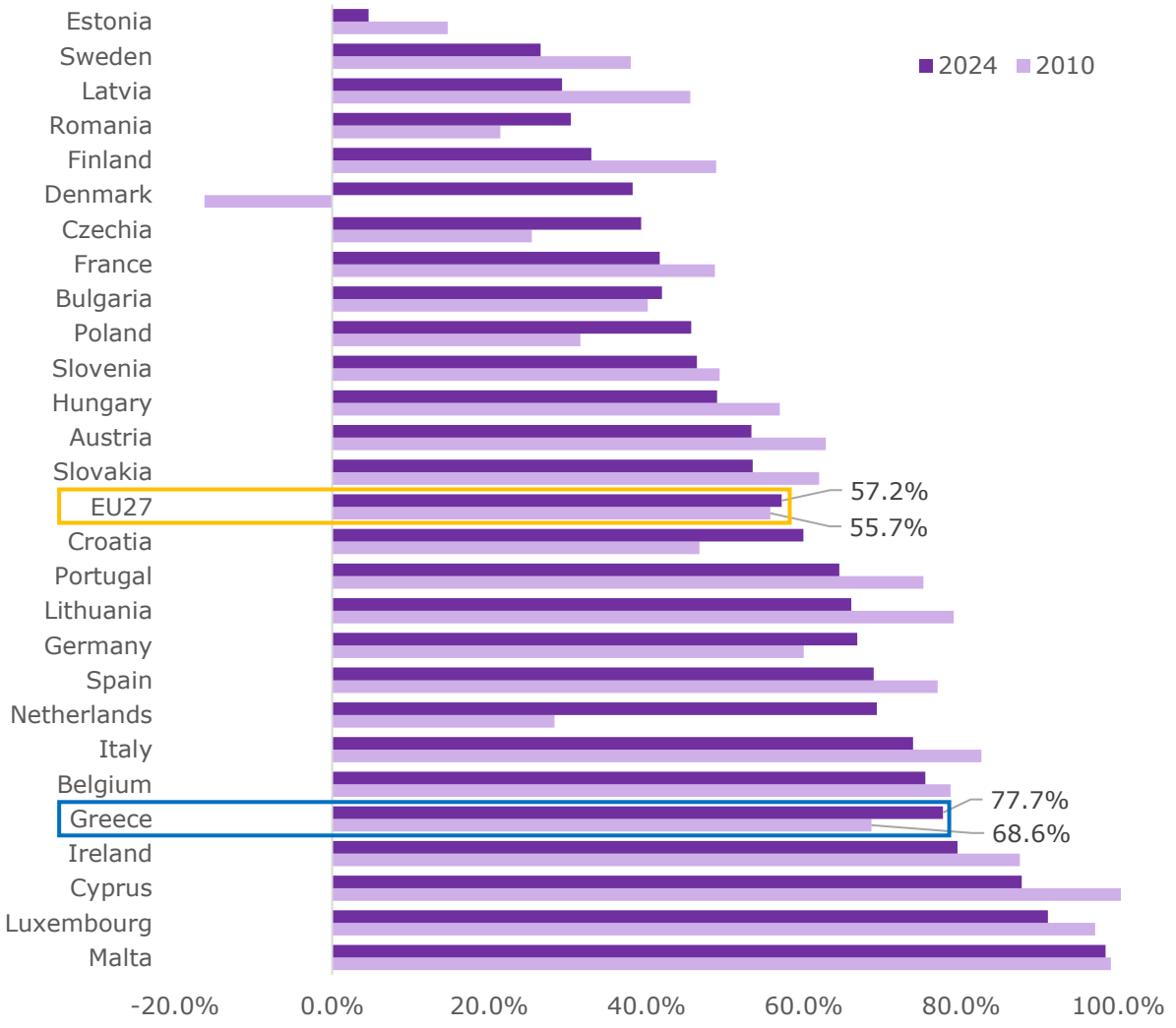
Source: World Bank, Enerdata, HAEE analysis

Energy import dependency remains high across the EU, with significant disparities, thus shaping national energy security strategies.

- The EU average import dependency remains around 55–57%, highlighting continued reliance on external energy sources despite diversification efforts.

- Greece records a high import dependency (~77%), reflecting structural reliance on imported fuels, particularly natural gas and oil.

Share of net imports in gross available energy by EU member State, [2010, 2024]



- Several EU countries show very high dependency levels above 80–90%, underlining limited domestic energy resources and strong exposure to global markets.

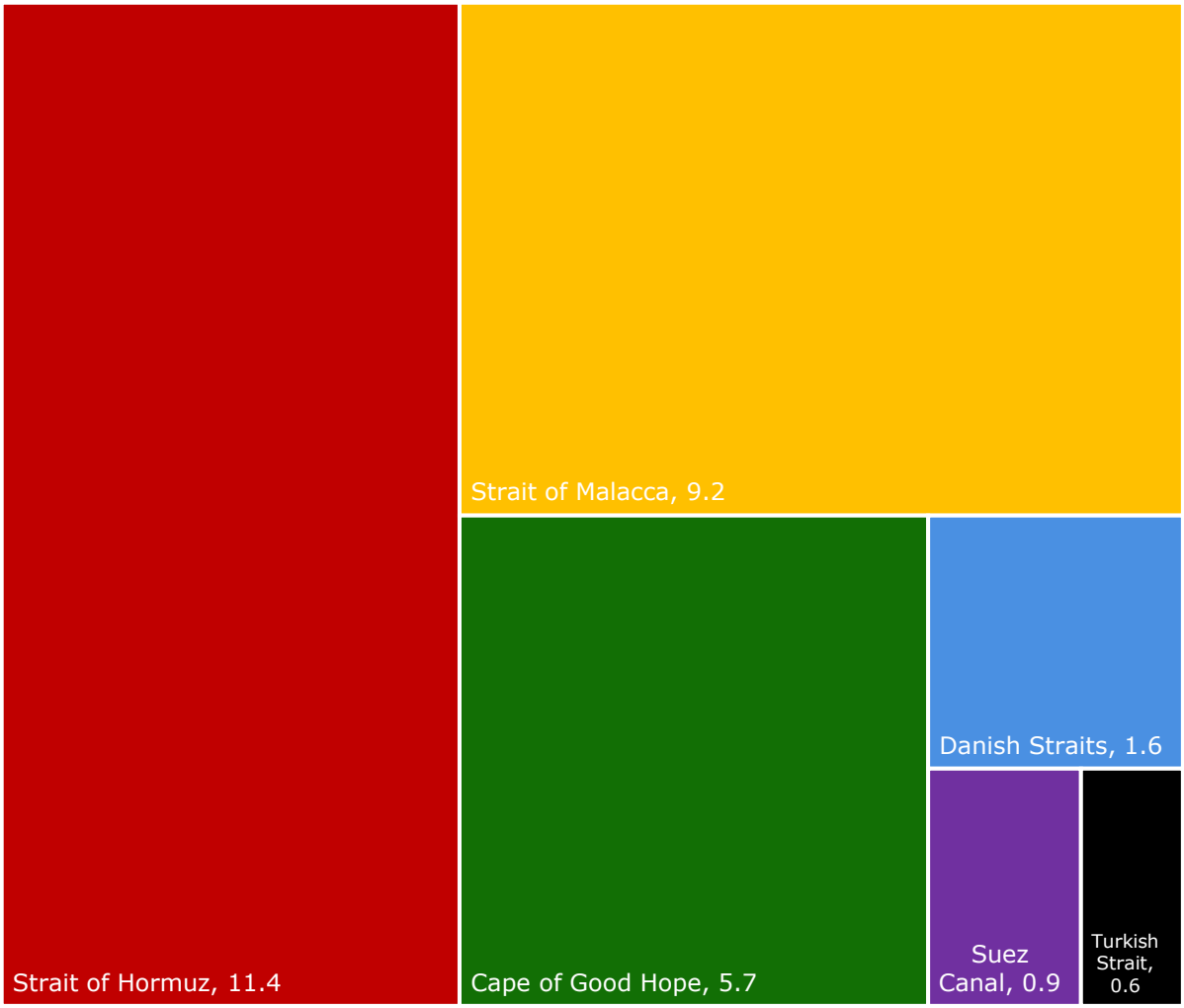
- Differences across member states reflect varying energy mixes, domestic resources and progress in renewable energy deployment.

Source: Eurostat, HAEE analysis

Global LNG flows remain highly concentrated in key chokepoints, with the Strait of Hormuz dominating and posing high geopolitical risk.

- The Strait of Hormuz handles the largest LNG volumes (~11.4 bcf/d), making it the most critical artery for global gas trade.
- The Strait of Malacca follows, linking major Asian importers to global LNG supply chains.

LNG quantities (bil. cubic feet per day) passing through global chokepoints, [2025 H1]



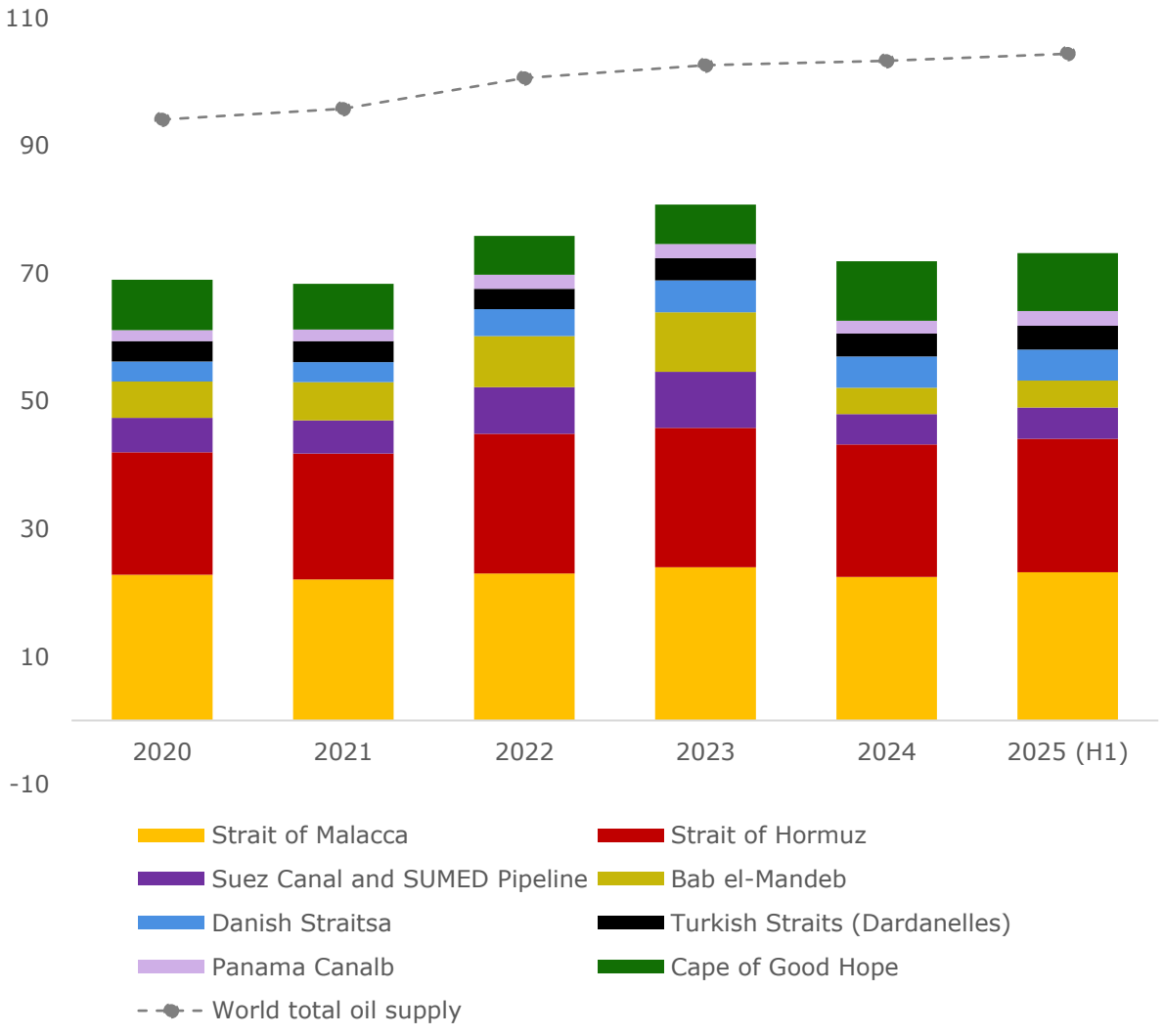
- Alternative routes like the Cape of Good Hope gain importance during disruptions, but increase costs and transit times.
- Smaller chokepoints such as the Suez Canal and Turkish Straits remain strategically important for regional flows despite lower volumes.

Source: Visual Capitalist, HAEE analysis

Global oil flows remain heavily exposed to chokepoints, with the Strait of Hormuz anchoring supply.

- The Strait of Hormuz consistently carries ~20 mb/d, making it the single most critical oil transit route globally.
- The Strait of Malacca is the second-largest corridor, linking Middle Eastern exports to Asian demand centers.

Oil quantities (mb/d per day) passing through global chokepoints, [2025 H1]



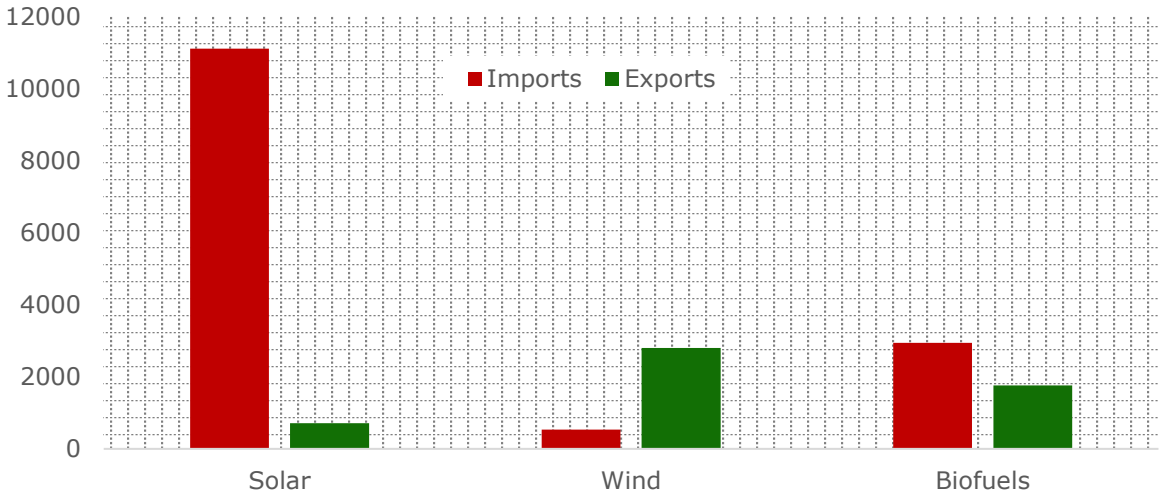
- Disruptions in the Bab el-Mandeb and Suez Canal can redirect flows, increasing reliance on longer routes like the Cape.
- The Cape of Good Hope acts as a fallback route, but significantly raises transport costs and delivery times during crises.

Source: EIA, HAEE analysis

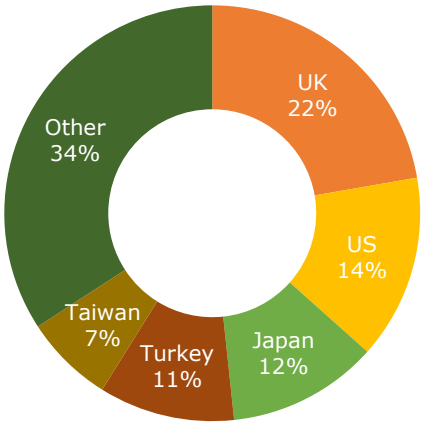
Europe's clean energy transition increasingly depends on global supply chains, exposing vulnerabilities in imports.

- EU solar deployment relies heavily on imports, with China accounting for ~98% of PV panel imports, highlighting strategic dependency.
- In contrast, the EU maintains a stronger position in wind, with significant exports of turbine equipment to markets like the United Kingdom and United States.

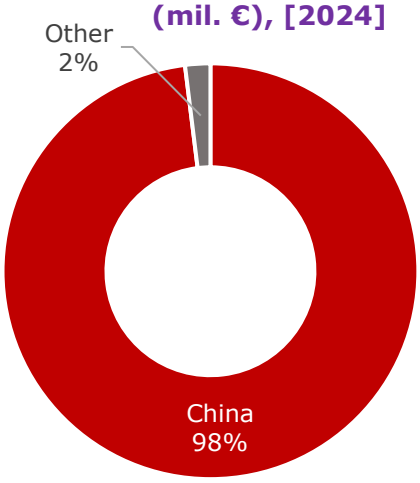
EU trade in selected green energy products (2024), [€ million]



Exports of wind turbine equipment from the EU (mil. €), [2024]



EU imports of PV panels, (mil. €), [2024]



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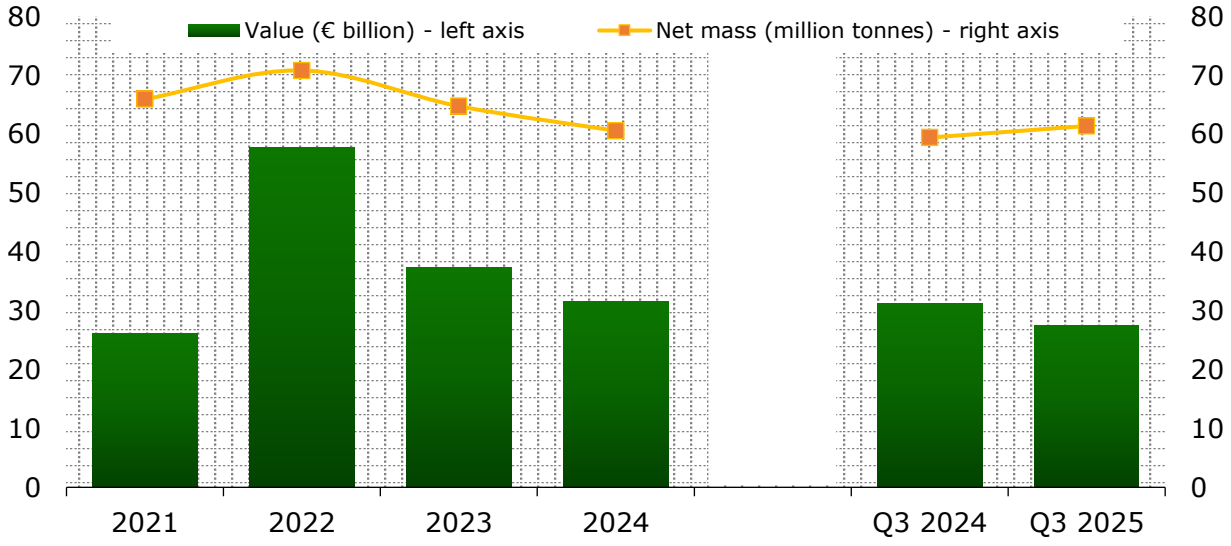
Source: Eurostat, HAEE analysis

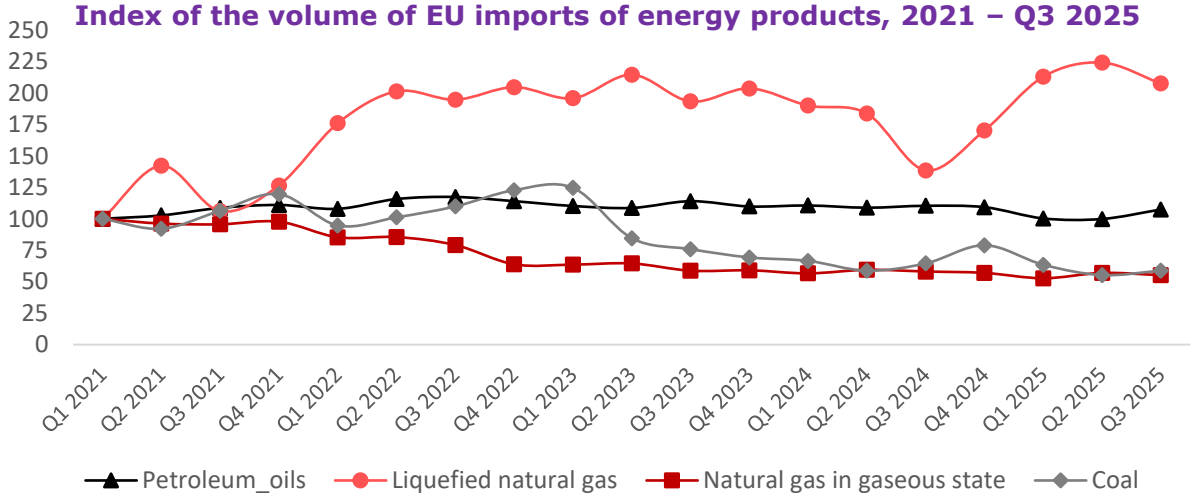
EU energy imports are stabilizing after the crisis peak, but LNG dependence remains elevated, reshaping trade patterns.

- Import values peaked in 2022 following the energy crisis, then declined as prices eased, despite relatively stable import volumes.
- LNG imports surged structurally, replacing pipeline gas and reinforcing Europe's exposure to global spot markets and maritime routes.

EU imports of energy products, [2021-2025]



Index of the volume of EU imports of energy products, 2021 – Q3 2025



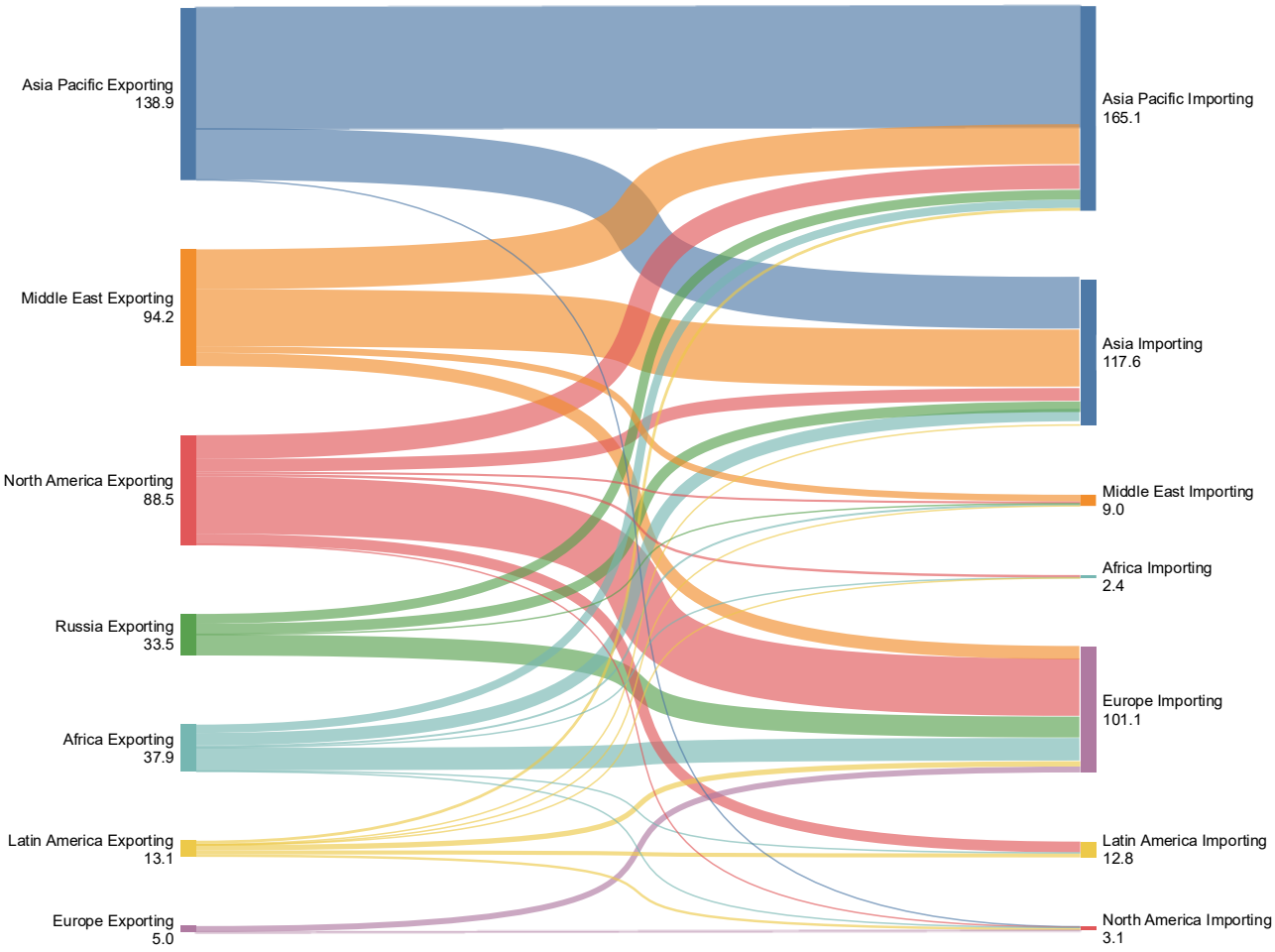
- Pipeline gas imports remain subdued, reflecting the long-term decoupling from Russian supply and a shift toward diversified sourcing.
- Oil imports show relative stability, while coal continues its structural decline, confirming the EU's gradual transition away from carbon-intensive fuels.

Source: Eurostat, HAEE analysis

Global LNG trade is increasingly polarized toward Asia, with flexible supply flows reinforcing competition between EU and Asia.

- Asia Pacific dominates global LNG demand, absorbing the largest share of exports and acting as the primary price-setting region.
- The Middle East and North America remain key suppliers, with flexible cargo redirection between Europe and Asia.

Global LNG trade (mil. tonnes) by region, [2024]



- Europe has emerged as a major LNG importer post-2022, intensifying competition with Asian buyers for spot cargoes.
- Russian LNG flows persist at lower levels, while African and Latin American exports provide diversification but remain relatively limited in scale.

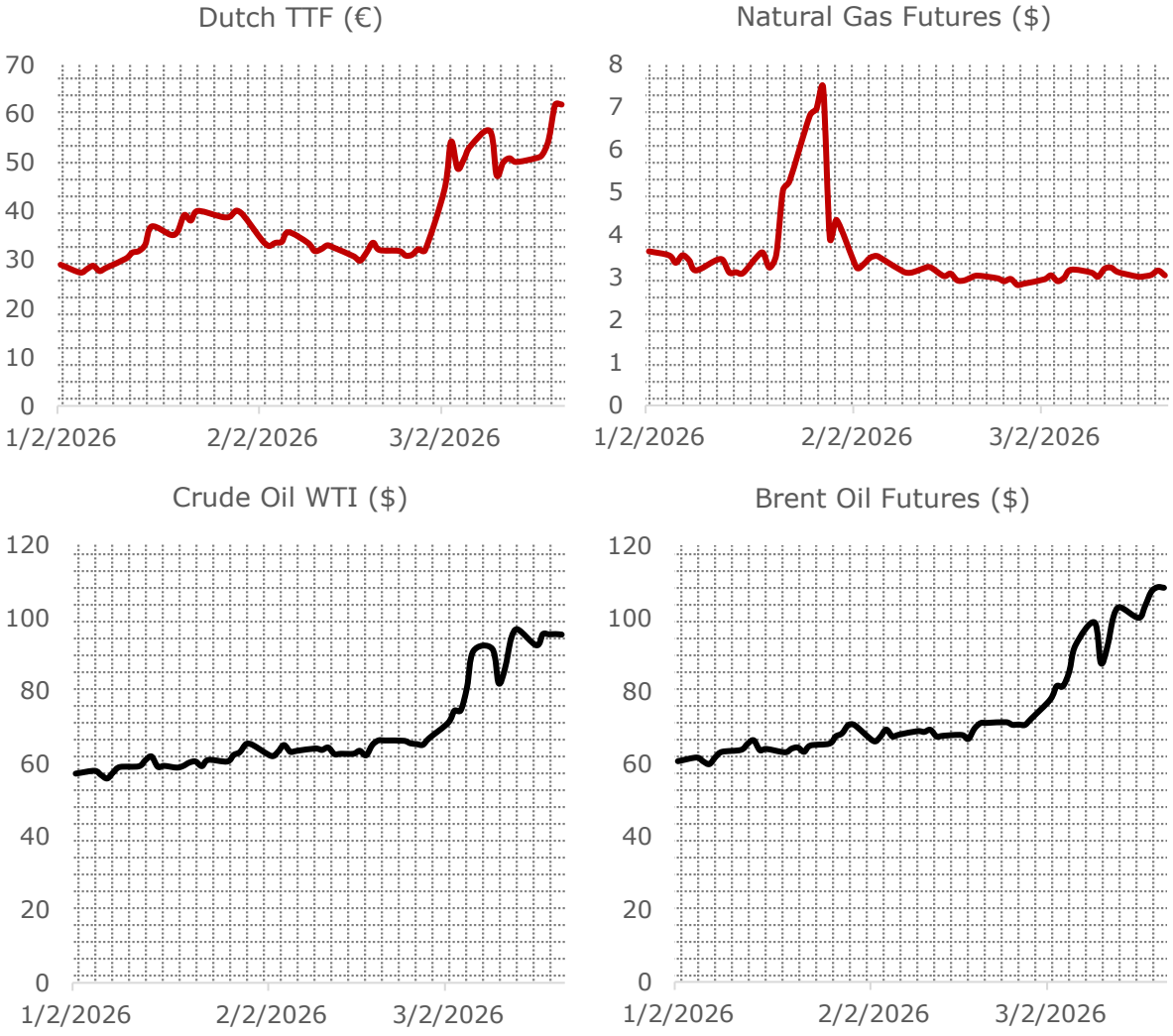
Source: Rystad Energy, GIIGNL, HAEE analysis

The Strait of Hormuz crisis triggered immediate price spikes across oil and gas markets, highlighting persistent vulnerability.

- The Strait of Hormuz disruption drove a sharp surge in European gas prices (TTF), reflecting heightened supply risk perceptions.

- Oil benchmarks reacted strongly, with Brent crude oil and WTI crude oil rising significantly as markets priced in potential supply constraints.

Prices of fuel commodities affected by the Strait of Hormuz crisis, [Jan 2026-Mar 2026]



- US gas markets (Henry Hub) showed a more limited response, indicating regional insulation compared to globally traded LNG-linked prices.

- The episode underscores how chokepoint risks can rapidly transmit volatility across energy markets, even without sustained physical supply disruptions.

Source: Trading Economics, HAEE analysis

Global rare earth reserves are highly concentrated, with China dominating supply, reinforcing strategic dependencies.

- China holds the largest share of global rare earth reserves, significantly outweighing other major producers and reinforcing its dominant position in global supply chains.

- Reserve distribution remains geographically concentrated, with limited diversification despite notable contributions from Brazil, Australia, and Vietnam.

Global rare earth mineral Reserves (mil. tonnes) by country, [2025]

- High concentration of reserves increases supply risk exposure for importing regions, particularly Europe, which lacks domestic critical mineral resources.

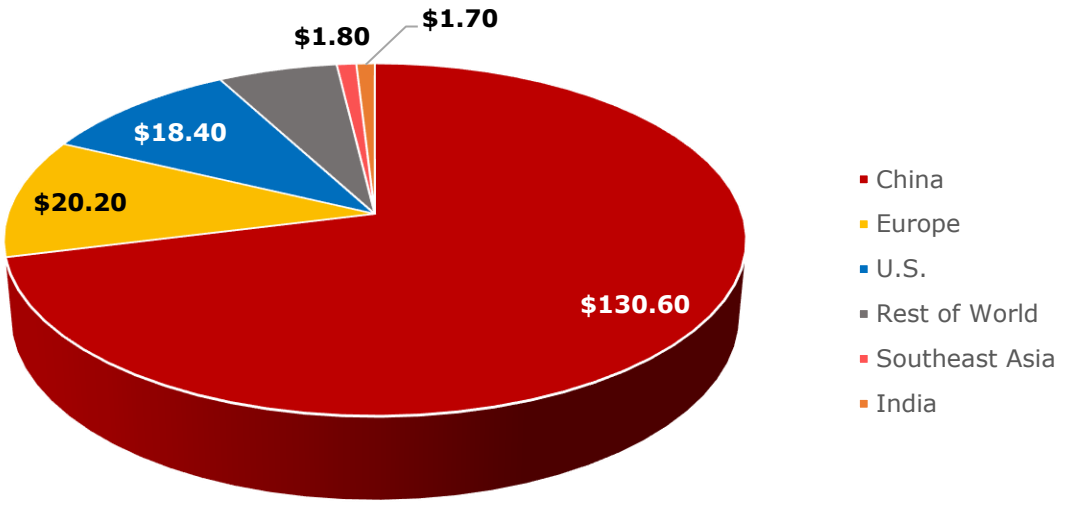
- Securing access to rare earths is becoming a strategic priority, linking industrial policy, energy transition goals, and geopolitical influence.

Source: Visual Capitalist, HAEE analysis

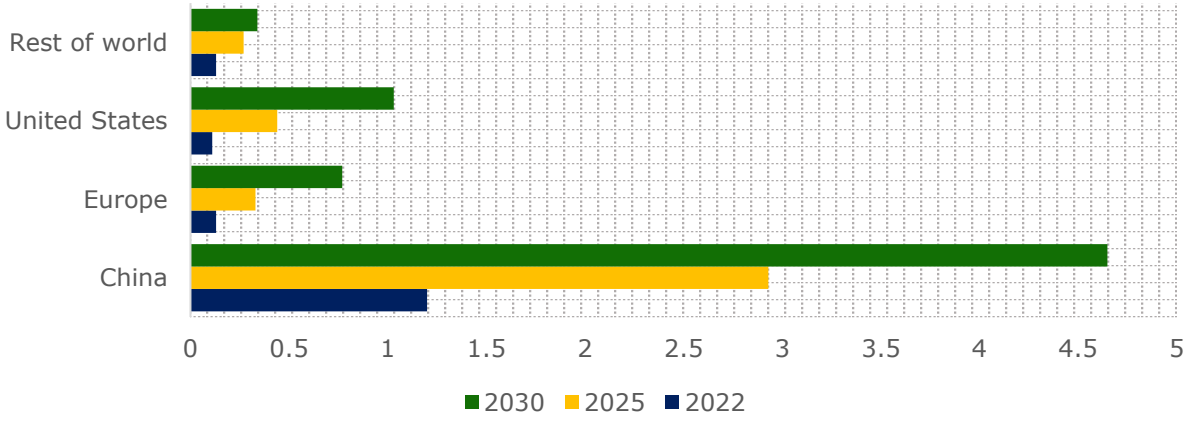
Battery manufacturing is overwhelmingly dominated by China, cementing the country in the clean energy value chain.

- China accounts for the vast majority of planned battery manufacturing investment, exceeding $130 billion, far surpassing Europe and the United States combined.
- Investment distribution highlights increasing industrial concentration, with limited scaling in emerging markets despite growing global demand for battery technologies.

Battery Manufacturing Investment (billion $) by Country, [2025-2026 Projection]



Lithium-ion battery manufacturing capacity (TWh) by country, [2022-2030]



- China's lithium-ion battery capacity is projected to expand significantly, reaching dominant levels by 2030 compared to Europe and the United States.
- Capacity gaps reflect strategic competition, with Europe and the U.S. accelerating policies to localize battery supply chains and reduce external dependencies.

Source: IEA, HAEE analysis

The Arabian Peninsula concentrates critical oil and gas infrastructure, making regional tensions a systemic risk to global energy flows.

- The Strait of Hormuz remains the primary export route for Gulf producers, handling a significant share of global oil and LNG trade.

- Major producers such as Saudi Arabia, United Arab Emirates, and Qatar rely on dense infrastructure networks linking fields to export terminals.

Oil and gas infrastructure in the Arabic peninsula

- Bypass routes, including pipelines across Saudi Arabia and the United Arab Emirates, partially mitigate risk but cannot fully replace Hormuz flows.

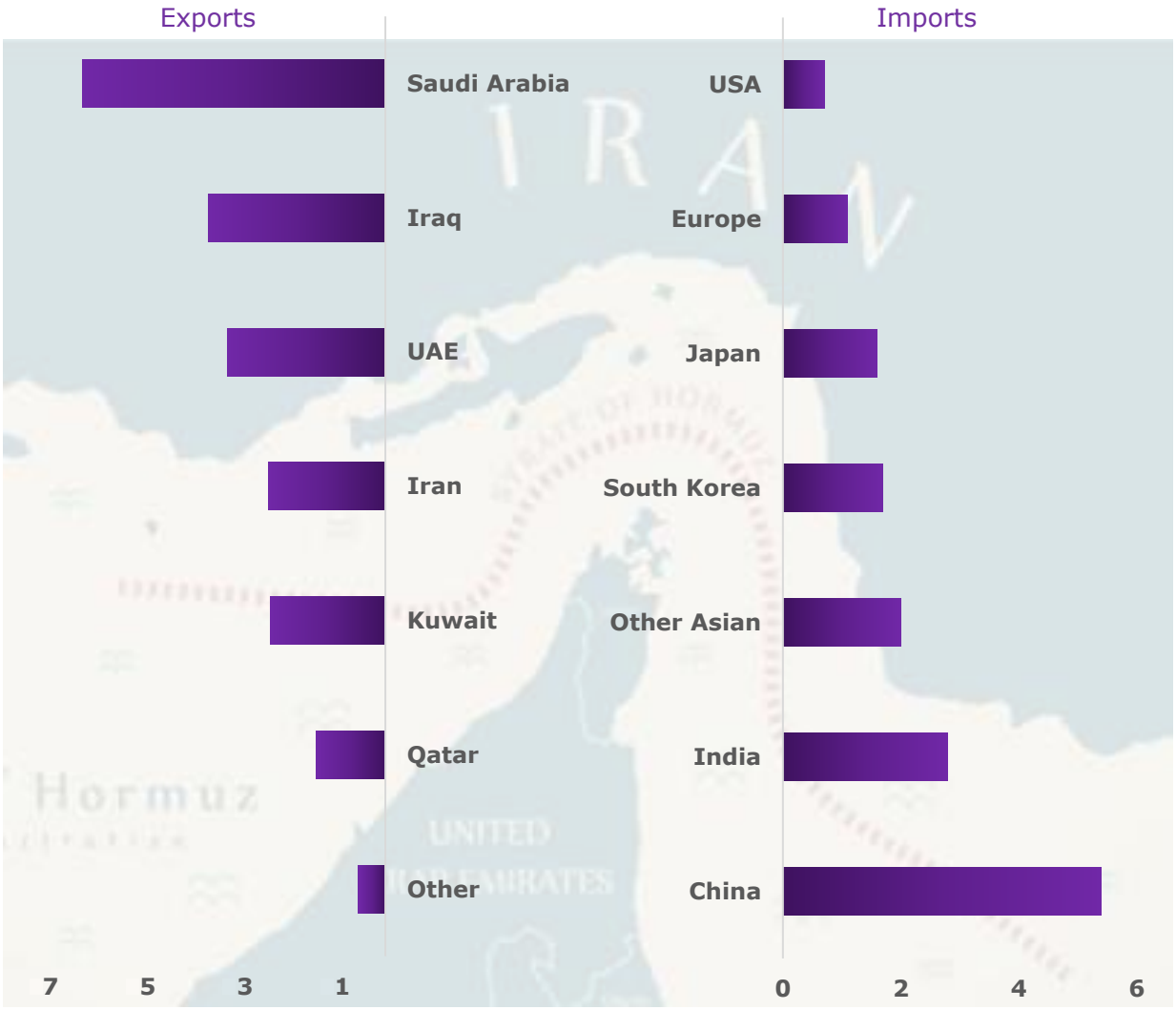
- Any disruption in the region rapidly escalates global supply concerns, reinforcing the strategic importance of infrastructure security and route diversification.

Source: HECSE, HAEE analysis

Oil flows through the Strait of Hormuz are highly concentrated, linking Gulf exporters to Asian demand.

- The Strait of Hormuz channels the majority of exports from Saudi Arabia, Iraq and the United Arab Emirates.
- On the demand side, China and India dominate imports, underscoring Asia's central role in global oil trade.

Quantities (mb/d) of oil passing through the Strait of Hormuz, (2025)



- European and US import exposure is comparatively limited, reflecting diversified supply routes and lower dependence on Gulf crude.
- The concentration of both supply and demand around a single chokepoint magnifies the global impact of any disruption in Hormuz.

Source: EIA, HAEE analysis

Data Sources

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Acronyms and abbreviations

AC	Alternative Current
BEV	Battery Electric Vehicle
CAGR	Compound Annual Growth Rate
CCS	Carbon Capture and Sequestration/Storage CRES
CCUS	Carbon Capture, Utilisation & Storage
CNG	Compressed natural gas
CfD	Contracts for differences
DAM	Day-Ahead Market
DC	Direct Current
ESG	Environmental, Social and Governance
EV	Electric Vehicle
EU	European Union
FEC	Final Energy Consumption
FSRU	Floating Storage and Regasification Unit
FSU	Floating Storage Unit
GDP	Gross Domestic Product
GHG	Greenhouse gases
ICE	Internal Combustion Engine
IDR	Issuer Default Rating
LCOE	Levelized Cost of Electricity
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MCP	Market Clearing Price
NECP	National and Climate Energy Plan
NG	Natural Gas
NII	Non-Interconnected Islands
NIR	National Inventory Report
NNGS	National Natural Gas System
NPEs	Non-Performing Exposures
OECD	Organisation for Economic Co-operation and Development
PEC	Primary Energy Consumption
PPA	Power Purchase Agreement
PV	Photovoltaic
RECAI	Renewable Energy Country Attractiveness Index
RES	Renewable Energy Sources
RRF	Recovery and Resilience Facility
RU	Russia
R&D	Research and Development
SE	Southeastern
SMP	System Marginal Price
SSLNG	Small Scale LNG
TAP	Trans Adriatic Pipeline
Y-o-Y	Year-over-Year

Units of measurement

bcm	billion cubic meters
bpd	barrels per day
bn	billion
CO2	carbon dioxide
EJ	exajoule
gr	grams
GJ	gigajoule
GW	gigawatt
GWh	gigawatt hour
ktoe	thousand tonnes of oil equivalent
kW	kilowatt
kWh	kilowatt hour
m3	cubic meter
mcum	million cubic metres
Mt	million tonnes
MtCO2	million tonnes of carbon dioxide
MtCO2-eq	million tonnes of carbon dioxide equivalent
Mtoe	million tonnes of oil equivalent
MW	megawatt
MWh	megawatt hour
m/s	meter pes second
pp	percentage points
sqm	square meter
tCO_2	tonne of carbon dioxide
toe	tonne of oil equivalent
tn	tonne
TWh	terawatt hour

Conversion of units

Natural and LNG	**To convert**						
	Billion cubic metres NG	Billion cubic feet NG	Petajoules NG	Million Tonnes oil equivalent	Million Tonnes LNG	Trillion British thermal units	Million barrels oil equivalent
From	Multiply by						
1 billion cubic metres NG	1.000	35.315	36.000	0.860	0.735	34.121	5.883
1 billion cubic feet NG	0.028	1.000	1.019	0.024	0.021	0.966	0.167
1 petajoue NG	0.028	0.981	1.000	0.024	0.021	0.952	0.164
1 million tonnes oil equivalent	1.163	41.071	41.868	1.000	0.855	39.683	6.842
1 million tonnes LNG	1.360	48.028	48.747	1.169	1.000	46.405	8.001
1 trillion British thermal units	0.029	1.035	1.050	0.025	0.022	1.000	0.017
1 million barrels oil equivalent	0.170	6.003	6.093	0.146	0.125	5.800	1.000
Units							
1 metric tonne	= 2204.62 lb		= 1.1023 short tons				
1 kilolitre	= 6.2898 barrels						
1 kilolitre	= 1 cubic meter						
1 kilocalorie (kcal)	= 4.1868 kJ		= 3.968 Btu				
1 kilojoule (kJ)	= 0.239 kcal		= 0.948 Btu				
1 petajoule (Pj)	= 1 quadrillion joules (1x10^15)						

Crude Oil	**To convert**					
	Tonnes (metric)	Kilolitres	Barrels	US gallons	Tonnes/year	
From	Multiply by					
Tonnes (metric)	1	1.165	7.33	307.86	-	
Kilolitres	0.8581	1	6.2898	264.17	-	
Barrels	0.1364	0.159	1	42	-	
US gallons	0.00325	0.0038	0.0238	1	-	
Barrels/day	-	-	-	-	49.8	
	To convert					
Products	Barrels to tonnes	Tonnes to barrels	Kilolitres to tonnes	Tonnes to Kilolitres	Tonnes to gigajoules	Tonnes to barrels of oil equivalent
From	Multiply by					
Ethane	0.059	16.850	0.373	2.679	49.400	8.073
LPG	0.086	11.600	0.541	1.849	46.150	7.542
Gasoline	0.120	8.350	0.753	1.328	44.750	7.313
Kerosene	0.127	7.880	0.798	1.252	43.920	7.177
Gas oil/diesel	0.134	7.460	0.843	1.286	43.380	7.089
Residual fuel oil	0.157	6.350	0.991	1.010	41.570	6.793
Product basket	0.124	8.058	0.781	1.281	43.076	7.039
Units						
1 exajoule (EJ)	= 1 quintillion joules (1x10^18)					
1 Briitish thermal unit (Btu)	= 0.252 kcal			= 1.055kJ		
1 tonne of oil equivalent (toe)	= 39.683 million Btu			= 41.868 million kJ		
1 barrel of oil equivalent (boe)	= 5.8 million Btu			= 6.119 million kJ		
1 kilowatt-hour (kWh)	= 860 kcal		= 3412 Btu		= 3600 kJ	

Source: BP Approximate conversion factors – Statistical Review of World Energy – updated July 2021

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