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ROMANIA`S ENERGY SECURITY IN THE CONTEXT OF COMBATING CLIMATE CHANGE

Abstract:	*Romania's energy security is an important and complex issue, as the paths to follow are sometimes winding, other times unclear, and always fluid, given that the core issues are constantly changing. This study aims to address as many aspects as possible that contribute to achieving this goal. Still, given the complexity of the subject, an exhaustive analysis cannot be carried out within a scientific approach of this nature. Therefore, the issue of Romania's energy security has been limited to the context created by European policies aimed at combating climate change.* *On the one hand, the study addresses the limitations imposed on member states by European regulations, which set out the milestones to achieve full neutrality regarding greenhouse gas emissions, a goal assumed by all member states by 2050.* *On the other hand, it analyzes the most important courses of action necessary to achieve and maintain energy independence, namely increasing and diversifying electricity production, identifying the optimal energy mix for Romania, improving the functioning of the electricity market, and, finally, the situation of the National Power Transmission System and its safety.* *Therefore, Romania must identify the appropriate measures that will allow it to achieve its fundamental strategic objective regarding energy security through means harmonized with the obligations it has undertaken as a member state of the European Union in combating climate change.*
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Introduction

Energy security has been a matter of international concern for a long time. Once it became clear to modern society and the global economy that essential resources are limited and unevenly distributed, a continuous global struggle emerged to secure them. Over the past decades, we have witnessed a true clash between various state and non-state entities engaged in efforts to acquire such resources.

An exhaustive list of these resources is difficult to compile, so we will limit ourselves to mentioning only the most important categories:

a) Natural resources and raw materials;
b) Human resources;
c) Financial resources.

Efforts to attract or direct these resources also generate their circulation, meaning flows of raw materials, specialized human resources, and financial flows.

The methods and instruments through which the distribution of these resources at the international level can be influenced or controlled are extremely varied. Some of these instruments are general, such as strategic or programmatic documents or decisions established through international agreements, the legislative

framework of each state, public policies (national, regional, or international), financial instruments such as financial markets, financial flows and access to them, or financial mechanisms (such as carbon certificates or green certificates), and, last but not least, technical instruments like infrastructure networks and their accessibility, best available techniques, sustainable energy mixes, technical quality standards, and product labeling systems. In addition to these general instruments, other types of tools or spontaneous or induced circumstances can influence resource distribution and have a special character, such as political and armed conflicts resulting in wars, terrorist actions or even piracy, bankruptcies of key entities involved in resource distribution, and major natural or catastrophic events that can significantly impact resource distribution in specific regions and periods. Of course, this description of the current context is extremely brief, and how the global struggle for resources is waged is far more numerous and diverse. It is also evident to any observer (even a less experienced one) that some of the means used to direct resources are legal, while others are less so, with some being openly used, while others are carefully concealed.

This brief overview aims to establish the general context that manifests globally and affects Romania. Additionally, the current regional context compels Romania to identify short-, medium-, and long-term solutions. This includes European policies aimed at combating climate change and the war in Ukraine, both of which pose significant challenges to Romania's National Energy System. It is important to note that an energy system consists of the production, storage capacity, and transportation of electricity. It must be viewed as a whole, encompassing the production of raw materials such as coal, natural gas, and oil, as well as their transportation to support electricity generation. A state's energy security is ensured when it can fully guarantee and control the functionality of all these elements.

The European context regarding the energy and climate change mitigation

European policies aimed at combating climate change have significantly influenced Romania's energy situation. The continuous reduction, up to the complete cessation, of atmospheric pollution through greenhouse gas emissions by major European polluters has also forced Romania to adopt specific measures to reduce coal-based electricity production. As is well known, the European Green Deal[1] is both an action plan and a new growth strategy based on ambitious climate and environmental objectives. Europe aims to significantly reduce greenhouse gas emissions by 2030 and to become climate-neutral by 2050. Regulation (EU) 2018/1999 of 11 December 2018[2] on the governance of the energy union and climate action establishes that the energy union must focus on five dimensions:

a) energy security;
b) the internal energy market;
c) energy efficiency;
d) decarbonization;
e) research, innovation, and competitiveness.

Thus, the goal of a resilient energy union, centered on an ambitious climate policy, is to provide EU consumers, including households and businesses, with secure, sustainable, competitive, and affordable energy, as well as to encourage research and innovation by attracting investments, which implies a fundamental transformation of Europe's energy system. Such a transformation is closely linked to the necessity of maintaining, protecting, and improving environmental quality, as well as promoting the prudent and rational use of natural resources, especially by promoting energy efficiency, energy savings, and the production of energy from new renewable sources. This objective can only be achieved through coordinated action, combining both legislative and non-legislative acts at the EU, regional, national, and local levels.

According to European regulations, the energy governance mechanism must be based on long-term strategies and integrated national energy and climate plans. These must cover ten-year periods, and their development and implementation began in the decade 2021-2030 but must continue until the proposed goals are achieved. At the same time, action programs must be followed by intermediate national integrated reports on energy and climate to highlight the results obtained, identify appropriate corrections, and set future objectives. Therefore, the reports submitted by member states will be followed by the European Commission's

[1] European Commission, *The European Green Deal*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en (12.11.2024)
[2] EUR-Lex, *Regulation (EU) 2018/1999 of the European Parliament and Of the Council of 11 December 2018,* https://eur-lex.europa.eu/eli/reg/2018/1999/oj/eng (12.11.2024)

integrated monitoring measures so that all member states advance in the same direction and, as far as possible, at the same pace, ensuring that no one is left behind. As a result, according to Article 3 of Regulation (EU) 2018/1999[1], by 31 December 2019, then by 1 January 2029, and subsequently every ten years, each member state must notify the Commission of an integrated national energy and climate plan. Finally, it is useful for this analysis to highlight the provisions of Article 4, point (c) of Regulation (EU) No. 1999/2018, mentioned above, which states that the energy security dimension of member states must focus on the following priorities:

- Increasing the diversity of energy sources and energy supply from third countries, which could aim to reduce dependence on energy imports;
- Increasing the flexibility of the national energy system;
- Managing the reduction or interruption of the supply of an energy source to improve the resilience of regional and national energy systems, including setting deadlines for achieving objectives.

In addition to the provisions above, Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018[2] on the reduction of annual greenhouse gas emissions by member states for the period 2021-2030 in order to contribute to climate actions in accordance with the commitments made under the Paris Agreement mentions in its recitals that the transition to clean energy requires changes in investment behavior and the provision of incentives across the entire spectrum of policies. Thus, a key priority for the Union is the creation of a resilient energy union that provides its citizens with secure, sustainable, competitive, and affordable energy. To achieve these objectives, the Just Transition Mechanism was created at the European level, mobilizing over 100 billion euros for the 2021-2027 period to be directed toward the most affected regions or economic activities whose resilience is considered imperative, as is the case in the energy sector.

Romania's perspective of energy security

As a member state of the European Union, Romania has undertaken the task of complying with European legislation on combating climate change. This commitment has been translated into legislative, administrative, economic-financial, and technical measures aimed at enabling the government and other competent authorities to strike the right balance between the obligations assumed at the European level and Romania's need for energy security and stability.According to Law No. 123/2012 on Electricity and Natural Gas[3] the national energy strategy defines the objectives of the electricity sector in the medium and long term and the most efficient ways to achieve them, ensuring the sustainable development of the national economy and meeting energy needs, as well as providing a decent standard of living in terms of quality, both in the present and in the medium and long term, at an affordable price.

The energy strategy is developed by the relevant ministry in consultation with representatives of the energy industry, non-governmental organizations, social partners, and business representatives and is approved by the government. The energy strategy is periodically revised at the initiative of the relevant ministry, without compromising the stability and predictability essential to such a document, with the revised version being approved by the law[4]. At the same time, Law No. 123/2012 establishes that energy policy follows the directions set by the energy strategy and is implemented by the relevant ministry based on the government program, for a medium-term period, considering likely long-term developments, in consultation with economic operators in the electricity sector, non-governmental organizations, social partners, and business representatives[5]. Thus, according to the law, Romania's energy policy primarily focuses on the following directions of action:

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[1] *Idem*

[2] Council of the European Union, European Parliament, *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030*, https://leap.unep.org/en/countries/eu/national-legislation/regulation-eu-2018842-european-parliament-and-council-binding#:~:text=This%20Regulation%20lays%20down%20obligations%20on%20Member%20States,sectors%20covered%20by%20article%202%20of%20this%20R (12.12.2009)

[3] *Legea nr. 123 din 10 iulie 2012 a energiei electrice și a gazelor naturale*, Article 4, Paragraph 1, "Monitorul Oficial al României", No. 485, 16 Iulie 2012

[4] *Idem*

[5] *Idem*

a) establishing an appropriate institutional framework by defining the bodies and authorities responsible for implementing this policy;

b) ensuring the legal framework necessary for the safe and stable operation of the National Energy System (SEN);

c) ensuring the security of supply with fuel and electricity and the operational safety of the SEN;

d) ensuring environmental protection and ecological reconstruction of sites affected by energy activities;

e) ensuring transparency in fuel and energy prices and tariffs;

f) increasing energy efficiency;

g) promoting energy from renewable sources, unconventional sources, high-efficiency cogeneration, and energy storage, with priority given to supplying electricity to isolated settlements;

h) developing international energy cooperation, participating in regional and European energy markets to achieve a single energy market at the EU level, and ensuring the secure and safe operation of the SEN.[1]

Furthermore, the same legal framework, referring to Romania's energy security, stipulates in Article 5 that the government is responsible for determining, in collaboration with other state institutions and authorities, mandatory measures for all economic operators in the electricity sector, regardless of ownership, to maintain continuous energy production and supply, as well as any other measures concerning the safety and security of the SEN's operation[2]. To ensure the safe operation of the SEN, based on adequacy assessments conducted by the transmission and system operator, the competent authorities may take necessary measures to develop and implement mechanisms to secure energy capacities, aiming to achieve the desired level of adequacy in compliance with and aligned with the specific provisions of current European and national regulations[3]. In practical terms, Romania's energy security is considered a critical component of the country's national security. However, an analysis of this aspect should focus on several key factors, such as:

a) ensuring a large enough/sufficient quantity of energy from domestic production to meet the needs of the economy and the population;

b) maintaining a balanced and diverse internal energy production mix that guarantees a secure energy supply under any circumstances;

c) having rapid, easy, and affordable access to electricity from external markets;

d) fostering a domestic electricity market that is free, fair, stable, and functional;

e) developing complete, secure, and operational energy infrastructure networks of all types.

Romania's energy independence

The first element to consider when analyzing Romania's energy security is the degree of energy independence. It must be noted that Romania has not yet achieved this objective, as it has not been able to meet the energy needs of its economy and population solely from domestic production. However, the share of electricity imports is not very high. This share is continuously correlated with both the level of domestic production and consumption. Of course, the level of consumption also fluctuates depending on various circumstances, such as climatic factors, as well as economic, social, political, or even technical aspects. It is well known that climatic, meteorological, or natural events can cause significant fluctuations in both energy production and electricity consumption.

At the same time, Romania has set a strategic objective to achieve full energy independence by 2035. This would require that energy production significantly exceeds consumption so that, regardless of external factors, Romania can independently produce the necessary electricity, as a part of the Romania`s energy independence. It is well known that green energy sources are directly dependent on various external factors such as light intensity, wind strength, tides, or precipitation, making them unstable, and a high share of these sources could compromise domestic electricity production. For this reason, the National Energy System (SEN) must maintain a high proportion of stable electricity sources to ensure the security and stability of the entire system. In Romania, this refers to thermal electricity production.

Greenhouse gas emission measurements from coal-fired power plants have shown high levels of emissions, which create unhealthy living conditions in these regions. At the same time, the pollution levels

[1] *Ibidem,* Article 4, Paragraph 2, published in Monitorul Oficial al României, No. 485/16 of July 2012

[2] *Ibidem,* Article 5, Paragraph *2,* published in Monitorul Oficial al României, No. 485/16 of July 2012

[3] [3] *Legea nr. 123 din 10 iulie 2012 a energiei electrice și a gazelor naturale*, Article 4, Paragraph 1, "Monitorul Oficial al României", No. 485, 16 Iulie 2012

generated by coal-fired power plants in Romania are in total contradiction with European policies to combat climate change. Given this reality and to maintain the stability of SEN and Romania's energy security, it has been decided through the strategic documents mentioned earlier that the capacities for electricity and heat production in coal-fired power plants will gradually be modernized and replaced with natural gas-based power plants. This transition is even more feasible as new natural gas explorations in the Black Sea Continental Shelf are expected to begin by the end of 2025. This refers to the Neptun Deep perimeter[1], whose first natural gas production is estimated for 2027.

Neptun Deep is Romania's first and largest offshore deepwater exploration project, with a surface area of 7,500 square kilometers, located about 160 km from the shore, in waters with depths ranging from 100 to 1,000 meters. According to information provided by OMV Petrom[2] the investment volume required for the project's development is estimated at 4 billion euros, and the natural gas deposit in this perimeter is estimated at approximately 100 billion cubic meters, making Romania the largest natural gas producer in the European Union.

This natural gas exploration project involves two major companies, namely Romgaz and OMV Petrom, with OMV Petrom being the operator of the Neptun Deep perimeter. Both companies have equal participation, each holding a 50% stake[3]. OMV Petrom is a company in which OMV Aktiengesellschaft (one of the largest publicly listed industrial companies in Austria) holds 51.2% of the shares, while the remaining 6.4% are owned by other foreign investors. Alongside foreign shareholders, OMV Petrom also has Romanian shareholders, who own over 42% of the shares. Of these, the Romanian state, through the Ministry of Energy, holds 20.7%, and 21.7% are owned by Romanian pension funds, in addition to nearly 500,000 individual investors and other Romanian entities.

The second partner in the Neptun Deep Project is the National Natural Gas Company "Romgaz" S.A. (S.N.G.N. ROMGAZ S.A.), a public enterprise and Romania's largest producer and main supplier of natural gas. The company is listed on the Bucharest Stock Exchange (BVB) and the London Stock Exchange (LSE). The main shareholder is the Romanian state, with a 70% stake. The company has extensive experience in the exploration and production of natural gas, with a history dating back over 100 years to 1909. Romgaz conducts geological exploration to discover new gas deposits, produces methane gas by exploiting the deposits in its portfolio, stores natural gas underground, performs interventions, major repairs, and special operations on wells, and provides professional technological transport services. In 2013, Romgaz expanded its field of activity by acquiring the Iernut thermal power plant and becoming a producer and supplier of electricity. On August 1, 2022, Romgaz became the sole shareholder of Romgaz Black Sea Limited, initially established by ExxonMobil Exploration and Production Romania Limited, following the completion of the acquisition and transfer of all shares representing 100% of this company's capital. Consequently, Romgaz Black Sea Limited is a subsidiary of Romgaz and holds 50% of the rights acquired and obligations assumed under the concession agreement for petroleum exploration, development, and exploitation in the Neptun Block XIX, Deepwater Zone of the Black Sea[4].

Given the ownership structure of the two companies involved in the Neptun Deep Project, it can be observed that the Romanian state holds a dominant corporate position, which can generate stability and security both for the conduct of extraction operations and for Romania's overall energy security. It should also be noted that oil and gas exploitation in the Black Sea Continental Shelf is not a new activity, as it began in the 1980s. Several companies hold petroleum agreements for the exploration and exploitation of hydrocarbons in the Black Sea, specifically in Romania's territorial waters.

Since the Neptun Deep deposit alone offers stability and energy independence for the next 20–30 years, without considering other exploitations, Romania's energy independence is achievable in a relatively short time frame. It should be mentioned that there are currently nine perimeters in the Romanian sector of the Black

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[1] Offshore Technology, *Neptun Deep Gas Fielad Project, Black See*, https://www.offshore-technology.com/projects/neptun-deep-gas-field-project-black-sea/ (12.12.2024)

[2]OMV Petrom, Neptun Deep, https://www.omvpetrom.com/ro/activitatile-noastre/explorare-si-productie/neptun-deep (28.10.2024)

[3]Consilium Policy Advisors Group, *Neptun Deep: A 4-billion-euro investment,* https://www.omvpetrom.com/services/downloads/00/omvpetrom.com/1522243280403/sinteza-studiu-de-impact-cpag.pdf (28.10.2024)

[4] Romgaz, *Romgaz Black Sea Limited*, https://www.romgaz.ro/romgaz-black-sea-limited (12.11.2024)

Sea Continental Shelf that have been concessioned to companies exploring new natural gas and oil deposits. These include eight companies that hold various shares in concession agreements for Black Sea perimeters, according to information provided by the National Authority for Regulation in Mining, Petroleum, and Geological Storage of Carbon Dioxide (ANRMPSG)[1].

Romania's energy mix

Romania's energy mix represents the structure of its domestic electricity production. This mix is monitored and publicly reported in real-time by Transelectrica[2] making it impossible to provide an exact snapshot, as it undergoes constant fluctuations over short intervals (within minutes). Although this information is highly fluid, to assess whether Romania has a balanced energy mix, we present a sample from November 2024, based on official data:

- Hydrocarbon-based energy (natural gas): approximately 25%;
- Coal-based energy: approximately 17%;
- Nuclear energy: approximately 23%;
- Hydropower: approximately 23%;
- Wind energy: approximately 10%;
- Photovoltaic (solar) energy: approximately 2%.

Even though this presentation is approximate, we can make several observations regarding Romania's energy mix:[3]

- The energy mix is diversified, which provides flexibility and stability, even in circumstances where one or more green energy sources are affected.
- The share of various energy sources is relatively balanced, contributing to the stability of the energy system.
- There is significant potential for the development of renewable energy sources**.**
- Stable energy sources hold a substantial share (such as hydrocarbons and nuclear energy), which, although not renewable, are less polluting than coal-based energy and provide stability in electricity production.

National energy infrastructure networks

Energy infrastructure networks primarily consist of electricity transmission networks and oil and natural gas transport networks. Given the scope of this scientific endeavor, an exhaustive analysis of all categories of critical and non-critical infrastructure is not possible. Therefore, we will focus on the electricity transmission network, as it is a vital component of Romania's energy security and the broader energy union being developed at the European level[4].

An important point to highlight is that in Romania's National Energy System (SEN), the electricity generation, transmission, and distribution activities are completely separated. This separation was formalized by Government Decision No. 627/2000[5], which established the National Electricity Transmission Company "Transelectrica" S.A. as a distinct entity from other state companies responsible for electricity generation and distribution. Transelectrica is a state-owned joint-stock company considered of strategic national interest. Transelectrica manages the transmission of electricity through the Electricity Transmission Network (ETN)**,**

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[1] The National Authority for Regulation in the Field of Mining, Petroleum, and Geological Storage of Carbon Dioxide (ANRMPSG), *Petroleum Agreements*, https://www.namr.ro/resurse-de-petrol/acorduri-petroliere/ (12.11.2024)

[2] Transelectrica, *The National Energy System*, https://www.transelectrica.ro/web/tel/sistemul-energetic-national, (14.11.2024)

[3] Cristina Oneț, *Greenhouse gas emission certificates-financial instruments for implementing environmental policies in Romania, "Pandemic Challenges for European Finance. Business and Regulation",* Editirta Universității "Alexandru Ioan Cuza" din Iași, 2021, pp. 330-348

[4] European Commission, *A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*, 2015, https://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0012.03/DOC_1&format=PDF (14.11.2024)

[5] Legislație.just, *HOTĂRÂRE nr. 627 din 13 iulie 2000 (*actualizată*) privind reorganizarea Companiei Naționale de Electricitate - S.A. (actualizată până la data de 9 august 2010*),* HG 627 13/07/2000 - Portal Legislativ (12.12.2024)

which consists of 81 substations and 8,834 km of transmission lines**.** The ETN is classified as a national and strategic network, with a nominal line voltage of over 110 kV[1].

Since Transelectrica is responsible for managing the ETN, the company has also developed a 10-year ETN development plan, approved in 2022 and set to be completed by 2031. This plan is based on Romania's government strategies and public policies, future scenarios for the evolution of the National Energy System, and the objectives of the European Union's new policy for competitive, secure, and sustainable energy[2]. At the European level, consolidated legislation has been adopted to facilitate the development of an integrated European electricity market. To ensure its full functionality, Regulation 2019/941 on risk preparedness was adopted to enhance preparedness for risks by encouraging cooperation between transmission system operators (TSOs) within the EU, neighboring countries[3], and the Agency for the Cooperation of Energy Regulators (ACER)[4]. This regulation facilitates cross-border management of electricity networks during an energy crisis through newly created regional operational centers under Regulation (EU) 2019/943 on the internal electricity market.

The European Network of Transmission System Operators for Electricity (ENTSO-E) develops and proposes a common methodology for identifying risks, in collaboration with ACER and the Electricity Coordination Group, which is later approved by ACER[5]. Four sets of measures have been proposed:

- Common rules for preventing and preparing for electricity crises to ensure cross-border cooperation;
- Common rules for crisis management;
- Common methods for assessing supply security risks;
- A common framework for better evaluating and monitoring electricity supply security**.**

The electricity market in Romania

In June 2019, the European Union adopted the fourth energy package, which includes Directive 2019/944 on electricity and three regulations: EU Regulation 943/2019 on electricity[6] EU Regulation 941/2019 on risk preparedness[7] and EU Regulation 942/2019 on the Agency for the Cooperation of Energy Regulators (ACER)[8]. This was followed by the fifth energy package, titled "Implementing the European Green Deal," which was published on July 14, 2021, to align EU energy sector objectives with new EU climate goals for 2030 and 2050[9]. As a result, national legislation was modified accordingly, and the new provisions were subsequently implemented.

In accordance with European regulations, the National Energy Regulatory Authority (ANRE) was established at the national level. ANRE is an autonomous administrative authority, with legal personality, under parliamentary control, fully funded from its revenue, and independent in decision-making, organization, and function. Its responsibilities include the development, approval, and monitoring of the application of

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[1] Transelectrica, *Management RET*, https://www.transelectrica.ro/ro/web/tel/date-generale-management (14.11.2024)

[2] Transelectrica, *The European Ten-Year Network Development Plan (TYNDP),* https://web.transelectrica.ro/noutati/noutati/word/PPDRET%202024-2028-2033.pdf (15.11.2024)

[3] *Regulation 2019/941 on risk preparedness*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0001.01.ENG#:~:text=This%20Regulation%20sets%20out%20a%20common%20framework%20of,are%20taken%20in%20a%20coordinated%20and%20effective%20manner (15.11.2024)

[4] Agency for the Cooperation of Energy Regulators (ACER), *EU Regulation No. 942/2019*, https://eur-lex.europa.eu/legal-content/RO/TXT/?uri=CELEX%3A32019R0942 (15.11.2024)

[5] https://www.entsoe.eu/ (15.11.2024)

[6] European Parliament and of the Council, *Regulation (EU) 2019/943 on electricity,* 2019, https://www.europex.org/eulegislation/electricity-regulation/#:~:text=Regulation%20%28EU%29%202019%2F943%20on%20the%20internal%20market%20for,role%20of%20the%20market%20in%20providing%20price%20signal 3A32019R0942 (15.11.2024)

[7] European Parliament and of the Council, *Regulation (EU) 2019/941 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC*, 2019, https://eur-lex.europa.eu/eli/reg/2019/941/oj/eng (15.11.2024)

[8] European Parliament and of the Council, *Regulation (EU) 2019/942 establishing a European Union Agency for the Cooperation of Energy Regulators*, 2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AL%3A2019%3A158%3ATOC&uri=uriserv%3AOJ.L_.2019.158.01.0022.01.ENG (15.11.2024)

[9] *The European Green Deal,* https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en (15.11.2024)

mandatory regulations at the national level necessary for the functioning of the electricity, thermal energy, and natural gas sectors and markets, ensuring efficiency, competition, transparency, and consumer protection[1].

According to the Law No. 123/2012 on Electricity and Natural Gas[2], ANRE monitors the implementation of rules related to the roles and responsibilities of transport and system operators, distribution operators, suppliers, consumers, and other market participants. ANRE also monitors the management of congestion within the national electricity systems and the implementation of congestion management rules. In this regard, transport and system operators or market operators present ANRE with their congestion management rules, including capacity allocation rules, and ANRE has the right to review and request modifications to these rules. The rules for congestion management within interconnection capacities are established by all regulatory authorities or by the Agency for the Cooperation of Energy Regulators (ACER)[3].

At the same time, Article 20 of Law No. 123/2012 on Electricity and Natural Gas firmly establishes that the electricity market is competitive, and transactions in electricity are conducted on a wholesale or retail basis[4]. According to Article 21 of Law No. 123/2012 on Electricity and Natural Gas**,** participants in the electricity market must comply with the operating rules issued by ANRE, being required to assume financial responsibility for imbalances they generate on the electricity market. Additionally, market participants must notify the transport and system operator of imports, exports, and transit activities during trading periods, with external partners, for each border[5].

Market participants have the right to trade electricity as close as possible to real-time, and at least until the closing time of the intraday market, with the possibility to trade electricity in time intervals at least as short as the imbalance settlement period, both on the day-ahead markets and intraday markets[6].

To provide protection to market participants against price volatility risks based on the market and reduce uncertainty regarding future investment returns, long-term risk-hedging products are traded on the exchange transparently, and long-term supply contracts can be negotiated in over the counter (OTC) markets, subject to compliance with EU competition law. The designated electricity market operator offers products for trading on the day-ahead and intraday markets that are of sufficiently small size, with the minimum offer size being 500 kW or less, to allow the effective participation of dispatchable consumption, energy storage, and small-scale renewable energy sources, including direct participation by consumers.

Participation in any electricity market is voluntary. On the electricity market, the transmission and system operator purchase system services, including capacity and energy services.[7] On the retail market, suppliers sell electricity to final customers through bilateral contracts, at negotiated prices or prices set by standard offers[8]. Romanian authorities, together with participants in the domestic energy market (e.g., OPCOM**,** Transelectrica, etc.), are involved in initiatives aimed at facilitating the integration of the electricity market at the regional level, particularly in the process of implementing Regulation (EU) No. 1222/2015 establishing guidelines for capacity allocation and congestion management[9] in the context of creating and operating the Single Day-Ahead Coupling (SDAC) and Single Intra-Day Coupling (SIDC)**,** including the relevant contractual framework.

In Romania, the Electricity Market Operator (OPCOM) is a joint-stock company with 100% state-owned capital, established by Government Decision No. 627/2000.[10] The shareholding structure is as follows: 97.84% of the capital belongs to the National Electric Power Transmission Company - Transelectrica S.A., and 2.16%

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[1] *Legea nr. 123 din 10 iulie 2012 a energiei electrice și a gazelor naturale*, Article 7, "Monitorul Oficial al României", No. 485, 16 Iulie 2012

[2] *Idem*

[3] *Legea nr. 123 din 10 iulie 2012 a energiei electrice și a gazelor naturale*, Article 7, Paragraph 1, "Monitorul Oficial al României", No. 485, 16 Iulie 2012

[4] *Ibidem,* Article 20

[5] *Ibidem,* Article 21

[6] *Ibidem,* Article 23, Paragraph 3

Ibidem, Article 23, Paragraph 7

[8] *Ibidem,* Article 23, Paragraph 8

[9] European Parliament and The Council, *Regulation (EU) 2015/1222 establishing guidelines for capacity allocation and congestion management*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015R1222 (15.11.2024)

[10] Romanian Government, *Decision No. 627 of July 13, regarding the reorganization of the National Electricity Company - S.A.*, https://www.cdep.ro/pls/legis/legis_pck.htp_act?ida=25333 (11.11.2024)

belongs to the Romanian State, represented by the General Secretariat of the Government[1]. Since September 2000, the wholesale electricity market and system services in Romania have been managed by S.C. OPCOM S.A. under the primary and secondary legislation in force. According to this, the Electricity and Natural Gas Market Operator "OPCOM" S.A. fulfills the role of administrator of the electricity market, providing an organized, viable, and efficient framework for conducting commercial transactions on the wholesale electricity market. It also manages centralized markets in the natural gas sector, ensuring consistency, fairness, objectivity, independence, impartiality, transparency, and non-discrimination[2]. The main activities conducted by OPCOM in the electricity sector, by the provisions of the primary legislation (Law No. 123/2012 on Electricity and Natural Gas) and secondary legislation (Government Decision No. 627/2000 on the reorganization of the National Electricity Company S.A.), are as follows:

- Organizing and managing centralized electricity markets;
- Acting as a clearing operator, carrying out clearing operations for the Day-Ahead Market (PZU) and Intraday Market (PI), determining payment obligations and/or collection rights for the Balancing Market and managing quantitative and financial imbalances for the responsible balancing parties;
- Organizing and administering the Green Certificate Market;
- Administering the platform for trading greenhouse gas emission certificates;
- Managing centralized markets in the natural gas sector;
- Monitoring the functioning of the markets managed;
- Collecting and publishing statistical market data, by the provisions of the Energy Law.

From the perspective of its area of activity and the responsibilities assigned to it, OPCOM is a member of the International Association of Power Exchanges (APEx), the Association of European Energy Exchanges (EUROPEX), and other national committees and associations. To ensure the quality of services provided under its licenses to third parties and involved authorities, OPCOM implements a Quality Management System certified by Lloyd's Register Quality Assurance. Additionally, to ensure the security, confidentiality, and availability of information to interested parties, OPCOM applies an Information Security Management System certified by Lloyd's Register LRQA[3].

Moreover, OPCOM undertakes necessary actions to fulfill its mission of providing reference prices for electricity and natural gas and forward price signals for electricity and natural gas, while ensuring the market conditions necessary for achieving the objectives of the National Energy Strategy. These actions aim to increase transparency and the overall integrity of the Romanian wholesale energy market, supporting the process of completing market liberalization and its integration into the European Single Market. Thus, OPCOM organizes and supervises the following specialized electricity markets:

a) Day-Ahead Market (PZU);
b) Intraday Market (PI);
c) Centralized Bilateral Contract Market - PCCB-NC trading method;
d) Centralized Double Continuous Bilateral Contract Market for Electricity (PC-OTC);
e) Centralized Universal Service Market (PCSU);
f) Centralized Renewable Energy Electricity Market Supported by Green Certificates (PC-ESRE-CV);
g) Centralized Anonymous Spot Market for Green Certificates (PCSCV).[4]

Conclusions

This study does not aim to provide a comprehensive analysis of Romania's National Energy System, as the topic would be too complex to cover in such a context. However, it offers an objective and well-argued overview of this system to assess whether Romania will be able to benefit from stable and real energy security within a short time frame.

Based on all the arguments presented throughout this work regarding each of the elements that determine the energy security of a country, we believe that Romania has set a realistic goal, with a high potential for achievement. Although there are still actions to be taken, such as expanding and strengthening

[1] *Idem*
[2] *Idem*
[3] *Idem*
[4] *Idem*

energy sources and transmission networks, improving the energy mix, and, finally, deeply and fully liberalizing the domestic market, as well as accessing other energy markets, the country is on the right path to achieving its energy security objectives.

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