

A Micro and Macroeconomic Analysis of the Energy Industry: The Economic Efficiency of Enterprises

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Abstract

The purpose of this article is to analyse at the micro- and macroeconomic level the energy industry in Romania, evaluating the economic efficiency of the company Nuclearelectrica SA in the period 2018-2022. Starting from a macroeconomic perspective, analysing electricity prices at the level of the European Union and Romania, a substantial increase in prices was observed that household and non-household consumers have fully felt since 2022, corroborated, on the other hand, with the profits obtained in general by companies in the industry, and in particular by Nuclearelectrica SA in the period 2018-2022. In order to evaluate the economic efficiency of a company, level and structure indicators and performance indicators were calculated and interpreted. The results of the study show that the economic efficiency of companies in this industry is high, facing the difficult legislation on environmental pollution and the rules imposed by the European Union on the creation of clean energy. This study provides an overview to investors and stakeholders, which is a basis for substantiating subsequent investment decisions.

Keywords: micro and macroeconomic perspective, economic efficiency, energy industry

JEL classification: G32, O11, O12, O13, Q43, Q49

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1. Introduction

In recent years, there has been an increasing emphasis on the significance of energy efficiency in both national and international political discourse. It is now widely recognised as an essential element that contributes to sustainable environmental and economic growth. In academia, there has been an increasing focus on analysing this energy industry as the target of large government organisations is to reduce pollution and significantly reduce climate change. Europe wants to have zero pollution by 2050, thus gradually establishing clear objectives to reduce air and environmental pollution ([European Commission, 2023](#)).

Achieving a global consensus on pollution neutrality efforts over the next 30-40 years is gaining momentum, which requires collaborative action to address the growing challenge of climate change internationally ([Zhang et al., 2022](#)). On the other hand, the most targeted industry seems to be the energy industry, because it is considered to be the most polluting industry, with over 15.83 billion tons of CHG emissions in 2022, followed by the transport industry, with almost half less than the energy industry, with 8.43 billion tons of CHG emissions in 2022 ([The Eco Experts, 2023](#)).

Romania's energy transition is a real challenge for the Romanian energy sector because it involves efficient management of social and economic impacts with an emphasis on regions heavily dependent on a certain industry, especially those on carbon. In this respect, both the European Union and local public administrations will play an essential role in attracting structural funds to help companies modernise their production to achieve the strategic objectives of economic efficiency and clean energy (the Ministry of Economy, Energy and Business Environment, 2020).

Regarding the structure of the article, the next section briefly presents the literature review, followed by a brief review of the research methodology. The results of the research are presented in the next part and in the last section the general conclusions of the paper are presented.

2. Literature review

Technological advances and the use of electricity significantly shape society, both at the macroeconomic and microeconomic levels. The main focus of society was on the impact that the energy industry has on the environment and how it increases the quality of life of the consumer ([Zorzo et al., 2016](#)). At the same time, strategies for reducing the impact on the environment and increasing the quality of life of consumers require investments to increase efficiency, both at the macroeconomic level, reducing the impact on the environment, and at the microeconomic level, maximising the value of investments for shareholders ([Agustoni and Maretti, 2012](#)).

Efficiency review has become a crucial endeavour in all business sectors, especially in the energy industry ([Sellers-Rubio and Mas-Ruiz, 2006](#)). At the macroeconomic level, economic efficiency refers to a balanced ratio between optimal consumption and production ([Anghel and Treapăt, 2016](#)). On the other hand, at the enterprise level, the most common form of economic efficiency refers to that of profitability, in other words, a company is efficient when the cash flow generated by the sales it makes is greater than the costs he engaged ([Anghel and Treapăt, 2016](#)). In other words, economic efficiency measures the results of an enterprise's economic activity in direct relation to the corresponding invested efforts. At the same time, it represents an essential qualitative factor in economic growth, ensuring an increase in results with a consistent invested effort ([Geamănu, 2011](#)).

The specialised literature shows that there are different methods to study economic efficiency, and most studies have analysed a certain industry. For example, [Janjua and Akmal \(2015\)](#) analysed the economic efficiency of conventional and Islamic insurance sectors in Pakistan for the period 2006-2011. The results obtained show that the insurances were average cost-effectiveness (75% versus 67%) and higher efficiency (77% versus 67%). However, analysis of company reports indicates that, on average, conventional insurance companies were more efficient. The study attributes the lower economic efficiency in Islamic insurance to their status as new entrants with less favourable profitability compared to conventional insurance during the analysis period.

Analysing the economic efficiency of Slovenian coastal hotel companies in the period 2015-2018, [Frančeskin and Bojnec \(2022\)](#) showed that most Slovenian coastal hotel companies were economically inefficient, with low returns due to difficulties in properly allocating resources. At the same time, the study shows that economic growth does not affect the economic efficiency of hotel companies when allocation of resources is carried out incorrectly.

[Pyatunin et al. \(2016\)](#) analysed the correlation between efficiency and various financial indicators of 48 European football clubs. Using data envelopment analysis (DEA) and its extensions, the study demonstrates the applicability of these methods to evaluate the effectiveness of football clubs. The results provide insight into the factors influencing efficiency and explain why certain clubs are more or less efficient.

Using the same method, [Neykov et al. \(2021\)](#) highlighted the key factors that influence variations in the efficiency scores of forest enterprises in Bulgaria and Slovakia, emphasizing that improvements made by companies

in forest management practices and investments in research and development activities are important strategies that promote sustainability and growth of the economic efficiency of forest enterprises in both countries.

To analyse the economic efficiency of companies, the specialised literature has shown that different methods can be used. For example, [Ovcharenko and Bessonova \(2016\)](#) chose to use the company rating method for Russian industrial companies in the period 2010-2013, having a number of advantages such as saving time, gaining informational content, and the applicability of the rating results to the management of the productive capacity of a company. The results show that the enterprises involved in the extraction of minerals were positioned as the most efficient. However, the trend is downward. Similarly, [Bartolacci et al. \(2019\)](#) analysed economic efficiency using ranking methods, thus integrating the economic and environmental perspectives of companies active in solid waste management in Italy.

3. Research methodology

Analysing the specialised literature, the proposed research methodology aims to practically analyse, through the lens of some financial indicators, the economic efficiency of the company Nuclearelectrica SA, listed on the Bucharest Stock Exchange, for the period 2018-2022. Thus, in order to practically illustrate the economic efficiency of companies, the following indicators will be calculated, organised as follows:

Level and structure indicators of efficiency

1. Turnover
2. Equity
3. The result of the exercise
4. Working capital
5. The working capital requirement
6. Net treasury
7. Liquidity
8. Solvency
9. Degree of indebtedness
10. The speed of rotation of current assets

Performance indicators

1. Economic profitability
2. Financial profitability
3. Financial risk

Figure 1. Indicators of economic efficiency at the enterprise level

Source: Adapted from [Anghel and Treapăt \(2016\)](#) and [Achim \(2017\)](#).

The main objective of this article is to analyse the economic efficiency of an enterprise in the energy industry. Thus, to achieve this objective, it started from the overall picture and the role that this industry has in satisfying the needs of consumers (household and non-household) and the needs of investors in an energy company (obtaining dividends).

Moving further, from the macroeconomic level to the microeconomic level, we believe it is extremely important to understand how companies in the energy industry use their resources to produce the cleanest

possible energy, while also being extremely important to observe the economic efficiency that they have. The importance of the research presented in this paper is justified not only by the influential role of the energy sector in the national economy (an internal factor), but also by external political and economic circumstances, thus providing a macroeconomic framework for the energy sector and its evolution.

4. Results of the research

4.1. Macroeconomic analysis of electricity price

Both at the level of the European Union and at the level of Romania, electricity prices were particularly affected by the COVID-19 crisis and the war between Ukraine and Russia, thus affecting demand and supply for both household and non-household consumers.

Figures 2 and 3 below show the evolution of electricity prices in Romania and the European Union from the second semester of 2018 (2018-S2) to the first semester of 2023 (2023-S1) for both household and non-household consumers. For household users, it can be observed that electricity prices in Romania experienced a constant increase from 0.096 Euro/kWh in 2018-S2 to 0.337 Euro/kWh in 2022-S2. In comparison, prices in the European Union fluctuated more moderately, starting at 0.133 Euro/kWh in 2018-S2 and reaching a peak of 0.240 Euro/kWh in 2022-S1, followed by a slight decrease in 2023-S1 to 0.234 Euro/kWh.

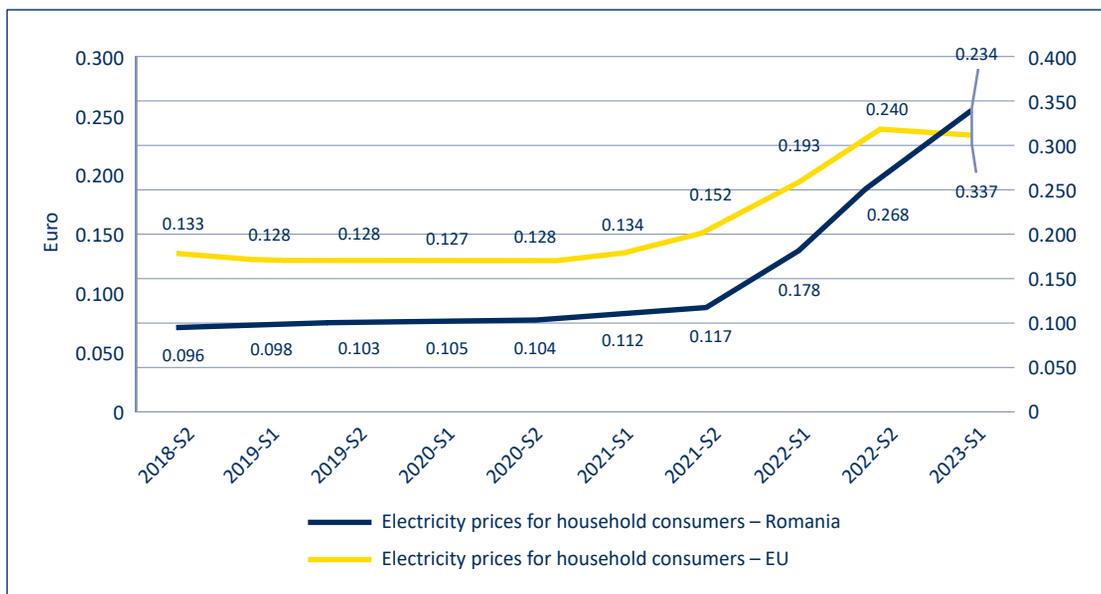


Figure 2. Evolution of electricity prices for household consumers

Source: Eurostat (nrg_pc_205 and nrg_pc_204).

On the other hand, for non-household consumers in Romania, a significant price variation is observed, from 0.073 Euro/kWh in the second semester of 2018 to 0.340 Euro/kWh in the first semester of 2023, thus noticing an increase of 4.62 times from 2018-S2 to 2023-S1. The analysis of the prices for non-household consumers in the European Union had a more moderate evolution, starting from 0.078 Euro/kWh in 2018-S2 and reaching 0.189 Euro/kWh in 2023-S1, observing, however, an increase of 2.41 times in 2023-S1 compared to 2018-S2.

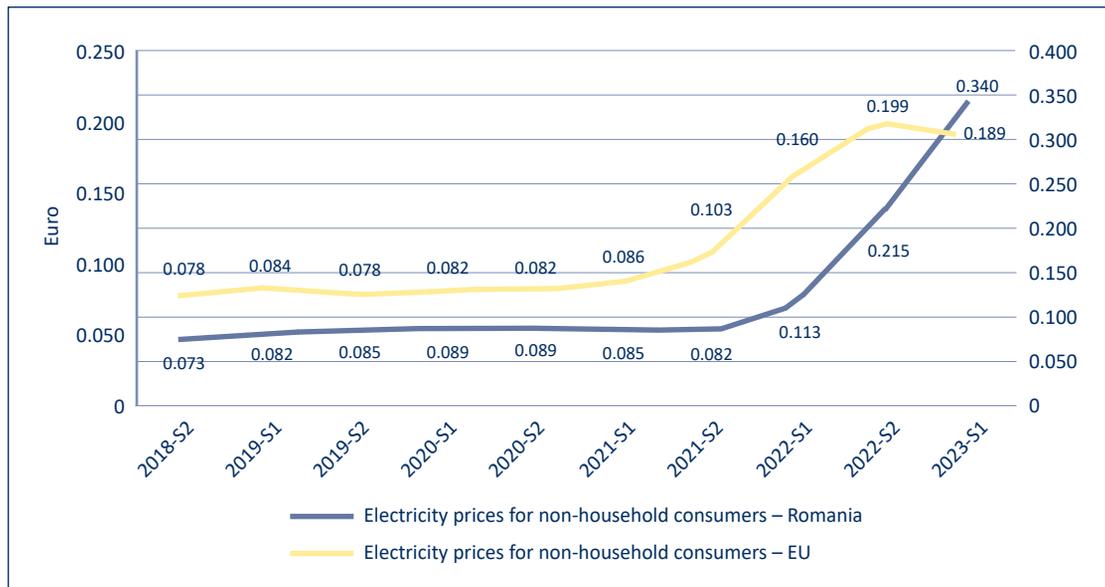


Figure 3. Evolution of electricity prices for non-household consumers

Source: Eurostat (nrg_pc_205 and nrg_pc_204).

4.2. Microeconomic analysis of the economic efficiency of Nuclearelectrica SA

Based on the balance sheet and profit and loss account of the company SN Nuclearelectrica SA, which operates in the energy sector in Romania, the indicators mentioned in the previous section for the period 2018-2022 will be calculated and interpreted. Thus, according to the data available in the company's annual reports presented on the website of the Bucharest Stock Exchange, we summarise the main elements from the balance sheet of Nuclearelectrica SA and the profit and loss account in order to develop our analysis in Table 1.

The data presented in Table 1 provide information on the main indicators of the Nuclearelectrica SA company, and among those presented, three indicators refer to economic efficiency. Equity increased significantly from 7,179,130,612 Lei in 2018 to 10,535,504,870 Lei in 2022, which implies substantial investments and the accumulation of profits from previous years. At the same time, the turnover increased significantly, rising from 2,178,668,011 Lei in 2018 to 6,366,542,655 Lei in 2022. The observed increase is due to the expansion of the economic activity of the entity, which obtains significant revenues from electricity sales. This increase in turnover is not at all surprising considering the electricity trading tariffs recorded at the end of 2021 (0.178 Euro/kWh for household consumers and 0.082 Euro/kWh for non-household consumers) compared to electricity prices at the end of 2022 (0.268 Euro/kWh for household consumers and 0.215 Euro/kWh for non-household ones), while operating expenses had a slower growth rate compared to that of revenues.

In addition, the profitability represented by the profit of the period also suggests a solid financial performance, increasing from 410,611,215 Lei in 2018 to 2,764,423,452 Lei in 2023. This indicator suggests increased efficiency in the management of expenses and growing profitability of the activities carried out.

Table 1. The main elements of the balance sheet and profit and loss account, in Lei

Element	2018	2019	2020	2021	2022
Tangible fixed assets	6,364,461,135	6,056,697,319	5,794,727,840	5,853,337,904	5,737,295,053
Intangible assets	54,834,052	60,760,656	53,470,674	48,391,975	50,773,837

Element	2018	2019	2020	2021	2022
Total fixed assets	6,671,435,847	6,301,960,107	5,995,541,879	6,110,845,076	6,049,279,168
Total current assets	2,194,769,056	2,508,893,666	2,848,927,551	3,514,280,287	5,743,493,184
Total assets	8,866,204,903	8,810,853,773	8,844,469,430	9,625,125,363	11,792,772,352
Reported result	3,658,054,141	3,843,269,056	4,055,915,983	4,648,549,459	6,876,165,858
Total equity	7,179,130,612	7,334,934,061	7,519,685,250	8,365,261,328	10,535,504,870
Total current liabilities	564,204,183	539,762,835	602,683,678	662,300,339	800,505,403
Total debts	1,687,074,291	1,475,919,712	1,324,784,180	1,259,864,035	1,257,267,482
Total equity and liabilities	8,866,204,903	8,810,853,773	8,844,469,430	9,625,125,363	11,792,772,352
Turnover	2,178,668,011	2,365,563,574	2,432,279,475	3,116,639,354	6,366,542,655
Total operating income	2,228,873,435	2,429,641,778	2,513,896,501	3,203,879,896	6,534,010,362
Total operating expenses	-1,642,333,345	-1,788,007,389	-1,728,780,035	-2,024,399,828	-3,548,002,492
Operating profit	536,540,090	629,425,763	771,391,918	1,179,480,068	2,986,007,870
Net financial result	36,083,184	1,849,945	44,016,697	24,613,234	206,489,041
Profit before income tax	572,623,274	631,275,708	815,408,615	1,204,093,302	3,192,496,911
Income tax expense, net	-162,012,059	-95,608,444	-116,086,386	-167,831,676	-428,073,459
Profit for the period	410,611,215	535,667,264	699,322,229	1,036,261,626	2,764,423,452

Source: Nuclearelectrica SA annual reports, available at www.bvb.ro.

Continuing our analysis of economic efficiency, the next set of indicators analysed are working capital, working capital requirement and net treasury. Working capital is an indicator that expresses the long-term financial balance of a company, highlighting the surplus of resources relative to a company's own capital (Gomoi, 2023a). The working capital requirement is an indicator that shows the resources that need to be consumed at the level of the operating cycle that are not financed from long-term debts (Mateş, 2022). Net treasury is calculated as the difference between the two indicators mentioned above.

Table 2. Working capital, working capital requirement and net treasury, in Lei

Elements	2018	2019	2020	2021	2022
Working capital	507,694,765	1,032,973,954	1,524,143,371	2,254,416,252	4,486,225,702
Working capital required	355,329,110	354,925,916	310,589,765	494,697,045	646,424,006
Net treasury	152,365,655	678,048,038	1,213,553,606	1,759,719,207	3,839,801,696

Source: Calculated based on Nuclearelectrica SA annual reports, available at www.bvb.ro.

Table 2 shows the indicators calculated based on the balance sheet elements and refers to working capital, working capital requirement and net treasury. The working capital of the Nuclearelectrica SA company expanded significantly, increasing from 507,694,765 Lei in 2018 to 4,486,225,702 Lei in 2022, registering an increase of 8.84 times compared to 2018. Working capital requirements decreased from 355,329,110 Lei in 2018 to 310,589,765 Lei in 2020, before increasing to 646,424,006 Lei, the recorded increase being only 1.82 times higher compared to the first year of analysis. On the other hand, the net treasury registers a substantial increase in the year 2022, being 25.2 times higher in the year 2022 compared to the year 2018. The trends recorded by the three indicators prove that the financial situation of the company is strong, indicating an expanded capacity to manage current activities and a healthy financial position.

Analysing the following set of indicators of level and structure of efficiency, we notice that during the analysed period, immediate liquidity, which represents the extent to which a company can cover short-term debts from available assets and registered receivables (Gomoi, 2023a and Mateş, 2022) of the company, has grown steadily, rising from 324% in 2018 to 636% in 2022. This growth trend indicates an improvement in Nuclearelectrica SA’s ability to meet its short-term financial obligations. Similarly, current liquidity has enjoyed constant growth, rising from 389% in 2018 to 717% in 2022. Current liquidity shows the company’s ability to cover current liabilities from current assets (Mateş, 2022), thus promoting a favourable position for the analysed company.

The solvency of the company shows the degree to which the debts held by Nuclearelectrica SA can be covered from the total assets held (Mateş, 2022). Analysing this indicator, we notice that it has increased significantly, rising from 526% in the year 2018 to 938% in the year 2022. The recorded trend indicates an improvement in Nuclearelectrica SA’s ability to cover the debts that it has.

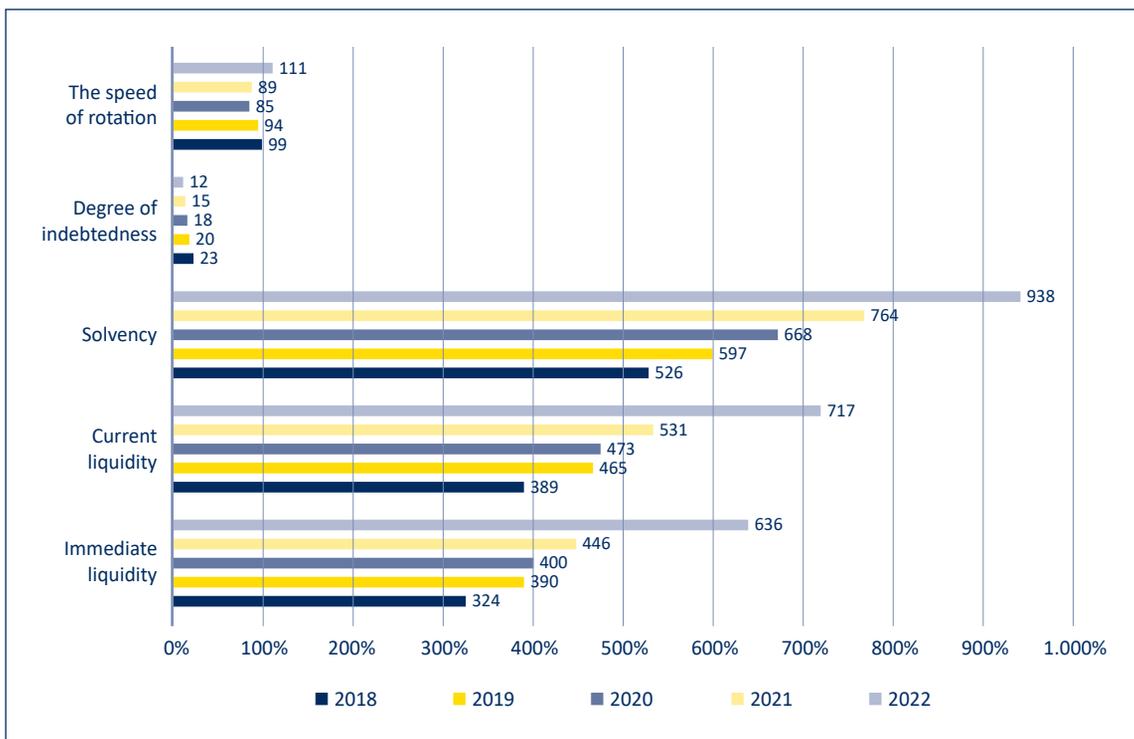


Figure 4. Evolution of the level and structure indicators of efficiency, expressed as a percentage

Sursa: Calculated based on Nuclearelectrica SA annual reports, available at www.bvb.ro.

The overall debt-to-equity ratio, calculated as the ratio of total debt to equity, has steadily decreased from 23% in 2018 to 12% in 2022, indicating a return of debt to equity and a stronger financial situation, thus having a very good degree of appreciation. The turnover rate of current assets shows the efficiency of the use of resources in order to obtain profit (Anghel and Treapăt, 2016), and we observe a slight change, increasing to 111% in the year 2022, indicating a better management of assets and an increased activity also due to the increase in electricity prices.

Analysing the performance indicators of the company Nuclearelectrica SA, we chose to analyse the economic return, financial return and financial risk. Return generally refers to the ability of a business to make a profit following the activity carried out.

Table 3. Return and financial risk, expressed as a percentage

Element	2018	2019	2020	2021	2022
Return on assets	4.63	6.08	7.91	10.77	23.44
Return on equity	5.72	7.30	9.30	12.39	26.24
Financial risk	9.12	9.61	19.04	32.39	94.23

Sursa: Calculated based on Nuclearelectrica SA annual reports, available at www.bvb.ro.

In the specialised literature, the economic return (return on assets – ROA) is calculated as the ratio between the net profit obtained divided by its total assets (Gomoi, 2023b). We observe that the return on assets is constantly increasing every year, in the year 2022 having a huge increase reaching 23.44% of the total assets. On the other hand, the financial return (return on equity – ROE) also plays an extremely important role, showing the ability of a company to generate profit with the help of its own capital (Gomoi, 2023b). In the case of Nuclearelectrica SA, a growth trend similar to that of the return on assets is recorded, reaching 26.24% in 2022. At the same time, financial risk refers to the ability of a company to cover the interest on the loans it has engaged (Anghel and Treapăt, 2016), observing in the analysis a positive trend of increasing this capacity.

5. Conclusions

The present study evaluated the economic efficiency of the Nuclearelectrica company in the period 2018-2022, starting from the macroeconomic level toward the microeconomic level. Thus, in the macroeconomic analysis card, the evolutions of electricity prices in Romania and the European Union were analysed, based on the data presented by Eurostat for the period 2018-2023. The analysis at the enterprise level was done by calculating and interpreting some level and structure indicators, as well as some key performance indicators, the information being taken from the annual reports of the Nuclearelectrica SA company available on the Bucharest Stock Exchange.

The evolution of electricity prices in Romania and the European Union, mainly caused by the COVID-19 crisis and geopolitical tensions, especially the war between Russia and Ukraine, generated significant increases for both household and non-household consumers. In Romania, for example, prices for household consumers rose steadily, reaching 0.337 Euro/kWh in 2022-S2, while in the EU, the fluctuations were more moderate, reaching 0.240 Euro/kWh in 2022-S1.

The Nuclearelectrica SA company recorded a solid financial evolution, highlighting a significant increase in equity, growth supported by the expansion of economic activity. The turnover also registered an increase, reaching 6,366,542,655 Lei in 2022, with an economic return of 23.44% and a financial return of 26.24%.

This study has theoretical implications, contributes to the specialised literature from the perspective of analysing the economic efficiency of an enterprise, and managerial implications, providing a clearer perspective to investors and other stakeholders regarding the economic efficiency of companies in the energy industry.

At the same time, the study has some limitations. First, the sample used is narrow, taking the case of a single company. Future research could look at a range of companies in the energy industry, providing a clearer perspective. Additionally, the study refers to a single country. Future research could look at companies from multiple countries, thus analysing their economic efficiency by region, thus broadening the horizons of stakeholders.

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