



27th IENE National Conference

“Energy & Development 2023”

Divani Caravel Hotel, 14-15 November 2023

Conference Overview and Conclusions

Athens, December 2023

On November 14 and 15, 2023, the annual National Conference “Energy and Development 2023”, organized by the Institute of Energy for SE Europe (IENE), was held at the Divani Caravel Hotel in Athens. The Conference aimed to highlight the obstacles involved in the energy transition, especially in an environment of energy crisis and two ongoing wars in Europe and the Middle East, as well as the need to find solutions based on proven technologies, which will be cost competitive.

This year, the Conference celebrated its 27th consecutive year, having commenced in 1996 under the stewardship of Mr. Costis Stambolis, well before the establishment of IENE. It has solidified its position as one of Greece's premier events in the realm of energy policy and business. The Conference draws the participation of key figures from Greece's political and economic spheres, along with experts in energy from both Greece and abroad. Distinguished personalities from the global energy scene actively engage in the discourse, fostering a substantial dialogue that advances fruitful discussions on the current developments within the crucial energy sector.

The delegates were greeted by the Chairman and Executive Director of IENE, who emphasized, among the various topics addressed, the critical matter of fortifying energy security in alignment with the objectives of the energy transition. These objectives, established at both national and European levels, were underscored, particularly in the context of Greece, referencing the recently submitted National Energy and Climate Plan (NECP) to the European Commission.

Once again, the Conference proved to be successful, featuring over 80 distinguished speakers and moderators from both Greece and around the world. They delved into the dynamics and future prospects of the energy sector, both on a national and global scale and they highlighted the sector's potential for adaptation amid the new international conditions, shaped by events such as the conflict in Ukraine and the Hamas-Israel conflict in the Middle East.

The Minister and the Deputy Minister of the Environment and Energy, Mr. Theodoros Skylakakis and Ms. Alexandra Sdoukou respectively, lent significant political weight to the discussion on the country's energy future. Their presence, along with representatives from various opposition political parties, set the political tone for the event. Furthermore, the participation of key players, including major companies and organizations in Greece's energy sector, provided a comprehensive overview of the current energy landscape. This encompassed a detailed analysis of ongoing and planned processes, as well as a thorough examination of the challenges confronting the energy sector.

The Conference provided a comprehensive exploration of vital elements in the broad energy sector encompassing energy resources, the environment, and the economy,

thoroughly delving into key parameters. The discussions extended to topics such as energy infrastructure and the pivotal role of natural gas and LNG in global and regional energy supply. Notably, the challenges facing electricity and natural gas markets in Southeast Europe were carefully examined.

The event benefited significantly from the physical presence and online contributions of numerous esteemed speakers hailing from diverse regions including France, the UK, the Netherlands, Bulgaria, Albania, Turkey, and Israel. This collective insight served to illuminate current developments on a global, European, and regional scale.

It is worth noting that this year IENE celebrates 20 years of continuous operation and contribution to the energy community in Greece and SE Europe. On the occasion of this specific milestone and in the context of the 27th IENE National Conference, a special event was organized, including a brief ceremony at the end of the first day of the Conference, whereby honorary distinctions were bestowed to several of its partners in recognition of their contribution to the Institute's work. Addressing the audience during the event, Mr. Costis Stambolis, Chairman of IENE, provided a brief historical overview of the Institute's journey and its milestones. Additionally, former Chairmen Mr. Yiannis Chatzivasiliadis and Yiannis Desypris, along with Mr. Spyros Palaiogiannis, former Deputy Chairman, Mrs. Teresa Fokianou, former Secretary General of IENE, and some of the founding partners, addressed the assembled audience.

Global Energy Trends

One of the IENE Conference highlights was, once again, the presentation of the latest World Energy Outlook (WEO) 2023, released by the International Energy Agency (IEA) last October. The WEO 2023 was presented by the Greek analyst Mr. Apostolos Petropoulos, who is part of the energy modeling team at the IEA.

The main conclusions of the IEA reference study can be summarized as follows:

1. Following Russia's invasion of Ukraine, instability in the Middle East could lead to further disruption to the energy markets and the energy prices. This emphasizes once more the frailties of fossil fuels, highlighting the advantages, both in terms of energy security and emissions reduction, that come with transitioning towards a more sustainable energy system.
2. Clean energy projects are facing headwinds in some markets from cost inflation, supply chain bottlenecks and higher borrowing costs. But clean energy is the most dynamic aspect of the global energy investments. The pace of its growth, in the coming decades in response to policy and market stimuli is key to explain the differences in trajectories and outcomes across our three

main scenarios. In all scenarios, the momentum behind the clean energy economy is enough to produce a peak in demand for coal, oil and natural gas this decade, although the rates of post-peak decline vary widely.

3. More specifically, in the Stated Policies Scenario, average annual growth rate of 0.7% in total energy demand to 2030 is around half the rate of energy demand growth during the last decade. Demand continues to increase through to 2050. In the Announced Pledges Scenario, total energy demand flattens, thanks to the improved efficiency and the inherent efficiency advantages of technologies powered by electricity – such as electric vehicles and heat pumps – over fossil fuel-based alternatives. In the Net Zero Emissions by 2050 Scenario, electrification and efficiency gains proceed even faster, leading to a decline in primary energy of 1.2% per year until 2030.
4. Moreover, the IEA, in its reference study, explores some key uncertainties, notably regarding the pace of China’s economic growth and the possibilities for more rapid solar PV deployment opened by a massive planned expansion in the manufacturing capacity (led by China). IEA also highlights the implications of a large increase in the exported LNG capacity, starting in the middle of this decade, led by the United States and Qatar. It was also emphasized that any escalation in geopolitical tensions could jeopardize both the prospects for energy security and the feasibility of a swift, affordable transition.
5. Extreme volatility in the energy markets during the global energy crisis has highlighted the importance of affordable, reliable and resilient supply, especially in price-sensitive developing economies that **witness** the largest increase in demand for energy services.

Statements by the Leadership of the Ministry of the Environment and Energy

The road to net zero involves profound economic considerations, but also technological uncertainties, according to the statements made by the Minister and the Deputy Minister of the Environment and Energy during the 27th “Energy and Development” Conference. Addressing the technological uncertainties inherent in the energy transition, the Minister referred to the electricity storage market and the competitive dynamics between different technologies.

“We don’t know which technology will prevail in the end and above all, whether we will choose the right or the wrong one”, Mr. Skylakakis emphasized. “If a mistake will be made in the forecast, then the financial losses will be enormous”, he underscored, giving as an example the case of the new lignite unit “Ptolemaida 5” for which, as he noted, about €1.5 billion were spent “and now, it has been surpassed by the developments”.

Referring to the future energy market, he pointed out that “it can be seen which technologies will prevail, but uncertainties exist”. As he argued, a small country like Greece should not invest prematurely in new technologies, as it risks being led to an increase in costs and subsidies to the detriment of the real economy. “We should not rush to adopt technologies that are not mature as we end up paying a lot of money, without this resulting in the development of the domestic industry or the capitalization of experience”, he stressed.

Ms. Sdoukou, even so, responding to objections to upgrade the target set in the revised NECP for hydrogen technology (used for energy storage), stated that any further development of hydrogen requires funds of more than €700 million per year in investment subsidies and she wondered: “What should we do? Invest money in hydrogen or protect consumers? “We need to assess the capabilities at our disposal”.

Also, Ms. Sdoukou referred to the importance of energy conservation and efficiency towards energy transition. “It is of high importance on the road to net zero. This is evidenced by the very successful actions and programmes catering to all income levels and diverse social groups. In the revised NECP, we aim for the final energy consumption not to exceed 15.4 million tonnes of oil equivalent in 2030, i.e. a 7% reduction from the previous NECP. A key driver in this direction is the “Renovation Wave” regarding the energy-efficient home upgrades”, she noted.

According to Mr. Skylakakis, offshore wind is the technology that has competitive advantages for Greece, which has the highest wind potential in the Eastern Mediterranean. However, a second competitive advantage stems from the development of floating wind farms, as they will be installed in close proximity to the islands, thereby minimizing network costs and maintenance efforts. The offshore wind projects, as he explained, will commence with pilot investments, while the final programme is expected to operate after three years, allowing for a more comprehensive understanding of prices.

To meet the national targets for the energy transition, Mr. Skylakakis prioritized investments in solar PV with storage, while noting that investments in grids are necessary in the medium- to long-term. He underscored at the same time, that there is limited energy space and therefore, investors should not deviate from the strategic targets outlined in the revised NECP.

Regarding the challenge of identifying sufficient energy space that will facilitate the smooth integration of the significant increase in RES deployment, Ms. Sdoukou referred to the necessity to upgrade and increase the grid’s capacity. “An electricity system with high penetration of RES cannot operate without storage. We support the penetration of batteries, funded by the Recovery and Resilience Fund. We need more

pumped storage, which holds substantial benefits and it is among our immediate priorities. We encourage the direct bilateral contracts between RES producers and consumers that contribute to the direct access to clean and cheap energy produced from RES”, she stressed.

Apart from investments in essential electricity interconnections, Ms. Sdoukou pointed out that the government’s plan to balance the system envisages a diverse mix of technologies that will include batteries and pumped storage, hydro and natural gas plants, distributed RES, demand response and production of renewable gases.

In addition, the Deputy Minister of the Environment and Energy outlined ten energy policy targets for the next four years. The objectives are summarized as follows:

1. Zero production from lignite after 2028.
2. 80% of electricity generation will come from RES in 2030.
3. The development of durable energy storage systems with batteries and pumped storage.
4. The connection of non-interconnected islands to the continental system by 2030.
5. The development and operation of offshore wind farms in the same year.
6. Security of supply and the operation of competitive electricity markets that will benefit consumers and the national economy.
7. The further electrification of final energy consumption, with an emphasis on buildings and transportation.
8. The promotion of self-production systems from RES and the digitalization of the network.
9. A new cycle of international electricity interconnections that will allow us to increase exports to the European markets and thus enable us to absorb the energy surplus, but also to better balance the national system.

Electricity

The Chairman of the Regulatory Authority for Energy, Waste and Water (RAEWW), Dr. Athanasios Dagoumas, emphasized that the Greek wholesale electricity market has closed the gap from other mature European markets, becoming a reference point for other countries in the region. He also highlighted the significant developments related to the Day-Ahead Market in SE Europe that have taken place this year.

In particular, on April 11, 2023, ALPEX launched the Albanian day-ahead market and is also expected to operate the Kosovo market, starting in the second half of 2023. MEPX introduced the day-ahead market in Montenegro on April 27, 2023. But also North Macedonia’s MEMO held its inaugural auction on May 10, 2023. As Dr.

Dagoumas added, both MEPX and MEMO have plans to establish intraday markets, a target that SEEPEX achieved on July 25, 2023.

Regarding the integration of the electricity market in the Western Balkans, the President of RAEWW reminded everyone that the integration in the market coupling for the countries of the WB6 initiative of the Energy Community – which includes Albania, North Macedonia, Kosovo, Bosnia and Herzegovina, Montenegro and Serbia – must be achieved by the end of 2025.

At the same time, he made special reference to the SEE Market Coupling Initiative. As part of the latest initiative, a meeting was organized on November 14 in Athens, during which a Memorandum of Cooperation was signed regarding the coupling of the electricity markets of the Balkan countries by the competent institutional bodies of Regulatory Authorities, Transmission System Operators and Energy Exchanges. The meeting was organized by the American National Association of Regulatory Utility Commissioners (NARUC), the US Energy Association (USEA) and RTI International with the support of the Greek RAEWW and it was sponsored by the US Agency for International Development (USAID). Dr. Dagoumas underscored that the signing of the aforementioned Memorandum of Cooperation strengthens the energy transition (grids, RES and flexible infrastructure), but also the regional role of Greece.

In his address, the Chairman of the Association of Energy Producers from PV (SPEF), Dr. Stelios Loumakis, presented his relevant analysis for the first 10 months of this year. While electricity exports constitute a policy of national and energy independence, the economic conditions under which they are carried out play a critical role in the mid to long-term sustainability and the benefits of these policies as well as the investments involved. He further highlighted that the documented net exports during the January-October 2023 period in the interconnected system, with an average income of €98.4/MWh, seem inadequate to cover the essential costs of electricity generation during this period in the interconnected system. These costs include thermal generation (>€150/MWh) and RES generation (~€122/MWh).

As for the prevalent forms of RES in the mix, only the current weighted average cost of wind turbines (~€91/MWh) is lower than the recorded weighted average export price for the given period. However, because they never operate alone, especially during peak hours of exports, no economic margin is documented in the recorded weighted average export price.

Mr. Loumakis added that the Merit-Order-Effect with the zero accounting pricing of RES operating under FIT, FIP and CfD schemes in the near future as well as the recovery of residual production costs from conventional sources during non-peak hours of energy supply and therefore outside export period, can largely account for

the phenomenon of export prices being lower than necessary. Indeed, the possible adoption of power mechanisms to strengthen conventional sources outside the day-ahead market is expected to exacerbate the problem. In both of the above cases, the residual cost of the exported power generation is ultimately borne by the domestic market and it is not recovered from abroad.

The further increase in RES penetration leading towards 2030 is expected to further reduce the costs of power generation, thereby giving impetus to economically more advantageous exports, provided however that wholesale prices do not decline even more aggressively, forcing exports to take place and again at lower than necessary prices.

The mismatch between the actual cost of electricity production and prices in the wholesale markets and particularly in the RES, poses a regulatory challenge at the European level, not just in Greece and it must be resolved [e.g. the RES Fee (ETMEAR) Base Tariff must be captured-integrated in some way in the wholesale and therefore also in the exports, in which case it will be recovered the full cost of the energy extracted].

In any case, the increase in RES penetration must not precede the necessary storage, which does not seem to be happening to the necessary extent in the NECP for 2030, where 23GW of wind and solar are “aggressively” planned to operate with only 5.3GW of storage and for power demand which, in his estimation, may not systematically exceed 10-12GW.

Even more concerning are the operational RES projects today, (~12GW) which, together with the issued connection terms, exceed 27GW. If one considers the 2GW from announced residential PV systems as well as those in the waiting queue at the Independent Power Transmission Operator (IPTO), it appears that the total could exceed 28GW, possibly even reaching 30GW.

In addition, the Chairman of the Hellenic Union of Industrial Consumers of Energy (UNICEN), Mr. Antonis Kontoleon, stated that the bilateral electricity supply contracts (PPAs) between RES producers and energy-intensive industries are the main way out for energy-intensive industries. In particular, long-term green PPAs are a means of hedging the risk of price volatility. However, as he noted, the risk of “cannibalization” of prices by the uncontrolled development of solar PV should not be overlooked.

However, Mr. Kontoleon raised a question, pointing out that despite 6,000MW of solar PV connection conditions were issued last year, the process of obtaining connection conditions for RES category B' (PPA with industries) has been indefinitely suspended, which stems from the observation that the energy produced exceeds consumption (it is being reminded that category B', with regard to environmental

licensing, refers to projects and activities, characterized by local and minimal impact on the environment and are subject to general specifications. In this case, Standard Environmental Commitments are issued, and these commitments are then integrated into the Operating License of the respective project or activity).

Thus, any advantage previously enjoyed by the country's industries, namely that RES producers have committed to enter into PPAs with industrial consumers, is negated by the transfer to an indefinite future time of receiving conditions for RES category B' projects.

At the same time, referring to the tenders for solar PV with batteries, Mr. Kontoleon emphasized that these should be accompanied by PPA, while it is proposed that from now on the acceptance of connection conditions for solar PV projects should mandatorily require them to be accompanied by batteries. In addition, it appears that the new tenders for solar PV with batteries will not impose a corresponding obligation on producers to enter into a contract with industries, not even for a part of the capacity.

Moreover, as provided by the new European Regulation (Article 19a par. 5), an advantage is given to producers participating in tariff tenders who sign part of their capacity to PPA.

According to Mr. Kontoleon, there is no sufficient incentive for demand response, since the steel industries today do not operate during peak hours (8-10 am and 6-11 pm), without compensation, since, as he pointed out, this operation cannot be taken for granted. Their selection by the Operator for demand response services is not as given if we assume that they change the way they operate, while he added that there are procedural obstacles and certainly there is no sufficient incentive for demand response. "An additional fee should be guaranteed so that they are committed to participating in demand response", the Chairman of UNICEN underlined.

Regarding the electricity market design, he mentioned that the capability is given to the member states to establish a support mechanism for the availability of flexible power, directed exclusively to demand response and storage services. Based on the new Article 19e, the demand response flexibility remuneration mechanism is completely disconnected from the flexibility mechanism of flexible production units. Also, for the application of the demand response flexibility remuneration mechanism, it is sufficient to establish that investments in non-fossil flexibility cannot by themselves ensure a satisfactory participation of the demand response, in accordance with the national target that should previously have set by the member state.

Finally, Mr. Kontoleon emphasized that demand cannot be ignored in the creation of energy space, while he mentioned that reducing the load during peak hours and

increasing the load during sunny hours could be more efficiently achieved through load shifting/curtailing, or switching. Specifically addressing the case of steel industries, he mentioned that, on one hand they can operate during all hours when 300MW solar PV plants produce and absorb their production, on the other hand they have the ability to interrupt their operation during all peak hours, while the batteries only for 2-4 hours respectively. However, he wondered whether a study had been conducted to assess the needs of the system in flexibility and in particular in demand and storage.

Natural Gas

The public suggestion of Mr. Spyros Palaioyiannis, former CEO of DEPA, regarding the establishment of a natural gas and renewable gases trading hub in Greece sparked a revealing exchange of views with the CEO of DESFA, Ms. Maria Rita Gali. Mr. Palaioyiannis argued that it is a “golden opportunity” for Greece to take such a step, thanks to the window opened by the geopolitical conditions in our region. “It must be a national goal, but the realization of such a project needs time, will and a plan”.

According to Ms. Maria Rita Gali, the CEO of DESFA, the country has a trading point at the Energy Exchange and it would be unnecessary to create a trading hub. “We don’t need it”, she emphasized, since today there is nothing missing from the domestic natural gas market.

Ms. Gali said that Greece is slowly becoming an entry point for natural gas for the countries of the region and emphasized that it is a strong advantage that diversified sources for its supply have been secured. Therefore, she added, the natural gas trading platform on the Hellenic Energy Exchange, which has been operating since March 2022, is more than sufficient for the size and dynamics of the domestic gas market.

According to her, in order to create a real energy hub in Greece, certain conditions must be met, such as the substantial expansion of import possibilities, the increase of export capacity and the investment in compressor stations, pipelines and storage facilities.

Ms. Gali also mentioned the increased interest in gas imports from third countries, as evidenced by the fact that the majority of Revythoussa’s capacity has already been sold until 2026. As she said, Revythoussa LNG terminal will continue to play a vital role both for the Greek market as well as for exports, because many Greek importers resell gas volumes abroad.

Mr. Palaioyiannis also referred to Russia’s attempt to create a trading hub in Turkey, in order to avoid sanctions and to be able to export the gas it produces through third parties. He stated that in addition to being a natural gas transit country, Turkey also

aspires to become a seller of natural gas and for that reason it immediately accepted Putin's proposal! However, the West opposes this plan, while there are serious problems with the imperfect regulatory framework that exists in Turkey, the former CEO of DEPA concluded.

During the same session, Mr. George Polychroniou, Executive Director of Strategy and Business Development of DEPA Commercial, emphasized the key role that natural gas will play in the path towards decarbonization. This is because Europe is highly dependent on natural gas, even if all the projections for 2020 and 2050 refer to a significant reduction in its share in the fuel mix and concluded that the energy companies will have to adapt to this new reality.

Hydrocarbons

Another key takeaway from the presentations and discussions at this year's conference is the imperative to expedite seismic and exploratory surveys for identifying potential significant hydrocarbon targets in both the Greek onshore and offshore regions. It was emphasized that any discovery, particularly of natural gas, could provide the country with valuable economic support for the next 30-40 years.

In fact, DESFA is already constructing pipelines that will transport natural gas and a mixture of natural gas and hydrogen and will be able to "switch" even to 100% hydrogen, as it appears to be the solution of the future, Dr. Michalis Thomadakis, DESFA's Director of Strategy and Development Division explained. "If the predictions come true, hydrocarbon activities will not only be vital for the country, but they will acquire a regional and wider European dimension", Ms. Sdoukou emphasized.

Also, the Professor of the University of Piraeus and former Minister of the Environment and Energy, Prof. Yannis Maniatis, pointed out that there is no doubt that Greece's reserves should be developed, while he also focused on the promotion of the East Med natural gas pipeline, as it is a project "technically and economically viable"; it has the gas which is needed and is supported by three key countries (i.e. Greece, Cyprus and Israel), the European Commission as well as large companies.

At the same time, Ms. Sdoukou, in her introductory speech, recalled that "recently the CEO of the Hellenic Hydrocarbons and Energy Resources Management (HEREMA), Mr. Aristofanis Stefatos, estimated that despite the fact that we cannot be sure, unless drillings are completed first, according to preliminary seismic survey data, gas reserves within the Greek territory surpass domestic demand".

RES & Energy Efficiency

The President and CEO of the Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP), Mr. Yiannis Yiarentis, highlighted the pivotal role of DAPEEP as Operator of the country's energy transition. He also announced that within the next month and a half the first auction of Guarantees of Origin will be held, while he defended the consolidation of the Special RES Account (ELAPE) asserting that it is in surplus despite contrary claims.

It should be noted that over the last two years DAPEEP has managed approximately €13 billion through ELAPE, the Energy Transition Fund (ETF), the EU Emissions Trading Scheme (EU ETS), but also through the granting of the notorious compensation to the industry to prevent carbon leakage, i.e. the transfer of its production activity to countries outside the EU where the cost of pollutants is much lower.

As Mr. Yiarentis pointed out, during the energy crisis, the ETF connected RES with the country's energy situation by allocating €8.5 billion in subsidies. In fact, a very large part of this amount came from the RES units, which were subject to an income cap of €85/MWh.

Regarding the Special RES Account, Mr. Yiarentis noted that it is in surplus, while he also referred to the third large account managed by DAPEEP, i.e. the revenues from pollutant auctions which contribute €1.4-€1.6 billion per year to the ETF and to other energy transition targets.

Regarding the auctions of the guarantees of origin, i.e. the guarantees that certify that the electricity is "green", Mr. Yiarentis noted that the platform created by DAPEEP for the auction of the guarantees of origin has been connected to the European platform AIB for a month now and very soon the first Greek auction of guarantees of origin will take place at the European level.

It was a common observation among speakers at the RES sessions of the Conference that their large penetration will require a wider grid transformation, as well as the ability to store electricity. Greece, due to its location, does not enjoy the electricity interconnections of the Central European countries in order to mitigate fluctuations and production-demand mismatches, especially due to the RES, while the electricity interconnections with the systems of the northern neighbors cannot ensure easy access to the Central European markets for serious amounts of power.

Therefore, the ambitious RES development goes necessarily through the transformation and expansion of the networks with innovative technologies and definitely under the condition of the wider development of the economy and an

increase in the domestic demand for electricity. Recognizing the capital-intensive nature of RES investments, facilitating borrowing on favorable terms becomes crucial, especially during recessionary conditions, which pose a burden and high risk for producers. Ensuring the sustainability of RES in operation should be the main concern of the entities involved, while state interventions are necessary to initiate and reignite investments in the sector.

In addition, important parameters for the further development of RES in Greece were discussed, such as their onshore and offshore location, while particular emphasis should be placed on the utilization of solar heat in the coming years.

Regarding energy efficiency, the importance of energy saving on the road to carbon neutrality was discussed. In addition to energy efficiency in buildings, there is energy efficiency in transportation and industry.

In particular, Dr. Konstantinos Balaras, Research Director at the Institute for Environmental Research and Sustainable Development at the National Observatory of Athens, focused on energy saving in buildings and transportation and argued that the implementation of policies and actions in this direction brings tangible and significant financial benefits both to consumers and the public at large. As he noted, the key to achieving the targets is to reduce energy waste through a combination of actions and the central axis is the European Energy Efficiency Directive (EED), the Energy Performance of Buildings Directive (EPBD) and the Renewable Energy Directive (RED).

Specifically, the new EED2023/1791, aiming to reduce energy consumption by 1.49% between 2024 and 2030, signals the necessity for swift changes to reverse the stability of final energy consumption in the EU. As he said, in the final energy consumption in Greece, buildings participate with 42.1%, while in the EU, at 41.6%, while CO₂ emissions from the operation of buildings reaches 27% in Greece – rising to 36% when including emissions from building materials and the construction industry. – and to 23% at EU level. Based on the targets set for final energy saving, the figures for 2050 show a significant shortfall in meeting these targets, particularly in terms of the contribution of RES to final energy consumption.

In the same session, Professor Konstantinos Mathioudakis, Director of the Thermal Turbomachines' Laboratory at the School of Mechanical Engineering at the National Technical University of Athens (NTUA), analyzed the economic impact of improving energy efficiency in buildings and transportation and pointed out the opportunities that open up for the Energy Service Companies (ESCOs).

As he noted, the energy policy of the European Union (EU) has advocated for energy-saving measures, emphasizing their benefits across various sectors. However, over

50% of these measures are directed towards the financial sector. The economic dimension of energy efficiency in buildings and transportation was previously highlighted by a relevant study by IOBE (Foundation for Economic & Industrial Research), in which it was stated that for every €1 invested in energy efficiency upgrade, about €1.43 is added to the Greek GDP and about €0.50 to the public revenue, while at the same time 34 new jobs are created in the Greek economy.

Professor Mathioudakis highlighted that the energy-saving targets for 2050 will be accomplished to a significant extent through behavioral changes. Consequently, he emphasized the fundamental role of education, as well as the contribution of financial and non-financial institutions.

New Energy Technologies

One of the most interesting sessions focused on the outlook for the development of new energy technologies. This included discussions on the continued digitization of the energy sector and the influence of Artificial Intelligence (AI), the adoption of green fuels, the production and utilization of hydrogen as a substitute for polluting processes, particularly in the industrial sector, the potential of biomethane production and its integration into the natural gas network, the possibilities offered by Carbon Capture, Utilization, and Storage (CCUS) technologies, and the expansion of electromobility aimed at reducing emissions in the transportation sector.

Conclusions

The energy sector is undergoing radical changes, and the transition to a new energy environment is already being shaped in Europe and Greece as a result of Russia's invasion of Ukraine and, more recently, the Israel-Hamas conflict in the Middle East. The need for energy fortification in the EU, and particularly in Greece, becomes increasingly apparent amid geopolitical uncertainties. This transition involves moving towards less polluting and smarter energy, with the widespread use of clean technologies and the simultaneous integration of digital technology. New ideas and innovative technologies are pivotal drivers, and digital technology is permeating every activity and daily life. Energy is becoming a complex sector characterized by high investments and critical economic, environmental, social, and geopolitical parameters, innovation, research, market reforms, all requiring an adaptable and appropriate regulatory framework.

Greece, encompassing its mainland, islands, and surrounding seas, presents significant energy challenges that require careful consideration and technical expertise. Addressing these challenges necessitates the implementation of suitable policies and well-planned development strategies aimed at maximizing social and economic

benefits. The nation's pronounced reliance on energy imports, including hydrocarbons and electricity, has notable adverse effects on both the economy and energy security. Therefore, the primary objectives of strategic planning should focus on reducing energy dependence and promoting the progress of a competitive energy sector, all while considering environmental considerations.

Energy security, the improvement of energy efficiency, the wide utilization of RES and the operation of a competitive market emerge as key policy axes. A major transformation is taking place in the electricity sector with the entry of RES. Rapidly evolving technologies in RES are achieving extremely low prices, with a highly dispersed generation, which are transforming the grid and the market and are forcing electricity companies to change their business models. The electricity grid is also being transformed with innovative technologies in order to integrate the increasing penetration of RES with high efficiency, reliability and with new services to consumers, while the market is reforming and looking for the tools to meet the new challenges for its operation.

Electricity is evolving as a main energy carrier with expanding applications replacing fossil fuels, as it spreads everywhere, such as transportation, heating/cooling, etc., also being a driver of growth. Electric cars and hydrogen production for fuel cells in buses and trucks that are rapidly entering the market will form an extension of the electricity grid.

In conclusion, the 27th "Energy & Development 2023" Conference, marked by wide participation and thorough documentation of current developments and technological solutions, conveyed a message of optimism. This optimism is grounded in the existing opportunities for further advancements in Greece's energy sector. These advancements will materialize through investments and substantial reforms aimed at streamlining the operation and optimizing the energy market. Such achievements can be realized through collaboration with relevant Greek and European entities and companies, which appear poised to actively contribute to the restructuring of the regulatory and operational framework currently underway. IENE has been, is, and will continue to serve as a facilitator in this effort.