

THE DYNAMICS OF THE ROMANIAN ENERGY MINING INDUSTRY IN THE EUROPEAN CONTEXT

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ABSTRACT: *The study presents aspects regarding the evolution of the coal industry in Romania in the conditions of alignment with the convergence factors stipulated by the decision-makers of the community space. In the last century, the Romanian mining industry has witnessed a strong development. The intensification of exploitation activities has intensified considerably as coal demand has been on the rise from one period to the next. Thus, the European directives impose the need to optimize the production costs in the coal industry on the basis of competitiveness in the conditions of obtaining alternative electricity at a lower cost than the one obtained through the combustion of coal.*

Key words: *energy mining industry, electricity, coal, production capacity*

Jel classification: *D23, L72, M40*

Introduction

Under the conditions of a market economy, the carbon industry faces a permanent challenge, on the one hand, to keep costs under control in a harsh competitive environment and on the other hand to ensure the sustainability of activity for the next generations. Thus, the mining activity has a secular contribution to ensuring the energetic and cultural identity of the country by ensuring the organizational framework necessary for the good development of all the activities that gravitate around this industry.

By extracting the energy of the earth, the carboniferous industry ensures stability of the national energy system and contributes to the improvement of the constantly changing social environment, influenced by the demographic factor regress in the conditions of the considerable advance of the energy resource consuming technologies. In the sphere of action of the new challenges manifested both by the decisions of the decision-makers of the european area that militate to reduce, in a considerable percentage, the electricity obtained from the burning of coal by substitution with the renewable energy resources, as well as by intensifying the optimization actions of the cost of electricity production at all the organizational subdivisions of the energy supplier.

In the current economic context marked by increasingly prominent challenges, the need to impose a responsible behavior by national decision makers to reorganize the carbon industry on the principles of economic competitiveness, sustainability and social responsibility becomes a priority given that business requirements on a fierce competitive market are increasingly demanding in order to align with the directions of action of the community's economic space.

The fundamental objective underlying the scientific research presented in this format was to highlight the importance of a key industry in the romanian economic system marked by profound transformations due to decisions coming from the community space which are directed towards the reduction by about 30% of the electrical energy obtained through the use of coal and supplementing this reduction with electricity from renewable resources. In this case, the analysis of the activity of the mining industry in terms of improving the economic performance of the activity is to be shown to contribute to the sustainable development of the mining communities on the one hand and its contribution to the sustainable development of the society as a whole.

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Literature review

Crowson P. notes in his study that the European mining industry has a long, profitable and varied history being faced with many challenges. In countries with developed mining, it is a small part of GDP indicator, but it contributes to the global production of many products. The European industry has a favorable comparison with that of the United States of America because of the fact that it has fewer metal products but has a strong trend for industrial minerals. The predominant feature of this industry is that it is a legacy of state ownership and incipient protectionism, as well as a complex property of land and rights to minerals. [1]

In the study undertaken by Kowalska-Jonek I (2017), coal mining in Europe is treated as a declining industry due to the economic growth and risk faced by the mining sector. In post-transition economies, such an approach poses a threat to energy security and local and regional economic development. Currently, the survival of coal mines in Central and Eastern Europe is threatened by global cumulative risk factors, in terms of the prices offered by various producers and the competition resulting from the exploitation of shale gas in the United States of America. [2]

As a basic component of the coal mining industry, coal plays an essential role in primary energy sources, notably by ensuring price stability as a major and indispensable factor for further stability and growth, as well as its distribution throughout the world (Dina C, 2010). [3]

Romania has a long tradition in the mining industry and has significant coal reserves that can ensure the continuity of production for more than 150 years. Coal reserves and resources were estimated at about 2.446 billion tonnes, of which 252.5 million tonnes are commercially exploited in rented premises (Ioana D et al., 2014). [4]

The region between the Danube and Olt rivers has been the subject of intense geological and hydrogeological research, whose results have materialized by highlighting the existence of several carboniferous deposits and important geological reserves, cantoned in sedimentary formations of higher Pliocene age. The coal complex in the sub-Carpathian area of Oltenia, where the exploitable lignite reserves are located, has a continuous development between the Danube and Olt rivers, on the territory of Vilcea, Gorj and Mehedinți counties. Part of these reserves, due to the favorable deposit conditions, entered the economic circuit, with an important share of the country's energy balance (Huidu E, 2007). [5]

According to Romania's Mining Strategy [6], energy independence has become the priority objective, appreciating that the EU's energy mix will continue to rely heavily on fossil fuels, including coal, and for Romania, coal will be the main pillar of energy security until 2035. European companies can rely on coal and lignite in their energy mix for decades now because of their very large resources. Domestic coal production demonstrates best practices worldwide for exploitation, environmental protection and job security. The security of fossil fuel supply and access to resources must therefore remain a priority for the Union's future energy policies.

The oldest archaeological evidence regarding the mining activity in our country, most of them indirect, but also some recorded in the historical writings, dates from the end of the Neolithic, the Bronze Age and the Iron Age (Ioana D., 2014) [7].

In his study, Miranda M, 2009 [8], recalls that Romanian mining is seen as a traditional occupation, proven since antiquity, when the Romans came here to extract gold and base metals from the mines in the Transylvanian mountains.

The existence of coal in Romanian space has been known since the earliest times, through the affluences in the hills or uncovered by the rivers or brooks, the inhabitants of the villages adjacent to the water courses using the lignite for domestic purposes [9].

Methodology of research

In the realization of the scientific approach, the onset of the research on the studied subject was represented by the correct positioning in the sphere of knowledge both of the general field of

research in which the present study is oriented and its specific subdomains. Therefore, this study considers the economic and social context under the influence of carboniferous activities.

The scientific approach of this paper was made by consulting various bibliographic materials, consisting of books, articles of specialty published at national or international level, legislative bibliography and sites specialized in the studied subject.

The elaboration of the scientific approach highlights the actions undertaken in order to achieve a quantitative research that is effectively combined with the qualitative research to give a considerable value to the undertaken study. Thus, the theoretical research was mainly performed in the initial structure of the work, the approach in this case being deductive, starting from concepts, theoretical notions and regulations specific to the study area. Also, scientific research has resulted in the inclusion of other methods and techniques of analysis of the studied subjects (statistical-mathematical methods, comparative methods, etc.).

The romanian energy mining industry in the european context

The first observations made on the coal deposit in the Jiu Valley were recorded in 1782, when it burned in the outskirts and burned for a long time, the observation being made by mineralogist Benkő Janos.

The tendencies of sporadic exploitation of the Lignites existed between 1916-1917, as a result of the difficulties created by the First World War, regarding the supply of fuel from the territory, leading to the extraction of 1000 tons, marking the beginning of the mining activity in the Rovinari basin towards example.

The national energy program between 1970-1980 involved a considerable increase in the amount of coal consumed to obtain energy to compensate for the low role of gas and oil in the production of electricity.

The geomorphic conditions and mineralogical characteristics of the deposits in Romania are complex, and the quality parameters are at the lower limit, relative to the quality of similar deposits currently exploited worldwide, with performing technologies with 5-12 times higher productivity.

The coal market in Romania has a tendency to increase since 2013 due to the additional demand for energy products due to favorable economic conditions. It is worth mentioning that during the analyzed period the consumption of coal was higher than the domestic production capacity, thus the necessary difference in consumption is ensured from import (Figure1).

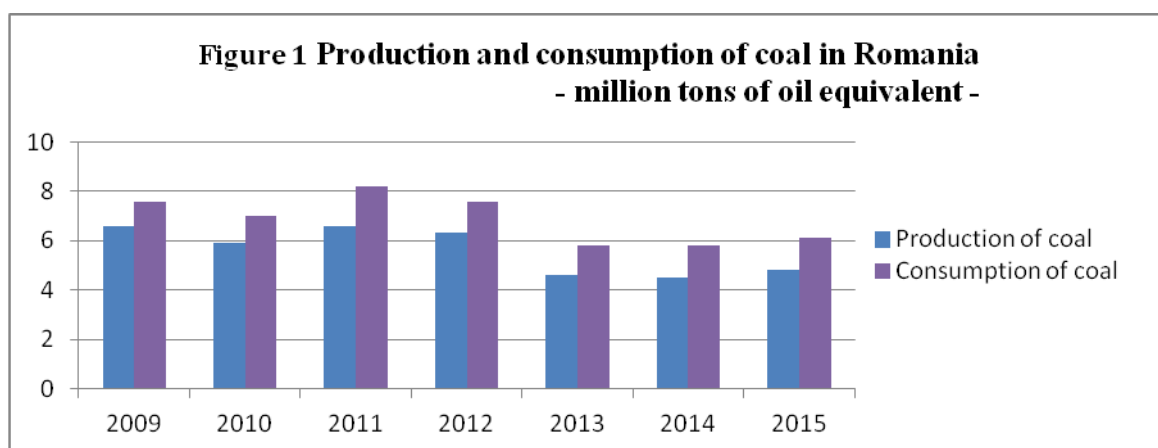


Figure 1. Production and consumption of coal in Romania

Source: Own processing based on data provided by EURACOAL (European Coal and Lignite Association), available at www.euracoal.org

The Oltenia Energy Complex is the largest coal-fired power producer in Romania (owns 99% of the national lignite production), with an installed capacity of 4300 megawatts at the

Rovinari, Turceni, Isalnița, Craiova II, Braila and 12 mining units in the Oltenia coal basin with operating licenses for another 50 years. The company has 16,000 employees including contractors' employees.

As a consequence of current legislation, market access is disadvantageous for energy suppliers using conventional resources, compared to those using renewable energy resources. At present, Romania has an installed capacity of approximately 24,400 megawatts, while the average consumption is 7,000 megawatts and 2000 megawatts can be exported. In addition to the 24 400 megawatts, more than 5000 megawatts are renewable sources with priority access [10].

Regarding coal production, Romania registered a decreasing trend over the period 2007-2014, from about 2.8 million tonnes of production recorded in 2007 to 1.5 million tonnes of production recorded in 2014 (Figure 2).

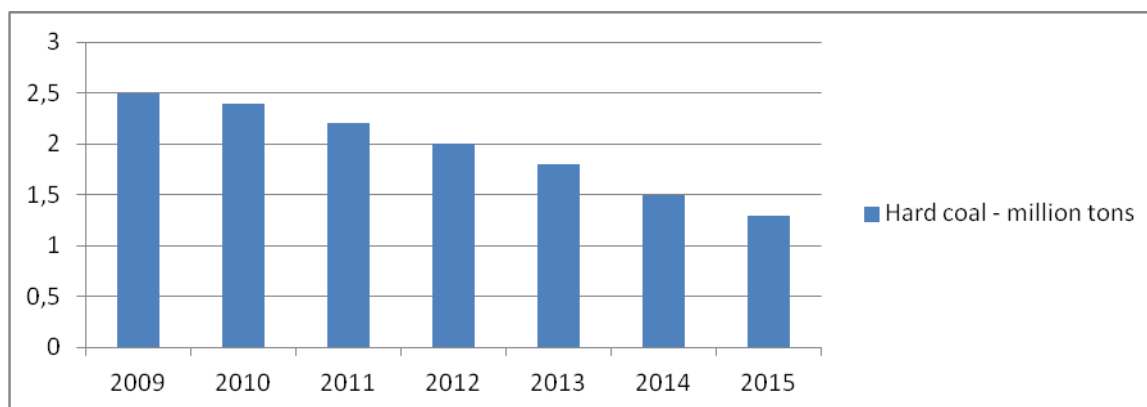


Figure 2. The evolution of coal production in Romania during 2009-2015

Source: Own processing based on data provided by EURACOAL (European Coal and Lignite Association), available at www.euracoal.org

This fall in the production of coal during the period 2007-2015 is due to the recording of very high production costs and obsolete mining technology.

Lignite production in Romania also drops from around 31 million tonnes in 2006 to 24 million tonnes in 2015 (Figure 3).

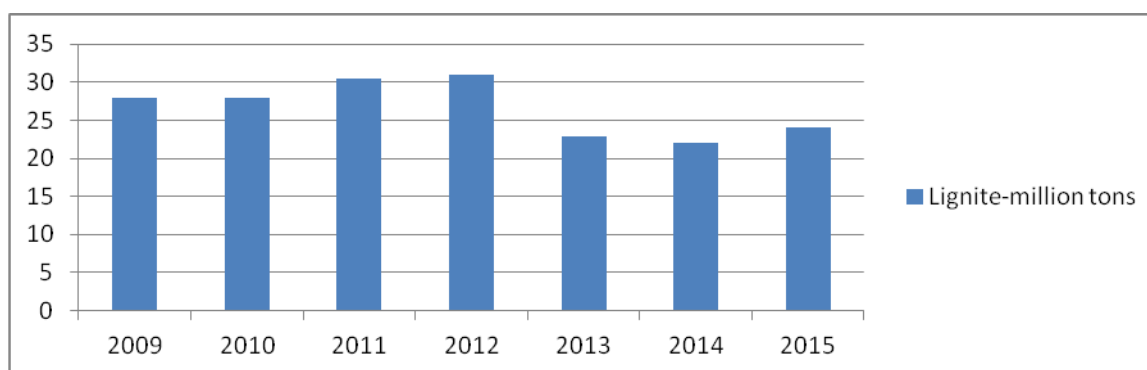


Figure 3. The evolution of lignite production in Romania during 2009-2015

Source: Own processing based on data provided by EURACOAL (European Coal and Lignite Association), available at www.euracoal.org

This decline over the period 2013-2014 was due to the difficult conditions of coal exploitation and the restructuring of the mining sector in Romania by shutting down those unprofitable production units and adapting production costs to the competitiveness requirements

established by the community space. Starting with 2015, production shows an upward trend over the previous year due to improved operating conditions due to investments made.

The european coal market has been on the downward trend since 2012 (Figure 4) due to the low price of electricity sold, losses due to subsidizing renewable sources, pressures on environmental protection and the moderation of mining investments.

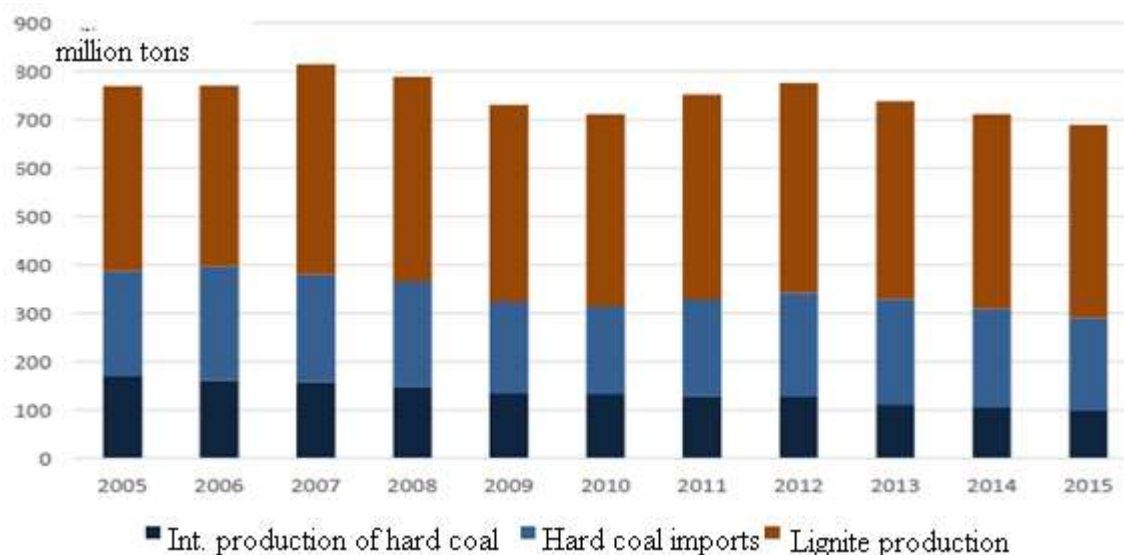


Figure 4. Evolution of the coal market at European level

Source: 1/2006 Report of the European Coal and Lignite Association - EURACOAL

The evolution of coal production has been declining over the last decade due to the deficient operating conditions, the increase in the role of renewable resources, the reduction of environmental footprint as well as cost reasons (Figure 5).

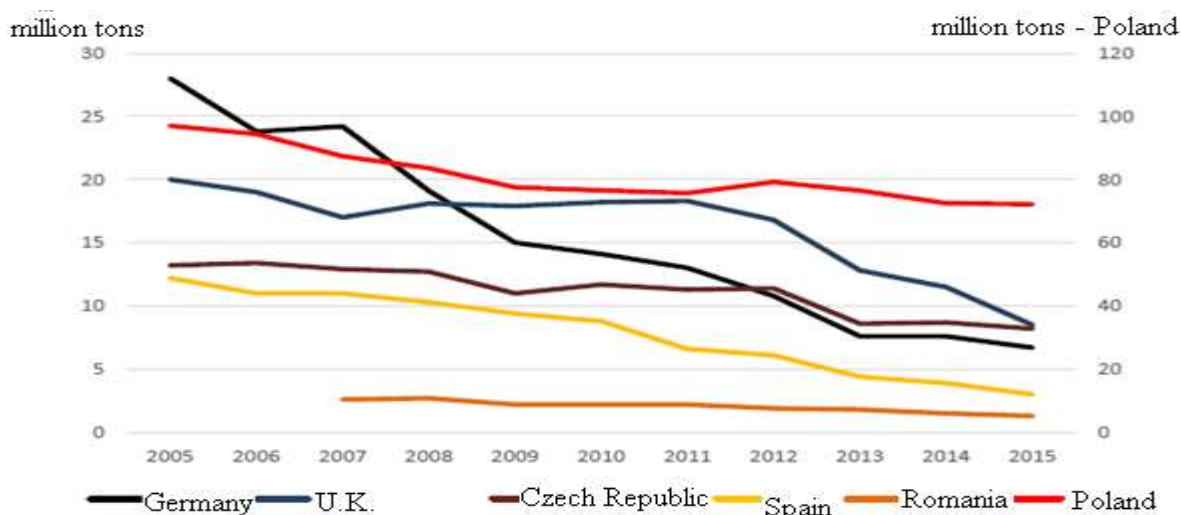


Figure 5. Evolution of European coal production in the period 2005-2015

Source: 1/2006 Report of the European Coal and Lignite Association - EURACOAL

The situation of lignite production at European level is somewhat similar to that of coal, given that only two countries (Romania and Bulgaria) register an increase in the quantity of lignite produced in the previous year in 2015, with the rest of the producer countries declining of the production of lignite during the same period. Evolution of lignite production over the last ten years at European level is shown in Figure 6.

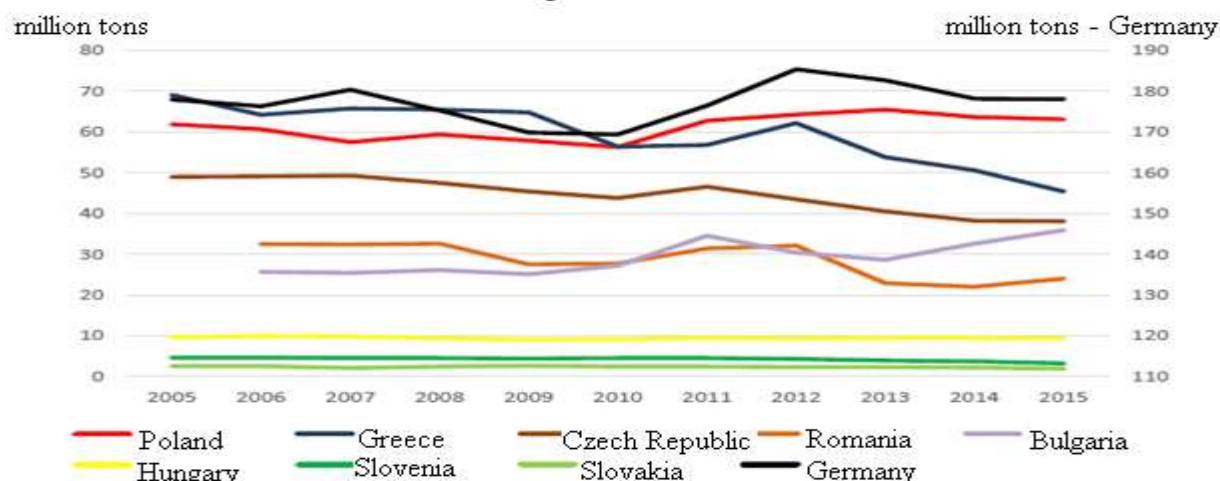


Figure 6 Evolution of lignite production at european level in the period 2005-2015

Source: 1/2006 Report of the European Coal and Lignite Association – EURACOAL

Analyzing the evolution of lignite production at european level according to Fig. 6 it can be concluded that most of the lignite producers registered slight decreases in the analyzed period but with growth prospects in the last two years for Romania and Bulgaria. The predominantly decreasing trend is due to various factors, among which we can limit the carboniferous resource by encouraging the renewable resource in the context of diminishing the footprint on the environment.

Analyzing the production of coal-based electricity compared to other alternative sources of electricity generation, it can be said that in 2014, the total quantity of electricity delivered to different producers' networks was 59.65 terawatts on hour. Producers holding dispatchable units delivered the quantity of 57.85 terawatts on hour, resulting from the monthly monitoring of the respective producers.

The structure of electricity delivered by different manufacturers, calculated on conventional and unconventional resources, is shown in Figure 7.

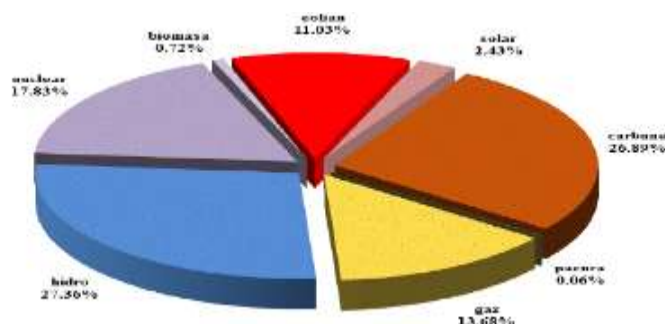


Figure 7. Structure by power source types supplied by different manufacturers

Source: ANRE, based on reports of electricity producers according to ANRE Order no. 69/2009

Compared to the power supply values delivered in 2014, in 2015 there is an increase of approx. 1% of the electricity delivered to the National Energy System, due to the export activity and the increase of the domestic consumption.

Analyzing the annual quantities of electricity produced by different producers according to the individual annual market shares, it is clear that in comparison with the previous year, in 2015 it is found that approx. 68% of the production was made by the 3 classical producers, Hidroelectrica, Oltenia Energy Complex and Nuclearelectrica, the rank order being the same (Figure 8).

With the exception of Nuclearelectrica, the production of which is comparable to that registered in 2013, the other two producers with the highest market share produced 24.5% (Hidroelectricita) and 12.5% respectively (Oltenia Energy Complex) of the previous year, while other developers registered a significant decrease over the previous year (a 40% decrease for OMV Petrom, 10% for Hunedoara Energy Complex and 14.7% for Electrocentrale Bucharest) [11].

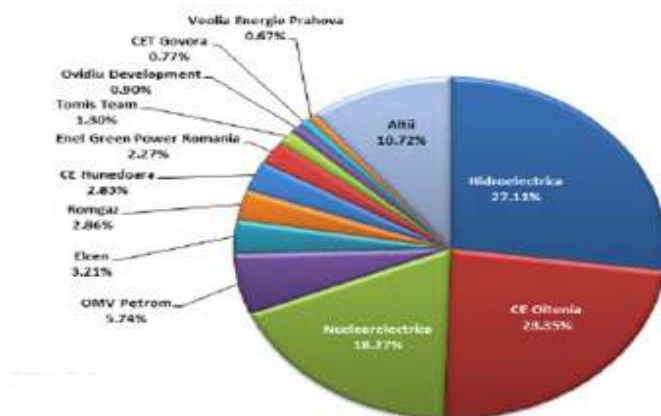


Figure 8. Market shares of producers in function of the electricity supplied to the networks
Source: ANRE, based on monthly reports of electricity producers

According to data presented by the European Coal and Lignite Association (EUROCOAL), coal (coal) resources are estimated at 2.446 million tonnes, of which 252.5 million tonnes are commercially exploitable perimeters. Lignite reserves are estimated at 280 million tons, of which 95% are located in the Oltenia mining basin, of which more than 80% can be exploited. The remaining lignite deposits have low economic potential, which is why extraction in most areas is stopped.

Romania has a long mining tradition, all lignite and coal production in Romania is used for heat and energy generation. At the end of 2015, there is a net installed capacity of 20 419 MW, out of which:

- ✓ 4,925 megawatts coal (24,1% - 1,148 megawatts coal and 3,777 megawatts of lignite),
- ✓ natural gas / liquid fuel 3 571 MW (17.5%),
- ✓ hydro 6.339 megawatts (31.0%),
- ✓ 1,300 megawatts (6,4%) nuclear power,
- ✓ Renewable sources of 4,284 megawatts (21,0%), mostly wind turbines

The peak demand is between 8,000 MW and 8,500 megawatts, which indicates an overcapacity of generation and the possibility of significant electricity exports.

In 2015, gross electricity production in Romania was 65.6 terawatts: 27.4% of hydro, 26.9% of coal, 17.8% of nuclear energy, 14.2% of renewable sources and 13, 7% of natural gas.

The first commercial nuclear reactor Romania started operating in 1996 and a second CANDU reactor was commissioned in May 2007, thus completing two of the five reactors whose construction started in the 1980s and increased the total gross capacity of the nuclear power plant at Cernavoda to 1,413 megawatts. Completion of two new 720 megawatts reactors is planned by the National Nuclear Power Company (SNN), in collaboration with an external investor.

Conclusions

The energy mining industry in Romania has been, over time, the creative activity of state, economic and social stability. Romania had the historic chance to hold a territory rich in mineral resources that have contributed, since ancient times, to the consolidation of the settlements around

the carpathian arch. These natural riches have been, throughout history, both the triggering factor of some military conflicts dated back to roman times and the decisive factor behind the founding and development of local communities.

The resources of hard coal are estimated at 2.446 million tonnes, of which 252.5 million tonnes are commercially exploitable perimeters. Lignite reserves are estimated at 280 million tons, of which 95% are located in the Oltenia mining basin, of which more than 80% can be exploited. The remaining lignite deposits have low economic potential, which is why extraction in most areas is stopped. Lignite offers Romania a competitive advantage by using upgraded technologies and skilled labor to provide low-cost electricity. Lignite reserves are concentrated in a relatively small area of 250 square kilometers where the operation is concentrated in twelve licensed perimeters for fifty years. These reserves provide a long-term supply of the Turceni power plants (1650 megawatts) and Rovinari (1320 megawatts). In addition, to the south are Craiova power plants of 300 megawatts and Işalnița 630 megawatts.

The use of coal adds value along the entire supply chain. This contributes to positive results in terms of economic performance and employment. With the implementation of appropriate carbon capture and storage technologies and other clean-up emerging technologies, coal will play an important role in a safe and sustainable supply in the future. The capacity of the carbon industry to ensure the continuity and stability of the energy sector under unsuitable climatic conditions is the rationale for investing in this area of activity and adopting appropriate management measures to meet the optimization and efficiency requirements of the business with an influence on funding opportunities regulated by decision makers of the community bloc.

Bibliography

1. Crowson, P., The European mining industry: What future?, *Resource Policy*, Vol. 22, pp. 99-105.
2. Jonek – Kowalska, 2017. Coal mining in central-est Europe în perspective of industrial risk, *Oeconomia Copernicana*, Vol. 8, pp. 131-142.
3. Dina, I.C., 2010. The romanian coal industry in the context of economic global development, *Annals of the Constantin Brancuși University, Economy Series*, Vol. 4.I, pp. 107-114.
4. Ioana, D., Diaconescu, C., Topor, D.I, 2014. Realities and perspectives concerning mining energy sector in Romania, *International Journal of Academic Research in Busines and Social Sciences*, Vol. 4, Issue 8, pp. 413-419.
5. Huidu, E., 2007. Mining Monograph in Oltenia, Targu Jiu, Maiastra Publishing House
6. Mining Industry Strategy, 2012_2035
7. Ioana, D., 2014. Developments and innovations in the management accounting and cost calculation in the energy mining industry, Doctoral thesis, Alba Iulia.
8. Miranda, M., 2009. Industria minieră și dezvoltarea durabilă în România.
9. Huidu, E., 2000. Monograph of mining in Oltenia, Constantin Brâncuși Foundation Publishing House, Targu Jiu.
10. European Association for Coal and Lignite (EURACOAL), Market Report 1/2015.
11. National Regulatory Authority for Energy (ANRE), Annual Report on the Activity of the National Regulatory Authority for Energy, April 2015.
12. [http\|: www.euracoal.org](http://www.euracoal.org)