

№

05

10
26

MEMO *info*

A market that connects,
energy that creates value.



Contents

Introduction.....	3
From Certificate to Market Product: The New Value of Green Energy.....	4
Comparative Analysis of the Day-Ahead Market: Before and During the Early Stages of CBAM in the Republic of North Macedonia	6
Negative Electricity Prices as a Driver for Adaptation, Innovation and New Opportunities.....	13
Current Developments	17
European Trends	22

Introduction

It is our pleasure to present the fifth issue of MEMO Info, the electronic newsletter of the National Electricity Market Operator – MEMO LLC Skopje.

This issue features topics that reflect current developments and new perspectives in the evolution of the Macedonian energy market. One of the key topics is the introduction of auctions for Guarantees of Origin for electricity, representing a crucial step towards greater transparency and the development of the green energy market. We also look at the possibility of introducing negative prices, as a natural step in the development of the organised market and the alignment of the Macedonian market with European market mechanisms.

Particular attention is also given to the Carbon Border Adjustment Mechanism (CBAM) and its impact on the electricity market, in the context of European decarbonisation policies and the gradual alignment of the energy sector with European regulatory and market mechanisms.

In the "Current Developments" section, we highlight the latest developments related to MEMO's role in the energy sector, including the expansion of its responsibilities through the assumption of the role of natural gas market operator in the country.

As in previous issues, we also focus on international cooperation and current European trends in the organisation, development and integration of energy markets.

We believe that this issue of MEMO Info will once again provide useful information, expert insights and a timely overview of the processes shaping the Macedonian and European energy markets, as well as the challenges and opportunities arising from their continued transformation.



National Electricity Market Operator – MEMO LLC Skopje



Rafajlovski:

FROM CERTIFICATE TO MARKET PRODUCT: THE NEW VALUE OF GREEN ENERGY

By: Denko Rafajlovski, Renewable Energy Manager

National Electricity Market Operator – MEMO DOOEL Skopje

The energy transition is not only about building new solar and wind power plants; it also entails creating mechanisms that will enable clean energy to acquire a clear, recognisable and real economic value. It is precisely in this context that the introduction of auctions for Guarantees of Origin for electricity should be viewed.

With the establishment of the Register in 2025, the National Electricity Market Operator – MEMO DOOEL Skopje created the basis for the issuance, transfer, cancellation and management of Guarantees of Origin.

MEMO's full membership of the Association of Issuing Bodies (AIB) represents another crucial step towards connecting the domestic market with the European system.

More specifically, on 20 May this year, in Athens, at the General Assembly of the Association of Issuing Bodies (AIB), MEMO became a full member of the Association. Together with the activities undertaken by the Ministry of Energy, Mining and Mineral Resources and the Energy Community Secretariat to facilitate the mutual recognition of Guarantees of Origin for electricity (Guarantees of Origin – GOs) between European Union countries and Energy Community countries, this brings Macedonia one step closer to joining the European system for the issuance, transfer and recognition of Guarantees of Origin.

Guarantees of Origin represent a unique and internationally recognised proof of the origin of electricity generated from renewable sources, and their role is becoming increasingly important amid accelerated decarbonisation and growing demand for proof of green energy consumption.

The next logical step is to create a transparent market mechanism for determining their value.

Auctions should precisely ensure that the price of Guarantees of Origin is determined through actual supply and demand. Instead of their value depending on limited or bilateral agreements, the market mechanism will enable all participants to gain a clearer picture of the actual value of the green component of the electricity generated.

This is particularly important for renewable energy producers. A Guarantee of Origin confirms that a certain quantity of electricity has been generated from a renewable source, but as the market develops, that certificate ceases to be merely an administrative document. It becomes an instrument through which producers can further valorise the green value of their generation.

At the same time, auctions create a clearer and more competitive way for suppliers and companies to secure Guarantees of Origin. This is particularly important for companies operating in the European market and facing increasingly stringent requirements related to decarbonisation, sustainable business practices and the reduction of their carbon footprint.

The growth in interest in this segment is already visible. Since April 2025, more than 500,000 Guarantees of Origin have been issued. This data shows that the market is gradually developing and that there is a real need for its further structuring and deepening.

Therefore, the introduction of auctions should not be viewed merely as the introduction of a new trading instrument. It is part of a broader ambition – to build a modern and functional green energy market in which transparency, competition and market signals will play a vital role.

Through further integration into the AIB network, efforts to secure recognition of Macedonian Guarantees of Origin in the European Union, and the development of the auction mechanism, we are creating the conditions for the domestic market to become more dynamic and liquid.

Ultimately, the goal is simple, but fundamentally important: for the Guarantee of Origin to become not merely a certificate of the origin of electricity, but a genuine market product.

When green energy acquires a clear and transparently determined market value, we create another important incentive for investment in renewable energy sources and for a just green transition.

Milosevska:

COMPARATIVE ANALYSIS OF THE DAY-AHEAD MARKET: BEFORE AND DURING THE EARLY STAGES OF CBAM IN THE REPUBLIC OF NORTH MACEDONIA



By: Stojana Megan Milosevska, Energy Markets Specialist

National Electricity Market Operator – **MEMO DOOEL Skopje**

INTRODUCTION

Europe's energy transition, driven by the European Green Deal and the goal of achieving climate neutrality by 2050, has led to the introduction of new regulatory mechanisms aimed at reducing greenhouse gas emissions and strengthening the competitiveness of the low-carbon economy[1]. In this context, the European Union introduced the Carbon Border Adjustment Mechanism, whose main objective is to prevent carbon leakage by establishing equal carbon costs for domestic producers and importers of products from third countries.

Although CBAM is still in its initial phase, its direct impact on the electricity sector can already be observed through changes in production costs, competitiveness and cross-border electricity trading. Under these conditions, the organised electricity market, particularly the day-ahead market segment, plays a key role, as the formation of reference market prices and the efficient allocation of electricity provide indicators for the further development of the economy.

Prices formed on the day-ahead market represent a reference indicator for Market Participants, as they reflect expectations regarding the relationship between supply and demand, the availability of generation capacities, energy prices and cross-border electricity flows. In addition, they provide a basis for the functioning of other segments of the electricity market, as well as for making trading and investment decisions.

2. ANALYSIS OF MARKET INDICATORS OF THE DAY-AHEAD MARKET

To obtain a comprehensive overview of the state of the electricity market, the analysis is based on several market indicators covering the main characteristics and changes in market behaviour. Since the electricity market is influenced by multiple factors, such as demand, supply, renewable generation, market liquidity and the conditions in neighbouring systems, a single indicator is not sufficient for a comprehensive assessment of its functioning. Therefore, the analysis uses indicators covering different aspects of the market, such as price levels and volatility, market liquidity, differences between prices during peak and off-peak hours, and the impact of renewable energy generation.

The combined assessment of these indicators provides a better understanding of market conditions and helps identify periods of increased price uncertainty, changes in liquidity, unusual price movements and differences in market behaviour across different periods. In this way, the analysis of the selected indicators is used to assess the development and stability of the electricity market, as well as to identify the main factors that may affect its performance during the period under review.

2.1 Price Volatility Index

For the purposes of the analysis, the price volatility values are obtained according to the following formula and they represent the degree of deviation of the hourly electricity prices from their average value in the analysed period:


$$\text{Price Volatility} = \sqrt{\frac{\sum(\text{Price} - \text{Average Price})^2}{\text{Number of Hours}}}$$

Price Volatility – price volatility for the period under review;

Price – price for the period under review;

Average price - average price for the period under review;

Number of Hours – number of hours.

Accordingly, based on the result obtained, prices may be classified as having high, normal or low volatility. Higher price volatility values indicate increased price fluctuations and potential short-term imbalances between electricity supply and demand. Conversely, lower volatility values are associated with greater stability, more uniform price movements and more efficient matching of Market Participants.

In European practice, a higher incidence of periods of high volatility is most commonly associated with a greater share of variable renewable energy sources, constraints on cross-border transmission capacities and short-term market imbalances. Hence, the analysis of price volatility is an important indicator for assessing market stability, liquidity and the ability of the market to respond to external shocks and changes in market conditions.

According to the results obtained for price volatility for the 2024–2026 period, the high-volatility category was present in all three years, accounting for 63.70% in 2024, 66.46% in 2025 and 59.70% in 2026. Such representation indicates that market prices have often been influenced by factors that cause pronounced market fluctuations. The high volatility is a feature of a young market that is in the development phase, so it can be noted that the volatility for 2026 compared to 2024 is significantly reduced, and thus the price distortion itself is reduced.

Table 1. Average price volatility

Volatility level	Average price volatility		
	2024	2025	2026
High volatility	63.7%	66.46%	59.70%
Normal volatility	23.12%	33.54%	25.89%
Low volatility	13.18%	X	14.42%

2.2 Relative Market Liquidity Index

High liquidity is considered an indicator of a mature market, and MEMO's liquidity depends not only on domestic trading but also on developments in neighbouring markets such as HUPX, SEEPEX and IBEX. Regional integration and cross-border trading enable more efficient price convergence and an increase in transaction volumes, which has a positive effect on market liquidity.

For the purposes of this research, a proprietary Relative Market Liquidity Index was developed, using the base traded volume (MWh) as its main parameter. This index reflects the market's ability to absorb buy and sell orders without causing significant price deviations. At the daily level, the total daily traded volume is used, while at the monthly and annual levels, the average daily volume for the respective period is calculated. The Relative Market Liquidity Index is defined according to the following formula:

$$2 \quad \text{Relative Market Liquidity Index} = \frac{\text{Current Volume Base}}{\text{Benchmark Volume}}$$

Relative Market Liquidity Index – Relative Market Liquidity Index;

Current Volume Base – base traded volume;

Benchmark Volume – reference (base) trading volume against which the current volume is compared and which serves as the benchmark value for comparing current market liquidity.

Table 2. Relative Market Liquidity Index

Relative Market Liquidity Index		
2024	2025	2026
1	1.42	1.81

The results show that relative market liquidity increased during the period under review, from 1.00 in 2024 to 1.81 in 2026 compared with 2024, representing an increase of 81%. This trend indicates a significant improvement in liquidity and increased market activity, with traded volumes in 2026 significantly exceeding the reference base volume recorded in 2024. At the same time, the number

of days classified as periods of high liquidity increased from 76 days in 2024 to 92 days in 2026. The number of days with low liquidity decreased from 105 days in 2024 to 57 days in 2026, representing a decrease of 45.71%. These results demonstrate increased market activity.

This trend is expected given the gradual increase in traded volumes and the continued development of the organised electricity market, which contributes to increased liquidity and a reduction in periods of limited market activity. However, it also reflects the fact that electricity Market Participants see an opportunity to sell their electricity within the country because they are still uncertain about the newly introduced CBAM mechanism.

2.3 RES Impact Index

The RES Impact Index is analyzed as a third market indicator. The Renewable Impact Index represents an indicator that approximates the impact of renewable energy generation on day-ahead market prices. The index is calculated as the difference between the average price for the period under review and the average price during the hours of expected peak renewable generation (11:00–16:00):

$$\text{Renewable Impact Index} = \text{Period Average Price} - \text{Daytime Average Price}$$

Renewable Impact Index – RES Impact Index;

Period Average Price – average electricity price for the period under review;

Daytime Average Price – average price during daytime hours, 11:00–16:00.

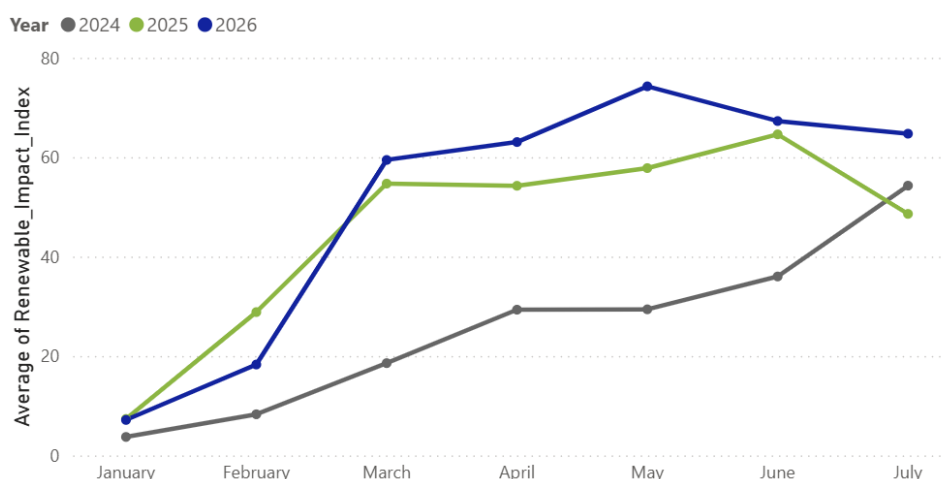


Fig. 1. Average RES Impact Index

According to the results shown in Figure 1, an increasing trend in the Renewable Impact Index can be observed over the period from 2024 to 2026, indicating a stronger impact of renewable energy sources on market dynamics. The values were particularly pronounced in 2025, when the average Renewable Impact Index was 45.25, while in 2026 it was 50.61. The index reached significantly higher levels compared with 2024, when the average index was 25.75. This shows that daytime prices during the hours of highest solar generation are increasingly lower than the average price for the period, which is characteristic of markets with a higher level of renewable energy integration.

In addition, the base traded volume, average price, as well as the average price during peak hours and the average price during off-peak hours for the period under review are presented in Table 4:

Table 3. Comparison of Results

	2024	2025	2026
Base Traded Volume	2527.64 MWh	3628.65 MWh	4409.06 MWh
Average Price	85.14€/MWh	109.36€/MWh	95.12€/MWh
Average price during peak hours	79.19€/MWh	€97.20/MWh	75.75€/MWh
Average price during off-peak hours	€91.08/MWh	121.52€/MWh	114.48€/MWh

The analysis shows that the average price during the summer days has been significantly reduced from €67.85 /MWh in 2026, compared to the average price of €101.42 /MWh for the same period in 2024. The results indicate positive market development, characterised by a significant increase in trading volumes, improved liquidity and a more pronounced impact of renewable energy sources on the formation of market prices

The results indicate positive market development, characterised by a significant increase in trading volumes, improved liquidity and a more pronounced impact of renewable energy sources on the formation of market prices. These circumstances contribute to an increase in supply, growth in trading volumes and improved MEMO liquidity. Hence, it can be concluded that, under conditions of energy transition and the gradual implementation of CBAM, the organised market is increasingly emerging as a key mechanism for placing electricity on the market and forming transparent and competitive market prices.

3. CONCLUSION

Although CBAM was designed as a mechanism to promote decarbonisation and protect the competitiveness of European industry, its effects are already beginning to be felt in electricity markets. Additional costs at the borders contribute to greater price differences between markets and a reduction in cross-border trading, with some electricity surpluses remaining in domestic markets instead of being traded regionally. In this way, the mechanism may lead to fragmentation rather than further integration of regional markets.

In an era of rapid energy transformation, increasing renewable energy generation, digitalization, and growing regional integration, the need for clear and reliable market indicators is becoming even more important. Indices derived from the day-ahead market of MEMO should not be seen only as technical calculations. They are important analytical instruments that help explain the functioning of the electricity market, its stability, efficiency, and future direction of development.

The challenges are particularly pronounced in countries with limited export potential from renewable energy sources. During months when solar generation reaches high levels while consumption decreases, some of the electricity generated cannot be fully consumed, exported or stored. Therefore, further development of cross-border infrastructure, regional trading and market coupling mechanisms remains crucial for increasing liquidity, improving the integration of renewable energy sources, strengthening energy security and reducing long-term risks associated with carbon regulations.

**Nikola Maksimovski:**

NEGATIVE ELECTRICITY PRICES AS A DRIVER FOR ADAPTATION, INNOVATION AND NEW OPPORTUNITIES

Nikola Maksimovski, Energy Markets Specialist
National Electricity Market Operator – **MEMO DOOEL Skopje**

Introduction

Can electricity have a negative price? Although this may sound unusual at first, it is becoming an increasingly common reality in European electricity markets. During certain hours, when electricity supply is high relative to demand, some producers are willing to sell their electricity at a price below zero.

The growing generation of electricity from renewable energy sources, particularly photovoltaic and wind power plants, is creating new conditions for the formation of market prices. Negative prices represent a new market reality that creates opportunities for more efficient use of generated electricity, the development of flexibility, and further integration with European markets.

Reasons for the Occurrence of Negative Prices

Negative prices occur when electricity supply in the market is higher than demand, while the possibilities for reducing generation, increasing consumption, storing or exporting electricity are limited. This happens most often:

- during sunny days in spring and summer, when increased generation from renewable energy sources is recorded;
- during weekends and public holidays, when industrial consumption is lower;
- during periods of strong generation from wind power plants;
- when transmission capacities are limited;
- when generation capacities do not have sufficient flexibility to rapidly reduce their output.

During certain hours, when electricity supply is high relative to demand, some producers are willing to sell their electricity at a price below zero.

For the Macedonian market, the continuous growth in the number of photovoltaic power plants represents an additional factor affecting electricity price formation. Due to their low operating costs, these generation facilities offer electricity at competitive prices, particularly during hours of high solar generation. As a result, pressure on market prices is increasing, while changes in the dynamics of supply and demand on the Macedonian electricity exchange are becoming more pronounced.

Increased Market Opportunities

The ability to submit orders at negative prices allows participants to trade in a wider price range and more efficiently adapt their activities to current market conditions.

For renewable energy producers, the wider price range creates additional opportunities to sell the electricity they generate, even during periods of high generation and low demand, when market prices may reach negative values. At the same time, low and negative prices create new opportunities for consumers, particularly industrial companies that can adjust their operations and increase consumption during hours when electricity is cheapest.

At the same time, this creates scope for the development of electricity storage systems, which can absorb electricity during periods of low prices and deliver it to the market when demand and prices are higher. In this way, negative prices create an economic incentive for the development of flexibility and more efficient use of generated electricity.

Impact on Market Participants

Negative prices have different impacts on market participants. For producers, they represent a challenge in managing revenues and planning future investments, particularly for power plants whose generation depends on weather conditions. At the same time, such price movements create incentives to invest in storage systems, improve generation forecasting, and develop hybrid power plants.

For suppliers and traders, low and negative prices create opportunities for cheaper electricity procurement and the development of new products for their customers, while at the same time requiring more appropriate strategies for managing price risks.

Consumers, particularly industrial companies with flexible production processes, have an opportunity to adjust their consumption to market conditions and reduce their electricity costs. In this way, active consumer participation becomes an important factor in the more efficient functioning of the market.

The Role of MEMO in Conditions of Negative Prices

The primary role of an organised electricity market is to ensure transparent price formation based on supply and demand. In this context, negative prices represent a market signal reflecting conditions during periods of high generation and reduced demand.

For MEMO, as the operator of the organised electricity market, such market conditions create opportunities for greater market participant activity and the development of new trading models, particularly in the intraday market. At the same time, negative prices create an economic incentive for the development of energy storage systems, aggregators and active demand-side management.

By providing transparent and efficient market mechanisms, MEMO plays an important role in creating conditions for the more efficient use of renewable energy sources and the development of a more flexible electricity system.

Challenges and Opportunities

As the share of renewable energy sources increases, the Macedonian electricity sector faces the need for further development of market mechanisms and greater flexibility on both the generation and consumption sides. In such conditions, particular importance is attached to investments in electricity storage systems, improvements in generation and consumption forecasts, and greater participation in the intraday market, which enables market participants to adjust their trading positions closer to the time of physical delivery.

Conclusion

Negative electricity prices represent a new reality in modern markets, arising from changes in the way electricity is generated and consumed. Although they create certain financial challenges for producers, they also open up new opportunities for consumers, the development of storage systems, and more efficient use of renewable energy sources.

For MEMO, negative prices represent a new phase in the development of the organised market, greater market participant activity, and more efficient balancing of supply and demand.

The future of the electricity sector lies not only in generating more green energy, but also in creating a flexible system that will enable this energy to be efficiently absorbed, stored and used at the times when it is most needed.

UPDATES

MEMO to Become the Natural Gas Market Operator



The Government has opted for an integrated model under which the electricity market operator will also assume responsibilities related to the organization of the natural gas market.

The Government has adopted a decision to establish a natural gas market operator, with this function to be entrusted to MEMO LLC, the country's current electricity market operator.

The decision follows consideration of the Information on the Need to Establish a Natural Gas Market Operator and the adoption of conclusions providing for the launch of the procedure for its functional establishment.

According to the Ministry of Energy, designating MEMO as the operator represents a choice of an integrated model, whereby the entity responsible for organizing the electricity market will also be given additional responsibilities for the natural gas market.

In the next phase, MEMO is expected to prepare a comprehensive plan for establishing the new function. The plan should cover the organizational, technical, IT, legal and financial aspects necessary for the functioning of the gas market.

The legal basis for organizing and managing the natural gas market as a regulated energy activity of public interest has existed since 2018, when relevant amendments to the energy regulatory framework were adopted.

With the development of gas infrastructure and the expansion of cross-border supply opportunities, the need has emerged to establish a functional and organized market.

In determining the model, the experience of several European and regional markets was taken into consideration. The Ministry notes that various solutions were analyzed, ranging from fully liberalized systems, such as those in Austria and Hungary, to hybrid models applied in Greece, Croatia, Bulgaria and Romania.

As an argument for choosing the integrated model, the Government and the Ministry point to MEMO's existing infrastructure and experience in managing energy markets. The company already has an IT platform, a market settlement system and institutional experience in organizing the electricity market.

The Ministry estimates that establishing an entirely new entity would require a longer period to become operational, as well as additional administrative and operational costs. Therefore, using MEMO's existing capacities is considered a faster and more cost-effective solution.

The decision comes at a time when North Macedonia is working on expanding its gas infrastructure and developing interconnectors with neighboring countries. The new interconnections are expected to provide access to additional sources of natural gas, including through LNG terminals, as well as greater opportunities for cross-border trade.

A functional market operator is a prerequisite for translating these infrastructure opportunities into a more developed market system. Its functions should include organizing market mechanisms, support transparent price formation, and establishing balancing mechanisms among market participants.

The Ministry of Energy considers that the integrated model is aligned with European practices characteristic of transitioning markets and represents a step toward greater integration with regional markets.

For the state, the establishment of a natural gas market operator also has broader regulatory significance, as it is linked to obligations arising from European regulations and the process of energy market integration within the Energy Community.

By assuming the new function, MEMO would effectively become a combined operator of the electricity and natural gas markets.

The success of this model will also depend on how the new responsibilities are structured, the regulatory framework, the technical mechanisms, and the conditions under which natural gas trading will take place in the future.

Welcoming the Children of MEMO LLC Employees Ahead of the New School Year



MEMO welcomed its youngest guests – the children of our employees – for a day filled with fun, games, learning, and togetherness.

The children had the opportunity to visit their parents' workplace and, in a fun and engaging way, learn more about electricity and the work of MEMO.

From educational games and the MEMO Mini Power Exchange to social and creative activities – the

day was all about curiosity, smiles, and having fun together.

At the end of the day, our youngest guests also received their certificates as Junior MEMO Energy Experts!

With new experiences, smiles, and great memories, we said goodbye to the summer and welcomed the new school year together!



Record Trading Volumes on the Macedonian Power Exchange in August 2026

The Macedonian Power Exchange recorded a historic trading volume in August 2026, with a total of 199.698,9 MWh of electricity traded on the day-ahead market, representing an increase of 58.15% compared to August 2025, when 126.292,1 MWh were traded.

The total monthly trading volume achieved in August marks a new record for the Macedonian Power Exchange and is a significant indicator of increased market participant activity and growing confidence in the market-based mechanism for electricity trading.

The previous highest monthly trading volume was recorded in January 2026, when 153.028,7 MWh of electricity were traded on the day-ahead market.



The comparison highlights a substantial increase in both the overall trading volume and the average daily activity on the exchange, confirming that the day-ahead market continues to play an increasingly important role in electricity trading.

The record results achieved in August provide further confirmation of the development of the Macedonian or-

ganized electricity market and the growing participation of market entities in exchange-based trading.

MEMO continues to undertake activities aimed at the further development, enhancement, and integration of the electricity market, with the objective of creating a more efficient, transparent, and competitive market for the benefit of all market participants.

MEMO LLC at a Meeting at the Ministry of Energy, Mining and Mineral Resources



The National Electricity Market Operator – MEMO LLC, participated in a meeting at the Ministry of Energy, Mining and Mineral Resources, dedicated to reviewing audit reports of institutions and companies related to the energy sector.

The meeting was chaired by the Minister of Energy, Mining and Mineral Resources, Sanja Bozhinovska, while MEMO was represented by its CEO, Zoran Gjorgjievski.

“Audit reports are an important instrument for strengthening institutional capacities, improving operations, and ensuring greater transparency and efficiency, while also further strengthening trust in the institution. We will continue to improve our processes in line with the best practices,” said Gjorgjievski.

The meeting was also attended by representatives of the Agency for Mandatory Oil Reserves – MAKORA, AD MEPSO, and AD NOMAGAS Skopje.



EUROPEAN TRENDS

Why electrification is Europe's most strategic investment

Europe faces a growing triple challenge of affordability, resilience and decarbonization. Addressing these structural challenges requires systemic change. Electrification is the transition from a fossil fuel-based energy system to one powered by electricity, driven by the deployment of clean energy, energy storage and expanded grid infrastructure; it offers a pathway to lower system costs, improve energy security and accelerate decarbonization simultaneously.



Copenhagen Infrastructure Partners (CIP) explores this in its latest report, *Charging Ahead: A Roadmap for an Electrified, Competitive and Resilient European Energy System*. It breaks down how Europe's energy system could advance towards 2050 under three scenarios: Competitive & Resilient, Slow Transition, and Net Zero.

As a member of the Leaders for European Growth and Competitiveness initiative, CIP points to a clear imperative: policy-makers and industry leaders must accelerate electrification, grid expansion and investment frameworks to secure a more competitive, resilient and affordable European energy system.

Today, Europe remains heavily dependent on imported fossil fuels, which account for around 40% of primary energy demand. This leaves the region exposed to volatile global energy markets, with Europe seeing a €100 billion jump in annual fossil fuel expenditure as a direct result of disruption in the Strait of Hormuz. Accelerating electrification, powered by homegrown clean energy, offers a pathway to reduce these vulnerabilities and improve security of supply.

Electrification also makes economic sense. An increasingly electrified energy system can reduce overall energy demand and create a more stable energy cost base. The result is a pathway to lower prices and improved industrial competitiveness. Decarbonization then follows as a clear and positive spill-over effect.

Electrification as the cornerstone of Europe's energy system

At its core, electrification is about efficiency. Fossil-based systems lose large amounts of energy in conversion and combustion, whereas electrified end-use technologies deliver the same services with significantly lower energy input.

Most energy demand can and should be directly electrified where feasible; this includes buildings, low-heat industrial processes, heating and cooling for households, and road transport.

This all means that, by 2050, final energy consumption in Europe could decline by more than a third, even as demand for energy-consuming processes and transportation increases. For example, while AI and data centres have increased demand for new electricity supply, the efficiency of the electricity-based energy system in transportation and heating supports an overall decline in energy use.

CIP's report indicates that, as electricity becomes the dominant energy carrier, electricity demand could rise from 21% today to 55% of final energy demand by 2050. This is very much in line with the 2026 EU Electrification Action Plan's midway target of 32% in 2030.

This transformation has profound economic implications. In a competitive and resilient energy system, it means power prices could fall by around 40% compared to today's levels, addressing the current energy cost gap between Europe, US and China. This is driven by the substitution of expensive gas-based power production by renewables.

Just as importantly, electrification strengthens energy security. By reducing fossil fuel consumption, Europe can cut imports by around 80% and reduce external dependency to roughly 10% by 2050. Electrification is therefore a foundation for long-term competitiveness and strategic autonomy.

Infrastructure: the binding constraint

While the case for electrification is increasingly apparent, realizing it at scale requires the necessary energy grid infrastructure. Today, the absence of this infrastructure has already emerged as the key bottleneck to progress for nearly half of EU countries.

With Europe's electricity demand expected to expand in the coming decades, grids – designed for a fossil-based system with large, centralized power plants – are under increasing pressure. As highlighted in the EU Grids Package, without accelerated grid expansion and modernisation, electrification simply cannot scale.

In Finland alone, Fingrid reported that, in 2025, enquiries for new electricity production projects were about 15 times the size of the nation's current production capacity, further underscoring how ageing grids are a barrier to meeting future energy needs.

Moving into a decentralized renewable energy system, where wind and solar PV are primary energy carriers, requires a dedicated lane to transport energy to end consumers. Meeting this challenge will require significant capital, with Europe needing approximately €5.2 trillion in energy system investment by 2050, including around €2.9 trillion for grid infrastructure alone.

Yet the cost of inaction is even greater. Every two years grid build-out is delayed represents approximately an additional €8-10 /MWh in consumer costs. This constraint highlights a clear opportunity: Expanding and modernizing grids can unlock electrification, improve efficiency and lower reliance on higher-cost fossil generation.

A strategic choice for Europe's future

Delivering this transition will require significant investment, and public capital is not enough. Attracting private capital requires stable regulatory frameworks and predictable market design.

Incentivizing electrification is an essential first step. In many European markets, electricity remains burdened by taxes and levies that do not apply to, or are higher than, fossil fuels. Removing these hurdles is essential to accelerating the transition.

At the same time, electrification is moving up the global policy agenda. Proposals like the EU's 2026 Electrification Action Plan reflect a growing recognition that electrification is the next phase of the energy transition.

The debate about Europe's energy future is often wrongly framed as a choice between competitiveness, security and decarbonization. Electrification provides a credible pathway to deliver on all three objectives.

The technologies are proven, and the benefits extend far beyond emissions reductions. The defining question is whether Europe can align policy, markets and investments quickly enough to deliver.

https://www.weforum.org/stories/energy-transition/why-electrification-europe-strategic-investment-energy/?utm_source=x&utm_medium=social&fbclid=IwB21leAUD3o9wZG9mBWV4dG4DYWVtAjExAHNydGMGYXBwX2lkDDM1MDY4NTUzMTcyOAABHtyLDlkoDrOjW9Ddfy5K0KDWT6EFdaPsd1p47b15B1u9qEY4SbnWX7QNmYrc_aem_ep7CINP9LXRBHicoA-z-rQ

ENTSO-E Position Paper on the Security of Critical Infrastructure

Europe's transmission grid and its secure operation remain essential for powering our society, and TSOs are responsible for ensuring reliable electricity supply for all Europeans at all times.

As the energy system becomes increasingly interconnected, digitalised and electrified, safeguarding critical infrastructure against evolving physical and cyber threats is more important than ever. Today, ENTSO-E provides recommendations to strengthen the EU framework for protecting our electricity infrastructure.

We welcome the European Commission's focus on energy security including upcoming Security Framework review and Drones Package, the European Grids Package, the list of European Defence Projects of Common Interest, and other related initiatives. It highlights that energy security requires an integrated approach covering security of supply, physical security, and cybersecurity.

Building on all European electricity transmission system operators' expertise and experience on ensuring security of supply and safe system operation, ENTSO-E presents seven recommendations to reinforce Europe's energy security framework. These include:

1. Developing harmonised risk assessments across the energy sector.
2. Establishing minimum standards for protecting critical grid assets.
3. Clarifying the respective roles of TSOs and public authorities during crises.
4. Strengthening regional cooperation for offshore infrastructure protection and recovery.
5. Enabling faster cross-border deployment of critical resources in emergencies.
6. Introducing security-sensitive transparency rules to better protect critical infrastructure information, and
7. Ensuring dedicated funding for electricity grid security investments.

Safeguarding critical energy infrastructure requires close cooperation between policymakers, operators, regulators and security authorities. ENTSO-E, with all its member TSOs, stands ready to play their part.

<https://www.entsoe.eu/2026/08/31/entso-e-position-paper-on-the-security-of-critical-infrastructure/>

<https://www.entsoe.eu/2026/08/31/entso-e-position-paper-on-the-security-of-critical-infrastructure/>





Publisher: National Electricity Market Operator
MEMO LLC Skopje

Address: Maksim Gorki St. No. 12, 1000 Skopje,
Republic of North Macedonia

Tel.: +389 2 3281 020

E-mail: info@memo.mk

Web: www.memo.mk

Editor: Marija Mustrik,
Public Relations and Marketing Specialist